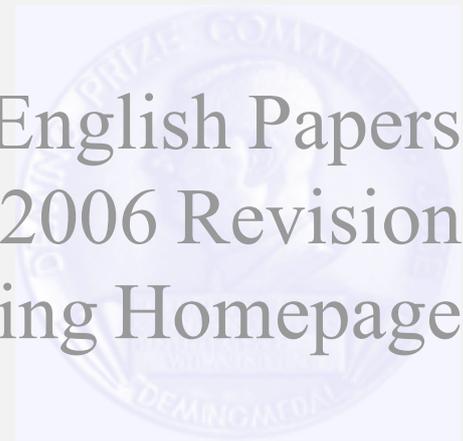




„Think Different“



Collection of the English Papers
in the December 2006 Revision
of the Deming Homepage



THE SWISS DEMING INSTITUTE

P.O. Box 71, CH-8126 Zumikon

Telephone +41 44 918 11 19

Telefax +41 44 918 11 70

E-Mail info@deming.ch

Internet www.deming.ch

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QUALITY: QUO VADIS?

Ernst C. Glauser

This most extensive and yet very compact and comprehensive presentation of the Deming Management Philosophy was the first contribution to the Deming Homepage in 1999. Even though this paper was originally only set up in German, it was downloaded more than 13'000 times since. Upon request of innumerable visitors, this basic paper was revised, updated and translated into English.

Page 5

The Germ Theory of Management

Myron Tribus

Myron Tribus constructs an illuminating analogy between 19th century medicine and 20th century management in order to illustrate why it takes so long for us to think differently and adopt new theories that are designed to improve our lives.

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Aristotle's Mistake or the Curious Incident of the Dog in the Night-Time

David and Sarah Kerridge

Posing the right questions is more difficult than getting answers. Only the right question leads to the right answer.

This short paper shows that by nature man is inclined to ask the wrong questions. A conscious effort is therefore required to look at things from a different viewpoint. David and Sarah Kerridge provide a number of examples of how real progress is made when man's natural inclination to look in the wrong direction is overcome. The authors demonstrate how many management practices are predicated on wrong questions with destructive and expensive consequences for the well-being of our organisations.

Learning to think differently is necessary before we can make real progress and is an essential part of the Deming philosophy.

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"Does anybody give a hoot about profit?"

Deming Speaks to European Executives

Transcript of Presentation prepared by Prof. Dr. Henry Neave

On the afternoon of 11 July 1990, Deming gave a short presentation to some 25 exe-

cutive from major European companies. The meeting, held at the Queen Elizabeth II Conference Center in Westminster, London, was jointly organized by the European Federation for Quality Management (EFQM) and the British Deming Association (BDA). This article provides an edited transcript of that presentation and the subsequent Question and Response Session.

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The Four Pillars of Wisdom

A System for 21st Century Management

Noel C. Spare

The purpose of this paper is to question the ability of current management practices to transfer scientific and technological advances efficiently for the greater good of mankind. The case is argued for transformation to a knowledge based management approach that would result in greater efficiency and less waste. The scientific methodology developed as long ago as the 1920's and operationalised in post war Japan is examined in detail.

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The Deming Dimension: Management for a Better Future

Herny Neave

On the occasion of his inaugural professorial lecture, Prof. Neave takes the opportunity to look back at the lifetime's work of Deming. He traces the development of Deming's unique and profound understanding of the process of management from its origins in the 1920's through to the 1990's and the pinnacle of his work, "A System of Profound Knowledge". Neave argues that in a world growing ever more complex, the need for learning of this rich legacy of wisdom becomes increasingly appropriate if all its citizens are to share in a better future.

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What are the Duties of Managers towards Quality?

René Bondt

Translation from German to English by Noel C. Spare

René Bondt is a historian, which wrote this article for die Neue Zürcher Zeitung.

After Japan and the U.S.A., Europe too needs the learning of William Edwards Deming.

At the end of the Second World War with their country lying in ruins, Japanese in-

dustry learned quickly from American teaching. The Asian nation succeeded in manufacturing products that became the hallmark for quality the world over. Here lies a paradox on two counts. Firstly, it took 30 years and an economic crisis for the U.S.A. to take up the methodology employed so successfully in post-war Japan. And secondly, this Far Eastern triumph was based firmly on American ideas.

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Birth of the Chaordic Age

Dee Hock, Founder and CEO Emeritus of VISA

Book Review by Noel C. Spare

Few of us have stopped to wonder what is behind the VISA logo. Three quarters of a billion people use VISA products in 200 countries and territories. It straddles language, culture and religion. It is the world's biggest commercial undertaking with an annual volume of \$1.4 trillion and growing. This is the story of the man who created and nurtured this unique organisation and his profound philosophy, born out of a lifelong distaste for our hierarchical, command-and-control institutions. And VISA is only the beginning...

Page 85

The Competitiveness of European Industry: Can the competitiveness deficit be recovered?

Ernst C. Glauser

"Between Europe and its main trading partners and rivals - the USA and Japan - there exists a recurrent and apparently intractable competitiveness deficit."

So reported the European Commission to the Special European Council in Lisbon, 23rd to 24th March 2000. The EU has lower growth than the USA, unacceptably high unemployment and too many of its citizens are excluded from employment. Simply, it is not as dynamic as its main competitors.

The report tries to answer the question above based on statistic data provided by the European Commission.

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Turmoil in the Swiss Quality Scene: A Missed Opportunity!

Ernst C. Glauser, Noel C. Spare

Interview with Prof. Dr. Søren Bisgaard, former Professor of Quality Management at the University of St.Gallen

Only after two years of teaching and rese-

arch at the University of St. Gallen, Prof. Bisgaard left the university and returned to the United States. With this step the hopes of the Swiss and the European quality community for the contemporary teaching of scientific principles in quality management were smashed. Professor Bisgaard explains in this interview the reasons for his abrupt retreat and describes his view on the way Quality Management is being taught and practiced in Europe.

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**Alfie Kohn, „No Contest, The Case Against Competition, Why we lose in our race to win“
Book Review by Ernst C. Glauser**

“No Contest”, which has been stirring up controversy since its publication in 1986, stands as the definitive critique of competition. Drawing from hundreds of studies, Alfie Kohn eloquently argues that our struggle to defeat each other - at work, at school, at play and at home - turns all of us into losers.

This book supports the conviction of Deming which appears in one of his best known quotes:

"Stop fighting for a bigger piece of the pie. Instead cooperate to make the pie bigger. Then everybody wins."

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**Alfie Kohn, „Punished by Rewards: The Trouble with Gold Stars, Incentive Plans, A's, Praise and other Bribes“
Book Review by Ernst C. Glauser**

How do we train, educate and manage?

“Do this and you'll get that.”

"Do this or here's what will happen to you."

This is the method of "Carrot and Stick" used by our parents to train the children, by the teachers to educate the students and by our leaders to manage their employees.

After the book "No Contest" Alfie Kohn launches another frontal attack toward well established, traditional methods to train our children, to educate our students and to manage our workforce by convincingly exposing the destructive effects of using rewards to control children and adults. The findings of Alfie Kohn are entirely supported by Deming.

„The merit system will put us out of business.“

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**The Toyota Phenomenon
Ernst C. Glauser**

How come the world's second largest automobile manufacturer grows continuously and makes large profits whilst its biggest competitors fight for survival?

Despite the fierce competition due to excess production capacity in the automobile industry of around 25 %, Toyota outperforms Western competition in every aspect, in technological innovation, in customer satisfaction, in continuous growth and in profit. In 2004 Toyota passed Ford to become the second largest automobile producer. Before long, Toyota will overtake General Motors becoming the biggest car company in the world probably having no less than 15% of the world market. Toyota will prevail. Most others will have the choice between shrinking or sinking.

This paper tries to shed light on the root causes of the Toyota Phenomenon, which for some reason or another Western companies find so hard to understand and much less on how to apply, despite their struggle for survival.

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**Swiss Deming Institute
Student Forum**

**Reflections on Thinking
Differently**

Noel C. Spare

The new generation of students, young university graduates and postgraduate students alike are very open to thinking differently. They accept new ideas more easily than the generation of managers running our businesses today, who, in due course, have to reject much of what they have practiced for decades. In just a few years the young generation of managers will take over and will have the chance to apply what they have learned. If they have understood the new concepts, they will be well prepared to lead their organizations through the obstacles of global competition.

A management instructor and two of his students reflect on what they have learned from one of the most outstanding contributions to management science, the paper of Myron Tribus, "The Germ Theory of Management".

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**Some Thoughts on the Germ
Theory of Management**

Sabine Lang

Sabine Lang is a second year student at the University of Applied Sciences, Fachhochschule in Offenburg, studying for her MBA in International Business Consulting. She hopes to graduate in 2002 and be able to apply Deming learning in the future.

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**Complexity Management, the
Germ Theory of Management and
Applications from the World of
Business**

Uwe Dindas

Uwe Dindas is a final year student at the Graduate School of the University of Applied Sciences, Offenburg, studying for a Masters Degree in International Business Consulting.

An introduction to the Deming philosophy has given Uwe a different perspective and he affirms that the new insight it has given him into systems and processes, leads to solutions and optimisation potential that had hitherto been obscured.

After graduating he would prefer to work either in a consulting firm or in the management of a company with a strong international orientation.

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Paradigm Shift in Quality Management

The evolution of world economy during the second half of the 20th Century went along with a fundamental change of comprehension or paradigm. The focus on quantity changed to focus on quality. Rigidly and hierarchically structured organizations became flexible organisms structured along the flow of production. The digital „zero-defect“ acceptance and reject thinking was replaced by the customer oriented desirability paradigm.

Page 8

World Economy After World War Two

The world after World War Two is characterized by the total revolution of actors, markets and distribution of economic power. The unexpected invasion of products from the Far East, which were both cheaper and of unparalleled quality, led to a disruption of the prewar global economy and to growing unemployment in the traditional Western industrialized nations. Europe and the USA were most seriously affected.

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The Deming Chain Reaction

After the war, neither recognized nor understood by the rest of the world, Japan introduced, tested and developed a fundamentally new philosophy for the continual improvement of products and services. Dr. W. Edwards Deming is the exponent of a group of American quality experts, who passed on to the Japanese their knowledge and experience in the mass production of industrial products. This group did an outstanding job, which showed overwhelming results on the world markets within a few years. The group did not ignite a straw fire but initiated a sustainable quality movement resulting in a competitiveness advantage the rest of the world was not able to overcome up until now. Deming liberated Japan from the humiliation of being a military loser. He became Japan's national hero and received highest honors by the em-

peror of Japan himself.

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Who is Dr. W. Edwards Deming?

A value structure as a believing Catholic, a strong theoretical background as a mathematician, physicist and statistician and more than four decades of pioneering activities made Deming the foremost authority in the field of quality.

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Corner Stones of Deming's Teachings

The basic elements of Deming's teachings may be put under the three headings: „Sustainable Policies“, „Continual Improvement“ and „The System of Profound Knowledge“.

A sustainable policy must be the answer to the question: „Why are we doing what we are doing?“ This question should be asked not only once but over and over again.

„Continual Improvement“ is the prerequisite for survival, not only in nature but also in industry.

„The System of Profound Knowledge“ includes appreciation for a system, knowledge about variation (dispersion), theory of knowledge and psychology.

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Deming, Quality Awards and Quality Standards

Deming was very critical about quality standards, certificates and awards. All are external motivators which change the focus of interest from quality to certificates and awards. Quality improvements do not require incentives. The benefit of efforts in quality means long term survival in business, something which no certificate and award can guarantee.

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The Seven Deadly Diseases

Deming identifies seven malpractices in companies which inevitably lead to bankruptcy and collapse.

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The Seven Obstacles

Similar to the effect of the deadly diseases, Deming recognizes seven obstacles which impede continual improvement and long term success.

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Fourteen Points of Management

Deming's famous Fourteen Points of Management are a consequence of his System of Profound Knowledge. They should ser-

ve as milestones in the process of continual improvement. They became a symbol for Demingism and are known and applied the world over. Pat Oliphant, a world famous cartoonist, tried to illustrate the message of each of these points by a cartoon. It is hoped that this visualization both endorses the meaning of each point and makes the point easier to remember.

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His Master's Voice

This chapter reproduces a collection of Deming's best known quotes. The intention was to give the reader an idea of the clear, direct, humoristic and sometimes harsh way Deming presented his thoughts.

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Revolution of Thought

In an industrialized world committed to the Scientific Management of Frederick Winslow Taylor, the Deming Management Philosophy requires a revolution of thought.

Pat Oliphant selected nine of the most deeply rooted convictions or paradigms, where Deming asks for a far reaching change of mind. He illustrated and at the same time endorsed the subjects of these mind changes in the language most familiar to him.

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Acknowledgement

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Bibliography

An innumerable number of books were published on various aspects of the Deming management philosophy, most of them in English. This bibliography only lists the books which this report refers to. A search in the internet bookshop www.amazon.com using the key word „W. Edwards Deming“ will provide the visitor with a list of some 500 titles.

Foreword

The postwar era brought a total turnover in the global distribution of economic strengths. The revolution in technology together with growing labor costs led to continuously improving production processes and to a shift in the creation of economic value from the primary (agriculture), to the secondary (manufacturing) and to the tertiary economic sector (service industry). This shift of the importance of economic activity led from the seventies onward to a growing loss of jobs with its first climax in the early eighties. Unemployment was not considered to be a problem in the primary sector despite its "disguised unemployment". The history of unemployment is the history of industrialization. Today, problems of labor market and unemployment including waste due to ill-health, crime and related costs stand at the top of the agenda in industrialized nations worldwide.

For many decades America and Europe dominated world markets. They both practiced a management philosophy based on the scientific management by Fredrick Winslow Taylor [1] and the bureaucracy model of the German sociologist Max Weber [2].

Like a Phoenix rising from ash and by Western economies neither recognized nor understood, a new player appeared on the court, playing the game with rules unknown before. Whereas Western managers under pressure by stockholders turned to short-term cost-thinking, the new protagonist concentrated on the qualification and motivation of its workers, the uniformity of the processes and the quality of products and services expecting that these measures will lower the cost in the long run. The history of world economy could not have confirmed more convincingly the validity of this assumption.

It is thus quite surprising that American production specialists, especially Dr. W. Edwards Deming (14th October, 1900, until 19th December, 1993), convinced the Japanese in 1950 of the firm relation between quality and cost as expressed by the Deming Chain Reaction. The new understanding for this relation focused the resources of an entire nation on one single goal, the conquest of the world market with products of unparalleled quality.

"Dr. Deming will be acknowledged by his descendants as the one personality with the greatest influence on the world eco-

nomy during the 20th Century."

This statement was made by John Witney, professor at the Columbia University Graduate School of Business and the Harvard Business School during the conference of the W. Edwards Deming Institute in Arlington, VA from the 10th to the 15th October 1998. The same assessment was expressed by Daniel J. Boorstin, historian and from 1975 to 1987 director of the Library of Congress in Washington D.C., the world's largest and most respected national library. Boorstin considered the management philosophy of Deming to be the cause of the latest and most distinctive turning point in the course of the human history during the past two millenniums (History's Hidden Turning Points [3]).

The competition from the Far East engaged the USA in a fierce fight for economic survival with unemployment rates increasing from below 4% in the mid sixties to close to 10% in the early eighties. In his famous book, „Out of the Crisis“ [4], first published in 1982, Deming developed recommendations on what the industry and the government should be doing in order to overcome the crisis.

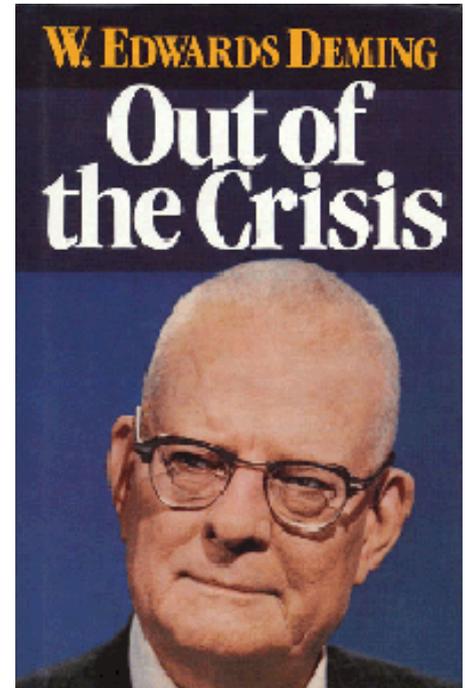
On the book-jacket, Deming himself introduces his book as follows:

„This book teaches the transformation that is required for survival, a transformation that can only be accomplished by man. A company can not buy its way into quality - it must be led into quality by top management. A theory of management now exists. Never again may anyone say that there is nothing new in management to teach.

When the management of most any company is asked „How do you go about improving quality and productivity?“ the usual answer that comes forth is „by everyone doing his best.“ Everyone doing his best is not the answer. It is first necessary that people know what to do. Drastic changes are required. The first step in the transformation is to learn how to change: that is, to understand and use the 14 Points in Chapter 2, and to cure themselves of the diseases in Chapter 3.

Long-term commitment to new learning and new philosophy is required of any management that seeks transformation. The timid and the fainthearted and people that expect quick results are doomed to disappointment.

Management will in time be judged not by the quarterly dividend, but by plans and



Picture 1: Book Cover of the best known book by Deming, „Out of the Crisis“ [4]. The book was first published in 1982 to show the United States the way out of its economic crisis. In October 1995 it appeared in its twenty-fourth printing.

innovation with the aim to stay in business, to protect investment, to ensure future dividends, and to provide jobs and more jobs through improvement of product and service for the future.

One requirement for innovation is faith that there will be a future. Innovation, the foundation of the future, can not thrive unless the top management has declared unshakable commitment to quality and productivity.“

The overwhelming challenge that faces the United States today is the need to regain competitive position in international commerce. America in fact continues to lose ground in manufacturing and service markets. The source of the problem? Low quality and high costs associated with many products and services.

The way to correct it? Managers must increase the quality and productivity of the systems of people and machines that they manage. Do America's managers understand what must be done? W. Edwards Deming proposes that most do not. In this, his landmark book, he explains with abundant illustrations what he believes managers have been doing wrong, informs them what they must do, and shows them Deming's Way Out of the Crisis.

Management Summary

During the past fifty years the roles of the various players in the global economy were totally rearranged. All of a sudden, a new player appeared on the playground asking for a part of the cake that before was divided among the traditional industrial nations. An entire nation set out to conquer the world market. The nation pursued this goal not with innovation but by doing known things better than others. It began to add something to products and services generally designated with the much over-used term „quality“. This is not remarkable. Remarkable however are two things: Firstly: It took more than thirty years and a severe economic crisis until the West started to understand what actually happened in the Far East. Secondly: The ideas and convictions of an American scientist initiated this most extraordinary turnover.

Economic data confirm that the United States learned the lesson. The same data show on the other hand that in Europe this learning process is just about to begin.

World War Two left Japan in a desolate situation: a people unable to feed themselves and without self confidence, a country without substantial natural resources and an industry in ruins.

Dr. W. Edwards Deming, a representative of the victors, driven by compassion for the suffering population and by a vision for the dignity of men in an industrialized environment, postulated the following basic human right: „**A man has the right to be proud of what he is doing!**“ Economies are to be restructured in a way to satisfy this basic requirement of human beings.

Based on the values of Christianity, Deming instilled the Japanese with a basic understanding for the quality of products and services, which, for that time, was most revolutionary. He explained them the compelling consequences of quality improvement, which later became known as the Deming Chain Reaction. This chain reaction was on the blackboard of every meeting with top management in Japan from July 1950 and onward.

The compelling consequences of quality improvements are:

- 1.) *Costs decrease because of less rework, fewer mistakes, fewer delays, snags, better use of machine-time and materials*
- 2.) *Productivity improves*

3.) *Capture the market with better quality at lower price*

4.) *Stay in business*

5.) *Provide jobs and more jobs*

The aim of quality improvements are jobs and more jobs. It is interesting to note, that Deming stresses the social function of a company and not the interest of the shareholders. Jobs activate the creative potential of human beings, generate income and provide welfare not just for a few, but for everybody. Unemployment is a waste, a terrible waste, which no nation should tolerate. Think of what the 5.2 million unemployed Germans could do for the nation.

This new understanding for the importance of quality penetrated all levels of the Japanese society and focused an entire nation on one common goal: The conquest of the world market with products of unparalleled quality.

The consequences of the subsequent efforts are now history. Japan conquered the traditional markets of Western industrialized nations. Consequently, unemployment rose in the West and arrived at a peak in the early eighties.

The history of modern age does not tell us of many ideas and concepts with a similar impact. Historians will have to explain why Western nations felt the painful consequences but were not able to fully grasp the true reasons behind.

In the Western hemisphere, the bomb exploded on 24th June 1980, 9.30 pm. The NBC documentary, „If Japan Can..... Why Can't We?“, shook the Americans out of their lethargic complacency.

Up until his death on 19th December 1993 Deming carried his message to top management with up to 35 Four-Day-Seminars per year. The subsequent actions of several hundred thousand managers led to a recovery of the American economy, to high productivity and low unemployment. The impulse of Deming was the beginning of the longest period of continuous growth of the US economy since World War Two.

Deming was not the only expert who came to Japan upon invitation by General Douglas MacArthur to teach the Japanese the secrets of mass production. Also Homer M. Sarason, A. V. Feigenbaum and especially Joseph Juran made significant contributions to the post war recovery of Japan. But Deming was the only one to create a totally new management philosophy from a value structure, from theory and experience

with such an impact on world economy as a whole.

This report intends to be an overview of the different philosophies and methods for the continuous improvement of quality of products and services. Quality will make companies not only competitive in the long term, it will also add jobs and more jobs. The report summarizes the revolutionary turnover of global economy since World War Two. It describes the contribution of Deming to the astounding recovery of Japan and the subsequent reaction of Western industrialized nations to the invasion of Japanese products. It explains the basic elements of the Deming management philosophy, sustainability of policies, continuous improvement and The System of Profound Knowledge (SoPQ).

„Without understanding, there is no improvement!“

This quote of Deming is the essence of his System of Profound Knowledge. Authorities on Deming are convinced, that this system is the most valuable legacy of Deming to contemporary and future generations. It stands on four pillars:

- 1.) The ability to think in terms of systems (Systems Thinking) and knowing how to lead Systems
- 2.) The ability to understand the variability of work in planning and problem solving
- 3.) Understanding how we learn, develop and improve
- 4.) Understanding people and why they behave as they do

The paper identifies the main reasons for the struggle for survival or collapse of organizations in terms of seven obstacles and seven deadly diseases. It lists his world famous Fourteen Points for Management, which became a symbol for Deming's teachings the world over. It presents a list of the best known quotes as an illustration on how Deming addressed critical issues.

Today's predominant management still seems to be incurably infected by the Scientific Management of Frederick Winslow Taylor (Taylorism). Deming, however, asks to shake off this chain. His philosophy requires a fundamental new way of thinking, a paradigm shift („Think Different!“). The report shows nine examples of today's management style in order to illustrate, what this change in thinking would mean in practice.

Paradigm Shift in Quality Management

Today the number of empty slogans linked to methods and procedures in quality management has become so immense that nobody is able to recognize the basic change of thinking, the paradigm shift, hidden behind. It is indeed a change of paradigm that took place under the pressure of the challenge from Far East. Two aspects, organization and variability, are used in order to illustrate this change.

Organization

Organizations expressed by Organization Charts

Today there is hardly any company which does not present its management structure in the form of an organization chart as shown in Figure 1.

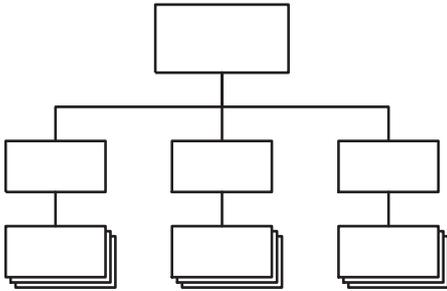


Figure 1: Conventional presentation of the management structure of an organization

Ordering criteria is hierarchy or the competence to make decisions. The information flows from the top to the bottom. The values of the superior determine the actions. The needs, desires and requirements of both internal and external clients are only considered when they are taken up by the decision process of the superior.

The objectives of a unit are decided by the unit itself within the limits given by the superior. The different members of a unit are generally not able to see the relation of these objectives to the policies and goals of the organization as a whole.

The duties of each member and the respective information needed are usually specified in individual lists of obligations.

Organization shown as a System

Figure 2 shows the organization in the form of a system. The fabrication of an industrial product is used as an example. The flow of information follows the flow of matter. All the efforts within the system are driven by the determination to exceed the expect-

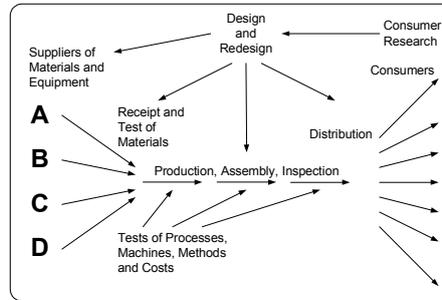


Figure 2: Systems-presentation of a manufacturing process

tations of the consumer. This figure was presented to the managers of Japan in 1950 and stood therefore at the very beginning of the subsequent conquest of the world markets.

Mutual dependance and cooperation of the members in units are decisive factors. Both are lost when units are enclosed in boxes and managed to compete with each other.

Work descriptions are not needed when every member of the team and the team as a whole recognizes, understands and continually improves their contribution to the aim of the system in which they work.

Understanding of Variation

In nature, there are no two things, which can be considered to be completely identical. This is far from being new. Men always knew how to get along with this fact. Products of craftsmen were custom-built. Industrial production, however, required exchangeable parts. Exchangeability and interchangeability depends on various prerequisites. There are two possibilities to satisfy these requirements. Each of these two is based on its own philosophy. Both have nothing in common. The change from one to the other represents therefore again a change of paradigm, acceptability versus desirability.

Acceptability Paradigm

Product specifications are usually based on this paradigm. When product properties are within specified limits, the product is considered to be acceptable, otherwise it is not acceptable. It is either this or that. It is either slow or fast, cheap or expensive, safe or unsafe. There is nothing in between.

In the acceptability paradigm, zero-defect quality is possible. Once the zero-defect quality standard is reached, no further improvement is possible.

Desirability Paradigm

This is the antithesis to the acceptability

paradigm. The digital viewpoint of acceptability is replaced by a more sensitive view. The desirability paradigm admits that between yes and no, good and bad, black and white, cheap and expensive, safe and unsafe, beautiful and ugly, etc., infinitely many intermediate shades are possible. It admits that a product or a service can always become better, safer, cheaper, more reliable, more economical, esthetically more pleasing, e.g. a product and a service can always be improved.

Walter H. Shewhart [6, 7], W. Edwards Deming [4, 5] und Genichi Taguchi [8] have developed the scientific basis for the practical application of the desirability paradigm. The findings of these eminent scientists were not recognized nor understood by the public for decades despite their application in the development, production and distribution of products recognized the world over to be of unparalleled quality.

Taguchi defined „Quality“ in terms of the financial loss caused by the deviation of a specific property of a product from its ideal state, called the „Target“. He developed a mathematical relation between these two variables, which became known as the „Taguchi Loss Function“. The overwhelming success of Japanese products on the world market is in part attributed to the application of this function. The practical application of this definition is called „Quality Engineering“.

Figure 3 shows the famous Taguchi relation. The loss incurred by deviation is minimal, when the average of the process variation occurs on target. In September 1960, Taguchi gave a new definition of World-Class Quality:

„On Target with Minimum Variance“

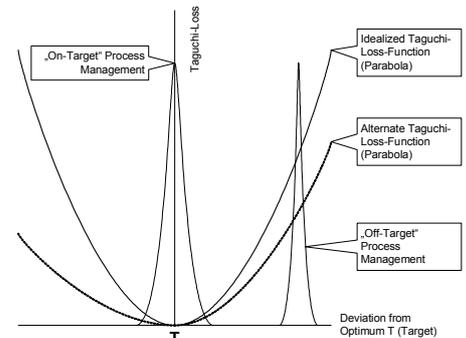


Figure 3: Definition of World-Class Quality according to Dr. Genichi Taguchi: „On-Target with Minimum Variance“

World Economy after World War Two

The surrender of Germany and Japan ended the Second World War. Only the production potential of the United States was left intact. The rest of the world lay on the ground and tried to get back on its feet generously supported by the United States.

The Marshall Plan for rebuilding Europe in the years after the war helped Europe to connect with its highly successful industrial past. The success of the subsequent reconstruction effort was amazing. Industrial production exceeded pre war level by 35% when the plan ended in 1952.

The situation in Japan was much worse. All industrial facilities were in ruins as well as the selfconfidence of the population and their confidence in the government. The country has a far from sufficient agricultural production and practically no natural resources. Iron or is imported from Australia and crude oil comes from the Far East. With respect to the supply of goods, Japan is the most dependent of all industrial nations. The only working capital of the nation are the human beings. But the first products exported by the industry earned the nickname „Japanese Junk“.

Figure 4 shows three economic indicators of the ten nations with the largest Gross Domestic Product (GDP) and 5 selected European nations calculated on the basis of Purchasing Power Parity (PPP). Shown are the GDP, the GDP per capita and the unemployment. The information is taken from the CIA World Factbook as published in www.cia.gov last updated on 7 September 2006.

The standard is set by the United States, which generates world's highest GDP of \$12.36 trillion together with one of the world's highest GDP per capita of \$41'800 and a relatively low unemployment rate of 5.1%.

The explosive growth rate of China's economy during the past years has pushed the country on second place with respect to the size of its GDP of \$ 8.859 trillion which, due to the sheer size of the population, is linked to a low GDP per capita of \$6'800 and a high unemployment rate estimated at around 20%. The low exploitation of the country's human resources suggests that China has indeed the potential to become world's largest economic power.

