

MANAGEMENTS' DILEMMA

IN DESIGNING AN EFFECTIVE QUALITY ASSURANCE SYSTEM

WHY DEMING?  
WHY JURAN?  
WHY NOT ISHIKAWA?  
WHY NOT CROSBY?  
WHY NOT CAPLAN?

THE EVALUATION AND SELECTION OF THE PHILOSOPHIES OF  
THESE QUALITY PROPHETS AND THE INTEGRATION OF THE  
SELECTED ONES INTO THE MANAGEMENT SYSTEM OF A COMPANY

COMPILED BY : P.W. ESTERHUYSEN - B.Sc. (ENG)  
- MBL HON.ENG IND (Q.A.)  
- M.ENG IND (Q.A.)  
- (ASQC) CQE.

E. LEWIS - (ASQC) CQT, CQE.

R. EDYE - (ASQC) CQE.

## CONTENT

1. PREFACE
2. THE PHILOSOPHIES OF THE VARIOUS PROPHETS
  - 2.1 Dr. WE Deming
    - 2.1.1 The man
    - 2.1.2 The philosophies
    - 2.1.3 Discussion on the philosophies
  - 2.2 Dr. JM Juran
    - 2.2.1 The man
    - 2.2.2 The philosophies
    - 2.2.3 Discussion on the philosophies
  - 2.3 Dr. K Ishikawa
    - 2.3.1 The man
    - 2.3.2 The philosophies
    - 2.3.3 Discussion on the philosophies
  - 2.4 Mr. P Crosby
    - 2.4.1 The man
    - 2.4.2 The philosophies
    - 2.4.3 Discussion on the philosophies
  - 2.5 Mr. F Caplan
    - 2.5.1 The man
    - 2.5.2 The philosophies
    - 2.5.3 Discussion on the philosophies

3. SELECTION OF THE PHILOSOPHIES AND THE INTEGRATION THEREOF  
INTO THE COMPANY'S SYSTEMS

3.1 Selection and integrated framework

3.2 Selection of the philosophies and underlying principles  
for a company

3.2.1 Companies are driven by a corporate culture

3.2.2 The value basis for establishing the set of  
philosophies for the company

3.3 The flow of systems and information through the  
organisation

3.4 The hierarchy of systems

3.5 The relation between the systems' hierarchy and the  
Policy-procedure breakdown

4. CONCLUSION

## 1. PREFACE

It is the age of ever increasing demands from endusers of product and service for improved quality, reliability and maintainability.

It is commonly accepted that this can only be achieved with the correct management philosophy, principles and strategies. There are various people all over the world which will be called prophets promoting certain philosophies. There are many success stories but also a lot of failures.

By taking a view on the South African scene, it becomes evident that corporations and companies have opted for different philosophies. As everybody will appreciate, this is an important decision because implementing any new philosophy is a major exercise that takes years to do.

To select a philosophy to get the best dividends and to achieve optimal reliability and maintainability has become a dilemma for management. All the prophets and their agents will claim that their philosophies are the best or that best results can be achieved.

This paper discusses very shortly the various philosophies and also how to make the selections.

Furthermore, the importance of integrating such quality philosophy into the companies' values and other management philosophies will briefly be discussed.

DR. DEMING

Dr. Deming was born 14 October 1900 in the State Iowa, USA.

He started his studies in 1917 and spent several years studying and lecturing at various universities. Contrary to general belief, Dr. Deming did no formal studies in statistics. His personal training was in mathematics and physics. Dr. Deming became interested in the theory of errors and trained himself in statistics.

He started a career with the US Department of Agriculture in 1929 as mathematical physicist. He became involved with work from a Dr. Neynam. This theory was applied for Government census based on sampling. Dr. Deming worked with the Bureau of Census from 1939 to 1946.

In 1946 he started as consultant in Statistical Studies and as full time professor in the Graduate School of Business Administration at the New York University. He retired as professor in 1975.

Dr. Deming's involvement with Japan started in 1946. During interactions with the Japanese statisticians he explained to them that they could revive their economy by applying statistical methods. In June 1950 he started training various groups of engineers and statisticians in statistical methods. Based on his experience in the USA, he realised that it was necessary to get top management involved. 45 top industrialists were invited to a meeting in the Industry checks by Mr. Ichiro Ishikawa, President of JUSE. All 45 attended and that was the starting point of the Japanese industrial revolution.

A little known fact is that Dr. Deming was involved in introducing statistical techniques into the American industry in the forties. Several brilliant successes had been achieved. But the whole programme collapsed. In retrospect, Dr. Deming said it was due to lack of top management involvement. In Japan, top management in fact started the application of statistics.

Dr. Deming achieved several national and international awards and the rest of his success story is fairly well known.

The factor of concern was what had happened to Dr. Deming after

experience.

This frustration with the American management and the theories and techniques for success on the other hand in my mind, forms the basis of Dr. Deming's philosophies.

So what are the Deming philosophies?

(a) The first Deming philosophy

The philosophy of continual improvement of product and service. Quality of product and service should be the company's underlying primary goal for improvement of productivity and assuring the company's existence and thereby provide continuity of employment for his workers.

It also takes into account the need to eliminate the obstacles that stand in the way of increasing quality and productivity which management policies in the USA have erected and promulgated. Management should strive for achieving lower cost and higher quality.

This philosophy is built around the Deming Cycle:

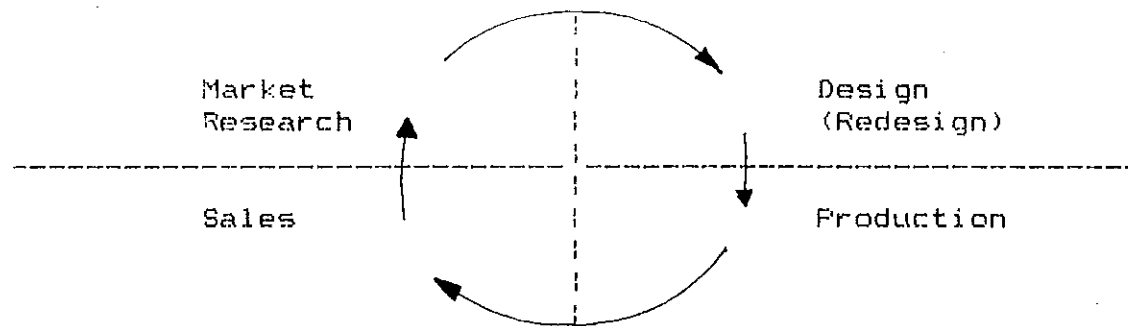


FIGURE 1 : DEMING'S CYCLE

(b) The second Deming philosophy

The philosophy of division of responsibility between the workers and management. There is a natural division of labour between the manager and the workers. The workers are responsible for doing work within the system. The manager is responsible for improving the system which can

must have a way of learning:

- (1) Which parts of the problems are due to the workers and
- (2) which parts are due to the system.

Deming understood that this can happen only if two circumstances are fulfilled:

- The worker and the management can speak the same language.
- The management uses the workers as essential 'instruments' in understanding what is happening at the place where the work is done.

An important part of Shewhart's contribution is that local sources of trouble must be eliminated, allowing a process to remain in statistical control, before innovations leading to improved productivity can be achieved. When there are inordinately large deviations from normal operation of a system because of the unexplained local causes, it is impossible to evaluate the effects of changes in design, training, purchasing policy, etc., made in the system by management. This implication and, in fact, the whole concept of statistical process control made a profound impact on W. Edwards Deming.

(c) The third Deming philosophy

The philosophy of utilisation of statistics as the language of communication between the workers and management.

And what is that language? It is the language of statistics. Deming, an established and esteemed statistician understood this immediately. We all use statistics every day.

Uncontrolled variations in a factory or other places of work lead to low productivity, poor quality and increased need for capital equipment for high rates of production. If the management is to control the variation, there is no escape from learning how to use statistics. Furthermore, if the co-operation of the workers is to be obtained, they too must learn the language of statistics.

metal disk being turned out by a particular manufacturing process. One can thereby create a series of pictures that show fluctuations in the process and can then use the pictures as a tool to determine when the system is out of statistical control and exhibiting more than simple random variation. One of the uses of this kind of feedback is in identifying local sources of trouble, such as, for example, individual workers who may, perhaps, need more training or particular machines or times of week.

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(d) The fourth Deming philosophy

The Deming philosophy is encapsulated in his fourteen cardinal points. The author's opinion is that the first three philosophies mentioned above are however not stated explicitly enough in the fourteen points. Furthermore, the fourteen points can be summarised into two main sub-philosophies as follows:

- (i) A certain management value system and approach for managing a company is required. (Deming's points 1 - 5 and 14).
- (ii) The worker is the most important asset of a company in attaining excellence in quality. This fact requires specific management actions in supporting the worker. (Dr. Deming's points 6 -13).

The Deming Philosophy is encapsulated in the following fourteen cardinal points:

01 Create constancy of purpose towards improving products



manufacturing and purchasing functions.

- 04 Reduce the number of suppliers for the same item by eliminating those that do not qualify with statistical evidence of quality. End the practice of awarding business solely on the basis of price.
- 05 Search continually for problems in the system to constantly improve processes.
- 06 Institute modern methods of training to make better use of all employees.
- 07 Focus supervision on helping people do a better job. Ensure that immediate action is taken on reports of defects, maintenance requirements, poor tools, inadequate operating definitions, or other conditions detrimental to quality.
- 08 Encourage effective two-way communication and other means to drive out fear throughout the organisation and help people work more productively.
- 09 Break down barriers between departments by encouraging problem solving through teamwork, combining the efforts of people from different areas such as research, design, sales and production.
- 10 Eliminate the use of numerical goals, posters, and slogans for the work force that ask for new levels of productivity without providing methods.
- 11 Use statistical methods for continuing improvement of quality and productivity without providing methods.
- 12 Use statistical methods for continuing improvement of quality and productivity, and eliminate work standards that prescribe numerical quotas.
- 13 Remove all barriers that inhibit the worker's right to pride of workmanship.
- 14 Management must promote all the above 13 points.