China pushed Japan on third place with its GDP of \$4.018 trillion, a GDP per capita of \$31'500 and an unemployment rate of 4.4%.

Figure 5 illustrates the influence of the de-

velopment of the Japanese economy on the unemployment in Western industrialized nations, the USA, Germany (BRD) and on OECD-countries as a whole. The USA was affected most. Unemployment rose from around 4% in 1965 to close to 10% in the early eighties.

An investigation of the competitiveness of the European industry, carried out by the European Commission [9 and 10] confirms the unfavorable initial position of Europe in the fight for a bigger share of the world market.

Figure 7 compares some selected characteristics of the European industry with the corresponding features of the industries in Japan and the United States. High unemployment and thus bad exploitation of the human resources have adverse effects on the standard of living and productivity.

The comparatively low productivity of Japan is not caused by an inefficient industry, it is the result of an inefficient agricultural and service sector.

Low expenditures for research and development, high tax loads, market distorting public subsidies are unfavorable prerequisites for sustainable competitiveness in the world markets.

Europe cannot withstand the competition from Japan and the United States and trust-

The 10 Nations with the largest GDP (PPP) and 5 selected European countries

GDP (Purchasing Power Parity) in Trillion USD

GDP (Purchasing Power Parity) per Capita in thousand USD

Unemployment Rate in Percent

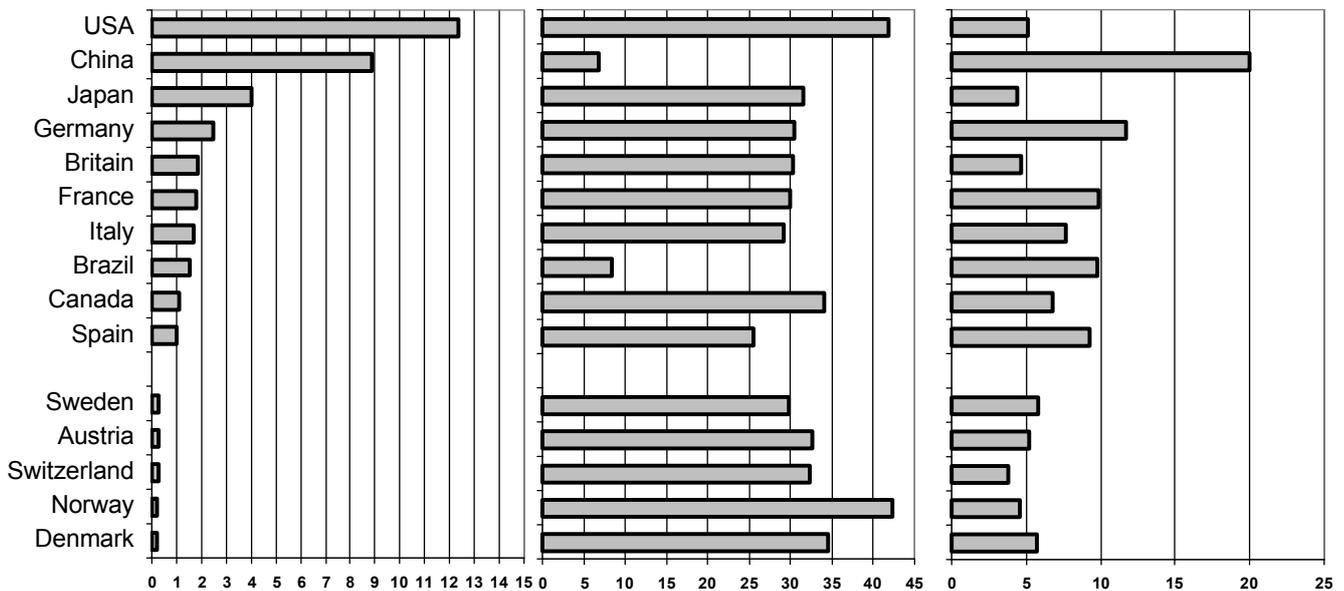


Figure 4: Economic data of the ten nations with the largest Gross Domestic Product (GDP) considering Purchasing Power Parity (PPP). The Figure shows the Gross Domestic Product (GDP-PPP), the GDP-PPP per capita and the unemployment rate for the year 2005. The information is taken from the CIA World Factbook as published in www.cia.gov last updated on 7 September 2006.

worthy efforts to change the detrimental factors are not visible.

A benchmarking study of the European Commission [9] confirms that this assessment is indeed true. Among other things, the Commission draws the following conclusions from this study:

- *The economy of Europe has a few strengths, but the European Union is not able to exploit its inherent potential and does therefore not exhibit the efficiency of its main competitors with respect to standard of living, productivity and and the creation of employment. Between Europe and its main trading partners and rivals - the USA and Japan -, there exists a recurrent and apparently intractable competitiveness deficit.*
- *Insufficient performance leads to little growth of value added, small profit margins and low demand for products in foreign markets.*
- *High costs and small investments especially in immaterial goods such as management knowhow, education and research are drawbacks.*
- *Research in Europe is not market oriented. A closer cooperation with industry is vital. New findings, new developments and new technologies are only reluctantly accepted especially in areas related to information technology.*
- *Procedures to finance innovation have yet to be developed. This seems to be a special problem in Europe.*

- *Unequaled quality of products and services is an irreplaceable attribute for survival in a highly competitive world market. A compassion for quality should be instilled on all levels of education, professional training and practice and of continuing education. Philosophies, methods and procedures developed over the past century by eminent scientists and engineers should be recognized, understood and applied.*

The Deming Chain Reaction

The reconstruction effort after the Second World War lead to a huge demand for industrial products. Quality was of no interest. Quality and productivity were considered to be incompatible. Managers firmly believed that measures to improve quality reduce productivity or higher productivity reduces quality. The book of Walter A. Shewhart, „Economic Control of Quality of Manufactured Product“ [7] establishes a completely different relationship. Figure 6 shows the sequence of compelling consequences of quality improvements. This relation became known as „The Deming Chain Reaction“, because it was for the first time presented to the Japanese by Deming in 1950. Henceforth, the relation stood on the blackboard of every discussion of Deming with Japanese managers.

Deming instilled in Japan a completely new view of the compelling consequences of quality improvements. It is essential to note that Deming stresses the social function

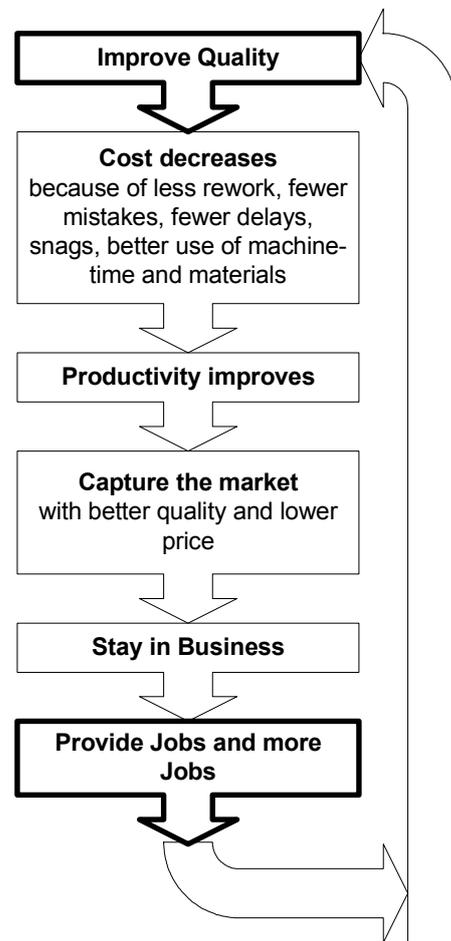


Figure 6: The new view of the compelling consequences of quality improvements: „The Deming Chain Reaction“

of a company and not the interest of the shareholder.

This new understanding for the importance of quality penetrated all levels of the Japanese society and focused an entire nation on one common goal: The conquest of the world market with products of unparalleled quality.

Deming told Japan in 1950 that within five years manufacturers the world over would be trembling and would begin to scream for protection. And indeed manufacturers did! Japan initiated a revolution of global economy not by talking about quality standards, certificates and awards but by satisfying customers the world over with products of unparalleled quality.

Who is Dr. W. Edwards Deming?

His Schooling

Williams Edwards Deming was born in Sioux City, Iowa (U.S.A), on 14 October 1900. After studies at the University of Colorado he earned his doctorate (PhD) in mathe-

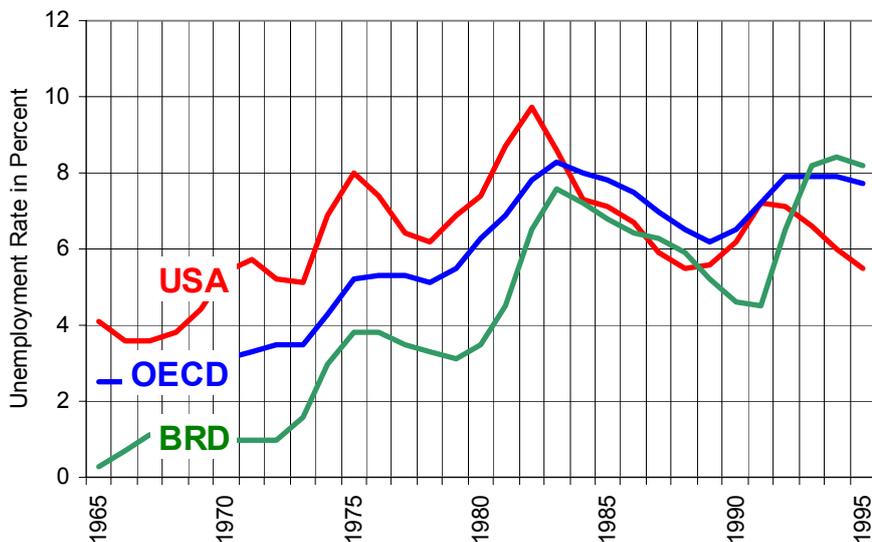


Figure 5: Unemployment in percent between 1965 and 1995 of Germany (BRD), the OECD-countries and the U.S.A. [9]

mathematical physics from the University of Yale in 1927.

He got his first employment as a physicist at the United States Department of Agriculture at a time when Sir Ronald Aylmer Fisher at the University College in London and Walter A. Shewhart at the Bell Laboratories made fundamental discoveries in the control of industrialized processes which later became known as „Design of Experiments“ and „Statistical Process Control SPC“ respectively. The close personal relation of Deming with these two eminent scientists and their fields of research was decisive for the later professional development from a physicist and mathematician to the world’s leading authority in the area of quality management.

His Values

Taylorism

In 1911 Engineer Frederick Winslow Taylor (1856 to 1915) published his landmark book “The Principles of Scientific Management” [1].

Taylor developed five principles of Scientific Management:

- 1.) Scientifically study each part of a task and develop the One best way of performing it.
- 2.) Select the best person to do the job.
- 3.) Train, teach and develop the worker.
- 4.) Provide financial incentives for following the methods.
- 4.) Divide work and responsibility so that

managers are responsible for planning the work methods and workers are responsible for executing the work accordingly.

The principles of Taylor were first applied by Henry Ford in the production of the T-Model in his factories River Rouge and Highland Park. The specific application of Taylor’s principles by Henry Ford was called Fordism. Workers were controlled not by superiors but by the repetitive tact of the assembly line, where the worker had to perform very few routine tasks within a short given timespan dictated by the assembly line.

Taylor wanted to exploit the work potential of a large uneducated and untrained workforce. This led at the very beginning of the industrial age to enormous productivity increases, higher salaries and shorter working hours, all in all to a higher standard of living.

Demingism

The management philosophy of Deming, called Demingism, is based on his values as a believing catholic. In his landmark book „Out of the Crisis“ [4] he often refers to statements of the Old Testament. Especially in Ecclesiastes 3,22 he sees a justification for a key element of his philosophy:

„So I (King Solomon) saw that there is nothing better for a man than to enjoy his work, because that is his lot. For who can bring him to see what will happen after him?“

Deming took up this statement of King

Solomon in Point 12 of his famous 14 Points for Management:

Point 12: Remove barriers that rob the hourly worker of his right to pride of workmanship.

Deming called pride in workmanship, a "birthright" of a human being. A principle task of leadership is to remove barriers. He claimed that it is the sense of having helped other people that is the single most important motivator in the workplace.

Albert Einstein expresses the same point of view in his speech to students at the State University of New York in Albany on 15 October 1936 [11].

„ To me the worst thing seems to be a school that principally works with methods of fear, force and artificial authority. Such treatment destroys the sound sentiments, the sincerity and the self-confidence of pupils and produces a subservient subject. It is the supreme art of the teacher to awaken joy in creative expression and knowledge. One should guard against preaching to young people success in the customary form as the main aim in life. The most important motive for study at school, at the university and in life is the pleasure of working and thereby obtaining results which will serve the community. The most important task for our educators is to awaken and encourage these psychological forces in a young man or woman. Such a basis alone can lead to the joy of possessing one of the most precious assets in the world -- knowledge or artistic skill."

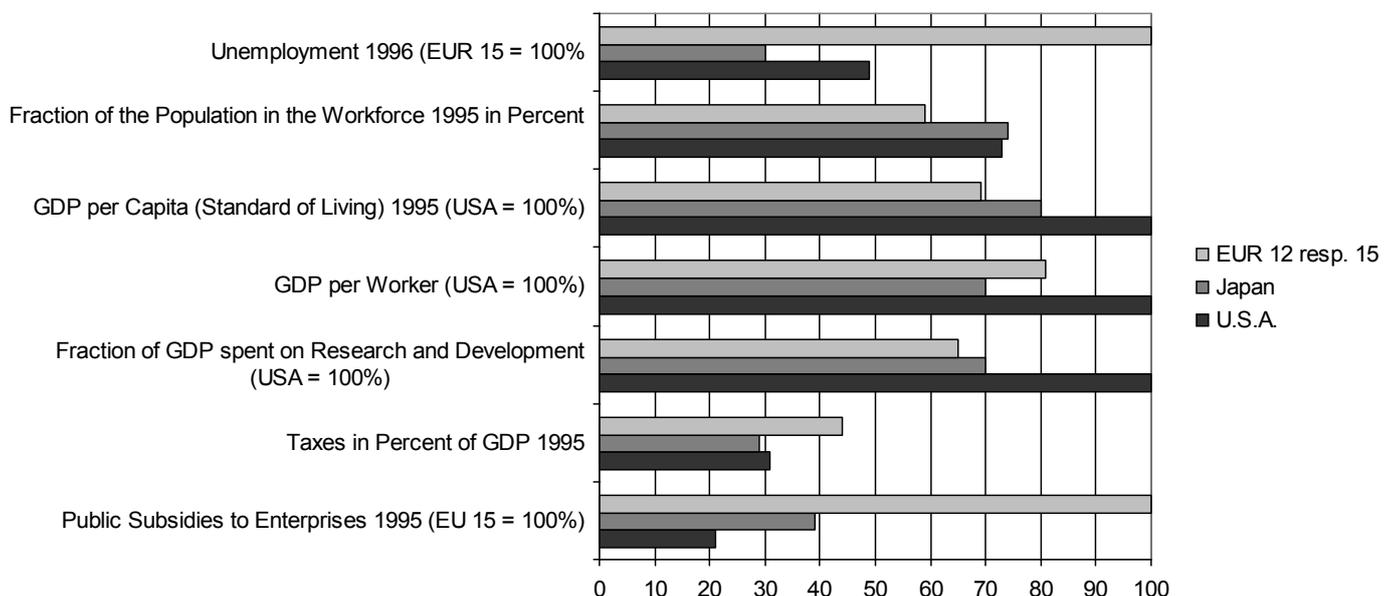


Figure 7: Key figures for the competitiveness of the European industry in comparison with Japan and the USA (Report of the European Commission on the Competitiveness of the European Industry [9])

Taylor versus Deming

The philosophies of Taylor and Deming are based on two totally different appreciations for the value and the psychology of human beings. They touch upon basic questions about the purpose of human life and are therefore undisputable.

In 1979, Konosuke Matsushita of Matsushita Corporation (Panasonic, National, Technics, etc.) gave a presentation to a group of American and European managers. Describing the commercial battle ahead, he quietly explained [12]:

“We are going to win and the industrial West is going to lose. There’s nothing you can do about it, because the reasons for your failure are within yourselves. Your firms are built on the Taylor model: even worse, so are your heads. With your bosses doing the thinking while the workers wield the screwdrivers, you’re convinced deep down that this is the right way to run a business.

Your kind of management consists of bringing the ideas in your heads in the hands of your workers.

We have outgrown the Taylor Model. Business nowadays has become so complex and survival in an increasingly unpredictable environment has become so difficult, that we cannot survive without using every single bit of creativity, knowledge and experience of our workers.“

His Vocation

W. Edwards Deming died on 19 December 1993 at the high age of 93 years. His teachings about the quality of products and services had a decisive influence on the development of world market during the second half of the 20th Century. They initiated the uncomparable dominance of Japanese products. They paved the way of Japan from military surrender to the economic superpower. They were also the reason that America after three decades of retreat was finally able to withstand the invasion from the Far East.

Japan heard and understood the recommendations of an American and went straight to work regardless of injured national pride and a „Not-Invented-Here-Syndrome“ thus setting totally new standards for other nations to strive for.

Deming was not the only quality specialist to pass on to the Japanese on invitation by General Douglas MacArthur the American experience in mass production. Others were Homer M. Sarason, W. S. McGill, Frank

Polkinghorn, Charles Protzman, A. V. Feigenbaum and Dr. Joseph Juran (Picture 2). Also the Japanese Dr. Kaoru Ishikawa and Genichi Taguchi left sustainable traces in the reconstruction of Japan.

However, it was the then president of the Union of Japanese Scientists and Engineers (JUSE), Icio Ishikawa, who in June 1950 introduced Deming to the absolute top representatives of the Japanese industry. Deming convinced this select group that unparalleled quality of products and services can only be achieved with the wholehearted and active backing of top management. „Quality must begin at the top!“ Quality can never be better than what top management conceives to be quality [13, pages 21 and 22]).

Deming emphasises later that without this presentation in front of the very top managers of Japan his appeal would never have produced the impact hoped for. His similar appeals in his home country remained unnoticed.

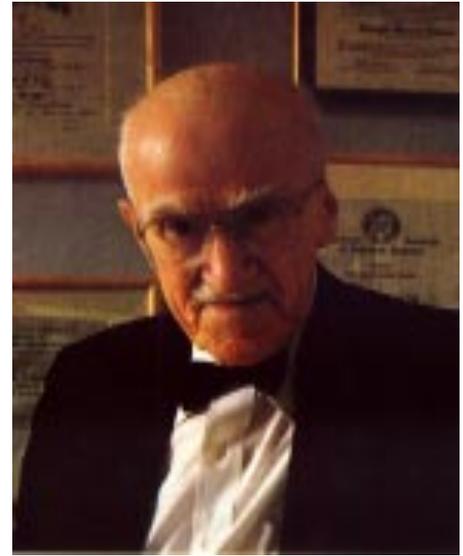
After the war, Japan disposed of a large number of top level statisticians. But this field of knowledge was of no interest. Deming showed to them that statistics is the crucial knowledge in the area of quality and that statisticians must play a major role in the reconstruction of the country.

Upon recommendation of Deming, JUSE invited Dr. Joseph Juran (Picture 2) in 1953 to come to Japan for his first time. Juran as well as Deming received in his home country very little attention. Juran became personal consultant to Eiji Toyoda. This assignment confronted him with the particular problems of the Japanese automobile industry thereby strongly influencing Japanese manufacturing practices.

Joseph Juran is an internationally acclaimed quality guru, similar to W. Edwards Deming. Both strongly influenced Japanese manufacturing practices. Joseph Juran’s belief that “quality does not happen by accident” gave rise to the quality trilogy: quality planning, quality control and quality improvement.

Many have consulted Japan along its way to world economic power. Success always has many fathers. But Deming was the only one who created from his set of values a management philosophy which showed to be vastly superior in the years to come.

Many Americans went on pilgrimage to Japan after the superior quality of its products became obvious. Since they did not have a theory, they did not know what que-



Picture 2 Dr. Joseph Juran began his consultancy work in Japan in June 1953. He proclaimed that quality does not happen by accident. This gave rise to the quality trilogy: *Quality planning, Quality control and Quality improvement*

stions to ask. After seeing the quality circles, they believed that this must be the secret of success. They copied visible processes without knowing the underlying conditions. They conducted benchmarking.

In 1979 Clare Crawford-Mason, a television journalist became aware of Deming after several detours [14]. NBC asked her to produce a documentary with the title: „What did Happen to Good Old Yankee Ingenuity?“ This documentary should answer the question, why the American industry did nothing to stop the invasion of Japanese products. The research for this assignment, however, did not produce worthwhile results, at least not results good enough to produce a captivating story. What she learned during her first talk with Deming in his small basement office just a few miles away from the White House seemed to her totally incredible. After talks with some of Deming’s clients confirmed what Deming told her, she decided to produce the documentary.

On 24 June 1980, 9.30 pm, the documentary with the new title „If Japan Can ... Why Can’t We?“ was watched in millions of American homes. The film acted like a bomb. „Quality does not improve just by working harder. Everyone doing his best is not the answer. It is first necessary that people know what to do! We expect miracles from Japanese working methods, but without a method we do not understand what we copy.“ The statements of Deming lead to a sudden awakening of his

fellow countrymen from a slumber in lethargic complacency. From one day to the next Deming became one of the most sought after management consultant. We have to be aware that when this happened Deming was already eighty years old.

Ford was one of the first to seek Deming's advise on how to find a way out of its pressing financial and quality problems. The advise of Deming helped Ford to reduce drastically its quality backlog against its Japanese main competitors. It is interesting to note that Ford was also the first to apply the „Scientific Management“ of Frederick Winslow Taylor 70 years earlier. The disastrous problems Ford finds itself in today show that the firm listened to external advise but was not able to transform the recommendations into sustainable competitiveness.

At an age, when most of his fellow countrymen wait to die in old people's homes, Deming's famous „Four-Day-Seminars“, - around 35 seminars per year each with several hundred participants-, carried the message to several hundred thousand top managers and consultants. Deming's activities were actively supported by the Reagan Administration. It is therefore not by accident, that in the early eighties the American economy entered the longest phase of continuous growth in history. After many years of depression, America finally found its way back to high productivity and low unemployment. This is what the Deming Chain Reaction promises to be the result of all efforts to improve quality.

Deming was an uncomfortable contemporary. His attacks of the American management were relentless. „*Only top management is responsible for the problems of the American economy. Every worker wants to work hard and to do a job he can be proud of. Quality begins in the board room and not in the workshop. It is stupid to make a foreman responsible for the quality of the products. He did not develop and design the product, he did not select the suppliers, he did not decide on the price and on the way a product is sold and serviced.*“ Enthusiasm, competence and experience and an unsurpassable success record characterized his message. His message was heard, understood and put to work.

When Deming's long-standing secretary, Mrs. Cecelia S. Kilian [13], appealed to her boss to slow down, she got the answer: „*I have now waited for thirty years expecting my contemporaries to listen to what I*

have to say. Finally, they are ready to do just that. I cannot retire before I have answered their questions.“

His Testimony

A Revolution of Thinking

The decades after World War Two brought radical changes to all aspects of human society. Taylorism, which served its purpose well in the first phase of industrialization, is no longer able to respond to these changes. Deming therefore asks for a revolution of thinking.

During the years after the war, industry was increasingly able to satisfy the hunger of the world for material products. Customers became therefore more and more interested in the quality of products and services. Organizations best able to respond to these changed requirements, became successful. Taylorism had to be replaced by a totally new way of thinking. Deming never said that this change of mind would be easy, quite the opposite.

Figure 8 shows eight areas with deeply entrenched convictions or paradigms, where the changes mentioned above required a paradigm change. Today only a few of these are widely accepted. Most of them, however, are still subject of endless discussions and this 50 years after Japan underwent this transformation and demonstrated the extraordinary effect of this new way of thinking.

Metamorphosis of the American Way of Management

The effect of Deming's message on the American economy cannot be ignored. His Four-Day-Seminars reached the boardrooms of America's most influential and respected corporations. His books [4, 5] and video recordings as well as the publications of his closest affiliates are sold in millions of copies. For the crippled American automobile industry the suggestions of Deming meant the last resort. The industry is able to restrain the flooding of Japanese imports. When purchasing products and services, the American Army considers the recommendations of Deming. Most organizations maintain a long range single supplier policy with their most important suppliers. The urge to continuously improve products and services penetrates all management hierarchies. In healthcare the abbreviaten CQI for continuous quality improvement became a key word. The law prescribes that in healthcare all services have to be engaged in a quality improvement process. Even organizations which

have earned an ISO-Certificate as a very first step on their quality journey use Deming's ideas as a guideline in the further development of the system.

It is unquestionable that Deming initiated in America a new and better understanding for the importance of quality. This appreciation was lost during the exhilaration for quantity and growth after the Second World War. Most importantly, however, the totally new view of management revealed by Deming will outlast future generations.

The Deming Prize

Upon his visit to Japan in July 1950, Deming lectured day after day his "Eight-Day Course on Quality Control" at the Auditorium of the Japan Medical Association in Kanda-Surugadai, Tokyo. This was followed by Dr. Deming's "One-Day Course on Quality Control for Top Management," held in Hakone. Through these seminars, Dr. Deming taught the basics of statistical quality control plainly and thoroughly to executives, managers, engineers and researchers of Japanese industry.

His teachings made a deep impression on the participants' mind and provided great impetus to quality control in Japan, which was in its infancy. The transcript of the eight-day course, "Dr. Deming's Lectures on Statistical Control of Quality," was compiled from stenographic records and distributed for a charge. Deming donated his royalties to JUSE. In appreciation of Dr. Deming's generosity, the late Mr. Kenichi Koyanagi, managing director of JUSE, proposed using the royalties to fund a prize to commemorate Dr. Deming's contribution and friendship in a lasting way and to promote the continued development of quality control in Japan. In 1951 JUSE's board of directors unanimously decided to establish the Deming Prize [15]. The medal shown in Picture 3 is given to the prize winners.

The list of prize winners reads like a „Who is Who“ in Japanese industry. The list shows well known names such as Toyota, Komatsu, Ricoh, Toshiba, Bridgestone, Matsushita, Texas Instruments Japan, Fuji Xerox etc. Also Western firms became interested to apply for the prize. In autumn 1989 the prize was awarded to Florida Power & Light, a utility.

The W. Edwards Deming Institute

The W. Edwards Deming Institute® was founded by Dr. Deming in 1993. The Institute is headquartered in Washington, D.C. It is a nonprofit corporation which provides educational services related to the

teachings of Dr. Deming. These services include conferences and seminars. The Institute also makes Dr. Deming's personal and professional papers available to researchers at the U.S. Library of Congress. The Deming Collection at the Library of Congress includes an extensive audiotope and videotape archive of Dr. Deming. The aim of The W. Edwards Deming Institute® is to foster understanding of The Deming System of Profound Knowledge™ to advance commerce, prosperity and peace.

Affiliates to the W. Edwards Deming Institute are active in practically all American states. Especially active is an organization headquartered in California. The In2: In-Thinking Network was formed in 2001 by a group of students of the work of W. Edwards Deming and related theorists. The aim of the network is to make thinking about systems, variation, knowledge and psy-

chology and their interaction - which comprises Deming's system of profound knowledge - more conscious.

Outside the United States, the W. Edwards Deming Institute has affiliates with the same objective in Australia, Canada, France, Germany, Great Britain, India, Italy, Norway, Russia, Sweden and Switzerland.

Deming as judged by Posterity

„Dr. Deming will be recognized by future generations as the personality with the strongest influence on world economy during the 20th Century.“

This statement was made by John Witney, professor at the Columbia University Graduate School of Business and at the Har-



Picture 3 This picture is of the Deming Medal, given to those organizations and individuals that receive the Deming Prize. It shows Dr. Deming's profile with his words inscribed on the medal: „THE RIGHT QUALITY & UNIFORMITY ARE FOUNDATIONS OF COMMERCE, PROSPERITY & PEACE.“

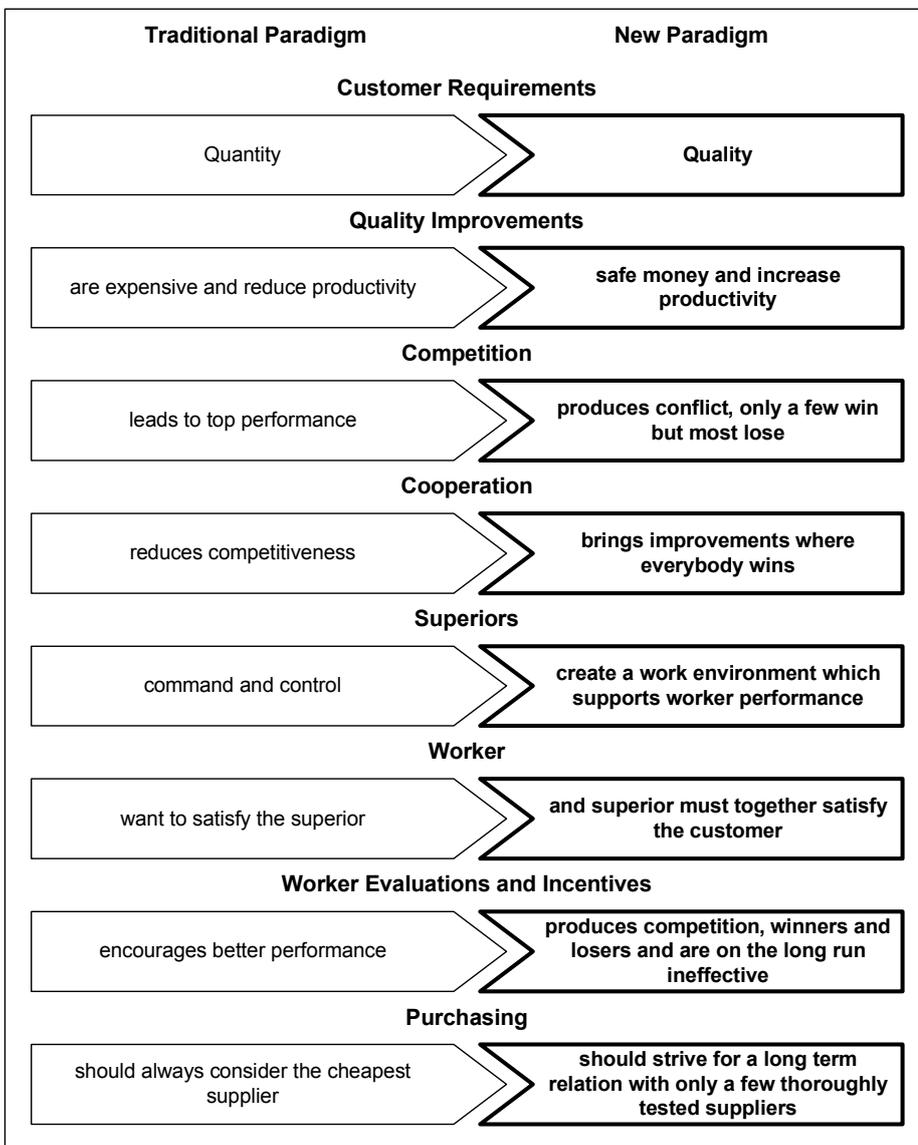


Figure 8 Paradigm Change in 20th Century Management. Eight areas which illustrate the paradigm change forced upon management by the change of the customer requirement from quantity to quality.

vard Business School, at the Fall Conference 1998 of the W. Edwards Deming Institute in Arlington VA. Professor Witney is not the only one to make this assertion. Daniel J. Boorstin, historian and Pulitzer Prize Winner, director of the Library of Congress from 1975 until 1987, considers Deming to be the cause of the last of the nine most significant turning points of the past two millenniums („History's Hidden Turning Points“ [3]). The sequence begins with Apostle Paul, who in the middle of the first Century spread the gospel of Jesus Christ in the Roman Empire, which at that time meant the entire world. The sequence ends with Deming, whose revolutionary thinking about the quality of products and services totally changed the course of world economy during the 20th Century.

Corner Stones of Deming's Teachings

Deming's teachings mean a fundamental change of convictions most people have followed for a lifetime without reflection. They create a new culture in organizations. They change the relations with customers, suppliers and fellow workers. His teachings will be later described in some detail in terms of the Seven Deadly Diseases, the Seven Obstacles and the Fourteen Points for Management. But the underlying ideas of all these rules can be presented under the following three headings:

- Sustainable policies
- Continuous improvement

- System of Profound Knowledge (SoPK)

Sustainable Policies

In their famous book, „Business Reengineering“ [16], Hammer and Champy recommend top management to answer over and over again the following question: „Why are we doing what we are doing?“ This question may sound trivial. But the answer is vital for the long term existence of an enterprise. Employees, suppliers and customers should know and understand the answer.

Deming used to love to tell the story about the carburetor industry, which grew to be one of the largest in America before it collapsed. The industry collapsed not because the products were bad. These were the best there are. The goal of the company was to build carburetors. But in order to stay in business, the goal of the company should have been to build a product which mixes air with fuel to get the car started and running. So the ignition pump appeared on the market, which did the job more efficiently and reliably. Consequently, the carburetor producer was pushed out of the market.

Continuous Improvement

Nobody will expect an organism or a man made system to work faultlessly. But for an organism and a system to exist on the long term, deviations are only allowed to vary within certain limits. They must be under control. Just as organisms of nature are provided with self healing capabilities, every excessive deviation in a man made system should initiate improvement processes. Improving means problem solving, problem solving means learning and learning means surviving, in nature as well as in industry. Learning ability is therefore the prerequisite for the long term existence of an enterprise.

Walter A. Shewhart, teacher and mentor of Deming, published today's probably best known problem-solving model in his book, „Statistical Method from the Viewpoint of Quality Control“ [7]. The improvement cycle of Shewhart consisted only of the three steps I: specification, II: production and III: inspection as fundamental steps in quality control.

- I. The specification of the quality of the thing wanted
- II. The production of things designed to meet the specification

III. The inspection of the things produced to see whether they meet the specification

In his landmark book, „Economic Control of Quality of Manufactured Product“ [6], Shewhart gives the following definition of the term „Control“ in the context of quality management.

„A phenomenon will be said to be controlled when, through the use of past experience, we can predict, at least within limits, how the phenomenon may be expected to vary in the future. Here it is understood that prediction within limits means that we can state, at least approximately, the probability that the observed phenomenon will fall within the given limits.“

In this sense, the eclipse of the sun is a predictable phenomenon. The same holds for the free fall of a mass in the gravity field. In both cases, prediction is even very precise unlike the prediction of the life expectancy of a certain individual or the tensile strength of a steel wire.

In 1950, Deming explained to his Japanese audience eager to learn a quality improvement cycle consisting of the four steps „Plan-Do-Study-Act“ (P.D.S.A.), Figure 9. He was always very careful to refer to this cycle as the Shewhart Cycle. This did not avoid the PDSA-Cycle from becoming known the world over as the Deming Cycle of Continuous Improvement. The cycle became a symbol for the success of Japanese products in global competition. Its specific application in Japan is called Kaizen [17].

Even today the West does not yet understand the application of the cycle that Shewhart had in mind. Shewhart intended this cycle being used together with his methods for process analysis. Only the correct view of process behavior leads to insight into the nature of processes as a prerequisite for process improvement. „What you do not understand, you cannot improve!“ It is also very helpful to view the cycle as a three dimensional spiral, since every passage of the cycle lifts the quality to a higher level.

When Deming in 1992, after the fall of the iron curtain and at an age of 92 years, was invited to come to Moscow to give advice for the economic development of the Soviet Union, he presented this cycle as a new

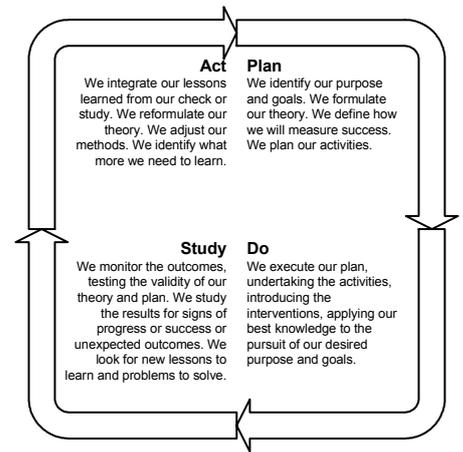


Figure 9 Plan-Do-Study-Act (P.D.S.A.)-Cycle (also known as Shewhart-Cycle, Deming-Cycle or Ishikawa Cycle) with the four steps for problem solving and continuous improvement

way of thinking.

The System of Profound Knowledge

Big efforts and hard work do not accomplish anything, if they are not led by profound knowledge. This profound knowledge cannot be replaced by anything else. What is not understood, cannot be improved. Changes without thorough understanding is tampering. Deming recognizes that profound knowledge rests on four pillars, also called Four Pillars of Wisdom, each pillar depending on the other three, thus each being part of a system, the System of Profound Knowledge (SoPK). The pillars stand for Appreciation for a System, Knowledge about Variation, Psychology, Theory of Knowledge (Figure 10).

Many are convinced that SoPK is the most valuable legacy of Deming for this and future generations.

Appreciation for a System

In 1950 Deming confronted Japan with a totally new view of the world, the systems view. But before dealing with this new world view, the concept of the system itself has to be understood. The following definition is taken from the book of Russel L. Ackoff, „Ackoff's Best“ [18, page 15ff].

A System is a set of two or more elements that satisfies the following three conditions:

- 1.) The behavior of each element has an effect on the behavior of the whole.
- 2.) The behavior of the elements and their effects on the whole are interdependent.
- 3.) However subgroups of the elements

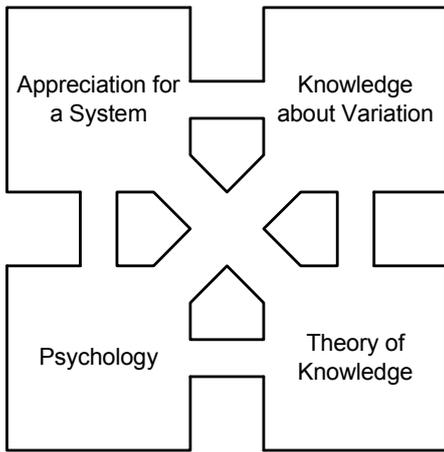


Figure 10 Deming's System of Profound Knowledge (SoPK) with its four pillars: Appreciation for a System, Knowledge about Variation, Theory of Knowledge and Psychology

are formed, each has an effect on the behavior of the whole and none has an independent effect on it.

Therefore, when a system is taken apart, it loses its essential properties, which again means, that a system cannot be understood by analysis. Synthesis, or putting things together, is the key to systems thinking just as analysis, or taking them apart, was the key to Machine-Age thinking. Based on this concept, Deming recommended the Japanese to view production as a system as shown in Figure 11 and not as something to be taken apart. In retrospect, Deming believed that this diagram had by far the biggest impact on Japan's recovery after the war.

Knowledge about Variation

Whatever man does, thinks, feels, perceives and senses is part of a process. Processes transform input to output and nothing in this relation can be said to be true, absolute, constant, fixed and unyielding. Everything is variable.

This is not new, it is natural. Man has always understood to live with it. This fact, however, became increasingly important in the transition from custom building to mass production with the need to make parts exchangeable. For many decades, statisticians investigated the nature of process variability and arrived at methods which became known as „Statistical Process Control“ (SPC).

Deming became acquainted with this field of research during his close cooperation with Walter A. Shewhart (March 18, 1891 - March 11, 1967), physicist, engineer and statistician (Picture 4). He became aware of the importance of a thorough understanding of process behavior as a prerequisite

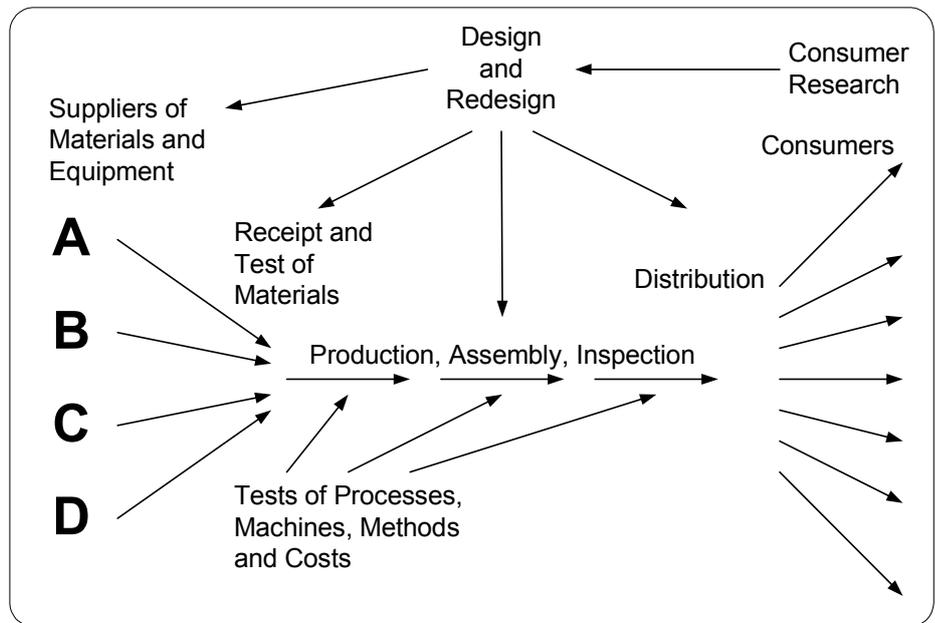


Figure 11 Production as a System as presented to the Japanese by Deming in 1950

for process improvement. „You can only improve what you understand“. Shewhart described his findings in the book „Economic Control of Quality of Manufactured Product“ [6].

Figure 12 shows the result of the application of Shewhart's method to a practical example. The variation of electrical resistance is shown over a certain period of time. The process behind produces an arbitrary looking scatter of points. At first glance, nothing can be said about the process. Does the process satisfy the requirements? When not, what could be done to improve it?

The method of Shewhart determines the arithmetic average of process variation $MEAN_x$, the upper natural process limit $UNPL_x$ and the lower natural process limit $LNPL_x$. This paper cannot go into the details of the application of Shewhart's method. Only a few explanations will therefore be given.

The upper natural process limit $UNPL_x$ and the lower natural process limit $LNPL_x$ define a certain width for the spread of the points.

If process variation would be completely within these limits, it could be said that the process is in statistical control. The reason for the variation is random. The variation has common causes. It is therefore called Common Cause Variation. There is no way to find out, why one point is different from the other. The reason may be an arbitrary combination of causes within the process. It can be said, on the other hand, that a process in statistical control will vary in the future between the same upper and lo-

wer limits if no external influence occurs. This is a prediction. Deming says over and over again: „Management is Prediction“.

The example in Figure 12, however, shows quite a large number of points outside these two limits. The process exhibits Special Cause Variations, it is out of statistical control. The process is chaotic and nothing can be said about its behavior in the future. No prediction is possible. Shewhart said that every point outside the limits is very likely to have a special cause and that it is therefore economically feasible to search for this cause. Causes have to be identified and measures have to be taken that these causes cannot occur again in the future. After all measures were taken, it has to be demonstrated that the elimination of all special causes will produce a process under statistical control, e.g. a process, the behavior of which in the future is predictable.

If the band width of a process in statistical control is not acceptable, the process must be reengineered, e.g. by replacing worn out machinery or by redefining process structure.

During his four-day-seminars, Deming used to visualize some of his most basic statements with experiments. The „Red Bead Experiment“ and the „Funnel Experiment“ were used to deepen the understanding for variation.

The Red Bead Experiment (Picture 6), in particular, was used to illustrate the following facts:

- Quality is defined by top management.

- In most cases, man cannot be made responsible for defects.
- Rigid and detailed work procedures do not guarantee for quality.
- A numerical quota is a fortress against improvement of quality and productivity.
- 100 percent inspection is costly and of limited use.

The Nelson Funnel Experiment (Picture 7) leads to the following conclusions:

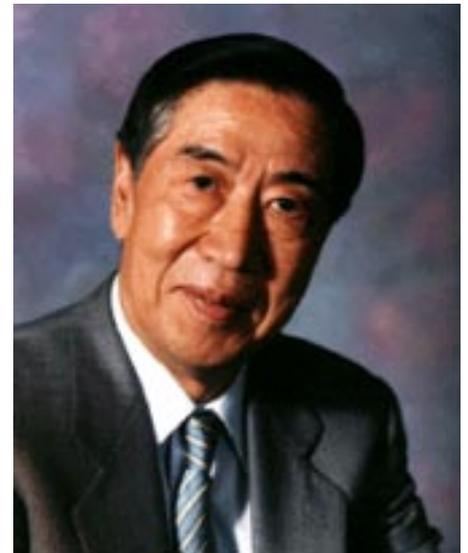
- There are processes, where man can decisively influence quality.
- Hasty and unreflected process interventions (tampering) will deteriorate quality and can produce uncontrollable conditions. Processes may get out of hand and may, in the words of Deming, escape to the Milky Way.

Both experiments are described vividly in the book of William J. Latzko und David M. Saunders, „Four Days with Dr. Deming“ [19].

Genichi Taguchi (Picture 5) made a pioneering contribution to the understanding



Picture 4 Walter Andrew Shewhart (1891 - 1967), physicist, engineer and statistician, father of statistical process control (SPC)



Picture 5 Genichi Taguchi (*1924), engineer and statistician. Inventor of the Taguchi Loss Function

of variation. He was a member of the first generation in the Japanese quality movement. He laid the basis for Robust Design as an employee of the Nippon Telephone and Telegraph Company (NTT) in the fifties and early sixties. His contribution to

the development of quality management was honored with the Deming Prize in 1962. Unfortunately, the corresponding publication „System of Experimental Design“ was published in English not before 1987 [8]. In the meantime, the products developed, designed and built on the basis

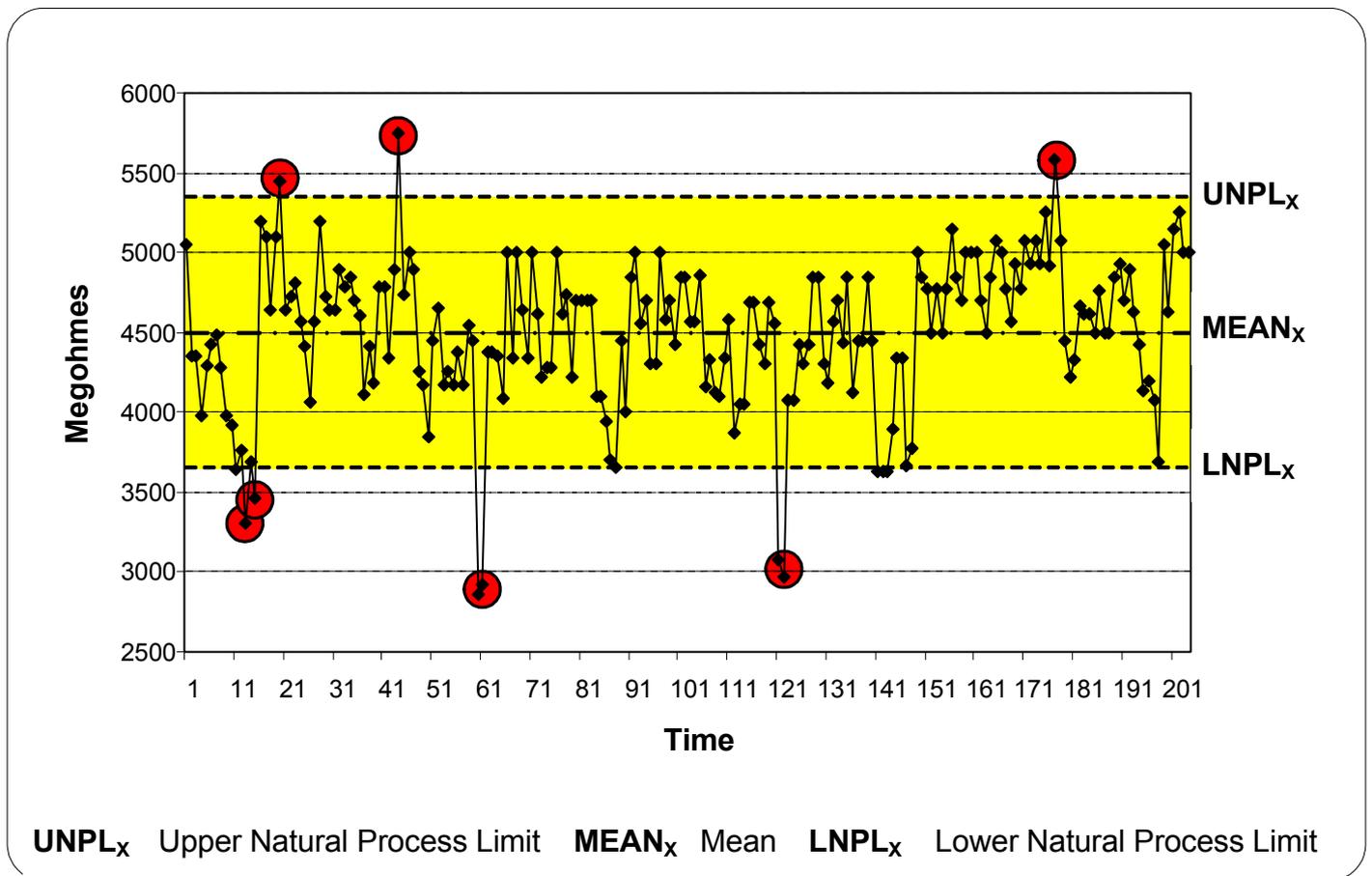
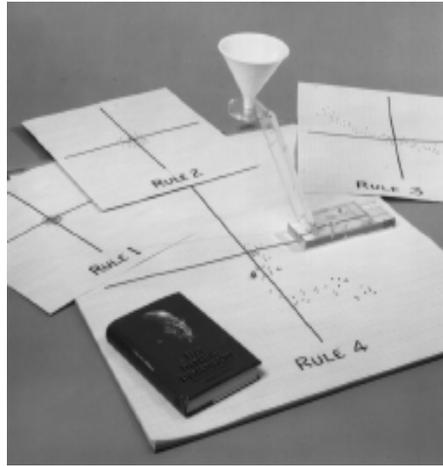


Figure 12 Application of Shewhart's method to a practical example. The variation of electrical resistance is shown over a certain period of time. The process behind produces an arbitrary looking scatter of points. The method of Shewhart determines the arithmetic average of process variation $MEAN_x$, the upper natural process limit $UNPL_x$ and the lower natural process limit $LNPL_x$.



Picture 6 Tools used to demonstrate the „The Red Bead Experiment“. The tools are a plexiglass tank containing 1800 white pearls (beads) and 400 red pearls. Mechanical samples are taken with paddles having 20, 50 or 100 depressions.



Picture 7 Tools used to demonstrate the „Nelson Funnel Experiment“. The picture shows the funnel placed on a stand, a little black ball and some record sheets.

of the Deming philosophy and the Taguchi method captured the world market. The supremacy of Japanese products is attributed to about 80% to the application of the Taguchi Methods.

Taguchi defined the term „Quality“ in a way that could be applied by engineers in all phases of the manufacturing of a new product. The practical application of the definition in the design process is called „Quality Engineering“.

The old traditional definition of quality states that quality is conformance to specifications. This definition was expanded by Joseph M. Juran (Picture 2). Juran observed that "quality is fitness for use."

Taguchi presented yet another definition of quality. His definition stressed the losses associated with a product. Taguchi stated that "quality is the loss a product causes to society after being shipped, other than losses caused by its intrinsic functions." Taguchi asserted that losses in his definition "should be restricted to two categories: (1) loss caused by variability of function, and (2) loss caused by harmful side effects."

Taguchi is saying that a product or service has good quality if it performs its intended functions without variability and causes little loss through harmful side effects, including the cost of using it. His philosophy embodies three important premises:

- 1.) For every product quality characteristic there is a target value which results in the smallest loss.
- 2.) Deviations from target value always results in increased loss to society.

- 3.) Loss should be measured in monetary units (dollars, pesos, francs, etc.).

This implies that any deviation from the target (based on customers' desires and needs) will diminish customer satisfaction. Customer satisfaction can always be improved. This definition of quality is therefore also called the desirability approach. This is in contrast to the traditional definition of quality as conformance to specifications, also called the acceptability approach. In the acceptability approach, zero defects are possible. When zero defect state is reached, further improvements are no longer possible.

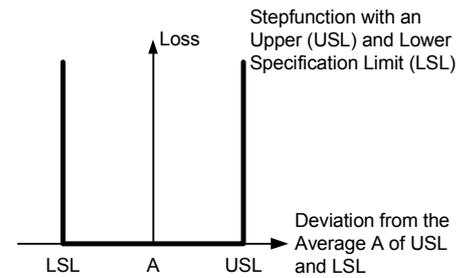
Management has been trying this approach since the beginning of the industrial revolution. The consequence was lack of progress. There is no reason to believe it will be different in the future.

The acceptability approach and the desirability approach have different objectives and lead therefore to different results. Management must adopt one or the other as a guiding principle.

This overview paper cannot go into detail with respect to the practical application of the Taguchi Methods. Since the middle of the eighties, a considerable number of books that deal with this subject were published in English, e.g. [20].

The Taguchi philosophy motivated the Japanese to strive for lower and lower deviations from target by continuously improving the work processes. The result were smaller and smaller dispersions of product characteristics producing gains as predicted by Deming all along his Chain Reaction.

Acceptability Approach



Desirability Approach

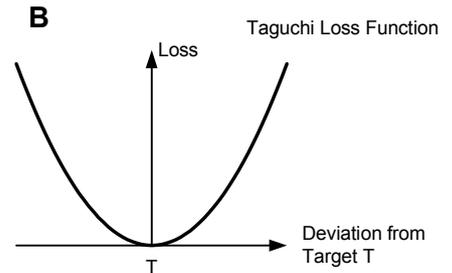


Figure 12 Two alternative definitions of quality: The Acceptability Approach and the Desirability Approach. The first definition assumes that a product is acceptable, when the deviation varies between the Upper (USL) and the lower specification limit (LSL). A loss of unknown size is produced when the variation lays outside these limits. The second definition assumes that every deviation from target T produces a loss assumed to be approximately the square of the deviation, the Taguchi Loss Function.

Japanese automobile manufacturers produce doors with that high a precision, that they can be fitted to the chassis without any adjustment. Parts are produced to „Snap-Fit“-Accuracy.

California was the first State where in 1960 the first penetration by the Japanese car makers took place. Frank Pipp, a former manufacturing executive with Ford completely disassembled a Toyota truck in order to get a feel for how well made it was. At that time, Ford, along with the other American auto makers, didn't believe that you could assemble a car without a rubber mallet to bang together the parts that didn't fit quite right. But when the invited automobile executives watched how a team reassembled the Toyota truck again, they were speechless. Not once did the team have to pick a mallet. All parts were entirely snap-fit. To make sure they were not hallucinating, they took it apart a second time and put it back together again. Incredibly enough, it was a snap-fit vehicle. Everybody

was speechless, until the division general manager cleared his throat and remarked: „The customer will never notice.“ Everybody agreed and trotted off happy as clams. For the American automobile industry, this arrogance toward the customer could not have had worse consequences.

This story was taken from the book of Kearns and Nadler, „Prophets in the Dark“ [21].

In the early eighties Ford equipped one of its products with an automatic transmission built for Ford by Mazda in Japan. The customer noticed, that the cars with the transmission built by Mazda operated with much less noise and no defects requiring costly warranty work as compared to the same type of car using the same automatic transmission built based on the same specifications by Ford in Batavia, Ohio [22].

Customers do not care whether something is built to specification or not. They no-

tice, however, whether they are satisfied with a product, even if they are not able to reason. They pass this feeling on to friends and new customers are won.

This is the reason for the extraordinary success of Japanese products on the world market. Japanese manufacturers did just everything to consider the needs and desires of customers from development, to design, production, distribution, after sales service and continuous product improvement. They still do it today as it is shown by the results of the J D Power Customer Satisfaction Study 2004, 2005, 2006 [23] in Figure 13.

Year after year, Toyota leads the list by a considerable margin, followed usually by the Japanese car manufacturers Honda, Mazda, Subaru and Mitsubishi. Over decades of consistent performance Toyota accumulated an immense capital in terms of public trust motivating customers to return and to take their friends along. Toyota

does not need to offer huge discounts and other sales incentives to “move the metal”. The result immediately shows up under the bottom line.

Despite today’s cruel economic environment, Toyota manages to grow continuously and to make large profits. In 2004 Toyota passed Ford to become the second largest automobile producer. Before long, Toyota will overtake General Motors becoming the biggest car company in the world probably having no less than 15% of the world market. Toyota will continue to grow because of the unparalleled quality of the products, the creative potential of the workforce and last but not least the tremendous financial strength as reflected by its market capitalization. Toyota will prevail. Most others will have the choice between shrinking or sinking.

Toyota is probably the most impressive demonstration that Deming’s Chain Reaction as shown in Figure 6 works indeed.

Theory of Knowledge

The term „knowledge“ has to be understood as a part in the sequence of data, information, knowledge, understanding and wisdom. Russell Ackoff [18] defines these terms as follows:

Data is raw. It simply exists and has no significance beyond its existence (in and of itself).

Information is data that has been given meaning by way of relational connection. This "meaning" can be useful, but does not have to be.

Knowledge is the appropriate collection of information, such that it's intent is to be useful.

Understanding is the process by which I can take knowledge and synthesize new knowledge from the previously held knowledge.

Wisdom beckons to give us understanding about which there has previously been no understanding, and in doing so, goes far beyond understanding itself.

When talking about this subject, Deming referred to the book of Clarence Irving Lewis, „Mind and the World Order“ [24]. The following statements are taken from his book, „The New Economics“ [5].

Management is Prediction.