#### DISCUSSION ON THE DEMING PHILOSOPHIES

is the author's conclusion that the Japanese Management practices and styles that Deming had observed, has influenced Deming's thinking and is contained in Deming's fourteen points. Deming's philosophy is primarily aimed at the USA, but is just as applicable to all other Western countries and the Republic of South Africa.

The Deming Philosophy is in the first instance a Management Philosophy. Management's emphasis should be on the continual improvement of the product and service. The client and his satisfaction should be management's and every employee's prime concern.

To achieve this need, a certain approach and management attitude, as represented by the first five of Dr. Deming's fourteen points, should be maintained. Furthermore, it also requires certain management styles to support the worker who is regarded by Dr. Deming as the most important asset.

The proper application of statistical theory based on the Shewhart model, provides the roadways and techniques to attain the ever increasing quality of product and service.

The simplicity of the Deming philosophy is astounding. It may be summarised as follows:

Every process has variation. By applying statistical techniques based on the Shewhart mode, it is possible to establish whether the variation is natural and caused by natural causes of variation. Unnatural variation is due to assignable causes.

The quality of product and service can be greatly improved by eliminating the assignable causes and by reducing the variation of the process.

In this process of reducing and controlling the variation both the worker and management have their own respective responsibilities. Management must improve the system and eliminate the assignable causes of variations. The worker is in direct contact with the process. When properly trained and with the correct equipment, he plays a vital role in detecting out of control variation and whether his personsability take corrective measures or report deviations to management for action.

Management should set the objective of continual improvement of product and service with a long term view of customer

nine points).

Although the Deming philosophy may be logic and simple, it is not easy to apply. For the Japanese manager, it came natural, but for the Western way of thinking management, it is not easy. WHY? Because it is necessary to get rid of long establishment cultures, beliefs and ways of doing things.

Various companies have proved that it is possible. Unbelievable results have been achieved.

## THE PROFESSIONAL - JOSEPH M. JURAN

JM Juran has since 1924 pursued a varied career in management as engineer, industrial executive, government administrator, university professor, impartial labour arbitrator, corporate director and management consultant. This career has been marked by a search for the underlying principles which are common to all managerial activity. Applied to the specialty of managing for quality, this search has produced the leading international reference literature and the leading international training courses, training books and video cassettes:

QUALITY CONTROL HANDBOOK (Third Edition 1974) is the international standard reference work on the subject, with a cumulative printing of over 250 000 copies.

QUALITY PLANNING AND ANALYSIS (with FM Gryna, Jr.), Second Edition 1980, is the leading textbook at the engineering level.

MANAGEMENT OF QUALITY (Fourth Edition 1981) is the notes for the course Management of Quality. It has been conducted over 300 times in over 30 countries on all continents, and has provided a training input to over 20 000 managers and specialists.

Collectively, these books have been translated into 13 languages: Chinese, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese, Romanian, Russian, Serbo-Croatian and Spanish.

Dr. Juran's most recent publication is JURAN ON QUALITY IMPROVEMENT. It is a series of 16 colour video cassettes plus related training manuals on the subject of annual quality improvement and cost reduction. By the end of the first year of publication this series will have brought the concept of annual quality improvement and cost reduction to over 30 000 managers and specialists.

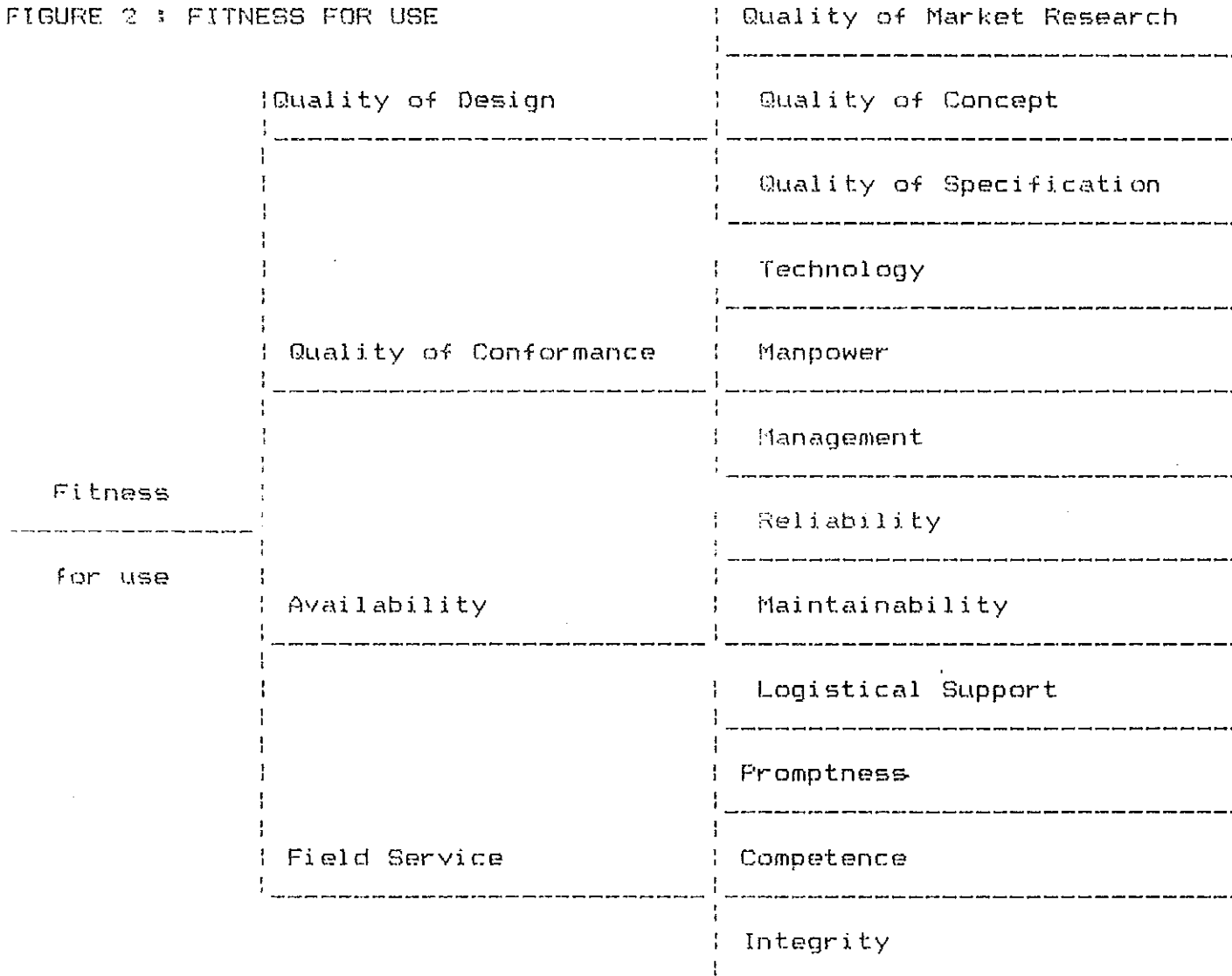
In the field of general management, Dr. Juran's book MANAGERIAL BREAKTHROUGH, generalises the principles of creating beneficial change (breakthrough) and of preventing adverse change (control). His book THE CORPORATE DIRECTOR (with JK Loudon) generalises the work of the Board of Directors. His book UPPER MANAGEMENT AND QUALITY (Fourth Edition, 1982), is the pioneering training manual on that subject. Beyond his 11 published books, he has authored hundreds of published papers.

(a) Juran's first philosophy

Fitness for use and the quality spiral

Dr. Juran defines quality as "Fitness for use". All the involving factors are the best explained by the following diagram:

FIGURE 2 : FITNESS FOR USE



DR. JURAN'S SPIRAL CAN BE BEST ILLUSTRATED BY THE FOLLOWING FIGURE

This collection of activities as depicted in the above two diagrams is conveniently called Quality Function.

(b) Juran's second philosophy

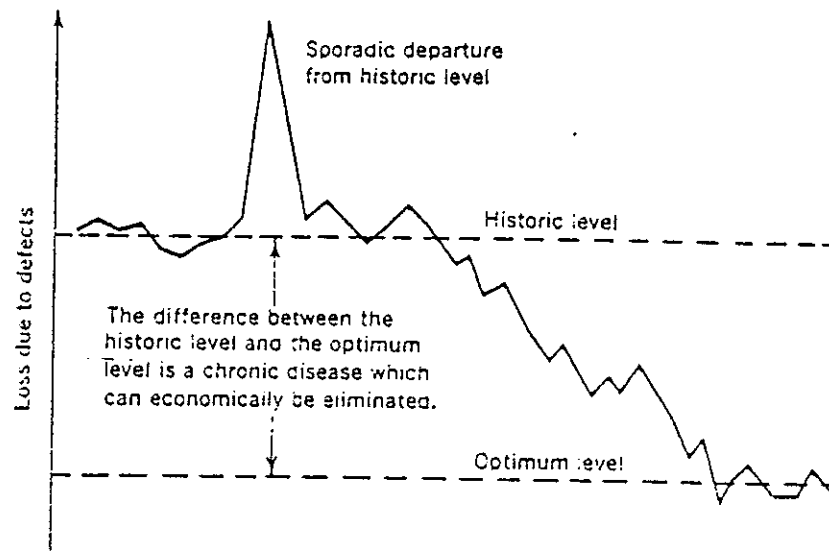
The philosophy of Management Breakthrough. Control means staying on course, adherence to standard, prevention of change. Under complete control nothing would change.