Management in any form is based on predictions. Even the most simple everyday decision, e.g. to drive home in the evening, is based on a number of predictions. Pre-

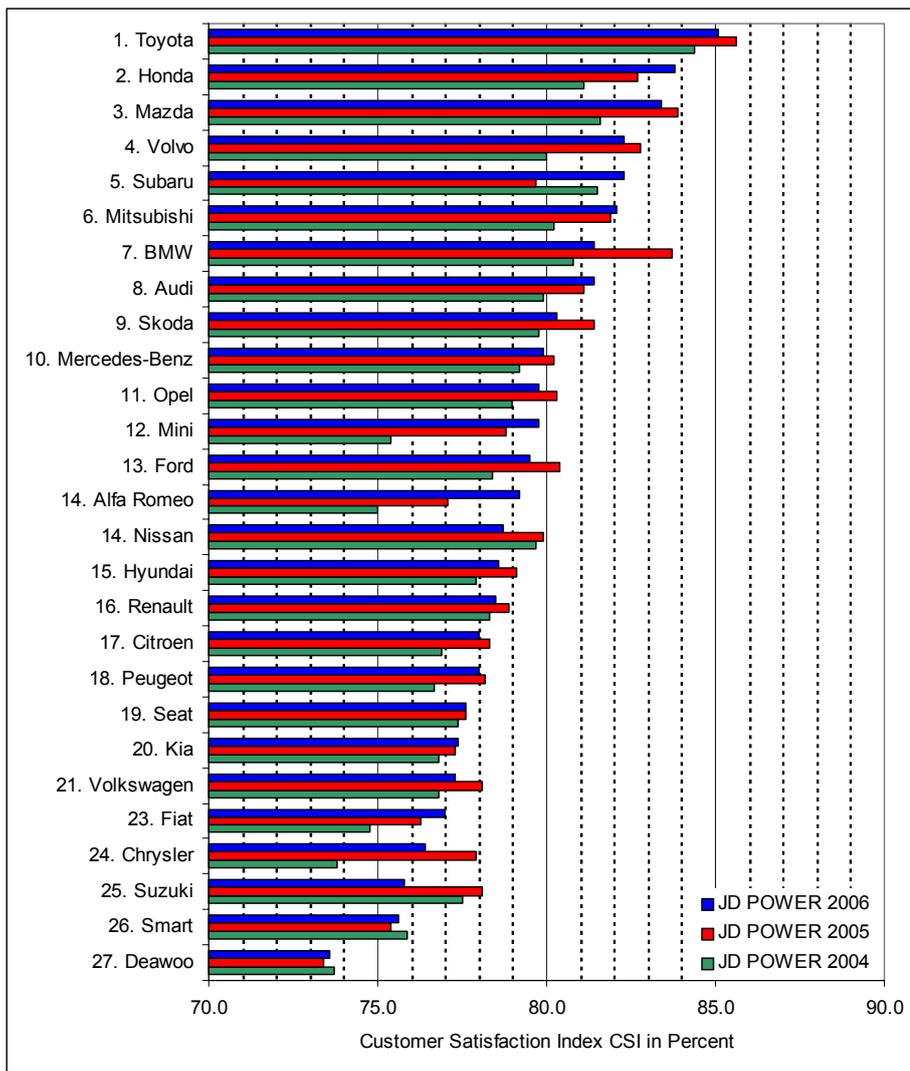


Figure 13 Results of the JD POWER Reports 2004, 2005, 2006 [23] about the satisfaction of German car drivers. The automobile manufacturers are ranked according to the results of the 2006 report. The American market research organization J.D. Power conducts this investigation in Germany every year since 2002.

dictions require knowledge.

Knowledge is built on Theory.

Without a theory, there are no questions, without questions there is no learning. Theory without experience is of no value, experience without a theory is dangerous and costly.

Use of Data requires Prediction

Interpretation of data from test or experiment is prediction on what will happen upon application of the conclusions or recommendations that are drawn from a test or experiment.

There is no such thing as a fact

There is no true value of any characteristic, state or condition that is defined in terms of measurement or observation. Changes of procedure for measurements or observations produce new numbers. The number of people in a room depends on who is counted. The amount of iron in a shipload of iron ore depends on the procedure for taking samples. The rules on how to measure or observe are called Operational Definitions.

Psychology

Psychology deals with mental processes and behavior. It tries to answer the question why humans behave the way they behave.

Products and services are produced by human beings and each of them is unique. Everyone disposes of an unforeseeable potential of wisdom, knowledge, creativity, experience and energy only waiting for exploitation. Neither understanding for systems, for variation nor knowledge can contribute as much to the success of an organization as a wise, thoughtful, responsible and understanding management of human resources.

Patrick M. Lencioni, an internationally known management consultant on team work, endorses this statement as follows:

"Not finance. Not strategy. Not technology. It is teamwork that remains the ultimate competitive advantage, both because it is so powerful and so rare. (...) If you could get all the people in an organization rowing in the same direction, you could dominate any industry, in any market, against any competition, at any time."

The Seven Deadly Diseases, the Seven Obstacles and the Fourteen Points for Management will show, that Deming supports a view on how to deal with human beings in organizations which completely

differs from what today is still considered to be good management practice.

Deming's view is supported by the results of a huge number of investigations described by Alfie Kohn in his two books „Punished by Rewards“ [25] and „No Competition“ [26].

Awards, Standards and Certificates

More than thirty years after Japan started to flood the world with products of unparalleled quality, Western industrialized nations choose to react. Not knowing any better, they finally decided to install quality awards and to develop quality standards.

The Malcolm Baldrige National Quality Award (MBNQA), the European Quality Award (EQA) and the ISO 9000 and ISO 14000 families of quality standards are briefly described below.

Malcolm Baldrige National Quality Award (MBNQA)

In the early and mid 1980s, many industry and government leaders saw that a renewed emphasis on quality was no longer an option for American companies but a necessity for doing business in an ever expanding and more demanding, competitive world market. But many American businesses either did not believe quality mattered for them or did not know where to begin. The Baldrige Award was envisioned as a standard of excellence that would help U.S. organizations achieve world-class quality.

Juran and Feigenbaum were the main creators of the criteria behind the award. Both Deming and Crosby refused to take part in setting up the Prize because they disagreed on the criteria.

Congress established the award program in 1987 to recognize U.S. organizations for their achievements in quality and performance and to raise awareness about the importance of quality and performance excellence as a competitive edge.

Malcolm Baldrige was Secretary of Commerce from 1981 until his death in a rodeo accident in July 1987. Baldrige was a proponent of quality management as a key to the country's prosperity and long-term strength. In recognition of his contributions, Congress named the award in his honor.

The Baldrige Award is given by the President of the United States to businesses—manufacturing and service, small and large—and to education and health care organizations that apply and are judged to be outstanding in seven areas: 1) leadership, 2) strategic planning, 3) customer and market focus, 4) measurement, 5) analysis and knowledge management, 6) human resource focus, 7) process management and results.

In the beginning, the interest of the industry for this award was quite lively. In 1991, more than one hundred applications were sent to the award committee. During the subsequent years, the number of applications decreased continuously. In 1997, only 20 applications were entered.

European Quality Award (EQA)

By 1989 14 major European companies (Bosch, BT, Bull, Ciba-Geigy, Dassault, Electrolux, Fiat, KLM, Nestle, Olivetti, Philips, Renault, Sulzer, Volkswagen) and the European commission founded the European Foundation for Quality Management (EFQM). In 1991 EFQM launched the European Quality Award EQA in response to the Deming Award in Japan and the Malcolm Baldrige Award in the USA.

Regardless of sector, size, structure or maturity, to be successful, organisations need to establish an appropriate management framework. The EFQM Excellence Model was introduced at the beginning of 1992 as the framework for assessing organisations for the European Quality Award. It is now the most widely used organisational framework in Europe and it has become the basis for the majority of national and regional Quality Awards.

The EFQM Excellence Model is a non-prescriptive framework based on 9 criteria. Five of these are „Enablers“ and four are „Results“. The „Enabler“ criteria cover what an organisation does. The „Results“ criteria cover what an organisation achieves. „Results“ are caused by „Enablers“ and „Enablers“ are improved using feedback from „Results“.

The Model, which recognises there are many approaches to achieving sustainable excellence in all aspects of performance, is based on the premise that excellent results with respect to performance, customers, people and society are achieved through leadership driving policy and strategy, that is delivered through people, part-

nerships, resources and processes.

ISO Management System

ISO (International Organization for Standardization), a non-governmental organization, is one of the world's foremost developers of voluntary technical standards. The ISO Central Secretariat is located in Geneva, Switzerland.

In 1987, ISO started to publish two families of management standards, ISO 9000 and ISO 14000. Both are among ISO's most widely known standards ever. They are implemented by some 887'770 organizations in 161 countries.

The ISO 9000 family is primarily concerned with "quality management". This means what the organization does to fulfill the customer's quality requirements and applicable regulatory requirements while aiming to enhance customer satisfaction and achieve continual improvement of its performance in pursuit of these objectives.

The ISO 14000 family is primarily concerned with "environmental management". This means what the organization does to minimize harmful effects on the environment caused by its activities and to achieve continual improvement of its environmental performance.

Both families are "generic management system standards". "Generic" means that the same standards can be applied to any organization, large or small, whatever its product including whether its "product" is actually a service in any sector of activity and whether it is a business enterprise, a public administration or a government department.

"Generic" also signifies that no matter what the organization's scope of activity, if it wants to establish a quality management system or an environmental management system, then such a system has a number of essential features for which the relevant standards of the ISO 9000 or ISO 14000 families provide the requirements.

"Management system" refers to the organization's structure for managing its processes - or activities - that transform inputs of resources into a product or service which meet the organization's objectives such as satisfying the customer's quality requirements, complying to regulations or meeting environmental objectives.

Effect of Awards and Standards on European Economy

Europe was very late to jump on the quality bandwagon, much too late. Europe did it after it has already lost most of its traditional markets. With apparently no resistance, Europe renounced from its leadership position in areas such as consumer electronics, photography, computers, motor vehicles and containerships. Without Nokia, the world's largest manufacturer of mobile devices, there seems to be no other area where Europe dominates the market. It is sad to observe that many of the most successful ideas in technology have European roots, but business is now made by others.

This sad development had unpleasant consequences indeed. The report of the European Commission to the Special European Council in Lisbon, 23rd to 24th March 2000 [27] says bluntly:

„Between Europe and its main trading partners and rivals, the USA and Japan, there exists a recurrent and apparently intractable competitiveness deficit. The EU has lower growth than the USA, unacceptably high unemployment and too many of its citizens are excluded from employment. Simply, it is not as dynamic as its main competitors.

Currently, around 10% of the workforce is unemployed (15 million people), poverty and social exclusion are colossal. The Commission estimates that the under use

of available human resources and the wider costs of wastage in the economy (including ill-health, crime and related costs) could be between one and two thousand billion Euro per year (12 to 20 % of GDP). This is a cancer at the heart of European society, wasted resources crying out to be more productively used.“

The report of the European Commission [27] also shows the development of the employment rate (an indicator for productivity) in Europe EU15, in the USA and in Japan over the past 40 years (Figure 14).

The invasion of Japanese products affected America more than it did Europe. As a consequence, in the 1970's, some of America's key industries were on the edge of ruin and unemployment reached its highest post-war level (Figure 5). American industry faced a crisis. On the 24th July 1980, the NBC documentary "If Japan Can..... Why Can't We?" shook America out of its complacency. The American public were amenable to the ideas, thoughts and concepts which 30 years earlier had been grasped in the Far East with overwhelming success but which in other industrial nations had been misunderstood and poorly applied. America returned from recession to higher productivity and employment. The message of Deming together with the business friendly politics of the USA's 40th President, Ronald Reagan (from 1981 to 1988), were critical for the recovery of the USA. It becomes clear from papers in the US Library of Congress that the Reagan Administration heard, understood and supported Deming's message and allowed it to influ-

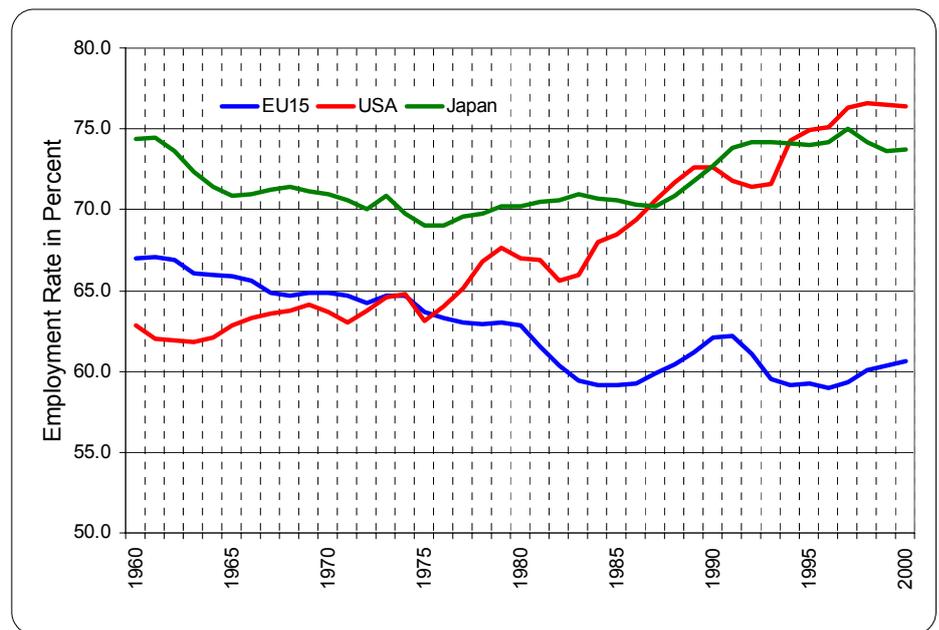


Figure 14 Development of the Employment Rate in Europe EU15, in the USA and in Japan between 1960 and 2000. (Report of the European Commission to the Special European Council in Lisbon, 23rd to 24th March 2000 [27])

ence political thinking.

Development in Europe was somewhat different. The invasion of Japanese products was never so strong as to set off a significant quality movement. Little by little, though, its traditional markets became eroded by Japanese competition. Even this did not wake up Europe from its self-righteous slumber. In 1987 a series of quality standards, ISO 9000 and ISO 14000, were released and in 1991 the European Quality Award EQA was launched. Figure 14, however, does not show any clear sign, that these measures were able to change the downward trend of the European economy.

A Critical View of Standards and Awards

Deming opposes all sorts of incentives or extrinsic motivators as a means to promote quality. Standards and awards focus organizations on the visible symbols of achievement such as certificates and medals and distract from the real goal of quality improvement, sustainable competitiveness in the world market.

The Deming management philosophy depends on a set of strong convictions or values. Ethnologists found that every human being is inherently provided with the same set of values. They are given to man by nature and do not need to be learned before. They are therefore also called laws of nature. Everybody feels about the same on what is good or bad, what is right or

wrong, what is beautiful or ugly, encouraging or depressing. Deming is led by the values of his Christian faith. Since these do not oppose laws of nature, everybody is able to agree.

Today, the life of mankind has become so interrelated, so complex, that laws of nature alone do not guarantee success in life and business. Figure 15 illustrates that requirements in the following seven areas must also be satisfied: 1) philosophy (values), 2) vision, 3) strategy, 4) skills, 5) resources, 6) rewards and 7) organization. If only one of these requirements is missing, success is jeopardized. Figure 15 shows the possible consequences, if one of the seven links in the chain is absent.

Deming was 87 years old, when in 1987 the first version of the ISO 9000 family of quality standards was published and the Malcolm Baldrige National Quality Award (MBNQA) was announced. Products and services of unparalleled quality were, up until then, the consequence of the profound understanding and application of the basic principles of quality management as taught by Deming in Japan in 1950 and the years after. They came about without the influence of quality standards and quality awards. These instruments did just not exist at the time.

The values, needs and desires of human beings are at the core of the Deming management philosophy. Quality standards and quality awards, however, want to be free of

values. This was the reason, why Deming could not support the criteria of the Malcolm Baldrige Award (MBNQA). The authors of standards and award criteria wanted these instruments to be applicable to any type of organization, a manufacturer, a charity organization, a university, a hospital, a financial institution, the Mafia (Casa Nostra), a terrorist network etc.

Even though Deming recognized the tremendous importance of standardization in society, quality standards and awards are of no meaning in his comprehensive, all-inclusive quality framework, his System of Profound Knowledge (SoPK). Understanding of basic principles is all that matters.

It is tragic for the millions of people that are unemployed that management of both public and private European organizations still largely ignore fundamental aspects of the philosophy behind modern quality management that helped the Japanese conquer large world market shares in electronics and automobiles and played a crucial role in the return of the US economy to the longest period of steady growth in the early eighties.

The ISO 9000 and 14000 series of quality standards represented a noble effort launched with good intentions. However, it did not work and many experts predicted that already back in the mid 1980's when the first draft standards were circulated. Certification, documenting procedures and so on does not necessarily lead to improvement of productivity and quality. At best it may serve as a minimum. But most often ISO 9000 is used to codify the current, not necessarily very good way of doing things and in practice there is little if any emphasis on improvement, satisfying customers and reducing costs. It is a command-and-control system that stifles innovation and a genuine quality spirit. Indeed it often breeds a cynical attitude towards quality. Instead of satisfying the customers with better products and services, the effort frequently is entirely focused on satisfying the auditors, on receiving the certificate or the award medal and on the incurred publicity.

Just like a new drug is tested before it is marketed, a scientific approach would demand empirical evidence from a pilot study showing significant benefits of ISO 9000 and 14000 before the system was implemented on a broad scale. That never happened! There exists no empirical evidence showing that companies using ISO standards have more satisfied customers, grea-

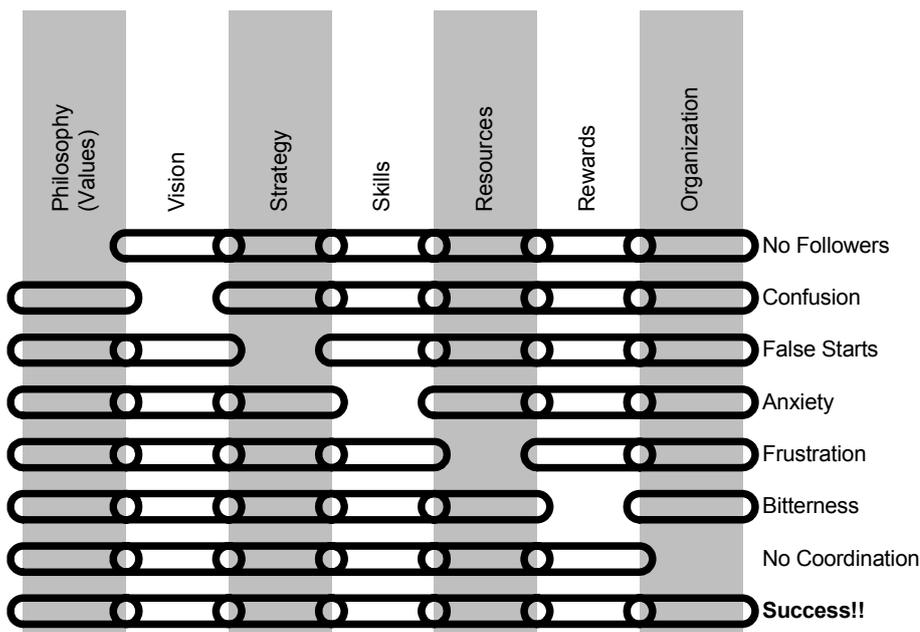


Figure 15 Success in business as well as in private life depends on various prerequisites. This figure shows on top the 7 prerequisites in the form of the links in a chain. All these requirements have to be satisfied, if success is to be achieved. The figure shows on the right hand side the consequences if one of the links is missing.

ter market share or have created more jobs than those that did not. Modern quality improvement as developed over decades in Japan and United States under the philosophical leadership of Shewhart, Deming, Juran, Taguchi, Ishikawa and others, on the other hand, have been tested again and again and has shown significant evidence of results.

In 2003, the author supervised the research for the thesis of an MBA student [29]. The research examined the question, whether the winning of an international quality award had a positive impact on overall corporate performance.

Each of the international quality award programmes examined (Deming Prize, MBNQA, EQA) claim that by implementing their criteria for quality and by being awarded with a prize for successfully completing the criteria, then this will ensure the companies business success for the future.

The Deming Prize committee claim that by implementing and winning their prize, it will open up the route to business success. The MBNQA claims that by winning their prize, it will help companies improve organisational practices, capabilities and results. The EQA claim that the companies that win the European Quality Award will be helped to continuously improve their business results.

Many studies were conducted to study the impact on awards on business success. They did alltogether not arrive at conclusive results. The MBA-thesis, however, applied for the first time the methodology of Shewhart on statistical process control SPC to answer this question.

Six companies that won quality awards in 1997 were investigated. Neither of the companies showed any sign of a special cause over the period of five years before and five years after the award that could be attributed to the award process. All investigated success criteria varied between the upper and lower natural process limits over the entire ten year period. This means that the awards had neither a positive nor a negative influence on business performance.

The Seven Deadly Diseases

Deming distinguishes between two types of barriers, which can impede or even prevent continuous improvement in organizations. Deadly diseases prevent and obstacles impede transformation.

Deadly Disease Nr. 1: Lack of Constancy of Purpose

It is the responsibility of top management to define and communicate the scope and objectives of an organization. Everybody should know them, the shareholders, the employees, the suppliers, the customers. A company that lacks constancy of purpose does not think beyond the next quarterly dividend and has no long-range plans for staying in business. The company is desperately sick and thus doomed to failure.

Many organizations lack planning. They prepare five year plans on glossy paper and distribute them to shareholders and employees. But plans without the corresponding action plans and performance reviews remain illusions.

Today's unsolved problems are the problems of tomorrow. An organization unable to distinguish between important and urgent is kept busy extinguishing fires. An extinguished fire does not solve a problem. It cannot do more than restore the original condition.

Deadly Disease Nr. 2: Emphasis on Short-Term Profits

With „creative bookkeeping“, every organization can show positive numbers on financial statements until close to collapse. This kind of management is called „paper entrepreneurialism“. The usual measures of this type of management are dismissals, acquisitions, mergers, evaluation of assets, transactions of bonds, securities, etc. Paper profits are the only ones easily available to professional managers who sit isolated atop organizations designed for a form of production that is no longer appropriate to Europe's place in the world economy. Paper profits divert attention and resources away from the difficult job of transforming the productive base. But nevertheless, this is what universities teach, and they do it well.

Deming is fond of saying: „*Paper profits do not make the pie bigger. They give you a bigger piece. But this piece is taken from somebody else. It doesn't help the society.*“

Deadly Disease Nr. 3: Performance Reviews

Deming rejects decisively merit rating and annual performance reviews. He suggests that „management by fear“ would be a better name. Management by objective (MBO) and management by the numbers fall in this category. The effects are devastating.

On the basis of many hundred investigations, Alfie Kohn shows in his book „Punished by Rewards“ [25] that performance reviews, merit ratings, incentive plans and other bribes encourage short-term performance at the expense of long-term planning. They discourage risk-taking, build fear, undermine teamwork and pit people against each other for the same rewards. Deming says that such reviews leave people bitter, despondent, dejected, some even depressed, all unfit for work for weeks after receipt of rating, unable to comprehend why they are inferior. It is also unfair as it ascribes to the people in a group differences that may be caused totally by the system that they work in.

We treat adults like children with report cards, except that we don't require a parent's signature. The damage done to children by rating is horrendous. Many children stop learning. When will we understand variation?

Every individual is different. No system and criteria can change the fact, that in a given group of people some are above average, some are about average and some are below average. The same would also hold for a group of Noble Prize winners. It cannot be observed that rating helped an individual to improve. Quite the opposite is true! There are always some who know how to manipulate the system for their own benefit. The ratings are a poor substitute for leadership.

People learn differently. Our educational system honors those who are fast to comprehend. But some are fast, others are slow. But this criteria doesn't mean anything for what a student is able to accomplish in his future practical work.

„*I never grade my students*“, said Deming when asked how he rates his students. „*I give them all A's. How do I know how the student will perform in the future. They may turn papers in, I don't care when. What do I get? Some of the papers are good, some are even excellent and ready to be published. Who am I to judge?*“

People are convinced that rating will initiate competition and competition will motivate improvement. What an illusion! The greatest accomplishments of mankind were made without competition. Two hundred years ago Sebastian Bach was writing the rules of harmony for all time. Why did he do that? Pride of workmanship. Was Einstein driven by competition? Certainly not! Who dared to be his competitor? Competition is the subject of another book by Alfie Kohn [26].

Despite all these drawbacks, extrinsic motivators such as performance reviews, grades, performance-related pay, rewards and bonuses are still considered to be good management practice.

Employees have a right for further development, a right to be trained and educated. Regular discussions with employees should not be conducted with rating in mind. They should reveal know how, knowledge, experience and respective needs of improvement. They should identify problems of working atmosphere and individual plans for long term personal development.

Deadly Disease Nr. 4: Job Hopping

At this point Deming describes the „White Knight Syndrome“. The white knight joins an ailing company as a rescuer promising to get the company back on track. He arranges for changes which promise short-term profit, shows positive results, collects the bonus and runs away before the long-term consequences of his actions become visible.

Mobility from one company to another creates prima donnas for quick results. It annihilates teamwork, and teamwork is vital for continued existence. Deming quotes J. Noguchi, managing director of the Union of Japanese Scientists and Engineers: „America cannot make it because of the mobility of American management.“

Mobility of labor is another problem, almost as bad as mobility of management. A strong contributing factor is dissatisfaction with the job due to lack of pride at the workplace. People either stay home or look around for another job expecting that pride will return. Absenteeism and mobility is largely a consequence of poor supervision and poor management.

Deadly Disease Nr. 5: Management by Figures

A company cannot be managed without visible figures. Figures are necessary for bookkeeping, the control of turnover, revenues, expenses and cash flow, payments to suppliers, payments of salaries, filing of tax returns, etc.. But he that would run his company on visible figures alone will in time have neither company nor figures.

The most important figures that one needs for management are unknown or unknowable, but successful management must nevertheless take account of them. What is the benefit of a happy customer or the damage done by an unhappy customer? The same question could be asked with respect to the effect of happy or unhappy employees. What is the benefit of quality improvement measures? What is the loss from inhibitors to pride of workmanship of employees or from the annual performance rating?

Visible figures such as monthly reports reflect the performance of the past. Managing a company by means of the monthly report is like trying to drive a car by watching the yellow line in the rear-view mirror. But managers still do that, even today. Explanations are required for any figures which are not as good as they should be. Reports have to be written. Action plans for dealing with the problem have to be established and then values had better improve - whatever that means.

Management should not worry about results, they should listen to the voice of the process. Management is prediction. Nothing can be predicted by just looking at a few figures of the past. Predictions can only be derived from the analysis of process behavior over a long enough period of time. If such an analysis shows a stable process, in other words, a process in statistical control, the process will most certainly remain stable also in the future. The process is predictable.

Improvement measures without a deep insight into the nature of processes will make the processes worse, unstable, chaotic and therefore unpredictable. This is messing around with processes, also called tampering.

Statistical process analysis takes time and only a few managers are ready to invest this effort. It surprises that there is never enough time to do something right from the beginning and always enough time to do the same thing over and over again.

Deadly Disease Nr. 6: Excessive Medical Costs

William E. Hoglund, CEO of the Pontiac Motor Division, asserts that Blue Cross Blue Shield is the second largest supplier of his company. The cost for health insurance amounts to appr. \$ 400 per car produced.

Even though this issue is of particular interest in the United States, it becomes a more and more a critical subject in other industrialized countries as well. Every dollar spent on healthcare is a loss or waste („muda“ in Japanese) and damages the competitiveness of a country in international markets. Nevertheless, people have become used to the fact, that healthcare branches off more and more of a nation's productive potential. In order to remain competitive, every effort has to be made to reduce medical expenditures to an absolute minimum. A system unable to accomplish this does not satisfy its purpose and should be replaced by something more effective.

Industry has learned that decades ago. Toyota became a world model company in productive excellence by eliminating every waste in its production system. Toyota considered everything being waste, which does not add value for the consumer.

Deadly Disease Nr. 7: Excessive legal costs

Also this issue is of particular relevance in the United States.

Contracts confirmed by handshake have become an exception in Western industrialized nations. But a handshake together with an open look into the eyes of the business counterpart expresses commitment, responsibility and mutual trust. It is much more difficult to violate an agreement made on this basis than it is to breach a written contract set up by lawyers in great detail.

Mistrust doubles the cost of doing business. Mistrust is the basic reason for procedures drawn up in great detail, often 30 or 40 or more pages, for any agreement or transaction in business, whether it be simple or complex.

In contrast, two companies would draw up an agreement in one or two pages, with phrases such as „details to be worked out later, if need arise.“ It is understood without comment that the basis for working out the details later would be win-win, neither party to be the loser.

The Seven Obstacles

Obstacle Nr. 1: Quick Fix

Some believe that quality can be installed in a company like a new machine or a computer network. Put somebody in charge and quality will follow! What an illusion! In quality, there is no quick fix, no instant pudding. Quality improvements are the result of long and sustainable efforts and not the result of a process called quality.

Obstacle Nr. 2: Automation, Computers and New Machinery

Many expect wonders from investments in automation, computers and new machinery. In general, new technology increases the variability of processes, since it is usually controlled by single data measurements. Before investments are decided upon, it is always better to analyze the existing processes, to eliminate all special causes and to look after the common cause variations afterwards. If new technology is considered to reduce the dispersion, a process reengineering should follow using the P.D.S.A.-cycle to make sure that the investment produces the expected results.

Obstacle Nr. 3: Search for Examples

Every company strives for better quality and higher productivity. Not knowing how to go about it, companies embark on excursions to other companies that are ostensibly doing well. They are usually received with open arms and the exchange of ideas begins. Without knowing the underlying principles and methods, neither company knows whether or why any procedure is right nor whether or why another is wrong. The question is not whether a business is successful, but why and why was it not more successful. One can only hope that the visitors enjoyed the ride. They are more to be pitied than censured.

It is a hazard to copy from the best in class. In most cases, it leads to failure and frustration. It is necessary to understand first the theory of what one wishes to do or to make.

In the early seventies, American and European managers went on pilgrimage to Japan. They saw the quality circles and went home with the illusion that all they had to

do to is to copy this tool only to find out some time later that they have a dud. A quality circle can thrive only if the management will take action upon the recommendation of the circle. But Western managers did not do their share of the work. Somebody in charge of introducing this tool is therefore careful to work first with the manager, to lay the foundation of a quality circle with a chance to succeed.

Another example is the Just-in-Time (JIT) supplier-client relationship. The system aims at having "the right material, at the right time, at the right place and in the exact amount."

It is generally not known that the Ford Motor Company applied this technique for the first time as early as in 1922. The technique was subsequently adopted, improved and publicised by the Toyota Motor Corporation of Japan as part of its Toyota Production System (TPS) after 1950. The system was developed as part of the huge effort under the direction of Taiichi Ohno (Picture 8) to reduce every possible loss (*muda*) in the production system that does not add value for the customer [28].

Just-in-time (JIT) inventory systems are not just a simple method that a company has to buy in to; it has a whole philosophy that the company must follow. It embraces suppliers and clients and is driven by the customer, who orders a product. Toyota does not build a car unless it is ordered and paid for. It requires close and long-range client-supplier relationships based on mutual trust and therefore excludes buying from the cheapest supplier only as it is still common practice in the Western world.