Breakthrough means change, a dynamic movement to new higher levels of performance. Breakthrough is the creation of good changes, whereas control is the prevention of bad changes. Each is necessary for survival and health of the company.

It is necessary in a company that breakthrough and control should be part of one continuing cycle of events.

This can be depicted by:

FIGURE 4 -- INTERRELATION OF BREAKTHROUGH AND CONTROL



Dr. Juran and others found in extensive analysis that more than 80% of defects of product and service are management controllable. In other words less than 20% of defects can be attributed to operator controllable mistakes.

(d) Juran's fourth philosophy

The philosophy of self-control. Creating a state of self-control for a human being requires that we meet several essential criteria. People must be provided with the means for:

- Knowing what they are supposed to do
- Knowing what they are actually doing
- Taking regulatory action

The relationship between Juran's fourth philosophy and the third philosophy is the following:

- A defect is operator-controllable if all three criteria for self-control have been met
- A defect is management-controllable if any one or more of the criteria for self-control have not been met

(e) The fifth philosophy of Juran

The philosophy of Quality Assurance

The term "Quality Assurance" as used here has a meaning similar to the word "insurance". In both cases there is a payment of a relatively small amount to secure protection against disaster. "Insurance" provides this protection in the form of payment of a large sum after the disaster has occurred. "Quality Assurance" is intended to provide the protection before the disaster through early warnings of trouble ahead. These early warnings take to major forms:

1. Quality audits
2. Managerial reports

in various circles.

Perhaps the greatest contribution from Dr. Juran comes from his concept of the quality spiral. With the spiral concept, Dr. Juran emphasises the fact that quality of product and service can only be achieved if it is addressed in all the stages of the product life cycle from market research right through to service and support of the product in the hands of the customer. This approach involves all departments in a company and everybody has a contribution to make. (It is interesting to note that Dr. Deming promoted the same idea in his book "Elementary principles of the statistical control of Quality" (JUSE, 1951), in what he called the helix. This was based on four steps: design; make it and test it; marketing and test in service. It is unnecessary to become involved in the argument who was first. The matter of the fact is that Dr. Juran made this concept of the spiral popular).

Most of the works of Dr. Juran is based on the concepts of the Quality Spiral. He expands on the various stages of the product life cycle. He explains the quality activities that should be executed during each phase. He discusses various principles and gives some useful techniques to enhance quality.

It is all very logical and useful. It must be the reason why the Quality Handbook edited by Dr. Juran, has become the standard reference book in the field of Quality Assurance.

The philosophy of Management Breakthrough is based on the observation that when a process, a company is running at a certain level of performance, it is only management with their intervention and correct actions that can improve the level of performance. Dr. Juran supports this philosophy with principles and techniques like the Pareto Analysis, Steering Arm and Diagnostic Arm.

It is interesting to note that Dr. Juran is very active in recent years doing consulting work - the emphasis on Quality Improvement. It is largely based on the concepts of the Quality Spiral and Management Breakthroughs.

The third philosophy of Dr. Juran is today widely accepted and is very often mentioned in management circles. More than eighty percent of quality and productivity problems is management controllable. Thus management has the bulk of the responsibility



philosophy of self control is one of very significant implications and consequences. The optimum for any company to strive for is that everybody from top management right down to the lowest level worker, should be in self control. Under these circumstances very little control measures, through inspection or other means, would be necessary. Management should spend most of their time to work towards achieving the preconditions of self control every worker and sublevels of management.

The Juran philosophy of Quality Assurance is not as involved and all encompassing as for instance Dr. Ishikawa's view. Basically Dr. Juran here speaks of providing protection before disaster occurs through quality audits and managerial reports. It is in other words a monitoring function to have the fingertips on the pulse of the company all the time. If the starting of deviations are detected, corrective action can be taken early enough to prevent major disasters.

## THE PROFESSIONAL DR. KAORU ISHIKAWA

### WHO IS HE?

Dr. Ishikawa was born in 1915 into the family of a prominent industrialist (his father was later to become the first president of the powerful Keidanren, or Federation of Economic Associations). Dr. Ishikawa graduated from Tokyo University in 1939 with a degree in applied chemistry. As a professor of engineering at his alma mater, he discovered the importance of statistical methods. In 1949 he became closely connected with the promotion of quality control. Since that time, he has helped many Japanese companies attain their present prominence through the application of QC. His life and the history of QC in Japan are separable. Currently, Dr. Ishikawa is president of Musashi Institute of Technology and is the most sought after QC consultant in Japan. He has also heeded the calls of a number of major companies, including most recently Ford Motor company.

In 1947 he returned to the University of Tokyo. Whenever he conducted experiments in his laboratory, however, he was faced with the problem of widely scattered data, which made it impossible to reach correct conclusions. So he began studying statistical methods in 1948.

In 1949, he heard that the Union of Japanese Scientists and Engineers (JUSE) had materials on statistical methods, and went there asking to see them. There a Mr. Kennichi Koyanagi, senior managing director of JUSE, insisted that unless he joined the QC research group and became one of its instructors, he could not agree to him using their materials. So Dr. Ishikawa became involved in statistics.

Dr. Ishikawa has become a well-known Quality prophet in Japan and the best.

He has helped China as well.

more correct to talk about the "Japanese Philosophy." On the other hand, this is also typically Japanese. Dr. Ishikawa will not claim philosophies for himself. He prefers to write about the Japanese. Therefore, in the rest of the paragraph, if it is written the Ishikawa philosophy, accept it also as the Japanese philosophy in general.

#### The first Ishikawa philosophy

The philosophy must be strictly adhered to during the stages in which new products are being developed. If defective products are produced at different stages of manufacture, even strict inspection cannot eliminate them. If the factors that cause defects are controlled from the beginning a large saving can be realised. This is the first phase. This is an important factor. One cannot be successful in controlling the manufacturing process with no regard to design, product reliability, safety and faulty material.

Total involvement means that all divisions of a given company and all of its employees must participate in quality control. Participation must become company-wide. This is the second phase. In the third phase the marketing division plays a significant role, because they are the contact with the customer. The true need of the customer must be determined. Ultimately the implementation of quality assurance at the earliest stages of product development must take place.

The philosophy of total involvement in Quality Assurance is thus the convergence of the quality assurance in the earliest stages of development and the company-wide participation in quality control.

#### The second Ishikawa philosophy

The philosophy of paying employees on seniority and ranks (not on merit). This is the document procedure in Japan. The justification for the merit pay scheme is the notion that people can be made to work for money.

The system of payment of seniority and ranking has a number of problems like the increase in life expectancy.

Joy, desire and pleasure have many different dimensions but it more important than working for money.

companies stress education and training, especially QC education. If employees are well-educated and well trained, that fact alone can benefit both the employees and the company immensely. In the United States and Western Europe, I understand that it is very difficult to implement the same type of education and training given by Japanese companies.

The fourth Ishikawa philosophy

The philosophy of extensive training of the Japanese worker

The Japanese people are very interested in education and the use of "kanji" (the Japanese writing scripts) may be in part responsible for this interest. Parents and society both have a good understanding of the importance of education and school attendance.

I have been repeating this frequently: "Quality control begins with education and ends with education." "To promote QC with participation by all, QC education must be given to all employees, from the President to assembly line workers." "QC is a thought revolution in management, therefore the thought processes of all employees must be changed. To accomplish this, education must be repeated over and over again".

The fifth Ishikawa philosophy

The philosophy of dependence on and keeping good relationships with vendors.

The average Japanese company is purchasing approximately 70 percent of its materials from outside supply.

If the parts purchased were defective, no matter how hard the final assembler worked, good products would not emerge. Knowing this, we began QC education among sub-contractors in the late 1950's. We also attempted to make these sub-contractors specialists in their own fields. Today, Japan's automobiles and electronics are considered to be the best in the world. This is due in part to the excellence of their parts suppliers.

The sixth Ishikawa philosophy

The philosophy of Democratisation of Capital

in the United States are, in the final analysis, caused by this inability to solve long term problems.

The seventh Ishikawa philosophy

The philosophy of Total Quality Control (TQC).

TQC stands on two legs:

- a. Quality Control and
- b. Quality Assurance

Quality Control:

Dr. Ishikawa's definition of quality control is the following:

"To practice quality control is to develop, design, produce and service a quality product which is most economical, most useful, and always satisfactory to the consumer."

To meet this goal, everyone in the company must participate in and promote quality control, including top executives, all divisions within the company, and all employees. It involves everybody right through the chain from raw material supplier.

The eighth Ishikawa philosophy

The philosophy: Total Quality Control (TQC) is a thought revolution in Management.

To associate revitalisation of industry with a thought revolution in management may sound somewhat excessive. But the expression represented the goal to which Dr. Ishikawa aspired. Many companies had transformed themselves after applying QC. The manner in which they were transformed may be classified in the following six categories:

1. Quality first - not short-term profit first
2. Consumer orientation - not producer orientation. Think from the standpoint of the other party
3. The next process is your customer - breaking down the barrier of sectionalism

## The philosophy of Quality Control Circles (QC-Circles)

It was difficult to educate engineers and staff members through various seminars and conferences, but there were simply too many foremen and group leaders to handle. These were also scattered across the country. It was not easy to start educating them.