Benchmarking is nothing but a respectable expression for „copying“. Quality does not come from copying but from profound knowledge for systems, variation, knowledge and psychology.

Obstacle Nr. 4: Our problems are different!

A common disease that afflicts management and government administration the world over is the impression that „our problems are different“. They are different to be sure, but the principles that will help to improve quality of products and services are universal in nature.

Obstacle Nr. 5: Manager Training

Management training programs at the uni-

versities are responsible for many of today's problems in industry. The programs want to prepare the student for management tasks in business. This means that young graduates expect to be able to apply in practice what they have learned in school. They are taught that there is a profession of management and that they are prepared to step into top jobs. But most students do not have experience neither in production nor in sales. But to work on the factory floor with about half the pay he hoped to get upon receipt of an MBA is not attractive to our affluent young generation. As a consequence, he struggles on, unaware of his limitations or unable to face the need to fill in the gaps. The results are obvious. What else can these young and smart men and women do after being shot to the top of corporations but to practice what has been already explained under Deadly Disease Nr. 5, management by figures.

Practically all our major corporations were started by technical men, inventors, mechanics, engineers, chemists, who had a sincere interest in quality of products. Now these companies are largely run by men interested in profit, shareholder value, profit and loss statements, not in the product.

Obstacle Nr. 6: Knowledge of Statistics

Statistics is the key subject matter of quality management. All the eminent scientists who laid the ground on which today's knowledge of quality management was built were statisticians: Sir Ronald Aylmer Fisher, Walter A. Shewhart, W. Edwards Deming, Josef Juran and Genichi Taguchi and many others.



Picture 8 Taiichi Ohno (1912-1990) is considered to be the father of the Toyota Production System TPS, also known as Lean Manufacturing [28]

European universities do not teach the type of statistics applicable to the field of quality management. After two years of teaching and research at the University of St. Gallen, Prof. Bisgaard left the university and returned to the United States totally disappointed with the way quality management is being taught in Europe. Before coming to St. Gallen, Prof. Bisgaard was professor for quality management at the University of Wisconsin. He presently holds the position of an interim dean at the Isenberg School of Management, University of Massachusetts at Amherst.

Prof. Bisgaard qualified Europe as a „Statistics Desert“. Based on this impression, Bisgaard became a co-founder of the European Network for Business and Industrial Statistics, ENBIS (for more information visit www.ibisuva.nl). This is an organization with now well over 280 members from more the 20 countries and is still growing. A primary purpose of this initiative was to encourage the use of statistics for quality improvement in European business and industry.

Obstacle Nr. 7: Specifications

There is obviously something wrong when a measured characteristic barely inside the specification limits is declared to be conforming, outside it is declared to be non conforming. The supposition that everything is all right inside the specifications and all wrong outside does not correspond to this world.

A customer does not care about specifications. All he wants is that a product does what it is supposed to do over a long period of time with no breakdowns. If a product does not meet his expectations, the customer will switch to another product.

Unfortunately, a satisfied customer may also switch on the theory that he could not lose much by switching and even might gain. Profit in business comes from repeat customers, customers that boast about your product and service and bring friends with them.

Gadgets and servomechanisms that by mechanical or electronic circuits guarantee zero defects will destroy the advantage of a narrow distribution of dimensions. They slide the distribution back and forth inside the specification limits, achieving zero defects and at the same time driving losses and costs to the maximum.

Quality will profit much more when supp-

liers are invited to participate in the development process. In this case, specifications are useless. The requirements for the characteristics of a product are worked out jointly.

Fourteen Points of Management

Deming described the essence of his management philosophy in 14 Points for Management. These 14 points became a symbol for Demingism and were widely accepted. They are explained in Chapter 2 of the book "Out of Crisis" [4] as guideline for the transformation of American industry.

In "Out of Crisis" these points are introduced as follows: *"It will not suffice merely to solve problems, big or little. Adoption and action on the 14 points are a signal that the management intend to stay in business and aim to protect investors and jobs. Such a system formed the basis for lessons for top management in Japan in 1950 and in subsequent years. The 14 points apply anywhere, to small organizations as well as to large ones, to the service industry as well as to manufacturing. They apply also to a division within a company."*

First attempts to concentrate both knowledge and experience into distinct statements go back to the sixties. First drafts showed 10 points which reflected the experience gained from the close cooperation with Japanese firms. The number 10 did not come by accident. The analogy to the Ten Commandments in the bible should point out their fundamental role for management.

The need for a later expansion to 14 points was forced upon Deming through his experiences with Western firms in the eighties and nineties. In Japan, fear in the workplace (Point 8) and barriers between departments (Point 9) was of no concern. Only Western organizations showed how much employees suffered from fear, rating, quotas and slogans.

In the late eighties, Deming felt the need to expand the number of points even further. He then realized that in the meantime the 14 points became so widely known that he decided to subdivide Point 11 into Point 11a and 11b, Point 12 into 12a and 12b.

Point 1: Create Constancy of Purpose



Create constancy of purpose toward improvement of product and service, with the aim to become competitive, stay in business and provide jobs and more jobs.

There are two problems for the company that hopes to stay in business, problems of today and problems of tomorrow.

Problems of today encompass maintenance of quality of product put out today. It is easy to stay bound up in the tangled knot of the problems of today, becoming ever more an more efficient in them.

Problems of the future command first and foremost constancy of purpose and dedication to improvement of competitive position to keep the company alive and to provide jobs for their employees. Establishment of constancy of purpose means allocation of resources to innovation, research, education and continual improvement of products and services.

Your customers, your suppliers, your employees need your statement of constancy of purpose, your intention to stay in business by providing products and services that will help man to live better and which will have a market.

Point 2: New Philosophy

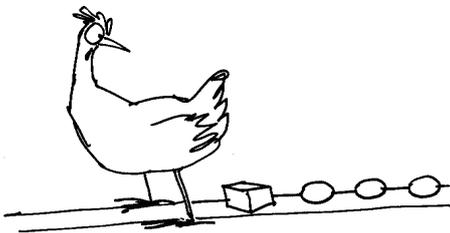


Adopt the new philosophy. We are in a new economic age, created by Japan. Western

management must awaken to the challenge, must learn their responsibilities and take on leadership for change.

Japan defined new dimensions for excellence in business. We can no longer tolerate commonly accepted levels of mistakes, defects, material not suited for the job, people on the job that do not know what the job is and are afraid to ask, handling damage, antiquated methods of training on the job, inadequate and ineffective supervision, management not rooted in the company, job hopping in management.

Point 3: Cease Dependence on Mass Inspection

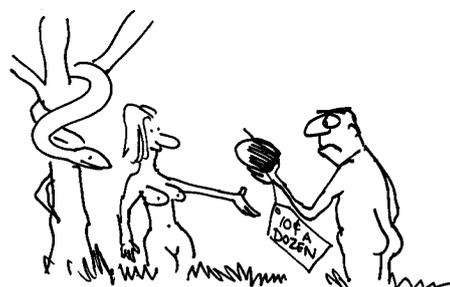


Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

Routine 100 percent inspection to improve quality is equivalent to planning for defects, acknowledgment that the process has not the capability required by the specifications.

Inspection to improve quality is too late, ineffective, costly. When a product leaves the door of a supplier, it is too late to do anything about its quality. Quality comes not from inspection, but from improvement of the production process. Inspection, scrap, downgrading and rework are not corrective actions on the process.

Point 4: End the practice of awarding business on the basis of price tag alone.



End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item on a long-term relationship of loyalty and trust.

About 110 years ago, John Ruskin made the following remarks about quality and prices:

On quality: *"There is scarcely anything at all which someone, somewhere, can't make in a poorer quality and sell more cheaply, and people who only look at the price are this man's legitimate victims."*

On prices: *"It's unwise to pay too much, but far worse to pay too little. When you pay too much, all you loose is some money - that's all. When you pay too little, then sometimes you loose everything, because what you buy isn't able to do what it was bought for. Common business practice makes it impossible to pay a bit and to get a lot - quite simply, it can't be done. If you accept the lowest offer, then you would be wise to insure yourself against the risk you run - and if you do that, then you can afford to pay for the better product anyway."*

We can no longer leave quality, service and price to the forces of competition for price alone - not in today's requirements for uniformity and reliability. Price has no meaning without a measure of the quality being purchased. Without adequate measures of quality, business drifts to the lowest bidder, low quality and high cost being the inevitable result.

Point 5: Improve constantly and forever the system of production and service.



Improve constantly and forever the system of production and service to improve quality and productivity and thus constantly decrease costs.

The road to improvement has no end. There is always a way to do things better and at lower cost. Innovation does not come from the client, it comes from the producer. Nobody asked for an automobile, a telephone, a radio, a television set, a copy

machine. Ideas are always generated in the heads of the producer.

When „zero defects“ is the objective, continual improvement ends when all specifications are met. The West worries about meeting the specifications. The Japanese worry about uniformity. Uniformity, in other words, processes on target with minimum variation, always leaves room for continual improvent.

Deming introduced the methods of Shewhart for statistical process analysis together with the P.D.S.A.-cycle for continual improvement in Japan in 1950. Today, these two basic tools are as vital as ever.

Point 6: Institute Training



Institute training on the job.

Deming dedicates one point to training on the job, because this form is both efficient and effective.

Management needs training to learn about a company all the way from incoming material to customer.

In Japan, a manager starts his career with a long internship (4 to 12 years) on the factory floor and in other duties of the company. He knows by personal experience the problems in production, procurement, accounting, distribution, sales.

A Danish producer of hearing aids requires that every manager writes in addition to his daily management obligations operation instructions.

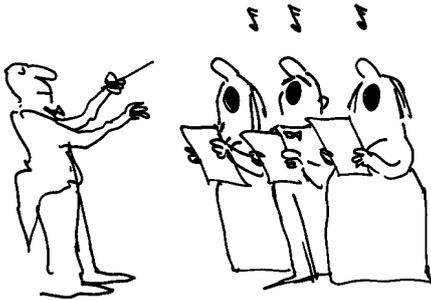
Every manager should be competent in elementary statistics such as process flow charting, fishbone diagrams, run charts, histograms, Pareto diagrams, scatter diagrams, control charts, elementary design of experiments.

Every Japanese employee is required to understand and use the following seven quality control tools: checksheet, Pareto

chart, flow chart, cause and effect diagram, histogram, scatter diagram and control chart.

Training has to be aware that people learn in different ways. Some have difficulty to learn by written instructions (dyslexia). Others have difficulty to learn by the spoken word (dysphasia). Some people learn best by picture, others by imitation, others by a combination of methods.

Point 7: Adopt and institute Leadership



Institute leadership. The aim of leadership should be to help people, machines and gadgets to do a better job. Supervision of management is in need of overhaul as well as supervision of production workers.

An advertisement by the renown Juran Institute, Inc. makes the following point about leadership:

"Can there be total quality without top management? No, never! Every successful total quality effort has included the active participation of the top management. We know of no exceptions. For quality to become a way of life, top management must carry out specific actions. These actions cannot be delegated. Top management must develop a strategic plan, review and approve the organization's quality policy, provide the resources, create and participate in quality councils and quality efforts. Achieving total quality demands top management be leaders, not cheerleaders."

Quality comes from the top. Only top management has the knowledge and the right to change the system the worker works in. Juran made the distinction between defects coming from the system and defects coming from the worker. His experience was that 85% are caused by the system and only 15% by the worker. Towards the end of his life, Deming was more and more inclined to suggest, that the relation should be 94% and 6% respectively.

Top managers alone have the responsibility

for the system. This responsibility cannot be delegated. It is not enough when the mission statement says that quality is of highest priority. Management must know what this responsibility actually means. Support is not enough, actions are required!

Point 8: Drive out Fear



Drive out fear, so that everyone may work effectively for the company.

Joy in work, innovation - not just improvement and cooperation are the three basic ingredients for a successful quality journey. The opposite of joy in work is fear in work. Nobody can do their best unless they feel secure. Deming has repeatedly emphasized that "drive out fear" should be the first of the Fourteen Points management should start to implement. It is the prerequisite for the implementation of at least 9 other points.

Fear prevents an organization from developing its full potential. Fear produces wrong numbers. Fear leads to loss. An organization managed by fear will ultimately fail.

The leadership style of Adolf Hitler during the Second World War provides a dramatic example. Western observers have no doubt that in the decisive phases of the war Adolf Hitler only received the information his subordinates knew would please him. He was therefore incapable of running the war which inevitably resulted in his defeat. Similar observations could be made during the War in the Gulf.

Fear is endemic in modern organizations. Fear has many forms as some of the following examples show: fear of losing the job if the firm cuts back, fear of not being good enough in general, fear that a colleague will be promoted and placed above your head, fear that the annual performance rating will not qualify for a raise, fear of not always

having an answer when the boss asks a question, fear of losing face in front of colleagues.

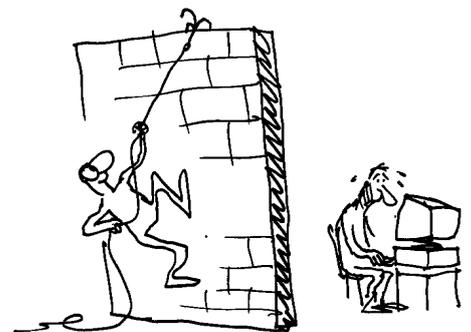
Lack of knowledge produces fear. Information, education and training are the most important measures to fight fear in a company. A survey showed that the following 7 measures out of 70 are most effective to prevent fear and to induce security:

- 1.) Competence and integrity of management
- 2.) Perceived responsibility in the job: The application of the P.D.S.A.-Cycle should be delegated to the operational level
- 3.) Sensitivity, tolerance, respect, dependability
- 4.) Feedback: Praise and acknowledgement when justified, help, support and instruction when necessary
- 5.) Job security
- 6.) Elimination of all psychological and organizational barriers impeding open cooperation of individuals and teams
- 7.) Information: Ignorance produces fear which can only be eliminated through an open information policy.

Further investigations show that competence and integrity of management (Point 1) and information (Point 7) are the most effective means to reduce fear in a company.

Deming distinguishes between „Fear“ and „Anxiety“. The reason for fear is well known. Anxiety is a state of mind without a recognizable cause.

Point 9: Break down Barriers between Departments



Break down barriers between departments. People in research, design, sales and production must work as a team to foresee problems of production and in use

that may be encountered with the product or service.

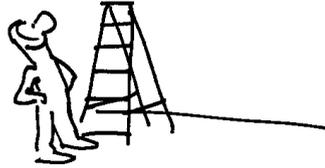
Restrictions and barriers always lead to less than optimum results. Deming recommends therefore to break down barriers between departments. Employees in departments and divisions such as product development, sales and production must work together to have any chance of anticipating quality problems. Organizations are to function as systems. Restrictions and barriers destroy the systems.

In the fifties, two important methods were developed in Japan, which together with other most positive effects lead to the demolition of interior barriers in large organizations: Quality Function Deployment (QFD) and Cross-Functional Management (CFM). Both methods are an immediate consequence of the systems thinking as introduced by Deming. Systems thinking is the opposite of the traditional cause-and-effect thinking and represents a fundamentally new view of the world, which was put to work in Japan so effectively during the second half of the 20th Century.

QFD transforms customer needs (the voice of the customer [VOC]) into engineering characteristics of a product or service, prioritizing each product/service characteristic while simultaneously setting development targets for product or service development.

CFM manages business processes across the traditional boundaries of the functional areas minimizing suboptimization. Suboptimization is when what looks like a benefit for a particular area in the company actually hurts the company as a whole. It consists of three components: appropriate management performance metrics, periodic meetings, and inter-department communication channels.

Point 10: Eliminate Slogans



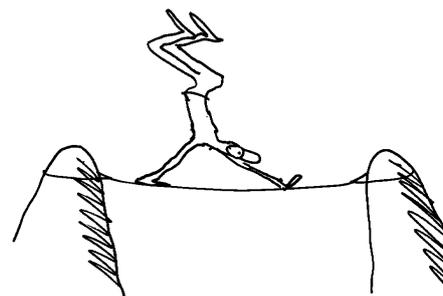
Eliminate slogans, exhortations and targets for the work force that ask for zero defects and new levels of productivity.

"Your work is your self-portrait." Would you sign that? No - not when you give me a defective canvas to work with, paint not suited to the job, brushes worn out so that I can not call it my work.

"Do it right the first time!" „Getting better together!" "Be a quality worker!" "Take pride in your work!" are directed at the wrong people. They arise from management's supposition that the production workers could, by putting their backs into the job, accomplish zero defects, improve quality, improve productivity and all else that is desirable. The charts and posters take no account of the fact that most of the trouble comes from the system which only top management can influence.

Exhortations and posters generate frustration and resentment. They advertise to the production worker that the management is unaware of the barriers to pride in workmanship.

Point 11: Quotas and Performance Ratings



Point 11A: Eliminate numerical quotas for the work force

In "Out of the Crisis" [4] we read: "A quota is a fortress against improvement of quality and productivity. I have yet to see a quota that includes any trace of a system by which to help anyone to do a better job. A quota is totally incompatible with never-ending improvement. There are better ways. Piece work is even more devastating than work standards. Incentive pay is piece work. The hourly worker on piece work soon learns that he gets paid for making defective items and scrap, the more defectives he turns out, the higher the pay for the day. Where is his pride of workmanship?"

Point 11B: Eliminate numerical goals for people in management

Internal goals set in management of a company without a method are a burlesque. Goals such as „Decrease costs of warranty by 10 percent next year!“, „Increase sales by 10 percent next year!“ „Improve productivity by 3 percent next year!“ cause frustration.

A natural fluctuation in the right direction is interpreted as a success. A fluctuation in the opposite direction sends everyone scurrying for explanations and into bold forays whose only achievements are more frustration and more problems.

To manage, one must lead. To lead, one must understand the work that he and his people are responsible for. An incoming manager must first learn from his people what they are doing. It is easier for an incoming manager to short-circuit his need for learning and to focus on the far end, the outcome. Focus on the outcome is not an effective way to improve a process or an activity. Management by numerical goal is an attempt to manage without knowledge of what to do and is in fact management by fear.

Point 12: Remove Barriers to Pride of Workmanship



Point 12A: Remove barriers that rob people of his right to pride of workmanship.

The responsibility of supervisors must be changed from stressing sheer numbers to quality. Remove barriers that rob people in management and engineering of their pride of workmanship. This means, inter alia, abolishment of the annual merit rating and of management by objective.

In the past, craftsmen were skilled workers and production was flexible and varied to suit the customer. Pride was a natural part of the work. No self-respecting craftsman would allow shoddy workmanship. He would never deliver a product which did not live up to the high standards of his craft. Under such a system, quality is built into the product and quality control is relatively easy.

This does not mean that we should turn the clock back to an earlier age. Mass production is here to stay. But today as well as in the past, pride remains the biggest motivator of all.

Dick Nunis, former Disney president is in no doubt: *"There are really only two words which make things work around here ... quality and pride. If you design, build, make and maintain quality, people will be proud of what they do."*

Walt Disney himself fully appreciated the importance of people: *"You can dream, create, design and build the most wonderful place on earth ... but it takes people to realize a dream."*

Point 12B: Drop the Annual Merit Rating

Appraisals and merit ratings prevent workers from having pride of workmanship. We suppose that the use of the annual merit rating gets the best from workers. As Deming says: *„The result is precisely the opposite. You get the worst out of people. You don't get what you pay for“.*

Appraisals create fear, reduce cooperation between workers and managers and focus on visible results only. Frequently managers use appraisals as a salary administration tool. They use them to reward and punish. Appraisals are subjective. They commonly do not reflect the actual performance or potential of the appraised person. Appraisals are a lie.

Point 13: Encourage Self-Improvement



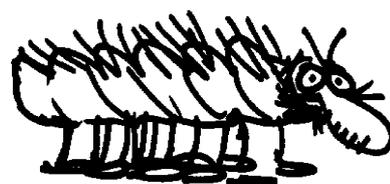
Encourage education and self-improvement for everyone.

Point 6 dealt with training. While training is specific, i.e. targeted at the skills required for the job, education is general, its aim being to improve employees' general knowledge.

A study carried out by Price Waterhouse, an international firm of consultants, shows that most investment in education goes to managers and specialists. Personnel at manager and executive levels use on average twice as many working days on supplementary courses as office staff and those paid by the hour.

We know today that investment in employees, even those paid by the hour, can have much greater effect than investing in machines. Investing in employees is a prerequisite of one of the sides of the new management pyramid: continuous improvement of products, services and processes. This effect can never be achieved through investments in machines alone.

Point 14: Accomplish the Transformation



Put everybody in the organization to work to accomplish the transformation. The transformation is everybody's job.

There is more to this point than meets the eye. Deming recognizes the difficulty of implementing the 13 previous points so, in this last point, he presents a seven point plan for action to implement the philosophy.

- 1.) Management must agree on the meaning of the 13 points.
- 2.) Management must have the courage to break with tradition.
- 3.) In building up a new quality organization, a manager for quality improvement who has direct access to top management must be appointed.
- 4.) Management must, as quickly as possible, build up an organization in order to carry out the continuous improvements throughout the firm.
- 5.) Management must explain why the changes are necessary and that they will involve everybody in the company.
- 6.) Management must explain that every activity, every job has its own customers and suppliers.
- 7.) Management must ensure that every employee in the company participates actively in a team.

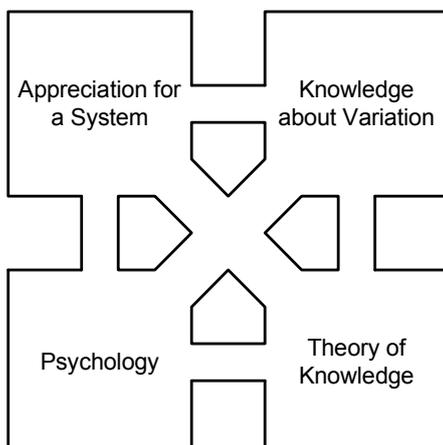


Picture 9 This picture shows Deming in the early eighties as speaker at one of his many Four-Day-Seminars. Deming passed on his extensive knowledge and experience to his clients, to university students and to the participants of his seminars practically up to his last gasp. During his last years he had to do the teaching from a wheelchair, not upright as shown on this picture.

His Master's Voice

Below, a list of Deming's best known quotes is added. It is the intention of this collection to give the reader an idea of the clear, direct, humoristic and sometimes harsh way Deming presented his thoughts. It was tried to arrange the quotes in the order of the four pillars in the System of Profound Knowledge (SoPK) shown below. This was not easy but it is thought that some kind of an order is better than a random presentation.

Most quotes were taken from Deming's book „Out of Crisis“ [4] and from a collection prepared by one of Deming's close personal friends, Ron McCoy [30].



Appreciation for a System

Deming's First Theorem: "Nobody gives a hoot about profit."

Deming's Second Theorem: "We are being ruined by best efforts."

There is an excuse for ignorance, but there is no way to avoid the consequences.

Management does not know what a system is.

You cannot achieve an aim unless you have a method. If someone can make a contribution to the company, he feels important.

A leader's job is to help people.

Retroactive management emphasizes the bottom line.

Management's job is to optimise the whole system.

Management is prediction.

Let us ask our suppliers to come and help us solve our problems.

It does not happen all at once. There is no instant pudding.

Innovation comes from the producer -- not from the customer.

Plants don't close from poor workmanship, but from poor management.

A leader is obligated to make changes in the system of management.

The performance of any individual is to be judged in terms of his contribution to the aim of the system, not on his individual performance.

The customer invents nothing. New products and new services come from the producer.

Quality starts in the boardroom.

A system must be managed. It will not manage itself.

You must have a supplier relationship of constant improvement.

Everyone is a customer for somebody, or a supplier to somebody.

Any manager can do well in an expanding market.

Without an aim, there is no system.

A leader is a coach, not a judge.

Does experience help? No! Not if we are doing the wrong things.

Stamping out fires is a lot of fun, but it is only putting things back the way they were.

Price is not the only cost.

A leader knows who is out of the system and needs special help.

Our problems is not the Japanese.

If you stay in this world, you will never learn another one.

You do not install quality; you begin to work at it.

The transformation will come from leadership.

Management's job is to look ahead.

Knowledge about Variation

3% of the problems have figures, 97% of the problems do not.

You cannot define being exactly on time.

We must understand variation.

Precise optimisation is not necessary. It would be too costly.

Shrink, shrink variation -- to reduce the loss.

Understanding variation is the key to success in quality and business.

You test to predict.

You should not tamper with the process.

Managing by results only makes things worse.

There is no such thing as a fact.

Change the rule and you will get a new number.

Confusing common causes with special causes will only make things worse.

Confusing special and common causes are the greatest two mistakes.

Meeting specifications is not enough.

You cannot inspect quality into the product; it is already there.

Improve quality, you automatically improve productivity.

Management by results is confusing special causes with common causes.

The process is not just the sum of its parts.

Nobody should try to use data unless he has collected data.

Without theory there is nothing to modify or learn.

Manage the cause, not the result.

The most important figures for management of any organization are unknown and unknowable.

Zero defects is a super highway going down the tube.

100% inspection will guarantee trouble.

Managing by results is like looking in the rear-view mirror.

We should work on our processes, not the outcome of our processes.

Theory of Knowledge

Information is not knowledge. Knowledge comes from theory.

You should not ask questions without knowledge.

Information is not knowledge. Let's not confuse the two.

There is no knowledge without theory.

Experience teaches nothing without theory.

You do not install knowledge.

A rule should suit the purpose.

Without theory we can only copy.

We should be guided by theory, not by numbers.

If you do not know how to ask the right question, you discover nothing.

You do not find knowledge in a dictionary, only information.

We want best efforts guided by theory.

Best efforts will not substitute for knowledge.

There is no substitute for knowledge.

There is no observation without theory.

It is so difficult to predict the future.

A goal without a method is nonsense.

It is easy to date an earthquake, but not an economic decline.

Without theory, there are no questions.

We know what we told him but we don't know what he heard.

It's management's job to know.

Without questions, there is no learning.

The problem is that most courses teach what is wrong.

Psychology

Our customers should take joy in our products and services.

Competition should not be for a share of the market -- but to expand the market.

If people did not make mistakes, there would be no mistakes.

Anybody can predict anything.

Have you ever known a golfer who was happy?

The merit system will put us out of business.

Judging people does not help them.

Making two people responsible guarantees mistakes.

When we cooperate, everybody wins.

Ranking. What does it do?

Forces of destruction: grades in school, merit system, incentive pay, business plans, quotas.

When a worker has reached a stable state, further training will not help him.

A man that knows his limitations is one that you can trust.

Why can't people work with pride?

Innovation comes from people who take joy in their work.

It is not necessary to confess past sins.

Whenever there is fear, you will get wrong figures.

The transformation can only be accomplished by man. A company cannot buy its way to quality.

Any two people have different ideas of what is important.

They are just doing their best. How do they know?

We can do something about our problems or continue the way we are.

People are entitled to joy in work.

We are being ruined by the best efforts of people who are doing the wrong thing.

Monetary rewards are not a substitute for intrinsic motivation.

If you destroy the people of a company, you do not have much left.

Revolution of Thought

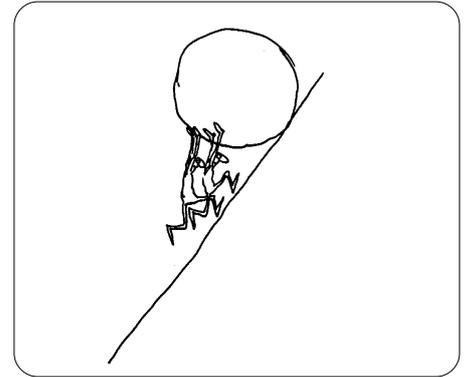
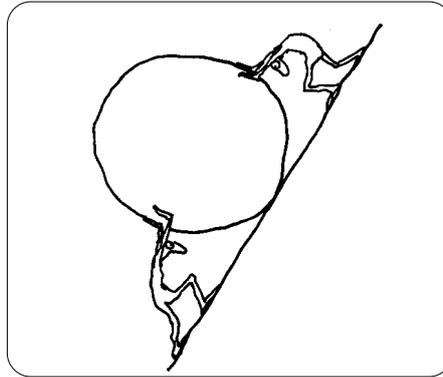
In an industrialized world committed to the Scientific Management of Frederick Winslow Taylor, the Deming Management Philosophy requires a revolution of thought. When after World War II the hunger for material goods was satisfied, customers became more and more interested in the quality of products and services specifically developed, designed and produced

to satisfy individual needs. Companies were the most successful which could meet manifold customer requirements at minimum cost.

Pat Oliphant -the New York Times considers him to be the most influential cartoonist of our time- has selected nine of the most deeply rooted convictions, where Deming asks for a far reaching change of mind. Pat Oliphant illustrates these mind changes in a language most familiar to him.

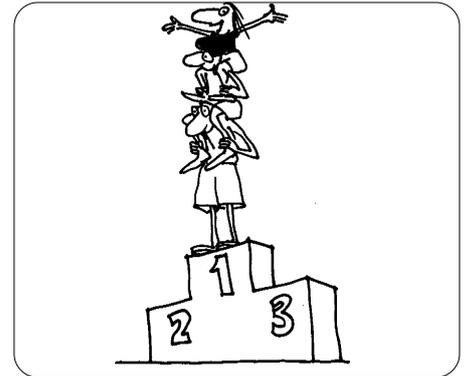
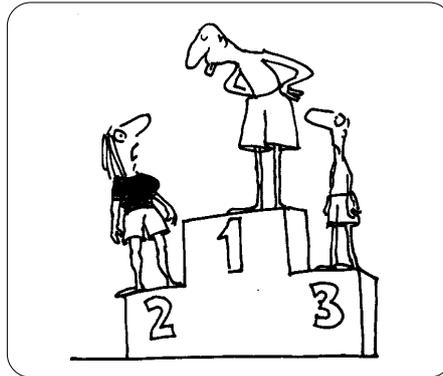
Cooperation instead of competition

Already during childhood, man is prepared for a life in a competing world following Darwin's belief, that only the most capable, both physically and intellectually, will survive. Man enters a cruel production system where many are not able to persist. Instead of a destructive life in competition, Deming proposes cooperation towards a mutually desirable goal.