We solved that problem by utilising the mass media, and began a QC Correspondence course for foremen in 1956 through the Japan Shortwave Broadcasting Corporation. In 1957 the Japanese Broadcasting Corporation (NHK) agreed to broadcast our programmes as part of its educational programming. The programme was well received by the public, and the text sold 110 000 copies, far exceeding the expectation of NHK. As a sequel to this success, JUSE published a monograph entitled A Text on Quality Control for the Foreman (A and B) in 1960, and it continues to sell well.

The QC Circle is:

- a small group
- to perform quality control activities
- voluntarily
- within the same workshop

This small group carries on

- continuously
- as part of company-wide quality control activities
- self-development and mutual development
- control and improvement within the workshop
- utilising quality control techniques
- within all the members participating

## DISCUSSION ON THE ISHIKAWA PHILOSOPHIES

Again the Ishikawa philosophies also represent the Japanese philosophies. By studying the Ishikawa philosophies, the influence by both Dr. Deming and Dr. Juran becomes evident. However, the management orientated philosophies are typical Japanese. The most significant observation is the fact that the Japanese managers and industrial leaders have listened very carefully to people like Dr. Deming. They have however, internalised these philosophies and principles into the Japanese culture. They have adapted it to the Japanese way of thinking and doing things.

that people can be made to work for money)

- The philosophy of lifetime employment
- The philosophy of democratization of capital
- The philosophy of Quality Circles . (Today Quality Circles are utilized all over the world)

Without going into the merits and demerits of these philosophies, it can be said that they remove some of the stumbling blocks between management and the workforce. For example the policy of lifetime employment and the trust of employees in management to honour this philosophy ensures that people are unafraid to introduce productivity improvement measures.

The following philosophies can be readily related to the influence of both Dr. Deming and Dr. Juran.

- ( Total involvement in Quality Assurance. (Dr. Juran/Dr. Deming).
- Extensive training of the Japanese worker (Dr. Deming/Japanese)
- Dependence and keeping good relations with vendors (Dr. Deming).
- Total Quality Control (Dr. Deming).
- Total Quality Control is a thought revolution in Management (Dr. Ishikawa).

( It is noteworthy and significant that Dr. Ishikawa himself said in his book "What is Total Quality Control - The Japanese Way" that they had a period of over emphasis on Statistical Quality Control in the fifties. Although they had achieved undreamt of successes, the movement remained among engineers and workers in the factories. Dr. Juran visited Japan in 1954, the first time on the invitation of JUSE. Dr. Ishikawa continues:

"Dr. Juran's visit marked a transition in Japan's quality control activities from dealing primarily with technology based in factories to an overall concern for the entire management. There

today has gone through an evolution. It has started with quality control (using the statistical techniques in controlling the processes as taught by Dr. Deming) and evolved to Quality Assurance. In Quality Assurance much attention is given to design, the true quality characteristics into the product and then ensure that the product is manufactured to specification by applying statistical quality control.

Total Quality Control means management control itself. Dr. Ishikawa uses the definitions of Total Quality Control as published by Dr. Armand V. Feigenbaum, but says very explicitly that the Japanese application is not imitating Dr. Feigenbaum's approach: Dr. Ishikawa stated:

"According to Feigenbaum, total quality control (TQC) may be defined as "an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organisation so as to enable production and service at the most economical levels which allow for full customer satisfaction." TQC requires participation of all divisions, including the divisions of marketing, design, manufacturing, inspection, and shipping. Fearing that quality which is everybody's job in a business can become nobody's job, Feigenbaum suggested that TQC be buttressed and serviced by a well organised management function whose only area of specialisation is product quality and whose only area of operation is in the quality control jobs. His Western-type professionalism led him to advocate TQC conducted essentially by QC specialists.

The Japanese approach has differed from Dr. Feigenbaum's approach. Since 1949 we have insisted on having all divisions and all employees become involved in studying and promoting QC. Our movement has never been an exclusive domain of QC specialists. This has been manifested in all of our activities.

What do I mean by company-wide or total quality control? It simply means that everyone in every division in the company must study, practice, and participate in quality control. Merely to assign QC specialists in every division as suggested by Feigenbaum is not enough. In Japan the vertical line authority relationship is too strong for staff members such as QC specialists to have much voice in the operation of each separate division. To counter this situation, our approach has always been to educate everyone in every division and to let each person

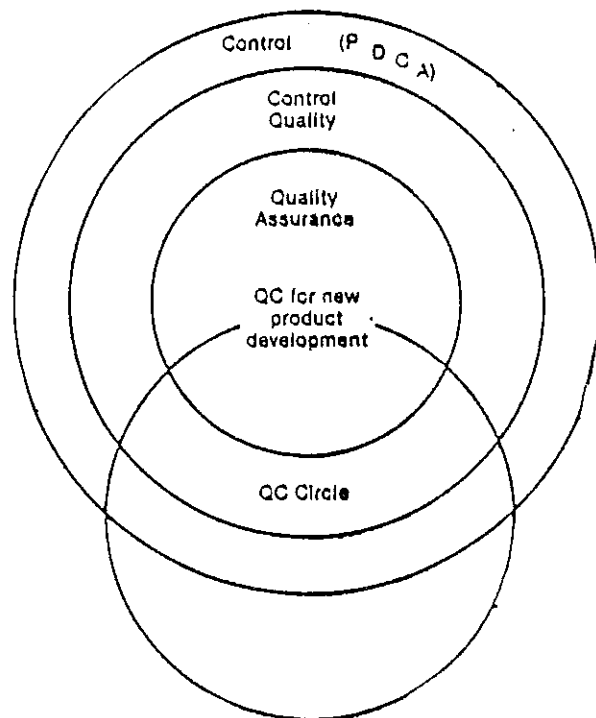


definition has been expanded to include subcontractors, distribution systems, and affiliated (keiretsu) companies. This system, developed in Japan, is quite different from what is being practiced in the West.

In effecting integrated quality control, control of quality is central, but at the same time cost control (profit control and price control), quality control (amount of production, of sales, of stock), and control of delivery date are to be promoted. This method is based on fundamental assumption of QC that a manufacturer must develop, produce, and sell commodities that satisfy the needs of consumers. In conducting QC, unless one knows the cost no quality planning and design can be effected.

If cost control is tightly managed, one can know how much profit could be realised if certain trouble spots were eliminated. In this manner, the effects of QC can also be easily anticipated."

Mr. Ishikawa uses the following diagram to explain this philosophy:



the principle of quality first. Management must have a consumer not producer orientation. Furthermore, the next process should be regarded as your customer and statistical methods must be used as a basis of decisionmaking. Respect for humanity should be managements's philosophy and should be enchanted by cross functional management.

Secondly TQC leads to the philosophy of education and training in Quality Control. Every employee from top management down to the lowest level must obtain sufficient training in understanding his responsibility towards the quality of the product and to enable him to do his job effectively.

Thirdly, TQC leads to the philosophy of worker participation in improvement of the quality of product and service and in lowering the cost of the customer by improving productivity and lowering the cost. This is done through the Quality Control Circle movement in Japan.

## THE PROFESSIONAL MR PHILIP CROSBY

### WHO IS HE?

Philip B. Crosby has had 34 years of firsthand experience in quality improvement. He was corporate vice-president of ITT responsible for worldwide operations for fourteen years. He worked his way up from line inspector.

Crosby started at the bottom of business and had had each and every job on the way up. Inspector, tester, assistant foreman, junior engineer, reliability engineer, group engineer, section chief, manager, director and corporate vice-president. This has produced a "dirt under the fingernail" education.

Because of these experiences, he tends to see things in terms of those who must finally wind up doing the job. He sees concepts and their implementation as people-oriented.

In February 1979 Mr. Crosby decided to resign from ITT corporation. His book "Quality is Free" has just started to create a lot of interest in the USA.

At this stage he was already getting calls once a week from executives of other companies asking for advice or assistance. Mr. Crosby thought if he could just obtain five or six clients and write a book a year he would survive financially.

On July 1, 1979, he started his own consulting company Philip Crosby Associates, Inc. His first assignments were with the companies Tennant and IBM on improvement.

Mr. Crosby was of opinion that the way not to cause improvement was to get involved in the technical problems of the client companies. The work had to begin with management concepts and then proceed to implementation of a formally run quality improvement process.

went nearly under, in 1984, the company had ninety three employees of whom twenty four were professionals. They occupy 68 000 square feet of space. They have had over 9 000 students through the college courses from hundreds of companies.

Mr. Crosby is the author of "Quality is Free" and "The Art of Getting Your Own Sweet Way" and "Quality without Tears." He is also well known as a lecturer.

Crosby's first philosophy

Quality is free - the art of making quality certain by striving towards Zero Defects.

Quality is free. It is not a gift, but it is free. What costs money are the unquality things - all the actions that involve not doing jobs right the first time.

It occurred to Crosby, while being an inspection technician; why spending all the time finding and fixing and fighting when the incident can be prevented in the first place? Nobody believed that could be possible. Crosby realised that there should be a way.

The conventional approach of managing quality was not effective.

So Crosby embarked on a deliberate strategy of establishing a cultural revolution - a cultural revolution that would last forever and become part of the corporate woodwork. Firefighting would have to be replaced with defect prevention; quality would have to be recognised as a genuine "first among equals"; the habit of doing things right the first time had to become routine; and most important of all, the whole thing had to happen within the units (ITT's word for subsidiary or other companies) because they wanted it to happen.

The four legs are:

- \* Management participation and attitude
- \* Professional quality management
- \* Original programmes
- \* Recognition

- Management Commitment
- Quality Improvement Team
- Quality Measurement
- Cost of Quality Evaluation
- Audity Awareness
- Corrective Action
- Establish an Ad Hoc Committee for the Zero Defects programme
- Supervisor Training
- Zero Defects Day
- Goal Setting
- Error Cause Removal
- Recognition
- Quality Councils
- Do it over again

The second Crosby philosophy

"Quality without Tears" - the art of hassle-free management by applying the four absolutes in Quality Management.