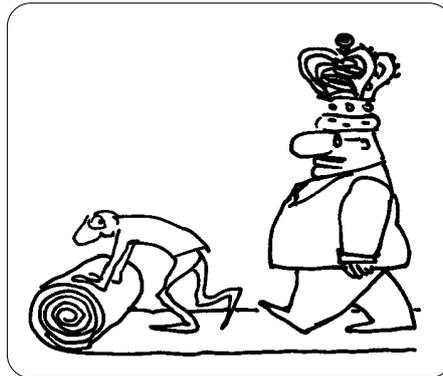
Everybody wins through cooperation

It is accepted without saying that for somebody to win, others must lose. If somebody wants to have a bigger piece of the pie, the other pieces will inevitably be smaller. But this does not need to be true. Work together to make the pie bigger, then the pieces will be bigger as well. Everybody wins!



Do not work for the boss, work for the customer

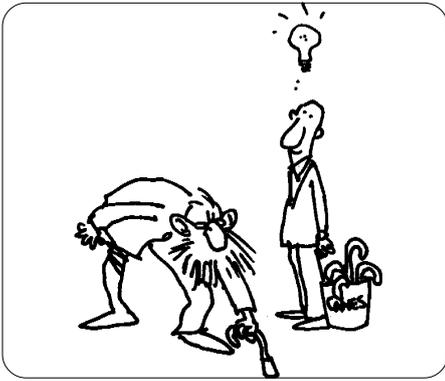
If you want to advance in school and later in business, you have to satisfy the teacher and then the boss. In a world striving for quality instead of quantity, there is no room for this type of attention to teachers and bosses. Customer satisfaction is a commitment for employees and superiors alike.



There is a culprit for every defect

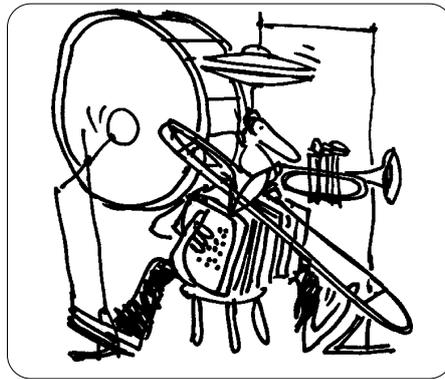
This statement is generally wrong. Experience shows that in 94% of all cases the system and not the worker is at fault.





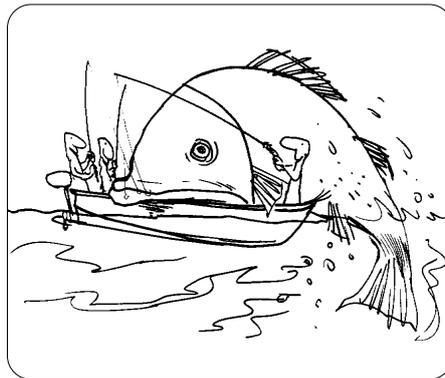
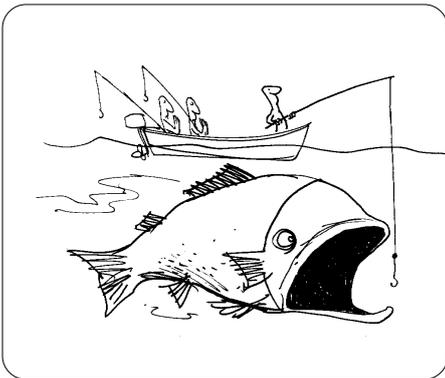
There is always room for improvement

The quality way has one goal, customer satisfaction, but no end. Possibilities for improvement can be found every time and everywhere, in a large context as well as in detail.



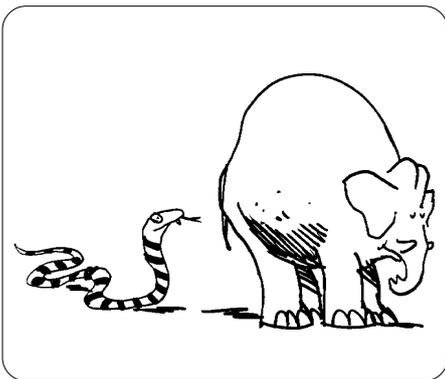
Good components do not necessarily lead to a good system

In the Scientific Management of Frederick Winslow Taylor [1] systems are cut into small components, which can be produced in large quantities with little or no know-how. But in systems, the weakest link determines the strengt of the chain.



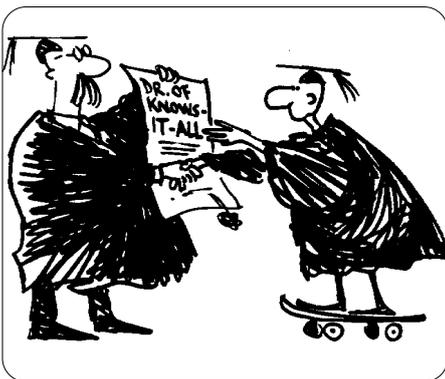
Inspections do not guarantee for quality

In an inspection based system only the products are of value which pass the inspection hurdle. A quality system, however, produces what the group expects.



Good financial statements are not indicators for long term success

Acquisitions, financial transactions and other gimmicks together with creative book-keeping can produce any desired financial statement. But the stomach ache when digesting the difficulties will show up only after the opulent meal.



A diploma does not mean the end of training and education

Diplomas, certificates, prizes and rewards lead the holder to believe that the goal was reached. But the challenges of today's world require lifelong learning. It would therefore be more appropriate if diplomas and certificates were called learner's permits.

Acknowledgement

The following individuals and organizations have actively contributed to this report:

Lloyd Dobyms, Clare Crawford-Mason and Robert W. Mason,

are the authors of the groundbreaking NBC documentary, „If Japan Can ... Why Can't We?“ In the United States, this television production made Deming a celebrity virtually from one day to the other. He became the nation's most sought after management consultant.

In 1980, this team founded CC-M, Inc. www.managementwisdom.com in Washington DC. CC-M produced a comprehensive presentation of the Deming philosophy. The Library contains now more than 32 hours of programs with narration and teaching guides on DVD.

CC-M, Inc. authorized the reproduction of 32 cartoons by the world renowned cartoonist Pat Oliphant. The artist drew these cartoons for the CC-M-production „The Prophet of Quality, Part I and II“ and „The Deming Revolution“.

Diana Deming Cahill, Linda Deming Ratcliff und Bill Ratcliff

are members of the The W. Edwards Deming Institute Board of Trustees.

The W. Edwards Deming Institute®, www.deming.org, was founded by Dr. Deming in 1993 with the aim to foster understanding of The Deming System of Profound Knowledge™ to advance commerce, prosperity and peace. The Institute is headquartered in Washington, D.C. It is a nonprofit corporation which provides educational services related to the teachings of Dr. Deming. These services include conferences and seminars. The Institute also makes Dr. Deming's personal and professional papers available to researchers at the U.S. Library of Congress. The Deming Collection at the Library of Congress includes an extensive audiotape and videotape archive of Dr. Deming.

The In2:InThinking Network

www.in2in.org is to promote study and awareness of individual and collective thinking about sub-systems, psychology, variation, knowledge, and their interactions - elements recognized as the basis of Dr. W. Edwards Deming's "System of Profound Knowledge (SoPK).

The concept of "inThinking" derives from "thinking about thinking", where thinking is defined as "a way of reasoning." InThinking invites an individual to learn to perceive the patterns of interdependencies surrounding him or her and to reason and judge with this insight.

Such a personal transformation of thinking builds upon the foundation of Profound Knowledge to include the theories of Dr. Russell Ackoff, Dr. Edward de Bono and Dr. Genichi Taguchi, among others.

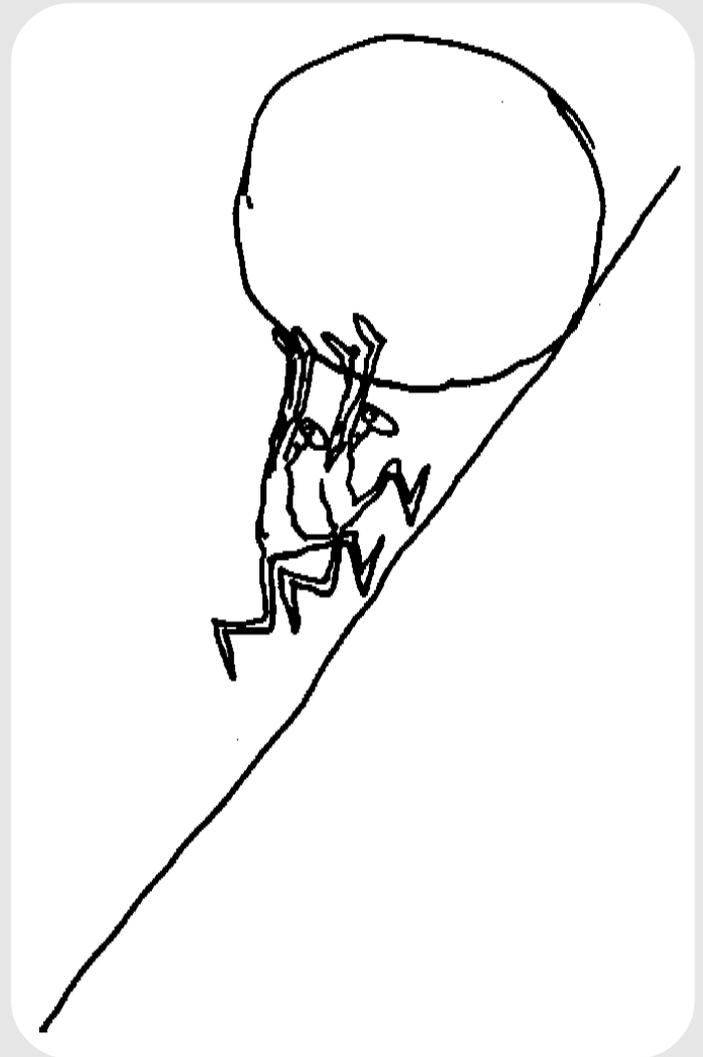
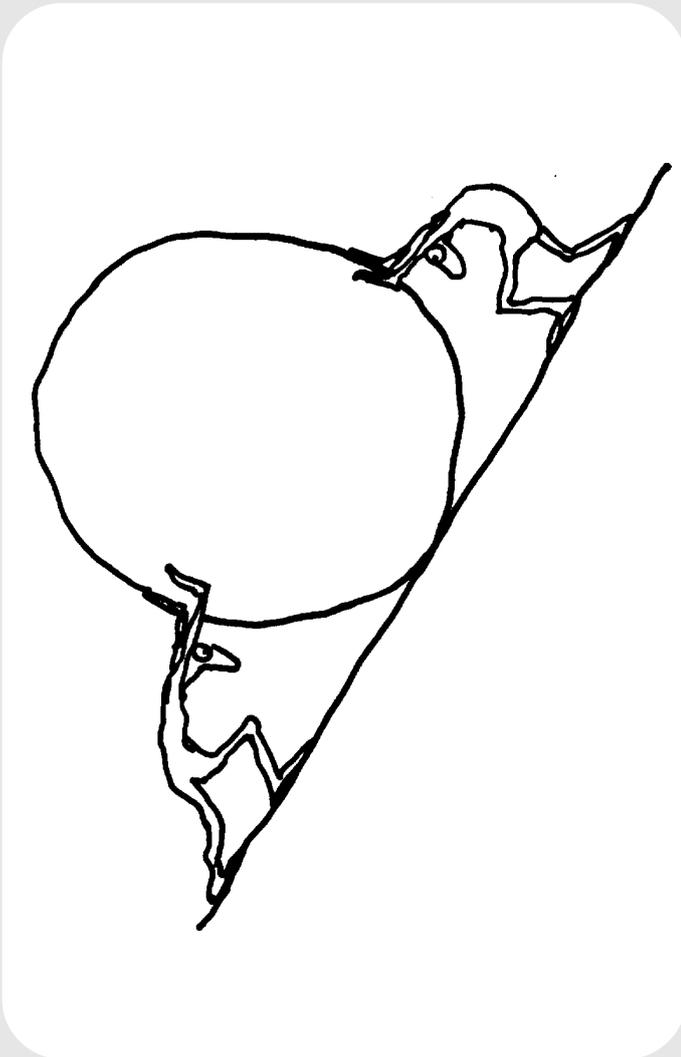
In 2002, the Network organized its first Annual Forum, which since then developed from a "west coast" Forum into something much larger – an international thinking network.

The Network distributes a monthly newsletter featuring news, articles, book and conference reviews, and other items of interest.

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THE SWISS DEMING INSTITUTE
P.O. Box 71, Langwisstrasse 22, CH-8126 Zumikon
Telephone: 0041 (44) 918 11 19
Telefax: 0041 (44) 918 11 70
Internet: <http://www.deming.ch>
E-Mail: info@deming.ch

The Germ Theory of Management

Myron Tribus, Director of Exergy, Inc., Hayward, California, and Director of the American Quality and Productivity Institute

Myron Tribus constructs an illuminating analogy between 19th century medicine and 20th century management in order to illustrate why it takes so long for us to think differently and adopt new theories that are designed to improve our lives.

Summary

In the decade or so since it first appeared, The Germ Theory of Management has been republished and downloaded countless times. It has been read and reread for its acute insight into the apparently perennial problem of why we struggle to adopt new theories that are aimed at improving our lives. It is thoroughly appreciated by those people who, having gained even a modicum of understanding and appreciation of the Deming philosophy, inevitably begin to ask the question "Why is this philosophy of management not more widely practised?"

Whilst the paper was clearly aimed at a U.S. audience, many of its observations on the difficulty of changing people's beliefs apply to virtually any community globally where it may, so far, only have reached a limited audience. The paper will be well known in some quarters in Europe but here too it has not been as widely read as it ought to have been.

Myron Tribus enables us to get an insight into this complex problem by brilliantly constructing an analogy with 19th century medicine.

It begins by examining the state of medicine in the middle of the 19th century when in all likelihood doctors were killing more patients than they cured. There was never any shortage of explanation for the fre-

quently disastrous clinical outcomes of medical procedures. None of these were right but the good doctors were held in such esteem by society and were deemed to be beyond reproach. That was until the work of Pasteur and Fleming provided a theory of infection and a means of disinfection respectively. Now the difficulty begins of trying to explain to the good doctors - the pillars of society, that they had a new set of beliefs to learn. Unless they changed their practices to take account of germs - that which they could not see and hitherto could not understand, they would continue to be a menace to anyone unfortunate enough to require medical treatment. In short, they had to "unlearn" most of what they had been taught, begin to think differently and rebuild their careers around a new theory. Conveying this disturbing realisation to the medical profession - that their careers had been based on the illusion of knowledge and conversely, if you are a doctor, learning for the first time of this new paradigm, placed both sides in positions of severe discomfort.

Tribus goes on to explain how many modern organisations become infected by a virus - the virus of variability - just as contagious and ultimately as deadly as the medical variety. It makes systems sick, they become congested with waste and emaciated; competitiveness withers away. Just

like the discovery of germs it takes new knowledge and understanding to be aware of its presence. However, thanks to the pioneering work of Walter Shewhart, it can be diagnosed and a rational approach to its treatment established. Despite the work of men like W. Edwards Deming, J. M. Juran and Homer Sarasohn who, just like Lister had understood the wider implications of the fundamental work, the treatment of variation in many modern organisations too often continues to be where the medical profession was when threads were left in operation wounds to let the pus drain out. Who will tell today's managers that they are doing more harm than good?

Examples are given of how variation can infect all kinds of organisations be they in the production or service fields and how we are complicit in accepting unacceptable levels of waste - the manifestation of variation. Furthermore, it is claimed that modern accountancy practices are allowing waste to be hidden and thereby, in effect, waste becomes institutionalised.

Tribus explores some of the solutions to this massive problem such as unlearning, re-education and new learning. Indeed if we are to rid ourselves of the disease that saps at our competitiveness we will need to institute a new theory of leadership and apply all the new competencies in order to **manage for quality**.



Myron Tribus

Myron Tribus, PE, is a consulting engineer, specialising in Quality Management and Cognitive Modifiability, with special emphasis on education. He is one of the co-founders of Exergy, a company specialising in the design of advanced, high efficiency, power production systems. He recently retired from Exergy after 12 years as a director. Before starting Exergy, he retired from MIT after 11 1/2 years as Director of the Center for Advanced Engineering Study. Before coming to MIT he served as a Senior Vice President for Research and Engineering for the Xerox Corporation, where he was in charge of Research, Development and Engineering for the entire line of XeroxCopiers, Duplicators and Telecopiers. Before that he served for two years as Assistant Secretary for Science and Technology in the U. S. Department of Commerce. For eight years he was Dean of the Thayer School of Engineering at Dartmouth College, where he introduced the Unified Engineering Curriculum and led the faculty in developing a curriculum based on engineering design and entrepreneurship. Dr. Tribus served for 16 years on the faculty of the College of Engineering at UCLA and two years on the Faculty of the University of Michigan. He has worked as a design engineer for the Jet Engine Department of the General Electric Company. In 1958 he hosted the television show "Threshold" for CBS in Los Angeles.

Dr. Tribus has published over 100 papers on topics ranging from academic subjects, such as heat transfer, fluid mechanics, probability theory, statistical inference and thermodynamics, to applied topics such as sea water demineralisation, aircraft heating,

aircraft ice prevention and the design of engineering curricula. He has published two books, "Thermostatics and Thermodynamics" (which provided the first textbook which bases the laws of thermodynamics on information theory instead of the classical arguments) and "Rational Descriptions, Decisions and Designs" (which introduces Bayesian Decision methods into the engineering design process). Dr. Tribus was active with Irving Langmuir in the pioneering days of cloud seeding and has published analyses of the role of statistics in weather modification.

Dr. Tribus has also published and lectured extensively on topics of social interest such as the position of engineers in politics, the decline of US competitiveness in world trade, the role of decision theory in political decision making and the role of technology in society. He has also written and lectured on the redesign of educational systems.

Over the last 20 years Dr. Tribus has become known through his writings on Dr. Deming's philosophy of management. He is one of the founders of the American Quality and Productivity Institute, which is devoted to teaching and promoting the fundamentals of quality management. The AQPI merged its efforts with the Transformation of American Industry project of Jackson Community College to form the Community Quality Council to foster the growth and development of community quality centers across the USA. This activity has recently been merged with the activities of the Association for Quality and Participation, which continues the support of community quality centers.

About a decade ago Dr. Tribus turned his attention to the theories and practices of Dr. Reuven Feuerstein, an Israeli Psychologist who developed the Theory of Structural Cognitive Modifiability. This theory, which has been in development for the past 60 years, has been used in many countries to increase the intelligence of people suffering from various types of learning disabilities. Dr. Tribus has become a certified trainer of teachers who take Dr. Feuerstein's methods into schools in different countries.

Dr. Tribus is a member of the National Academy of Engineering. He has served on several boards of directors and been a consultant to many companies and governmental bodies. He has received five awards for technical papers and public service and two honorary doctorates. He received the BS in Chemistry from the University of

California, Berkeley in 1942 and the PhD in Engineering from UCLA in 1949.

Dr. Tribus is married and has two grown daughters and four grandchildren.

Introduction

In a recent review of the Deming Theory of Management, William B. Gartner and M. James Naughton wrote (1) :

"Medicine had been 'successfully' practiced without the knowledge of germs. In a pre-germ theory paradigm, some patients got better, some got worse and some stayed the same; in each case, some rationale could be used to explain the outcome.."

Doctors administer to the needs of their patients according to what they learn in school and in their training. They also learn by experience. They can only apply what they know and believe. They have no choice. They cannot apply what they do not know or what they disbelieve. What they do is always interpreted in terms of what they understand is "the way things work". As professionals they find it difficult to stray too far from the common knowledge and understanding of their profession. They are under pressure to follow "accepted practice". In this regard, Doctors are no better and no worse than the rest of us. We are all prisoners of our upbringing, our culture and the state of knowledge of our teachers, mentors and fellow practitioners.

Today we smile when we read that after sewing up a wound with silken thread, the surgeons of 150 years ago recommended to leave a length of the thread outside the wound. This was done to draw off the pus that was sure to follow the insertion of unsterilized thread by unwashed hands using an unsterilized needle.

Changing People's Beliefs is not Easy

Try to imagine that it is now the year 1869. Pasteur has only recently demonstrated that fermentation is caused by organisms which are carried in the air. Only a few months ago Lister tried out the first antiseptic, carbolic acid, and found that it worked to prevent inflammation and pus after surgery.

120 years ago the spread of medical information was much slower than today. Imagine you are a young researcher in a medical school in the USA. The Civil War is over and you are trying to develop your own career after army service. You are a serious young doctor who tries to learn the latest developments in the medical pro-

fession. Suppose that you have just read about Pasteur's and Lister's work and that you have been invited to speak before a group of distinguished physicians, many of them having come to fame for their heroic service as surgeons during the American Civil war. What you now understand from your readings is that these famous physicians are actually killing their patients. Your responsibility is to explain to them, if you can, that because they do not wash their hands or sterilize their instruments, they sew death into every wound. Your assignment is to persuade them to forget most of what they have been taught, to abandon much of the wisdom they have accumulated over their distinguished careers and to rebuild their understanding of the practice of medicine around the new theory of germs. Do you think you could do it? Do you think you could convince them? Do you believe they will they be glad to hear you?

Suppose, instead of being the speaker, you are a member of the audience. You are one of the good doctors who have earned respect and prestige in your village. You have a nice house on the hill, a pretty wife, a nice carriage, some fine horses and a few servants. You are part of the elite of your society. How will you feel if someone starts spreading the word that your treatments are a menace, that the theories you hold are bunk and that your habit of moving from one patient to another, laying unwashed hands on each, guarantees the spread of disease to all who are so unfortunate as to become your patients? What do you think will happen to your practice if this kind of word gets bandied about? How would you be likely to greet the messenger?

The Origin of the Germ Theory of Management

In 1865 Pasteur was in the south of France to investigate what was killing the silkworms in the silk industry of France. He not only isolated the bacilli of two distinct diseases, he also developed a method to prevent contagion. Lord Lister applied this knowledge in medicine in the same year.

Thus was born the germ theory of medicine.

In the 1920's Walter Shewhart at the Bell Laboratories was asked what to do to increase the reliability of telephone amplifiers. These amplifiers were necessary to strengthen the signals in long distance tele-

phony and were placed about a half mile apart on long distance lines which the Bell System intended to place underground.

Unlike the doctors, the Bell System wanted to be sure the amplifiers were healthy so they could bury them! If the amplifiers died, they would have to be dug up.

The amplifiers were built using vacuum tubes, which were then notoriously unreliable. Shewhart's assignment, therefore, was to discover what could be done to guarantee the life of the vacuum tubes, to keep them from getting sick, so to speak. In the process Shewhart discovered the antiseptic for the virus of variability.

When a vacuum tube is assembled, if every component that goes into the vacuum tube is the same as in every other vacuum tube, if each tube is put together precisely the same way, if each is free of contamination, and if each is subjected to exactly the same load conditions, then vacuum tubes would all have exactly the same life. Their maintenance could be scheduled. It would be possible to determine just why and how vacuum tubes failed and to increase their life. However there is always some variability in materials; in processes of manufacture, in the training of operators, in the conditions of the workplace and in a thousand other factors. No two vacuum tubes will fail exactly the same way. If engineers and scientists cannot determine why vacuum tubes fail and they will not be able to increase their life.

Just like Pasteur's germs, variability is everywhere. It cannot be seen with the naked eye. The virus of variability can only be detected by using special instruments.

Germs are controlled by pasteurization. Shewhart showed how to measure the virus of variability, how to reduce it and how to keep it under control. In short, Shewhart invented the equivalent of pasteurization.

In the beginning people thought that Shewhart's approach was only suited to the manufacture of devices.

Just as Lister understood the broader significance of Pasteur's work to the practice of medicine, so too did Dr. W. Edwards Deming understand the significance of Shewhart's work to general management. Deming was not alone. There were other pioneers, such as Homer Sarasohn and J. M. Juran who also saw the broader implications of Shewhart's work to management. These men realized that the key to better management is the study of the processes whereby things get done and through such

study to learn how to reduce its variability and to obtain predictable results from all processes, even intellectual processes such as designing, planning and budgeting.

Shewhart's investigations thus laid the foundations for the "germ theory of management".

How the Virus of Variability Makes a System Sick

The first thing that Doctors had to learn was that germs, although invisible, could be transmitted by various means from one patient to another. They had to form new images of the world. They had to learn about sterilization and antiseptics. They had to believe it was important to wash their hands. They had to learn about germ cultures and the causes of infection.

Let us consider as an example how the virus spreads in manufacturing.

When the Nashua Corporation first started to work on quality, they chose as their first project the improvement of their line of disk packs for computers. They began by investigating the variability of the aluminum from which the blank disks are made. Although all the aluminum they bought was within tolerance, they found that some suppliers produced much more uniform alloys than others. They changed suppliers. The fraction of acceptable diskettes increased.

The smoother surfaces made it possible to pinpoint problems with the conductive coating so the variability introduced in the paint preparation could now be detected and reduced. The previously concealed problems with the coating machine could be investigated. The net result of decreasing the variability of the several processes which had been infecting one another was an increase in the quality of the diskettes and their popularity in the market-

place. At the time they obtained an increase in yield from 65% to over 90%. When I told this story to a man from 3M he said, "I know. They drove us out of the business".

Nashua found that the virus of variability in the incoming materials infected the disk production process. This variability was amplified by the coating process and added to the virus of variability already in the paint. With so many unhealthy diskettes, it was impossible to detect which viruses were present, in the same way that in a dirty hospital it is impossible to say what causes patients to get sick. The variability of the materials not only infected the production process, it also infected the maintenance process and caused unpredictable tool wear, necessitating an increased inventory of expensive tools. When the variability of the aluminum was reduced, the tool wear became predictable and the inventory in the tool room was reduced.

The process of infection is easy to understand. As shown in Figure 1, if the variability of the incoming material to System A is not dampened by the system, the variability passed on to system B will be increased. This variability will be increased and passed on to each following system so that in the final output the variability may be too great and much of the output will be unacceptable. Schedules are missed, products fail to meet specifications, too much money is spent trying to correct errors. The symptom of the virus of variability at the factory floor is the size of the waste bins.

The virus can infect service activities as well. Consider for example the loading of a ship. The cargo arrives at the dock in trucks and is unloaded by hand. Then the cargo is picked up by a stevedore and loaded into bundles to be lifted by a crane. Bundles of cargo are picked up and deposited on the deck where another stevedore loads separates the bundle into separate items again. The separate items are loaded onto a fork lift truck and moved into the hold. A

colleague of mine once observed that this was the way it was done for the Nina, the Pinta and the Santa Marie. If you watch this activity for awhile you will see that the variability of cargo sizes, the variability of movement of cargo and the variability of the performance of people and machines wastes time.

The same difficulty arises whenever people have to work in series, whether it is in accounting, sales, maintenance and repair or in customer service. In service, the symptom of the virus of variability is wasted time. The trash bins are invisible, but they are there for those who have the instruments with which to look.

Sometimes the variability is so inherent in the system there is no way to improve except to change the system itself. That is why container ships have been so successful. By pushing the inefficient packing problem onto someone else, the shippers have eliminated the variability in the loading process. The turn around time for ships has been reduced to hours instead of days.

The virus can infect a personnel office if the variability of the experience of the newly hired workforce is too great. Unless system A, which provides the initial training, is properly designed, it will amplify the differences in the trainees and the results in the workplace will be disastrous. The result will be human waste; i.e., excessive turnover with all its attendant expense.

An entire city can become infected as well. Suppose you live in a small town served by a feeder airline. Suppose that the airline schedule is not reliable; that is, you cannot be sure when your airplane will take off. This variability of performance causes you to make your appointments at a distant city with considerable slack in your schedule. Sometimes, just to be safe, you travel the day before and must pay for a hotel room for one night. You dare not count on the morning flight to get you there and the evening flight to get you back. Consider the total effect on the other businesses in the community and you have a recipe for the decline of a local economy.

Too many people accept scrap, rework, delays and missed schedules as "normal". They do not know what it means to be well. A few of them go to countries where the trains run on time, the mail gets delivered promptly, the phone system works without delays, the taxis are clean and the streets are free of debris. They visit clean factories and wonder how it all happens. They

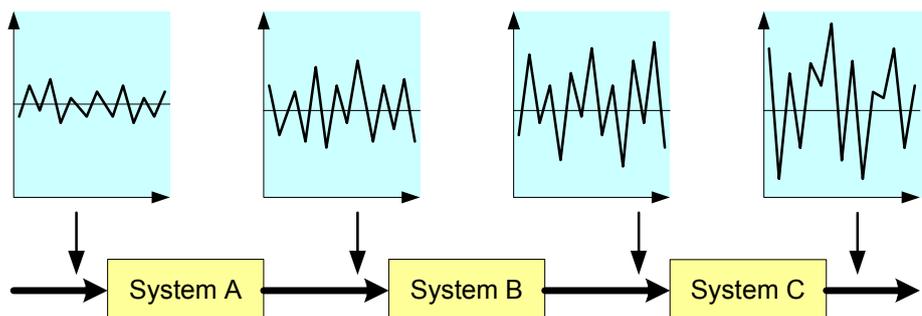


Figure 1 How the virus of variability is spread from one system to the next

marvel at the sense of good health. They do not imagine they, too, could be healthy if they managed differently. Most managers dismiss these differences by saying, "It's the culture".