( Dissatisfaction with the final product or service of an organisation is called trouble with quality. It is only a symptom of what is happening inside the firm.

The absolutes answer the questions:

- (a) What is quality?
- (b) What system is needed to cause quality?
- (c) What performance standard should be used?
- (d) What measurement should be used?

The four absolutes are:

The first absolute - The Definition of Quality is conformance to requirements

The second absolute - The system of Quality is Prevention

( he third absolute - The performance standard is Zero Defects

The fourth absolute - The measurement of Quality is the Price of Nonconformance

The implementation of these concepts is again done through

The Quality Improvement programme. Nowhere in the books written on these philosophies does Crosby promote the idea of improvement beyond conformance to specification. In the author of this thesis' mind it is based on the assumption very little cost is necessary to reduce non-conformities to zero. In other words, Mr. Crosby assumes that the "requirement" is this definition of quality (Quality is conformance to requirements), are correct. As long as these requirements are fulfilled, the customer will be happy.

Mr. Crosby has a very sound concept in his first philosophy. That is that the standard of performance should be "zero defects." What is missing however, are the guidelines and tools to really achieve this. Although Mr. Crosby explicitly makes the point that "zero defects" is a standard and not a motivation programme, it was widely applied as such in the USA.

The basic procedure for installing the quality improvement programme has certain shortfalls. Although the executive and management must be committed to the programme, the programme is run by a taskforce and not by line management.

The involvement of the employees is based on the premise that the workers are motivated and not careless, there will be no defects. This ignores the factor of variance of the process the possibility assignable causes in an unstable process.

Furthermore, Mr. Crosby does not indicate that he understood the concept that management is responsible for more than eighty percent of nonconformities. The commitment that management should make in the Crosby programme, is to strive for zero defects in his own job and support his employees in attaining this goal. The fact that management should consistently work on improving the system and remove barriers is not stated clearly. This is a reactive process.

In this programme, the worker's knowledge, and experience and skills are utilized for identifying problems and causes. All they have to do is to report problems and expert teams would help them to solve it. It is not the worker and management that shall do it together. (Properly applied Quality Circles utilize the worker and his supervision to do it themselves). This is not utilising the full potential of the worker.

will take place without a road map."

Furthermore Dr. Deming comments:

"Eliminate targets, slogans, pictures, posters, for the work force, urging them to increase productivity, sign their work as a self-portrait, etc. ZERO DEFECTS is another. Would you sign your work? No: not when you give me defective canvas to work with, paint not suited for the job, brushes worn out. Posters and slogans like these never helped anyone to do a better job. What is needed is not exhortations but a good road map to improvement, management's obligation.

"Do it right the first time." This has a lofty ring to it. But how could a man make it right the first time when the incoming material is off gauge, off colour, or otherwise defective, or if his machine is not in good order, or the measuring instruments not trustworthy? I fear that this solution to all problems is merely another slogan, a cousin of zero defects."

( b) Dr. Juran's comment on the Zero Defect programme is as follows:

"Defects can be classified as management-controllable or operator-controllable, depending on whether the criteria for operator controllability have been met. The approach to reduction of management-controllable errors and the approach to reduction of operator-controllable errors by Juran is explained.

In theory, a worker in a state of self control has no reason to make errors (defects). Yet in practice all human beings make errors to such an extent that human fallibility has long been taken for granted - "to err is human." This contradiction between theory and practice was one of the ingredients of a widespread aspect of that debate was the assertion by zero defects (ZD) advocates that if workers are properly motivated they will make no errors - literally zero defects. Many companies, mainly in defense industries (and under the urging of the Department of Defense), undertook to establish quality motivation programmes for workers. Many of these programmes consisted solely of motivational propaganda. Such programmes had little effect on quality -

that:

1. The bulk of defects (over 80 percent) are management- controllable, not operator-controllable.
2. There are multiple subspecies of operator-controllable, error; the matter is not as simplistic as motivation alone."

(c) Dr. Ishikawa discusses the Zero Defects programme under the following heading:

#### WHY DID THE ZERO DEFECT MOVEMENT FAIL IN THE UNITED STATES?

"Shortly after QC Circle activities began in Japan, the United States started its zero defect (ZD) movement in small groups. The Department of Defense refused to issue procurement orders to companies that did not participate in the ZD movement, so the movement became a well-established one for awhile. However, it has disappeared completely. In its place QC circle activities seem to have taken hold in the United States.

Why did the ZD movement fail? In 1965 I observed the ZD movement in person and felt that it could not succeed. Here I wish to give my analysis to provide lessons for us not to repeat the same mistakes.

1. The ZD movement became a mere movement of will. It emphasized that if everyone did his best there would be no defects.
2. Starting from that assumption, it failed to teach participants the QC method of implementation. It was a movement without tools. It was not scientific.
3. It decreed that good products would ensue if operation standards were closely followed. As I have discussed in this book repeatedly, operation standards are never perfect. What operation standards lack, experience covers. In our QC circles we insist that the circle examine all operation standards, observe how they work, and amend them. The circle follows the new standards, examines them again, and repeats the process of amendment, observance, etc. As this process is



5. The word "kickoff" in the ZD movement sounded fine. But wasn't it another term for commanding and forcing the workers to start a campaign for which they had very little enthusiasm.
6. All responsibilities for mistakes and defects were borne by the workers. Normally the share of the blame that workers must bear is one-fourth or one-fifth, and the remainder is borne by the managers and their staff. In the ZD movement, those mistakes which were not the making of the workers were considered to be theirs. No wonder the movement went astray. Incidentally, Dr. Juran has also been critical of the ZD movement because of its tendency to shift all the blame on the workers although their share of responsibility should never have been more than one-fifth.
7. The movement became just a big show. The Department of Defense decreed that no procurement orders would be issued to nonparticipants in ZD. It encouraged paper compliance.
8. There was no headquarters to promote a nationwide movement. Had there been an organisation like the BC Circle Conference to provide opportunities for mutual development, results might have been different.

Mr. Caplan writes as follows:

During the 1960s, there was a rash of packaged motivational programmes, the most famous of which was the "Zero Defects" programme of Martin Orlando. In concept, this programme recognised the broad scale of personnel involvement in quality. All employees of a division, including the general manager, and vendors and field service personnel as well, were expected to sign a pledge that they would henceforth produce nothing but perfect output. In practice, what worked eminently well at Martin Orlando had a mixed result elsewhere and, although adopted by the US Department of Defense as a government and defense industry-wide programme, has quietly died away except in a very few instances. It has, however, a very wide application in Japan.

Why the mixed results and gradual disenchantment in this country with a programme with such potential? Most

Orlando had trained their people thoroughly, had provided them with proper work instructions and visual aids, and had installed or was prepared to install equipment capable of producing the required quality of product. They had also promoted and followed the same types of activity among their suppliers. Very few American companies went this far or saw the need to, and as a result the majority failed to realise the benefits of their programmes.

## THE PROFESSIONAL MR. FRANK CAPLAN

### WHO IS HE?

Frank Caplan has had broad quality management responsibilities at such firms as General Electric, Westinghouse, and the Aerospace Components Division of Atlas Chemical Industries, Inc. Since 1976, he has served as Manager of Quality System Planning for the Communications Group of Motorola, Inc. He has been a Fellow of the American Society for Quality Control since 1958 and has contributed to a number of technical publications and seminars in the Quality field. Frank is a Registered Professional Engineer in Quality and as ASQC Certified Quality Engineer.

### ( The first Caplan philosophy

The application of a systems approach for a company to achieve complete customer satisfaction at appropriate benefit to the producers.

The objective of a Quality System is to achieve complete customer satisfaction, at appropriate benefit to the producer. The Quality System provides a management-orientated description of all activities required to develop and operate a completely effective Quality System in any enterprise.

A Quality System is according to Caplan "the collective plans, activities, and events that are provided to ensure that a product, process or service will satisfy given needs." The same document recognises that "quality" includes "economics, safety, availability, maintainability, reliability, design and all other characteristics that need for the product or service involves." It can readily be seen that nothing less than the achievement of complete customer satisfaction is intended and that the Quality System involves the co-ordinated activities of every person in an enterprise.

Determining the structure of any system involves identifying

System - a source book for Managers and Engineers" is divided into nine sub-systems:

1. Quality System Management
2. Product Development Control
3. Purchased Material Control
4. Process Development and Operation Control
5. Quality Data Programmes
6. Special Studies
7. Quality Measurement and Control Equipment
8. Human Resources Involvement
9. Customer Contact

The second Caplan philosophy

The philosophy of Quality Control through the application of primary and secondary control elements.

There are six primary controls:

1. System audit

The planned scrutiny of product, process, and system-related activities for conformance to specification and procedural requirements

2. Quality costs

The separation of accounting figures into the categories of prevention, appraisal, internal failure, and external failure

3. Customer-centred quality audits

The examination of the product from a user's viewpoint - this audit relies on using customers or simulated customers and goes beyond the design criteria in the evaluation, even considering reasonable misuse of the product

4. Yield Control

The measurement of rates of nonconformity associated with vendors, in-house production, and warehousing, combined with techniques to reduce those rates

its products and services

The third Caplan philosophy

The philosophy Quality System Engineering in developing priorities and managing the Quality System.

In developing and applying the Quality System for an enterprise, an overall end date should be established, and the following steps should be taken, roughly in this sequence:

At the local level, managers of all involved functions are concerned with the day-to-day application of the Quality System programmes in their activities. This requires everyone's thorough familiarity with the relevant portions of all procedures; the availability to all personnel of the pertinent procedures and other related documents; the assignment of sufficient capable personnel to perform the work; and the regular generation, analysis, and timely reporting to all of those data that reflect the current condition of each control measurement.

The corporate Quality System Manager is frequently concerned with encouraging and supporting the introduction of the Quality System in a number of operating units at the same time. To do this effectively requires the tools with which to evaluate the state of Quality System health in each unit and those with which to measure changes and accomplishments.

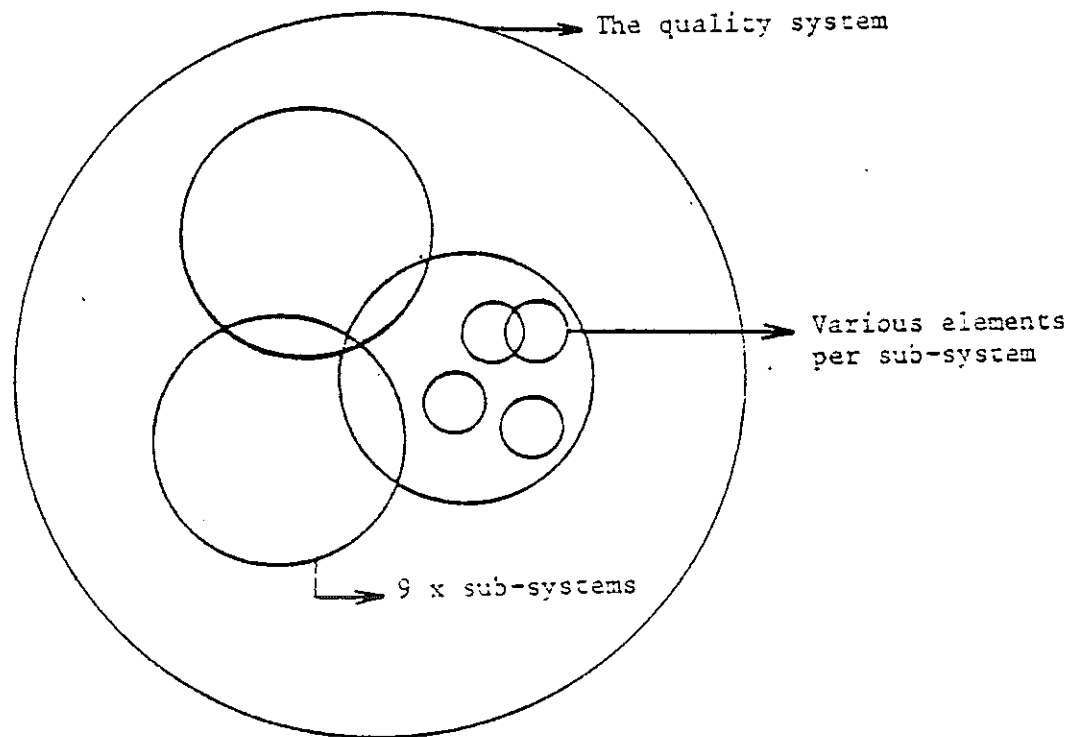
The Element Priority Work Sheet is usable for that purpose in every unit. The corporate Quality System Manager will find it helpful to have it used in every case, giving him a picture of the overall strengths and weaknesses of the enterprise. It would also list those areas where his staff might be able to contribute technical bulletins or other publications, eliminating the need for them to be developed several times.

When all of the Quality System is operational, virtually every element will support all the others, making each of them more effective than it is alone. The net effect of this is a quantum leap upward in customer satisfaction and economy, only partly realised as each element is put in place. Continuing positive attention to all aspects of management of the Quality System will then produce unanticipated dividends for the organisation involved.

way. To manage a company within the dynamic environment of today, becomes extremely difficult and complex. The point that all these professionals make, is that the Quality Programme must be integrated into the management system of the company. Because of these complexities, it is logical to approach the Quality Programme in a systematic and co-ordinated manner. This is why the Quality System of Mr. Caplan make good sense. It has become widely accepted in Management circles that the systems approach towards management of complex companies is essential. With the Quality System the total spectrum of quality and quality related activities that are needed to achieve customer satisfaction is organised into subsystems and elements. In this way it became possible to understand the relationships and interrelationships between subsystems and elements. It became possible to grasp and understand and visualize how the quality activities interlink with each other.

The Caplan Systems approach can be visualized in the following manner by using the Venn diagram principle:

FIGURE 5 : THE CAPLAN SYSTEM PRINCIPLE



The second philosophy of Quality Systems control should be understood in perspective. This control is indicative of the status of the Quality activities in the company. It can not be used for daily controls. The quantitative results of these controls could be used only to show tendencies. From a Quality Management viewpoint, they are therefore important. Quality control of the product and service should be done in a much more directly controlled manner.

The third philosophy on System Engineering provides the basis for determining the status of the various subsystems and elements in the company. Together with the analysis of possible benefits, it becomes the basis for priority determination. No company has unlimited resources. Therefore priority determination becomes essential. The principles and techniques that support this philosophy provides the method for a optimum action programme.

## 2.6 OVERVIEW OF THE PHILOSOPHIES

2.6.1 Deming's four philosophies and Juran's philosophy on management and operator-controllable defects are the same.

Juran's philosophy on the Quality Spiral is supplementary to these philosophies.

As been said before, the Ishikawa philosophies originated from the influence of Dr. Deming and Juran.

What puts Deming and Ishikawa in a different league, however, is their idealism, their strive for excellence. Do it right and improve. It is not a quality improvement programme. It is the strive for excellence.

2.6.2 The Crosby philosophies

There is nothing wrong with the Crosby philosophy when taken at face value. He expresses a couple of good points eg.

- It is the non-quality that costs money
- The standard of performance should be zero defects
- Etc.

The way in which he applies and introduces the philosophies completely incorrect.

2.6.3 Caplan with his systems' approach provides an excellent checklist, a framework of what all the relevant issues for Customer Satisfaction is, in fact, is



## 7. SELECTION OF THE PHILOSOPHIES AND INTEGRATION THEREOF INTO THE COMPANY'S SYSTEMS

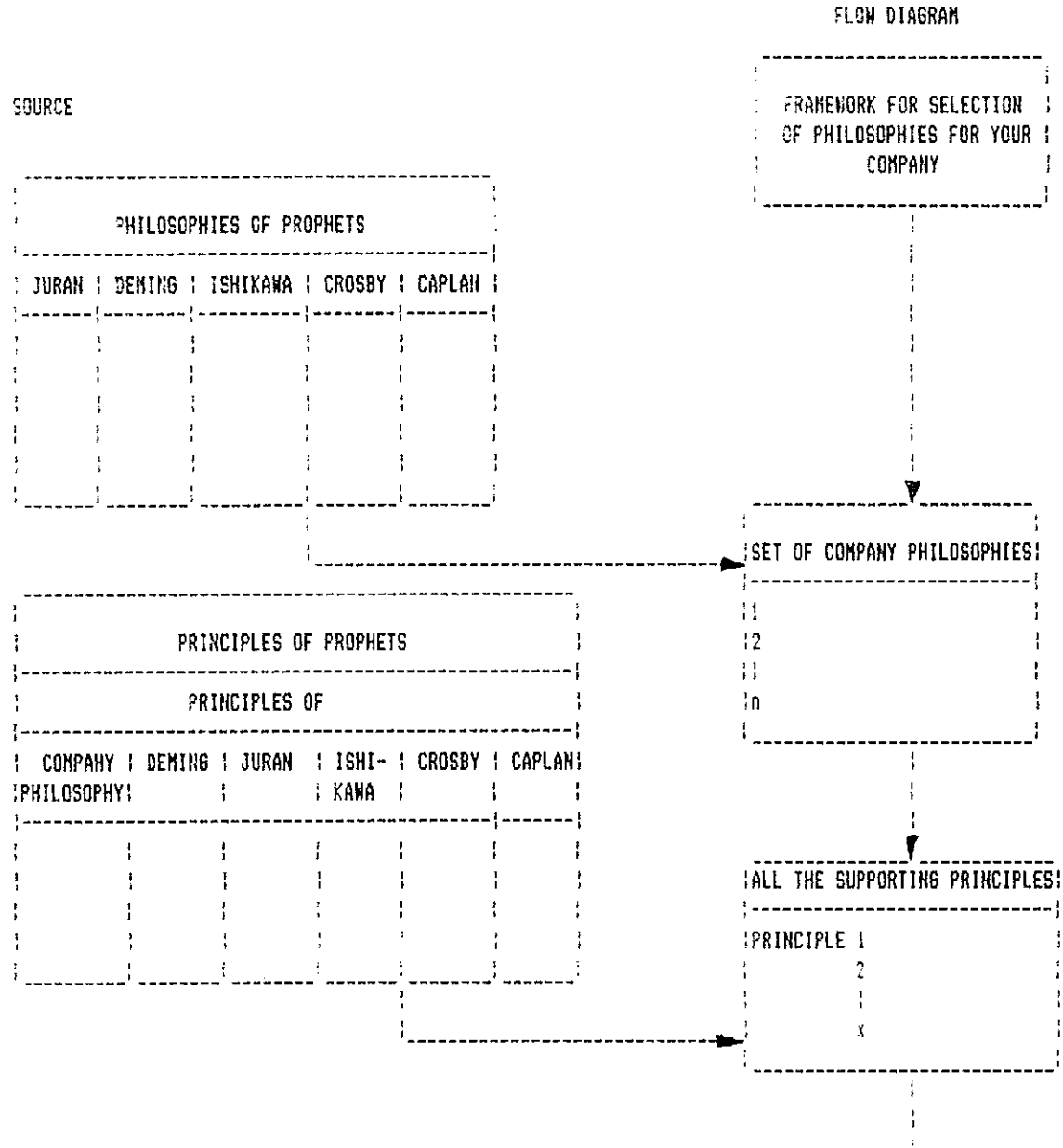
### 3.1 Selection and integrated framework

Any company must have an organisation structure. The structure should be made functional with systems and subsystems. The organisational structure will be developed and the company will be regarded as a system. Through the systems analysis, policy statements, policies and procedures can be defined. These policy statements, policies and procedures will provide the mechanism for integrating the quality values and principles into the companies' management and operational systems.