When I encounter managers who persist in thinking it is the culture, I like to show them the following figures given to me by Mr. Ken Sasaoka, President of Yokagawa-Hewlett-Packard in Japan (YHP).

In 1975 an internal audit was made to examine the performance of the several divisions of Hewlett Packard. In this survey, as shown in Figure 2, Yokagawa-Hewlett Packard ranked last in both field failure rate and profitability. This turn of events was most distressing to Mr. Ken Sasaoka, President of YHP. He determined to do something about it. He and his top management team studied the new approach to management and applied statistical methods to some of their processes. He discovered for himself how the virus of variability worked. After he tried the methods out on the assembly line, he moved to other departments until finally his company was running according to "CWQC", Company

Wide Quality Control. When the next survey was run in 1980, YHP had won the coveted Deming Prize. The results of the survey are shown in Figure 3.

I like these two figures because they demonstrate that it is not a matter of culture--it is the managerial culture. As Mr. Sasao-ka will testify, the primary basis for the new way to manage was the elimination of variability, first in the factory floor and then in all departments of the company.

How much could be saved if all processes had zero variability? No one knows. Consider just this one example: In the early 1950's, to demonstrate just how quickly a house could be built, the Henry Beck company of Dallas, Texas, assembled a two bedroom, one floor house on a previously prepared concrete slab. As pictured in Life magazine, from the time they started until the house was completely assembled, finished, painted, with one woman taking a hot bath in the bathtub and another cooking dinner on the kitchen stove, was less than three hours. Think of that--three hours! The usual time is at least 30 days, often more.

Why does it take more than three hours to

build a house? It is because the activities of all the people cannot be scheduled so closely. If the painter starts to paint a board 15 hours after the board has been nailed instead of 60 seconds the time scale changes by 900. Three hours stretches into an elapsed time of 2700 hours.

No one expects to be able to schedule all the people who are required to build a house so that each one does his or her job with only seconds to spare. But the overall time can be reduced by making each process more precise. When this is done errors, goofs, flaws, and their attendant delays all begin to disappear. As the virus of variability is reduced, savings in time and money are discovered, which our methods of accounting now hide so cleverly in the "overhead" that we have grown to think that the waste is "normal".

Managers can also introduce variability into a system simply by the way they behave. One of my employees once put it to me this way: "Did you ever take an old fashioned alarm clock apart? Do you remember there was one great big wheel connected to the main spring and if you turned it just a little bit, one of the little wheels would spin like crazy? Well, you are a manager--a big wheel--and when you turn just a little bit, you make me spin like crazy".

Deming has captured this wisdom in one of his points for managers: **Maintain constancy of purpose.**

A good manager goes beyond constancy of purpose and makes sure that the purpose is understood, that it creates loyalty among the employees, and it gives good guidance in their every day work. With a carefully crafted statement of purpose, employees can be relied upon to support the purpose of the enterprise without constant attention.

People can see the waste in a factory because it is there, in the trash barrel. In the office the waste is measured by time spent in correcting mistakes, in follow up that is not required, in missed appointments, in misinformation and in tinkering with systems that should be left alone. For most people, the virus is invisible. Sometimes its cost is invisible too. It takes special accounting instruments to find viruses. You have to know how to look.

The doctors had a theory of how malaria was spread. They called it "mal-aria" to emphasize that it was the bad air, the unhealthy vapors in the night, that caused the disease. Their theory of medicine caused

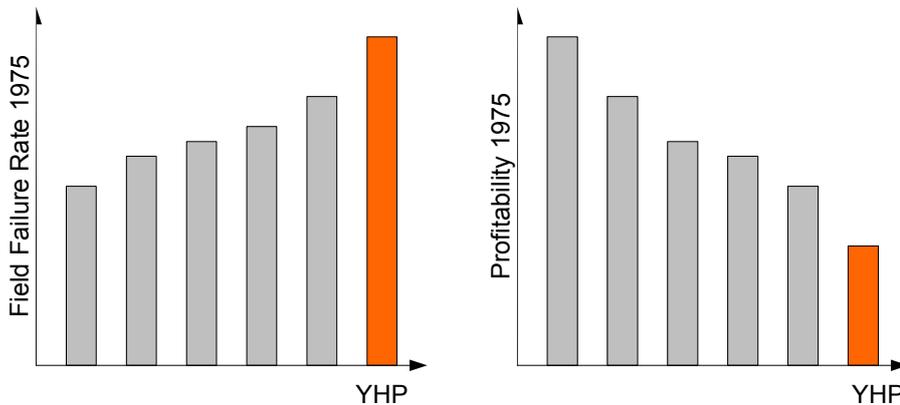


Figure 2 Field failure rate of Yokagawa-Hewlett-Packard of Japan (YHP) in comparison with other divisions of Hewlett-Packard in 1975

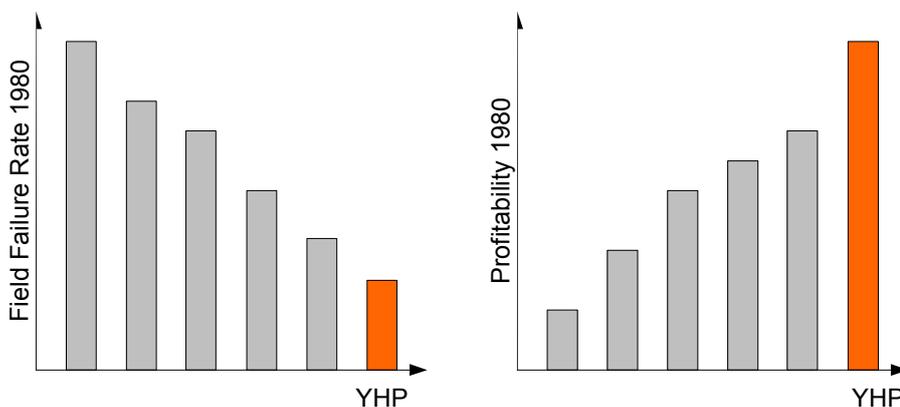


Figure 3. The same comparison made in 1980 after YHP changed its managerial approach. The work force is essentially the same as in Figure 2, only the managerial approach has been changed.

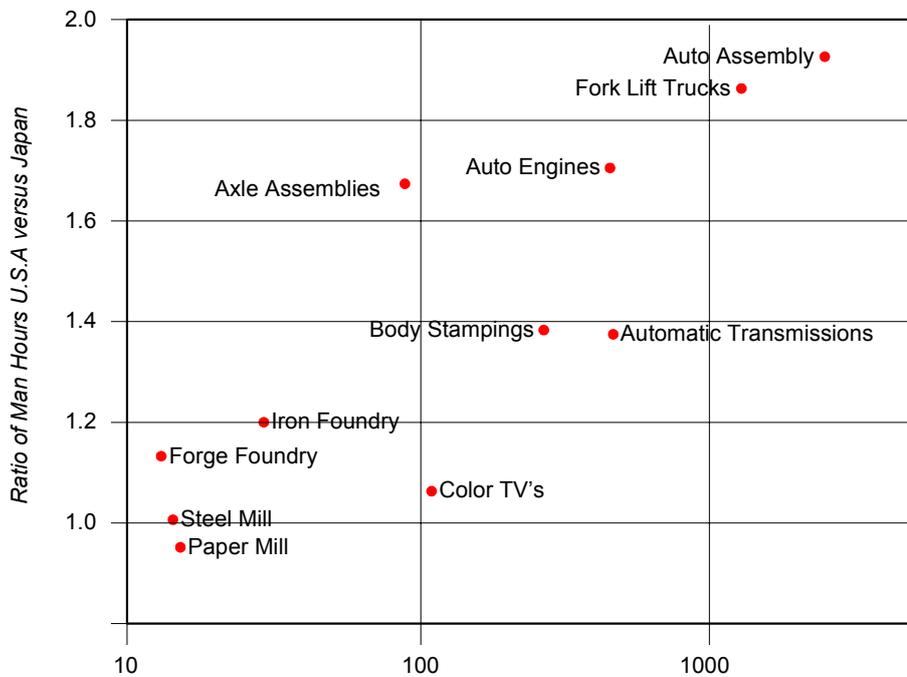


Figure 4. Ratio of number of labor hours required per unit of product as measured for Japanese and U.S. manufacturers. As the number of manufacturing steps increases, the ratio becomes more unfavorable to the US. (Data from Boston Consulting Group).

them to look in the wrong places for wrong answers to the solutions to their most pressing problems.

Today our managers often do the same. When they are up against tough international competition they look to changes in economic policy, in tax structure, in trade policy--everywhere except in their own understanding of what makes a company competitive. We hear demands for a "level playing field"--and it is true that in many markets there are unfair trade practices, which are bound to get worse as times goes on. However, as the data from the Boston Consulting Group indicates, on a level playing field the old way to manage cannot survive in competition with the new.

We are being forced to deal with a changed paradigm of management. The differences are as great as the shift from thinking the Earth is flat to understanding it is round. What is at issue is a complete redefinition of the manager's job. It is a new world and manager's need to learn how to navigate properly in it. If they think the world is flat, they will be continually worried about falling over the edge. They will be forever bound to staying very close to home, afraid to venture into new territory. Innovation will cease.

The Manager's Job has been redefined

The germ theory of management requires

managers to pay much more attention to the systems and processes for which they are responsible than before. It is time to adopt a new definition:

The People work in a System. The Job of the manager is to work on the system to improve it with their help.

There are several key words in this definition:

1. **"work in a system"**. If you accept this definition, then you should also accept that workers do not control what goes on in their work. Managing by telling people you hold them personally accountable for results flies in the face of what you really know. When you do this, you are inconsistent with yourself. "But", you are certain to protest, "If I don't hold them responsible, they won't do anything". First of all, that's not true. But more importantly, you should hold them accountable to help you to improve performance of the system.
2. **"the job of the manager"**. What did you think your job was?
3. **"work on the system"**. Do you know how to define the system upon which you are supposed to work? Do you know how to work on a system? Do you know what you have to learn to do it? Do you know where to go to learn?
4. **"to improve it"**. Do the people who work in the system have an unambiguous definition of what it means to improve? Do you? Does your definition of improvement

include removal of the virus of variability?

5. **"with their help"**. Are you prepared to let them help you? Have you trained them to do so? Do they understand the virus of variability? Do they have the tools and techniques to measure it? Do they understand what needs to be done to reduce it?

This definition proposes a new division of labor between managers and operators. Because the virus of variability is everywhere, everyone in the enterprise must be on the alert to detect variability and propose how to reduce it. To do so requires improved training, honest communications and a new spirit of cooperation between management and labor.

It also brings out the importance of another of Deming's points: Eliminate fear. I have yet to find more than handful of companies in which employees were unafraid to tell the truth.

Under the old style of management getting at the truth is almost impossible. Without honest communications, it is impossible to sterilize systems.

Just as germs are everywhere, so are the causes of variability. To sterilize a process will require someone to study what causes the variability and to remove the causes one by one. Managers are the only people authorized to tamper with the system. If you, personally, do not do this for the systems under your management, it will not get done. Your entire operation will become sick. As a manager, you cannot delegate to someone else the responsibility for the health of the processes for which you are responsible. If you can delegate this responsibility, why do we need you?

Don't Start by Blaming the People

There are many reasons why people do not all perform alike. They do not all have the same training or dexterity, for example. Shown in the Table are the records for 8 workers, all doing the same work over a 12 week period.

Good doctor, what do you make of these data?? What would you prescribe?

If you were the supervisor of these workers, what would you do? How would you go about improving things?

I have presented this table to audiences across the USA, in Mexico, in Canada, in

Week	1	2	3	4	5	6	7	8	9	10	11	12	sum
Marry	0	0	0	0	0	0	0	0	0	0	0	0	0
Joe	0	0	0	0	0	0	0	0	0	0	0	0	0
Eva	1	0	0	2	0	0	3	0	0	1	0	0	7
Fred	0	0	0	1	0	0	2	0	0	0	0	0	3
Jim	0	0	0	0	0	0	0	0	0	0	0	0	0
Ed	0	0	0	0	0	2	0	0	0	0	0	0	2
Kate	0	0	0	0	0	0	0	0	0	0	0	0	0
Carl	0	0	0	1	0	0	0	0	0	0	0	0	1

Table: Observed flaws per week over a period of 12 weeks in a working group of eight employees

Australia, in the UK and I always get about the same reaction. People suggest a good talk with Eva. They propose putting Eva alongside Mary or asking Mary to help her. They propose to fire Eva. They propose to give Eva more training.

One astute statistician at a meeting of the Royal Statistical Society in London even went so far as to observe that there was a 30 day periodicity in Eva's output and that might have something to do with things.

After the audience suggests different cures based on the common wisdom, I explain to them that the numbers in the tables were actually generated by the random number generator in my computer. The flaws were generated and assigned to memory cells, to which I attached people's names. In other words, the faults were generated entirely by the system.

In only two or three instances, out of thousands of people, did anyone suggest that perhaps the problem was in the system itself-- that the system had been infected with the virus of variability and it was not the fault of the workers. In the last four years, only three people have suggested that we analyze the data in the table to see if we could compute whether Eva's results should be expected in the light of the variability exhibited by the system.

The fact is the process itself is infected with the virus of variability. If you don't set about sterilizing the process, that is, reducing its variability, it will certainly infect the workers. Not only will it infect the workers, it will infect your judgment.

People change their views very slowly. I shall never forget the one manager who

said afterwards, "Look, I know that the numbers were generated by a computer, but nevertheless, I would still talk to Eva"!!

The output of these workers has been infected by the variability of the process over which they had no control. Suppose that the supervisor, with the objective of urging the workers to better performance decided to post the above table on the bulletin board. Of course we do not expect the workers to understand the germ theory of management. They may think that the results are their fault and they will try to do better. Do you not see how the virus of variability of the system will infect their interpersonal relations and perhaps even the home lives of the workers? If the supervisor does not understand the theory, do you not see how the system of supervision will become infected? Suppose there is an annual rating system for supervisors and the data in the above table are available to the upper management? Suppose the upper management does not understand the variability virus and therefore thinks

the supervisor should have done something drastic about Eva. Suppose the supervisor, however, does know about variability and does understand it is the system that needs to be fixed. Given this disparity in understanding, how do you think the manager will rate the supervisor?

I am not describing a far fetched scenario. I am describing what goes on daily in factories and offices all around the world. This kind of experience inspired Juran's famous maxim:

Whenever there is a problem, 85% of the time it will be in the system, 15% of the time it will be the worker.

The instinctive reaction of most managers I meet is to blame the person. Sometimes I find a manager who, when confronted with a problem will even say it is his own fault, he should have done something else. As a consultant I often find it difficult to persuade him that in fact it is the system which is fault. Many managers will persist in thinking that they need to change something in their personalities when in fact it is the system which needs to be changed.

The Fallacy of Management by the Organization Chart

Too many managers have a generic organization chart in their heads (Figure 5). They forget that the work flows across the organizational chart, more or less perpendicular to the lines of authority. They are unaware that the different steps in the process infect one another. They think that the organization chart defines how things get done. They issue crisp orders to subordinates.

Too many managers think they can divide the system into parts, along the lines of their generic organization chart.

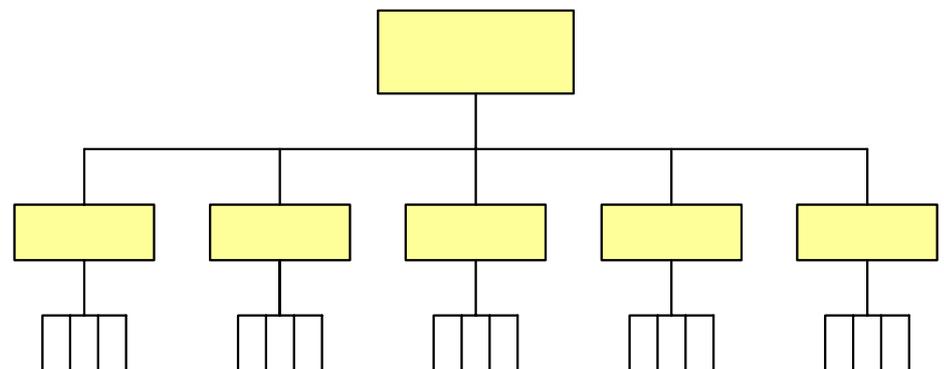


Figure 5 Generic Organizational Chart

Their managerial strategy is "divide and conquer". They see the organization the way some friends of mine in Holland see it (Figure 6).

Too many managers do not know how to recognize and define a system of processes. They do not understand what is meant by a process. They do not know how to recognize when processes which flow across an organization chart are out of control.

Seeing this discrepancy between how too many managers think about their jobs and the reality of their situation has prompted the development of the "perversity principle", which goes down hard for managers who think in terms of organization charts.

If you try to improve the performance of a system of people, machines and procedures by setting numerical goals for the improvement of individual parts of the system, the system will defeat you and you will pay a price where you least expected to (perversity principle).

Suppose you set a target for the people in one department, telling them they are to process a certain number of orders per month. Then you give another target to your sales force, consistent with the first target. It certainly matters whether the orders arrive bunched up or spread out. It matters if they arrive in a predictable fashion. In other words, even if the sales force produces the target number of orders, on average, the variability in performance day by day will cause extra expense and

waste in other departments. Setting targets for the individual performers does not speed up the process. It slows it down as each performer tries to look good at the expense of the others. Instead of just setting targets the manager should study the effects of variability and, in cooperation with the department heads, develop practices and procedures to mitigate the effects on the overall performance of the company.

This consideration emphasizes another of Deming's points: **Break down barriers between departments.** Stop thinking of the enterprise according to the organization chart and begin to think about the processes whereby things get done.

If you set targets for the people at the bottom of the system, or for the people in between, without regard for the systems aspect of the work, you are abdicating your responsibility.

The Manager as Planner -- Preventing Viral Attacks

The previous discussion has been concerned with the improvement of operations. Managers, however, should do more than work on current operations. How a manager spends his or her time depends upon the level in the enterprise at which the manager is stationed. Professor Yoshikazu Tsuda, of Rikkyo University has proposed the following diagram (Figure 7) to represent a reasonable distribution of manage-

ment time as a function of level of responsibility.

When planning future operations and designing products or services managers should pay special attention to the virus of variability. This means putting a high priority on worker training for all new undertakings. It means studying processes not just outcomes. It requires the development of quality indices, to measure the effects of variability on the quality of output.

A well trained manager, who understands the virus of variability, will consider at least the following 6 categories of variables:

- Variables controlled with precision
- Variables controlled, but poorly.
- Variables uncontrolled, but measurable.
- Variable uncontrolled, but predictable.
- Variables uncontrolled and unpredictable.
- Variables unknown and therefore unpredictable and unmeasured.

For each category of imprecisely known or controlled variable, the manager should prepare a countermeasure.

If a variable is controlled, but poorly, the manager should design the system or the product so that it is "robust" with respect to variations. Various methods can be devised to make a design or a process less sensitive to a poorly controlled variable. For example, if, due to traffic conditions, it is not possible to control the time at which employees arrive at work, the practice can be adopted of using the early hours to clean up the area or undertaking other work which does not require a full crew.

At the very minimum, managers, when examining strategies for the future, need to ask about the uncertainties in the data and what countermeasures are to be taken. They need to identify measures which provide leading indicators for those aspects of the future which are most uncertain and to develop tactical measures to take advantage of them.

In summary, then, when considering the improvement of current operations, managers need to look for evidence that the virus of variability is infecting operations and they need to find the right antiseptics. When considering the future, managers need to be certain they take into account uncertainty--both in planning what to do and in planning for products and services which will be robust-- healthy enough to

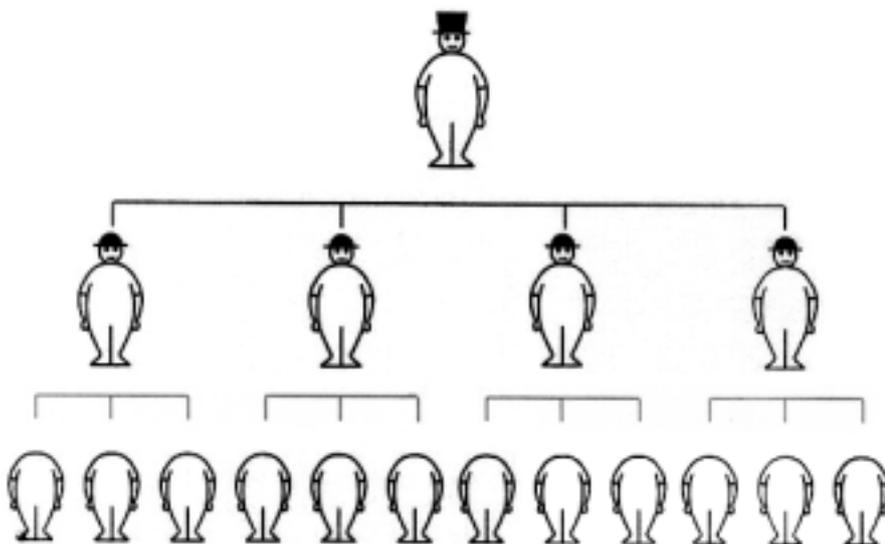


Figure 6. The hidden assumption in many manager's heads. The people at the bottom have no heads. (Courtesy of MANS Organization, The Netherlands)

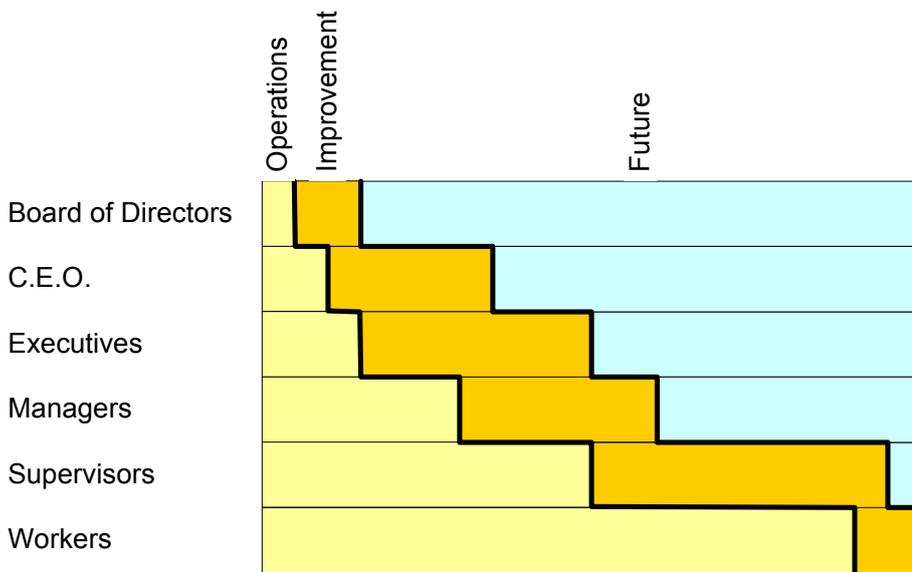


Figure 7. Recommended disposition of people's time as a function of the level of responsibility in the enterprise. Everyone works on improvement. (Chart courtesy of Professor Y. Tsuda)

withstand viral attacks--and they need to develop indicators which will enable them to respond quickly when viral attacks occur.

What the doctors were taught was not good enough. Some things they did were downright dangerous and harmful. But in time, they learned. So, in time, will today's managers? But a lot of people had to die along the way. Doctors, after all, can bury their mistakes. Unfortunately, many enterprises will have to go bankrupt before we develop a new generation of practitioners. The causes will be buried in the dead files of the bankruptcy courts.

All of the variability cannot be removed. No one knows, however, just how much can be done. Until Sarasohn, Deming and Juran applied these ideas in Japan and the results were seen on a large scale, it was not appreciated that in many instances costs could be cut by as much as 50%. The results have been seen in both goods and services.

The Task is Re-Education

The readers of this paper, of course, are different. They are the independent thinkers who deign to run with the herd. They are obviously the enlightened people. Surely they would not behave as the doctors a century ago behaved when they were told they should see that their operating rooms were sterile. They fought it tooth and nail.

"What, stop to wash my hands? Don't be silly. I have important things to do"

It was a lot of work for them to change. They had to admit they had a lot to learn. They were human. They resented the need to change and hoped in their heart of hearts that it would all blow over.

In the first place, changing the practices and procedures in the operating room was not something they could do alone. They needed nurses and orderlies to help them. They had to begin by first understanding the germ theory of disease themselves. It is one thing to learn a new theory when you are a young student in medical school; it is another when you are busy supporting your family through your practice of medicine. After they learned the theory themselves they had to teach the nurses and orderlies how to sterilize instruments and medical facilities. They could not just leave these things to chance. They had to institute practices and procedures and train people to follow them. They had to influence the training and education of nurses so that these nurses would do the right things without having to be told. Such changes could not come about over night.

Today I meet managers who do not want to learn. They are busy with mergers and acquisitions and with plant closings. They are busy beseeching the government to do something to somebody else, all the while asking to leave them alone. With their false images of how an enterprise ought to be managed, they make demands on their workers and thereby they provide job se-

curity only for labor leaders.

The task of re-education is so vast that it is difficult to see where to begin. One is reminded of the recipe for eating an elephant: One bite at a time.

A Check List of Things Managers Need to Learn

To begin, it is useful to list the things most managers are unlikely to know but which they should know to compete in the new era. The following list is by no means complete, but it does cover the most significant missing elements in most manager's education.

Every Manager should be competent in elementary statistics.

Process Flow Charting

Fishbone Diagrams

Run Charts

Histograms

Pareto Diagrams

Scatter Diagrams

Control Charts

Elementary Design of Experiments

Every Manager should learn how to

Recognize, define, describe, diagnose and improve the system for which he or she is responsible.

Diagnose the variability of a system and decide which variations are special, and require special action and which are common and will require a change in the system design and operation. The managers must be able to tell the difference between signals and noise.

Lead teams of people having different educational levels in problem identification, data gathering, data analysis and the generation of proposals for solution, implementation and test.

Diagnose the behavior of humans and distinguish difficulties which are due to the variations in human abilities (15%) and those which are caused by the system (86%) (Juran's Rule).

The Issue is one of leadership

There are not going to be enough educational facilities in the country to tend to the needs of all the managers who need to

be re-educated and are willing to learn. Every manager who learns how to manage the new way will have to teach his or her subordinates. Mentoring is an essential part of managing. It is also an essential part of leadership.

When Homer Sarasohn was on MacArthur's staff in Tokyo, he taught the Japanese to differentiate between managing and leadership. What he told them in 1948 is as true today as it was then:

A leader's main obligation is to secure the faith and respect of those under him. The leader must himself be the finest example of what he would like to see in his followers.

(Sarasohn in Japan, 1948)

Conclusion

This country is now engaged in a struggle for its existence. Its industries have been destroyed, one by one. Because the economy is in difficulty, it does not generate the revenues required to run the government. It is cutting back on services--including defense-- because it can no longer afford them. The only way to survive is through learning how better to manage resources. That's your job-- learning how to manage the right way--to manage for quality.

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There are a few general references which those who are new to quality management can read with profit. Among them are:

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Aristotle's Mistake or the Curious Incident of the Dog in the Night-Time

David and Sarah Kerridge

Posing the right questions is more difficult than getting answers. Only the right question leads to the right answer.

This short paper shows that by nature man is inclined to ask the wrong questions. A conscious effort is therefore required to look at things from a different viewpoint. David and Sarah Kerridge provide a number of examples of how real progress is made when man's natural inclination to look in the wrong direction is overcome. The authors demonstrate how many management practices are predicated on wrong questions with destructive and expensive consequences for the well-being of our organisations.

Learning to think differently is necessary before we can make real progress and is an essential part of the Deming philosophy.



David and Sarah Kerridge sign as the authors of this paper. Prof. Dr. David Kerridge was Director of Research of the former British Deming Association. He began his career in medical research and served for more than two decades as chairman of the Department of Statistics at the University of Aberdeen, Scotland. Sarah Kerridge is his daughter.



**“The dog did nothing in the night-time.”
“That was the curious incident.” remarked Sherlock Holmes.**

The Silver Blaze: Conan Doyle

The Greek Philosopher Aristotle was a very great thinker. He laid down rules of logic that we now take as “obvious” and use all the time. But they were far from obvious when he first taught them. He made one very interesting mistake. He thought that nothing moves unless something or someone is pushing it [1].

This seemed like “common sense”, and no one questioned it for more than a thousand years. Of course, it was hard to see why an arrow keeps flying through the air even when it has left the bow. But eventually Galileo showed by experiment that Aristotle was wrong. The opposite is true. Things

go on moving until something makes them stop.

It was a mistake, but a natural mistake. Recent studies of the way children learn seem to show that they start off thinking like Aristotle [2]. They may, if they are well taught, overcome this mistake, but many never do. Even if they can quote the right answer, and pass examinations in physics, they unconsciously think the wrong way round. It seems a more natural way to think.

Remember the remark of Sherlock Holmes. We tend to think that “nothing happened” is of no interest. Instead, we should realise that it is natural for dogs to bark, and for things to happen. The “curious behaviour” is when things remain the same, and we should look for the reason.

As soon as Galileo asked “Why do things not move?” he discovered friction, and inertia. In the same way, when physicians stopped asking “What makes us ill?” and asked “Why are we usually well?” they discovered a whole range of defences against illness, like the immune system, which keep us well.

We all make the same mistake, in many other ways. Many managers believe that workers do nothing unless they are rewarded, or fear to be punished. So they try to “motivate” them. As soon as we look at the problem the other way round, we discover intrinsic motivation. And we begin to ask, as Dr. Deming did, “What stops people doing a good job?” In the same way, we look at an organisation, and say “What can we do to make things more efficient?” It is Aristotle's mistake, once again. The right question is “What forces within the

system stop it improving?” The Deming Management Philosophy is much more about removing obstacles - poor training, pay for performance, and other barriers within the system, than in telling people what to do, or even about improving processes. Once we realise that most people want to do a good job, and are frustrated because of the many things that stand in the way of doing it, this approach is natural.