This approach can be illustrated with the following logic diagram in Fig. 6:

FIGURE 6

LOGIC DIAGRAM FOR SELECTION OF PHILOSOPHIES AND PRINCIPLES FOR THE COMPANY AND INTEGRATION INTO COMPANY'S SYSTEM



THE SELECTION OF THE PHILOSOPHIES AND UNDERLYING PRINCIPLES  
FOR A COMPANY

3.2.1 Companies are driven by a corporate culture.

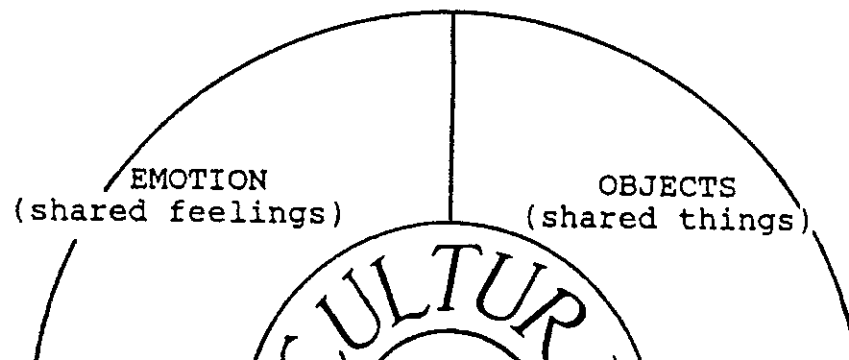
It is important to understand that each company has at any specific time a culture with its supporting values, beliefs and norms. Dr. Deming stresses a very strong point that the present cultures in most of the USA companies are adverse to achieve the required quality of product and service.

He is demanding a change in management attitudes and therefore the corporate culture. The stumbling blocks in the way of management as described by Dr. Deming are the manifestations of this 'wrong' culture.

To decide on a certain set of philosophies for your company, it is an absolute necessity to determine the set of values and beliefs that will drive these philosophies. The present existing culture must be carefully analysed to determine the difference. A programme of change in values and beliefs must then be introduced.

The company culture can be visualised with the following diagram:

FIGURE 7 : THE CULTURE DIAGRAM



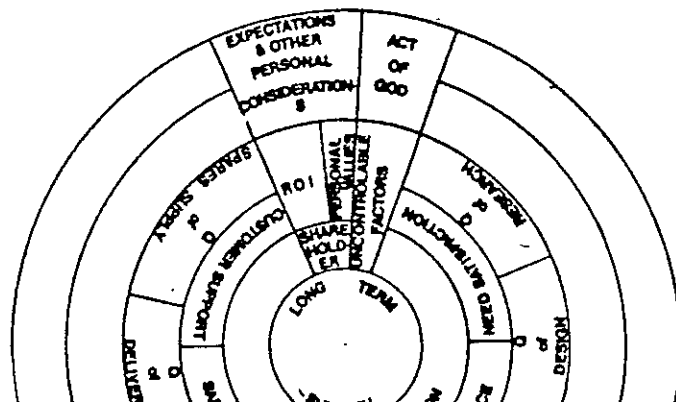
3.2.2 The value basis for establishing the set of philosophies for the company.

In the previous chapter the various philosophies and principles of the different prophets were analysed. Why should one company make a different selection from it than another company? It must be influenced by the present values and beliefs (culture) of the company. The end result after implementation will be different. One company will survive. The other one will go bankrupt.

Therefore, if a company has to make a selection of philosophies and principles, what should the value basis be? What can be used as a guideline to ensure the correct choice that will guarantee longterm survival?

An organisation can be regarded as a living organism with an instinct and will for survival. The interdependence of the longterm survival on other factors can be represented by the following figure 3-3

FIGURE 8 : THE WHEEL OF INTERDEPENDENCE



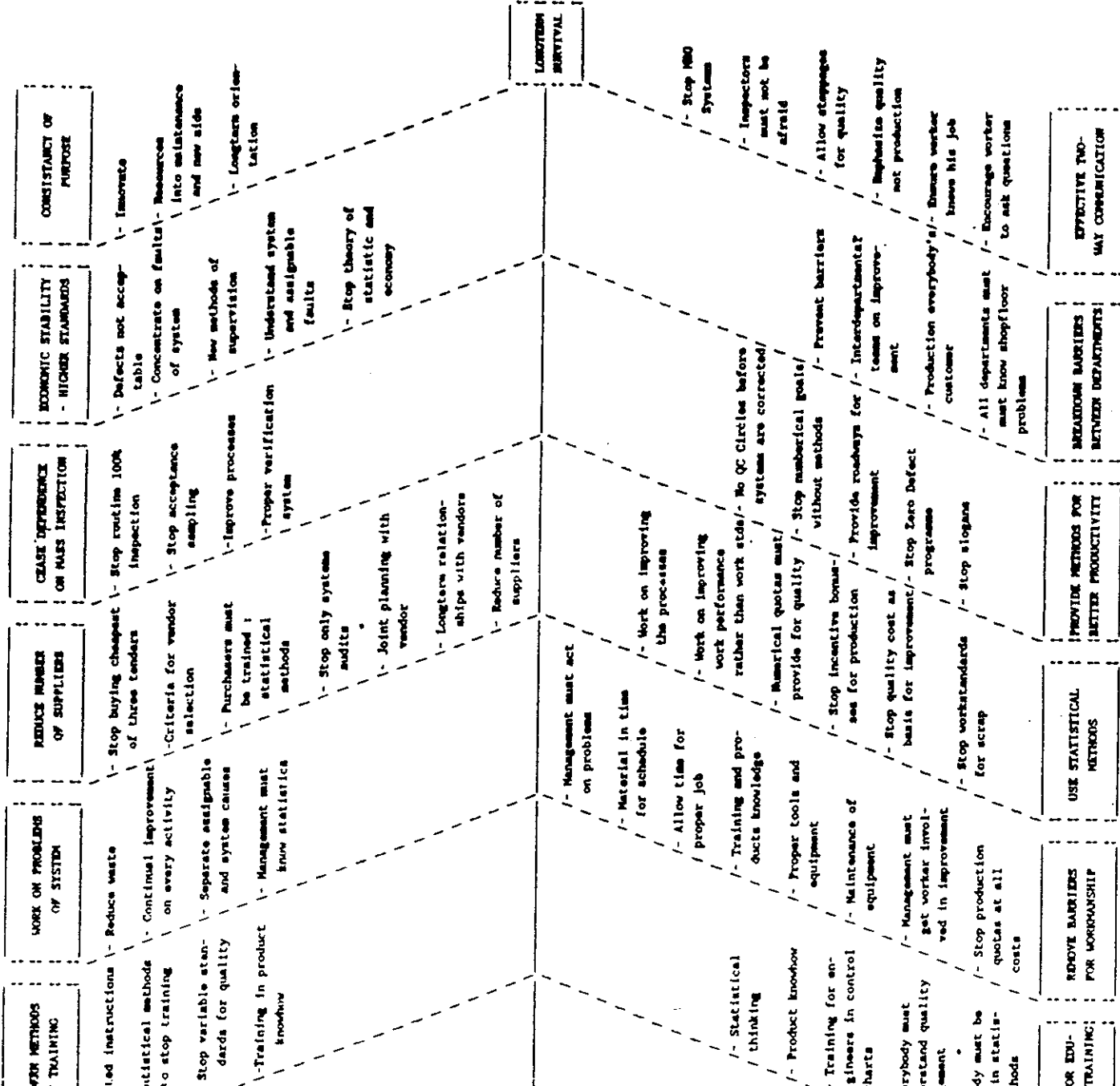
From figure 8 it can be ascertained that customer satisfaction in the end depends on the quality of management in the manufacturing environment. It is therefore necessary to create or provide a value set for the quality of management.

From the study of literature on the management profession as well as the quality profession, one such a framework is provided by Dr. W.E. Deming. Dr. Deming's fourteen points are essentially providing the needed value set. It is further suggested to incorporate the fourteen points of Dr. Deming to establish the values and beliefs (culture) needed. By comparing the present culture of the company against the needed culture a basis for a change programme can be determined.

To understand and visualise the longterm survival in relation with the fourteen points of Dr. Deming on the Ishikawa Diagram it is shown in figure 9.

FIGURE 9

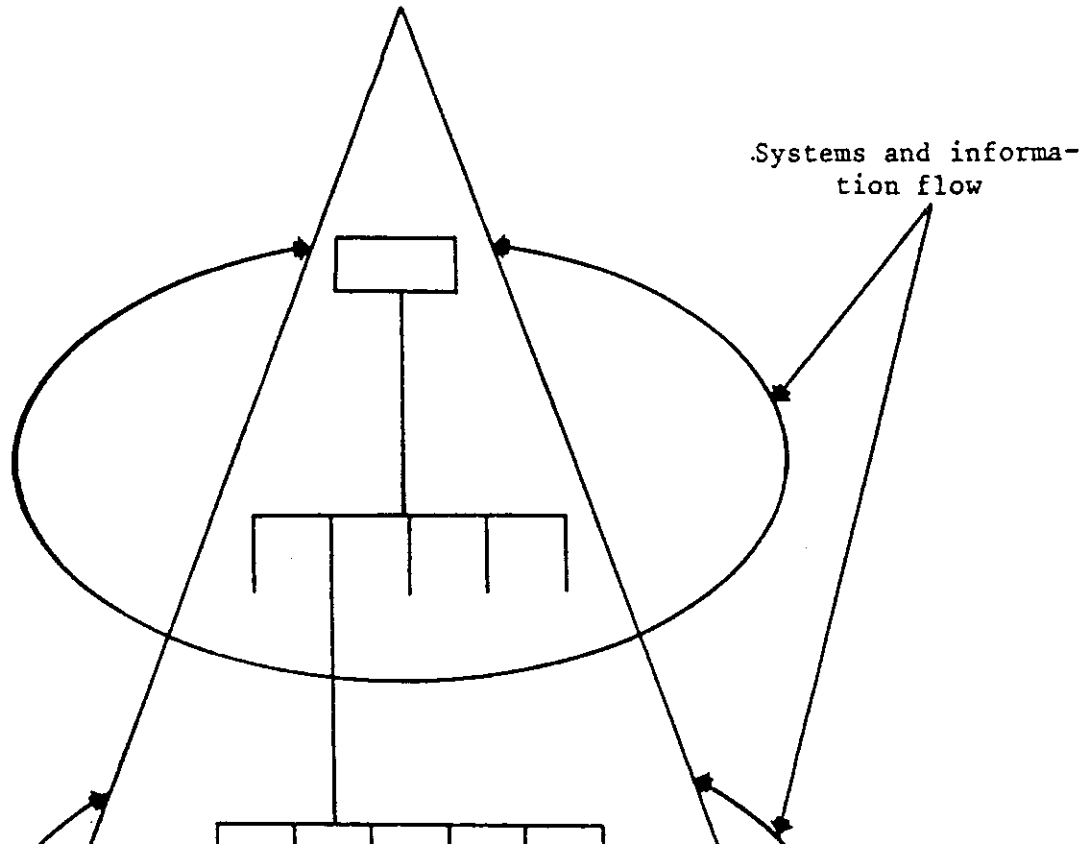
ISHIKAWA DIAGRAM



3.3 The flow of systems and information through the organisation.

A department or section within an organisation cannot function in isolation. A constant flow of physical items and/or information takes place. In order for the organisation to function as a whole entity, these systems, sub-system and information flow should be defined properly. The systems and information flow becomes the nervous system and bloodflow of the organisation. It can be represented with the following diagram.

FIGURE 10 : INTERACTION BETWEEN ORGANISATION STRUCTURE AND SYSTEMS



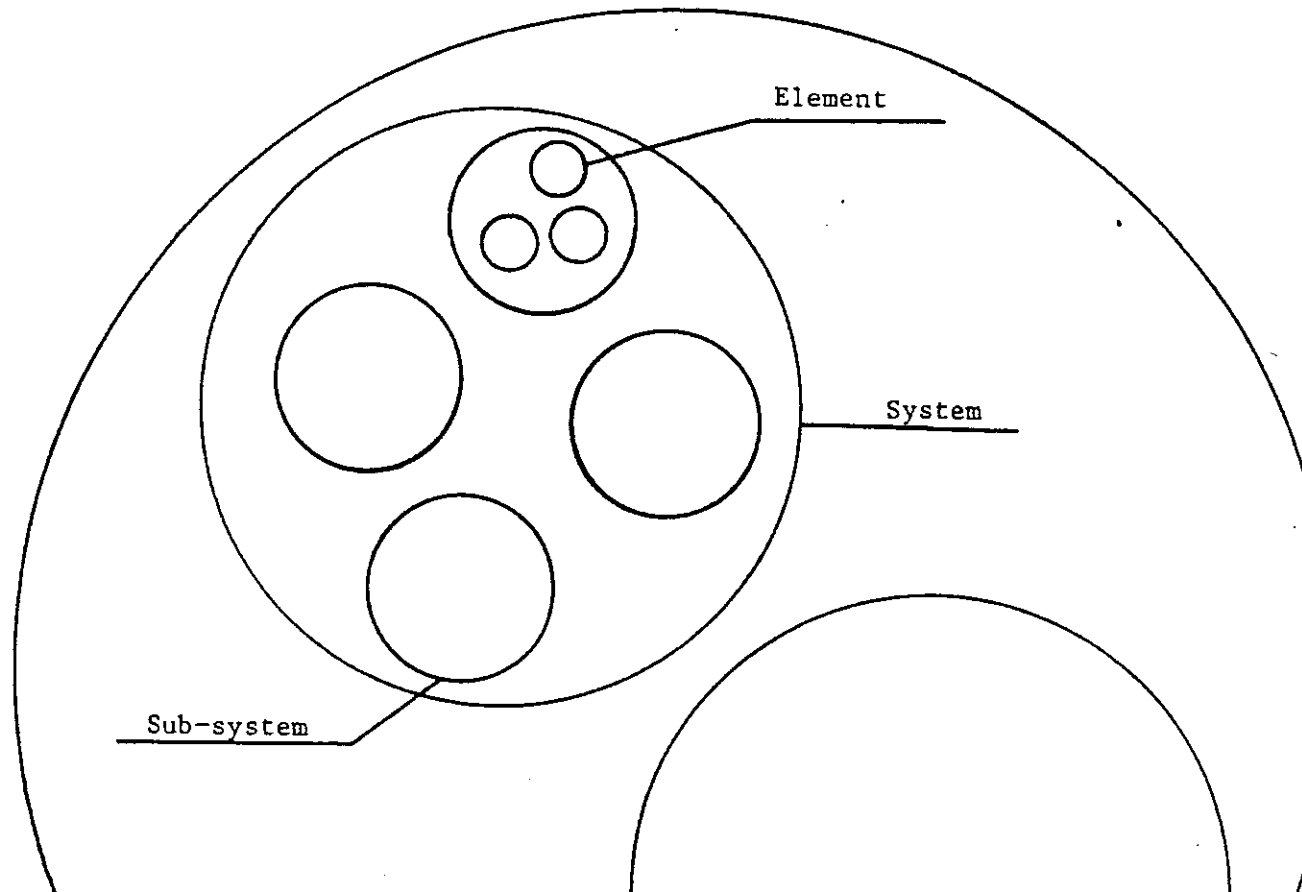
### 3.4 The hierarchy of systems

Caplan proposed and used the following hierarchy:

Main system  
Systems  
Sub-systems  
and elements

This can be symbolically represented with the following Venn-diagram.

FIGURE 11 : SYSTEMS HIERARCHY FOR A COMPANY



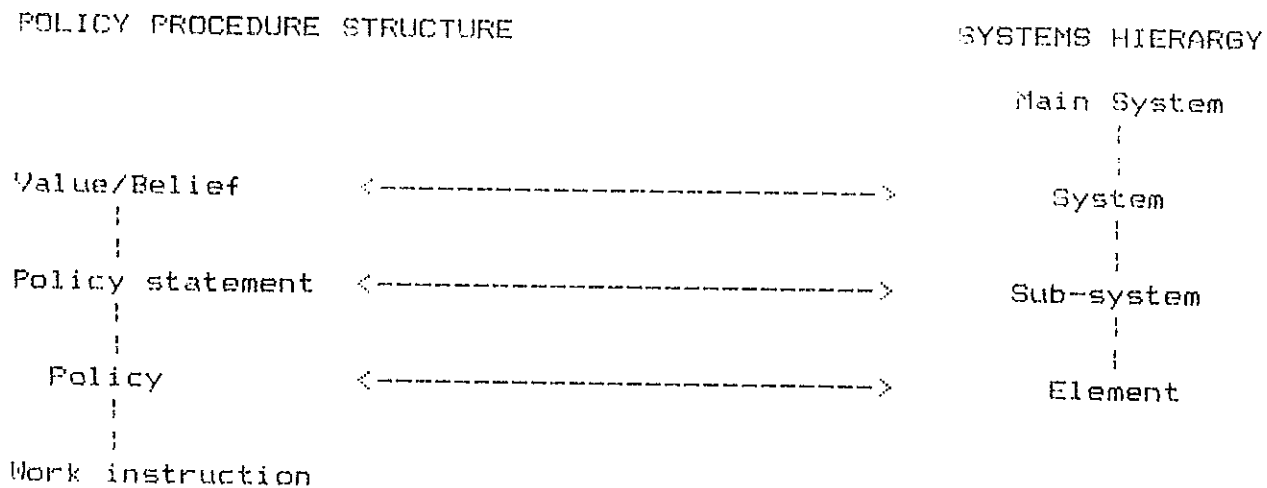


It is thus necessary to define the different systems operating (or that should operate) in the company. For each system the sub-systems is to be developed. For each sub-system the elements are to be defined. This way the company is broken down into all the elements of the company.

3.5 The relationship between the system's hierargy and the Policy-procedure breakdown.

The relationship can be represented by the following figure:

FIGURE 12 : RELATIONSHIP BETWEEN POLICY PROCEDURE STRUCTURE AND SYSTEMS HIERARGY



One consequence of the above is that the System - Sub-system - Element breakdown is giving the values policy statement - policy-procedure breakdown.

4. CONCLUSION

Each prophet has only some of the truth.

The most important prophets' philosophies were discussed. An outline and structure of how it would be integrated into the present culture and organisation was very briefly covered.

This approach has proven to be very successful.