Walter A Shewhart looked at the problem of variation the “other way round”. Systems are sometimes stable, with only common cause variation. What keeps them stable? There must be forces in the system that produce that kind of stability. We cannot always see them, but they are there, and they are very strong indeed. When we try to overcome them by “trying harder”, we make things worse.

Or we might look at a control chart, and be disappointed that there are no “special causes”. But during the time that we were collecting data, many things will have happened, some of which could have caused changes. The dog did not bark: so we learn something important about the factors that do not make the process change. Perhaps they do change the process a little, but they are weaker than the forces that keep the system the same. To reduce variation, or improve the system, we must do something that changes those forces.

The most interesting example of “Aristotle’s mistake” arises when we try to prove a theory true. There is no way we can do it. All we can do is to try to prove it false. We can look for naturally occurring situations in which the theory would be expected to fail, if false. Or we can try to create such circumstances by experiment. If the theory is wrong, the dog should bark. If it does nothing in the night-time, it is safe to go on using the theory. But how often do you hear people asking for proof that the Deming Philosophy works?

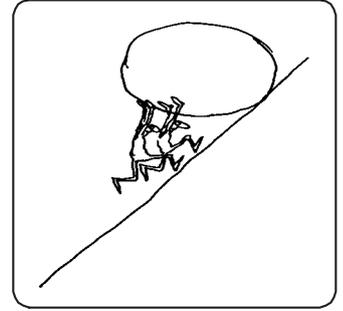
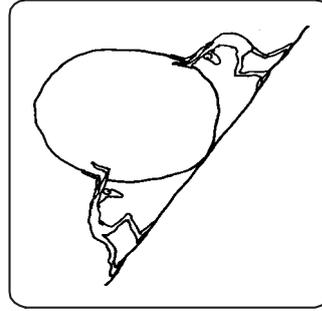
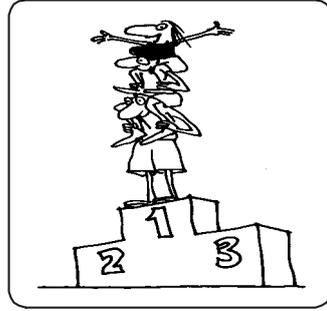
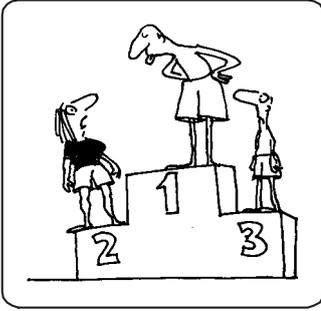
References

- [1] Aristotle, „Physics“
- [2] Howard Gardner, „The Unschooled Mind“, Basic Books 1991

Editors Note: Grasping this approach can be difficult but it is fundamental to pragmatic thought and the Scientific Method. Dr Deming explained it thus -

“No number of examples establishes a theory, yet a single unexplained failure of a theory requires modification or even abandonment of the theory”.

Further thoughts on theory, knowledge and prediction can be found in, The New Economics Ch. 4. - A System of Profound Knowledge. For deeper understanding, the origins of scientific method can be studied in, “The Logic of Modern Physics” and “The Way Things Are” by P. W. Bridgeman..



“Does anybody give a hoot about profit?”

Deming Speaks to European Executives

Introduction

On the afternoon of 11 July 1990, Dr W Edwards Deming gave a short presentation to some 25 executives from major European companies. The meeting, held at the Queen Elizabeth II Conference Center in Westminster, London, was jointly organized by the European Federation for Quality Management (EFQM) and the British Deming Association (BDA). This article provides an edited transcript of that presentation and the subsequent Question and Response Session. This article was first published by the BDA in the booklet, “Deming Speaks to European Executives” [1].

The transcript was originally prepared by Henry R. Neave, Director of Education and Research of the British Deming Association (BDA) and W Edwards Deming Professor of Management in the Business School of the Nottingham Trent University in Great Britain. Prof. Neave assisted at all of Dr Deming’s celebrated four-day seminars held in Britain and elsewhere in Europe from 1985 through to Dr Deming’s death in December 1993. His popular and comprehensive book on the Deming approach, “The Deming Dimension” [2] was described in 1998 in a publication of the American Society for Quality as “The best overall theoretical yet practical explanation of the Deming philosophy”.

Where appropriate to enhance readability, some rewording and reordering have been carried out, and a few references added. However, most of the material appears here exactly as it was said on the day.

The presentation was structured around Dr Deming’s paper “A System of Profound Knowledge” (May 1990) [3]. This is re-

produced in a separate BDA booklet bearing that same title, and page references here relate to that edition.

The delegates were addressed in the morning by Peter Bonfield, Chairman and Managing Director of ICL (at present chairman and CEO of British Telecom). Dr Deming’s session was chaired by Patrick Dolan, Secretary General of the BDA, and the speakers and delegates were welcomed by Kees J van Ham, Secretary General of the EFQM.

Presentation Session

Dr Deming: I feel that I don’t belong here. There is such power in this room. Think what you could do for the world — provided what? Provided you knew what to do. How would you know? How would you know?

We’re talking about quality. Everybody has the answer: everybody knows just what to do. We find answers in speeches, in letters to the editor, in books. Let’s review some of those suggestions (prescriptions) for quality; some are good, none are sufficient, many of them do more harm than good.

Automation; Gadgets; Computers: no question about it! New machinery. One of our biggest companies in North America invested \$45,000,000,000 in new machinery. How does it work? You should follow me around: then you’d see. But you’ll have to admit that the Chairman had faith in the future. It was not an investment for quick profit: he had faith in the future, he believed in the future.

More inspection: intensify inspection — that’ll do it! Quality audit; Audit trails: tighten up! Some people establish an Office for Quality; they create a Vice-President in

charge of Quality. That’ll do it! No question about it. SPC; MBO; Ranking of people, teams, plants, divisions; Best efforts; Hard work. And there are others, of course; I’m just enumerating a few, to show there are some.

I decided some two years ago on Deming’s Second Theorem:

“We are being ruined by best efforts.”

Ruined by best efforts, doing the wrong thing, with hard work, putting forth best efforts, everybody putting forth best efforts. I’ve enquired of 50,000 people (as a rough estimate) at my seminars: “Who here is not putting forth his best efforts? Let him stand.” No-one has stood up yet!

At this year’s conference of the British Deming Association in Birmingham, someone enquired of me: “You’ve told us Deming’s Second Theorem. But what is Deming’s First Theorem?” My reply was that I hadn’t thought what it should be. But I began to worry about it. And during the night, a few weeks later, I decided.

Deming’s First Theorem is:

“Nobody gives a hoot about profit.”

I mean long-term profit. We talk about it, but we don’t do anything about it. Let’s talk about it today. (I am, incidentally, assuming that there’s no harm in profit.)

Where does quality come from? It comes from the top. I was very pleased this morning to hear the talk by Mr Bonfield. He’s at the head of his Organization, and he’s leading quality — he’s a leader. Where does the power of a leader come from? It comes from knowledge, I believe. He has power by virtue of his position, of course. But stronger power comes from knowledge. I didn’t come here to evaluate anybody, or

to pass judgment; but I saw a leader here this morning.

Two weeks ago, I was talking with 120 hourly workers (as we call them in North America). They thought that a leader was a man on a horse, the reins in his left hand and a sword in his right, leading his people, charging up the hill or down the hill: that was their idea of a leader. But we need more than that in a leader.

Let's think again of those wrong answers on how to achieve quality. Some of them are positively harmful. The worst one of all is ranking — toughen up the annual appraisal of people! The ranking of people, teams, plants, divisions, with reward and punishment, is wrong. What's wrong? Failure to appreciate variation: fundamentally, that's what's wrong. The source of the problem is failure to understand a little bit about variation; just a little bit would do.

What's missing here, from all this? There is a missing ingredient. And I have no name for it except **Profound Knowledge**, a System of Profound Knowledge for management of industry. And by "industry" I mean service, banking, hotels, restaurants, financial services, insurance — anything. It is a System of Profound Knowledge for management in industry, education and government.

The System of Profound Knowledge appears here in four parts:

Appreciation for a system: (see below)

Some knowledge of variation: In an hour, I can only use words without any explanation and hardly any examples: there's no time — it's an impossible task.

Theory of knowledge: Theory of knowledge: by which we know that experience, in the absence of theory, teaches nothing. An example teaches nothing. Suppose you study a company. You'll learn nothing without theory; for all people can do then is copy. Thousands of people go to Japan and come back to say that they didn't learn anything: they saw a few things different in Japan, but "it's mostly the same there as what we have at home". Why do they say that? Because they had no questions to ask. If we have some theory, then that theory leads to questions, by which we learn. Either the theory seems to hold, or we may have to abandon it, or modify it. Chantecclair, the rooster (from Jean de la Fontaine's fables), had a theory. He crowed in the morning, flapped his wings — and, behold, the sun came up. He understood it perfect-

ly. There was only one little trouble: one morning, he forgot to crow — but the sun came up nevertheless. So he had to modify his theory; but he learned. He learned by observation because he had a theory. He learned that his theory was wrong, and that he'd have to modify it. Without theory, we have no questions, we learn nothing. Without theory, an example teaches nothing: all people can do is copy, and then they wonder what's the matter.

Psychology: Psychology is an important ingredient, I think, of this System of Profound Knowledge. For example, if psychologists understood variation (only just a little bit, what we learn from the Experiment with the Red Beads [3, page 3]), they would never again participate in improvement of instruments, questionnaires, or other ways to carry out annual appraisal of people. Does that mean we don't want to know how our people are doing? Not at all. We just know the impossibility to rank them — the impossibility to rank them with meaning. Is it any different from throwing dice? That, at least, would be fair.

I'd like to talk about a system. (I'll call it a system: you may have another word for it.) What do we mean by a system? I'll define a system as a network of components, parts of the Organization, functions, activities, that work together for the aim of the Organization. There must be an aim. We must know what is the aim of the company, what is the aim of the organization. For without an aim, there is no system.

If economists understood a system, the theory of a system, and the role of cooperation in optimization (which I'll come to), they would no longer teach and preach salvation through adversarial competition. They would instead lead us into optimization, by which everybody would come out

ahead. The fact is, I believe, that if any two or three or any number of people had a monopoly, a stranglehold, on any service or product, they would be fools to set the price any higher than that which would optimize the whole system (including themselves) if they really cared about profit. But then again, remember Deming's First Theorem: does anybody give a hoot about profit? I think that, within 30 minutes, you'll agree with me that nobody really cares, not really, not enough to do anything about it. Worry, yes; best efforts and hard work, yes. But best efforts and hard work do not produce desired results without knowledge; there is no substitute for knowledge. A flow diagram will help; and it doesn't need to be too complicated. Figure 1 is a flow-diagram of a system. I will take manufacturing as the example, though this would apply just as well to a hospital, to education, to banking, to anything.

In the case of manufacturing there will be supplies coming in from various sources; I've called them A, B, C, D. They go through various stages. They come out as a product, which might be semi-finished; the point is that it's different from what went in: there has been a change of state. The product goes into distribution, it goes to one or more customers. Then we do consumer research to try to discover what improvement or innovation in product or service might help the customer in the future, and will entice him to buy. That may call for different inputs, and design or redesign of product or service.

I believe that this diagram (Figure 1) made the difference in Japan. I'd been to Japan twice, in 1947 and 1948, at the invitation of one of General MacArthur's people. Then, in the Spring of 1950, there came a letter from Mr Ichiro Ishikawa, who was Presi-

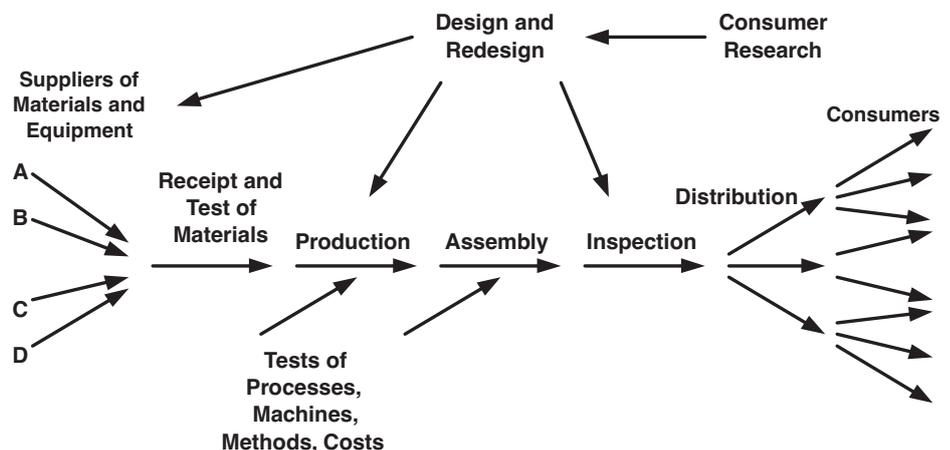


Figure 1: Production Viewed as a System

dent of JUSE (the Union of Japanese Scientists and Engineers), asking me to come and help Japanese industry. I was able to go in June 1950, and I was there through July and August.

It is important to see that top management invited me: Mr Ishikawa was also President of the great Kei-dan-ren, the association of top management. He was highly respected, unselfish, brilliant. He invited me, and I took that to mean he was interested. He was. I knew that I would accomplish nothing unless he brought top management together. He did so, at a dinner meeting in the Industry Club in Tokyo on a Tuesday night. He brought together the 21 top people of Japan. My diary has just four sentences in it, because I did not realize then how highly important this was to be: I was just trying to do my job. But I know now that all I was trying to do depended on that evening. I had little idea what to say. I tried. If you read the report written by the Japanese, I think you will find that the greatest way I accomplished anything there was through that diagram, Figure 1 — and the fact that I had faith in them. I knew that they could do it. I told them that I thought I knew what they should do, and that I could help. I was back in six months, back in another six months, back the year after that. Every one of the 21 people in top management was there every time, at every conference. They went straight to work. I told them that, within five years, manufacturers the world over would be trembling and would begin to scream for protection. Several people in top management told me later that I was the only man in Japan who believed it. They beat it by a year. I know it: I was part of it.

Let me tell you what Dean Seebass of the University of Colorado has said: I did not export to Japan any American practice. I took to them something new: it's still not known in the Western world. The Japanese learned it, and went to work. And Figure 1 was the most important force, because through it they saw manufacturing as a system, the whole operation as a system. They already had knowledge, great knowledge, but it was in bits and pieces. Some of the bits and pieces were in conflict with each other. They had knowledge; but they did not see it as a system.

One need not be eminent in any part of Profound Knowledge in order to understand it as a system, and to apply it and to make it work. One need not be eminent, but he must understand a system. By “system” I mean components that work together for

an aim. And the aim is a value-judgment. The aim of a system is not a theorem: you don't derive it from axioms and corollaries. The aim that I'd propose for a system is gain for everybody — stockholders, employees, suppliers, customers, the community, the environment. Everybody should fare better, everybody in the system should be ahead, his quality of life should improve: that's what I mean by the aim of a system. Remember that without an aim there is no system. And the aim of a system must be clear to everybody in it. If we understand a system, and work on it, then everybody will gain. Everybody will take part in the aim, and will be a beneficiary of the aim. A system is not just composed of divisions, teams, plants, people: these must work together to be a system. If we take Figure 1, but put rings around the various people and groups (Figure 2), to separate the people and divide up the company into components that are competitive, then you will not have a system: it will destroy itself. But that's what we have, that is what we have.

By the way, if you break up this system into parts, all competitive and in conflict, you lengthen the time it takes from inception of new product to get it into the hands of the customer — everybody dragging his feet, interfering with everybody else in that chain of events, in conflict with all others. The cost of the delay we cannot measure.

Look out for innovation. The copying machine is an example. The Halogen-Xerox people, working 24 hours a day, developed a copying machine based on the photovoltaic effect. They engaged a marketing consultant to look into the possible market for a copying machine, on the assumption that they could successfully develop one. His report was: “It's an interesting device,

but of little commercial value.”

Dr Neave read yesterday a report to Western Union, a telegraph company of North America, from 1876. They were thinking of going into the telephone business. A consultant advised them that the telephone had no future. It was an interesting device, but they should forget it. This telephone has too many shortcomings to be seriously considered as a means of communication. Whereupon they forgot it. Think what they could have done. The Halogen-Xerox people continued in spite of the sad, unattractive market that somebody predicted for them.

The Japanese learned what a system is, the whole system, and optimization of a system. They learned it: it's not difficult. They made it work. Again, I did not export American practice. What I took to Japan was new knowledge, profound knowledge — and it came from the outside.

Optimization of a system should be the basis for negotiation between any two people. They should form a system. Any two people should regard themselves as components of a system; any two divisions, or three, union, labor, and management, should regard themselves as parts of the same system. And the aim is optimization, in which everybody gains. This should be the rule for negotiation between competitors, between countries. Everybody would gain.

Let me add this: He that goes into negotiation with the aim to protect his rights is licked. The aim should be overall gain by which everybody comes out ahead. He that goes into it with the idea just to defend his rights does not understand a system.

Let's look at the diagram in Figure 3. It has a scale showing degrees of interdepen-

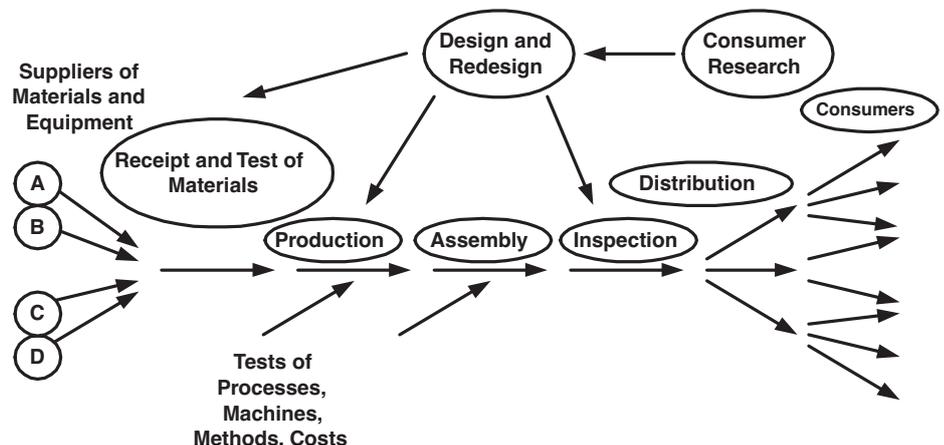


Figure 2: Production Not Viewed as a System

dence: low at the left, high at the right.

A bowling-team has low interdependence (while they are playing): the team is rated just by adding up the scores. (When they are not playing they will, of course, cooperate and work together, with everybody trying to help everybody else to improve.)

We have on the right of the diagram examples of high interdependence: a business and an orchestra. I don't care which is more to the right: interchange them if you like — they're complicated. But what is the difference between the Royal Philharmonic Orchestra of London and some other orchestra that is not as good? Same music, same specifications, not a mistake from either orchestra, everything just right. What's the difference? Just listen to the difference. One is managed better than the other. The players of the Royal Philharmonic Orchestra of London are there to support each other: every one of the 140 supports the other 139. They're not there as prima donnas.

You could have the best engineer, the best man in finance, the best man in manufacturing, the greatest man in distribution, in all this world: but you would not have a company — unless they work together. Having the best is not the answer. Sure, they must have some competence. But the answer lies in management, and whether people understand their jobs as part of a system. In an orchestra, the players are not there as prima donnas, each to play as loud as he can, to play his own solo. Each one is there to support the others. And one orchestra is better than another if the people there, the players, support each other better. That takes management. The conductor of the orchestra is a manager. The players understand that they are there to support each other. And you'll sometimes find some players doing nothing, just sitting there counting, playing nothing — but they're supporting the others. A business is not just an organization-chart, with all departments striving for individual goals: sales, profit, productivity. They all need to work in support of each other.

What I'm trying to explain is that the performance of any component is to be judged in terms of its contribution to the aim of the system, not for its individual production or profit, nor for any other competitive measure.

Think of the companies that are dashing themselves on the rocks by introducing competition between their components. I do not mention names of clients, but I can



Figure 3: Various Degrees of Interdependence of Elements in a System

criticize them without name. You may find, you do find, in a company two divisions, competitive, in conflict, because they are judged and rated on some competitive measure such as sales — as the result of which both divisions have a full line, all the way from smallest to largest, each one trying to outdo the other. The losses are incalculable. Can you blame them? That's the way their job is defined. Can you blame someone for doing his job?

Just an example: It would be poor management to save money on traveling expenses without regard to the physical welfare of the travelers.

Here's a little anecdote. I would be in New York on Monday. A woman called me from Chicago: she wished to see me. I'd be glad to talk to her. Her purpose in going to New York was to attend a meeting that Monday afternoon and to deliver a paper, to tell people there in New York what she was doing in Chicago, and to try to learn from them. For that she needed to be alert (I should think).

She told me that her flight would arrive in New York at 7 o'clock in the morning. Seven o'clock in the morning. My head did a little arithmetic. There's an hour difference between Chicago and New York. Now, she'd have to be on board the airplane at 04.30 New York time in order to arrive at 7 o'clock: that would be 03.30 Chicago time. It would take her two hours to get to the airport (whether Midway or O'Hare). So she'd have to leave home at 01.30 (Chicago time). She'd have to get out of bed at 00.30. Why bother to go to bed? She'd be up all night.

As I said, the purpose of her trip was to deliver a paper at a meeting in the afternoon and to learn what they were doing in New York. She'd be totally physically unfit for the job. She'd have to hold her eyelids open with tape, or with toothpicks. Totally unfit. My point is this. Any other flight would cost \$138 out of her own pocket. Also, if she were to come the night before, the company would not pay her hotel bill — and a hotel in New York is pretty expensive. Can

you blame her company's Travel Department? The Travel Department saved \$138 on that night-coach fare. Can you blame the Travel Department for saving money when that's their job? That's their job: to save money — never mind the traveller. The Travel Department will get a plus, but the traveller six minuses, for she would be totally unfit for her job. Can you blame the man in the Travel Department for trying to save money? That's his job. He has to eat, buy clothes, pay his rent.

Delegate: Dr Deming, could I ask you a question? Taking your system model of a manufacturing business, could I ask you your views on introducing the owners' of the business into the system? What lies behind my question is that, many of us believe, we in Western manufacturing are at a disadvantage because the job of the analysts in the City of London, and the other stock exchanges of the West, is to maximize short-term (speculative) profits for investors. In Japan, investors see themselves as owners, as part of the system, so they take a long-term view, and they encourage the managers in the businesses to get the products right and to take the time to do it. I'd be very interested in your views.

Dr Deming: Short-term: that's the problem. May I put it along with some other problems? Remember again that a system is a network of components that work together for an aim, each contributing the maximum for the overall aim of the system. And each component is not to be ranked, rated, judged, on any competitive measure. His job, anybody's job, is contribution to the system.

Now, let me try to put this together. Consider somebody (or a company) who decides to become selfish, only concerned about himself — see Figure 4.

It's impossible. He cannot do this, he cannot draw a ring around himself. For he is influenced by many forces that are part of the system, e.g. ranking — ranking people, plants, divisions, with reward and punishment: reward at the top, punishment at

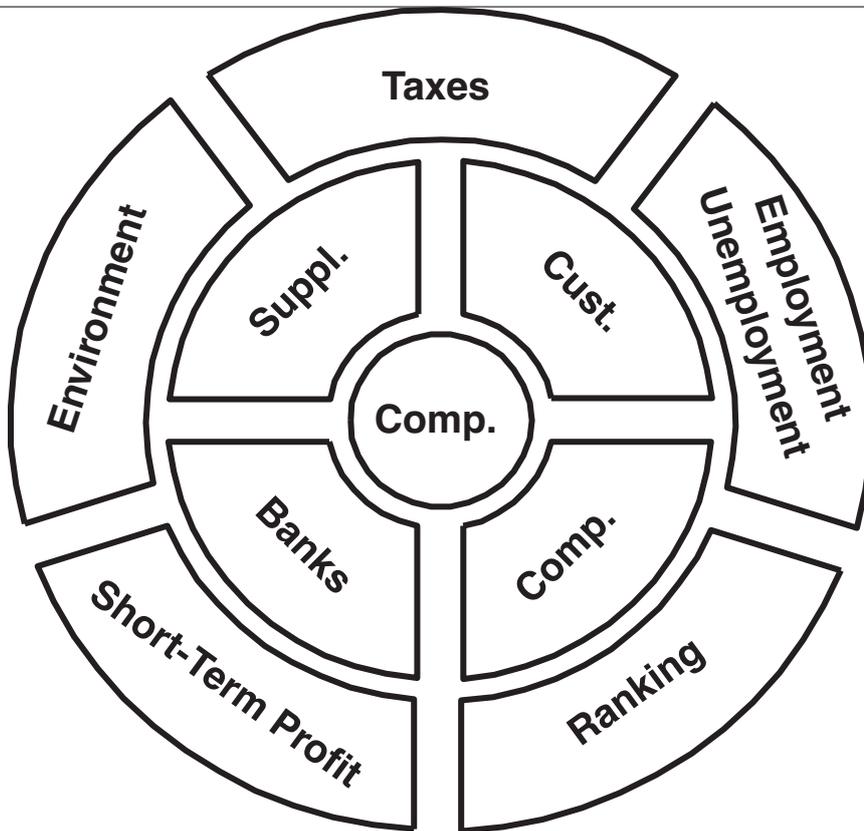


Figure 4: Impossibility of Isolationism

the bottom. As I said, the fundamental flaw is lack of understanding of variation. And other forces: taxes, reports, the bank working on short-term profit, the educational level of people, the environment, the competition, the amount of employment and unemployment in the country, customers, suppliers. You cannot do this: you cannot draw a ring around yourself. You have to draw it without a ring. Whether you like it or not, they are all part of the system, and we need to optimize the whole system. Now, the bigger we make the system (not only this company: let's include suppliers and customers), the better will be the chance for greater gain to everybody; but also, the more difficult is the problem of management.

How far can we go? As we expand, as we include more activities and more companies, the more difficult it is to manage, and the more knowledge is required for management of the system. How far can we expand? Let's take short-term thinking, and some other evils in the system. Let's talk about them separately. In the first place: it is wrong, a wrong theorem, that "if you cannot measure it, you cannot manage it". The most important losses and gains cannot be measured, yet they must be managed.

Let's write down here some of the gains and some of the losses.

Gains from:

- long-range planning
- education
- training
- morale
- loyalty

Losses from:

- short-term thinking
- emphasis on short term gains
- ranking (people, teams, plants, divisions)
- annual appraisal of people
- bonuses
- incentive pay
- MBO
- Quotas for production, for sales,
- uncoordinated business plans

These are heavy gains and losses: their magnitude unknowable, most of them not even recognized, not even under suspicion; these are the ones we must manage.

I read in the newspaper just two days ago about the numbers of people admitted to be chartered accountants. Your profit and loss statement says nothing about those gains and losses just mentioned. The profit and loss statement contains the easy figures: it doesn't include the difficult ones, the important things. But those are the ones we must manage.

Think of the losses. Think of the mismanagement that I've heard about, some that has taken place just in the last six months. Are we deteriorating or improving? What about making hospitals, and services by physicians, competitive? What about the universities? What about schools? Schools in some parts of the United States are ranked, and the money they get depends on their rank. So they become competitive — anything to get more money. Are some universities in this country being subjected to that kind of thing? And hospitals? I hear about it. I'm alarmed. Why introduce conflict? Conflict means we break up the system into components, and the components then become competitive, whereas they should be managed for optimization. I'll express it now as: "Knowledge about chaos that comes from putting together random forces, each of small magnitude."

It is very easy to put them together in a way that produces chaos: worker training worker in succession (off they go to the Milky Way!); executives working together, doing their best, under stress, working without guidance of Profound Knowledge; committees in industry, education, and government, working without guidance of Profound Knowledge; Congressional committees in our country, e.g. the Federal Reserve Board deciding the prime rate of interest; our Anti-Trust Division, or your Monopolies and Mergers Commission, operating without guidance of Profound Knowledge; our United States Council of Economic Advisors to the President, working without knowledge, working without Profound Knowledge. Look at the evil results. Let our President give a speech, for example (they probably wrote it for him): "It's about time we evaluated the benefits of education, considering all this money we're spending." Evaluate it? Such nonsense! You cannot measure it. And you cannot evaluate this meeting this afternoon. Years from now, it will mean something. But you will not be able to evaluate it today, nor tomorrow, nor for years. The things we need to know cannot be evaluated, yet they must be managed.

Chairman: It is almost 40 years to the day,

I think, when Dr Deming first spoke in Japan at the invitation of JUSE, and that's why he's saying we won't be able to evaluate the importance of this meeting for some time.

Dr Deming: There are some frightening paragraphs in the paper [3, page 14]. If I could only show that they are wrong, I'd be happy. Unfortunately, they're correct, I believe.

“Enlargement of a committee does not necessarily improve the results ... “

How could it? How could it? Enlargement of a committee is not going to produce knowledge. That's not a way to acquire Profound Knowledge.

Some of the corollaries are frightening. Is a popular vote going to make things better? How could it, without knowledge? And where's that knowledge going to come from?

Here's another [3, page 14]. So far as I've been able to observe.

“... Profound Knowledge must come from the outside, and by invitation.”

I know of no exception: that doesn't make it right, it does not establish a theorem, it's simply an observation. It must come by invitation. It can be implanted, but you don't get it by enlarging the committee, nor by popular vote.

I will tell you that my time is up. Is that what you were going to tell me, Mr Dolan?

Chairman: That's what I was going to tell you, Dr Deming.

Dr Deming: I know it, and I've known it for a long time! I'm so fortunate to know Mr Dolan. I think he knows the right people, by which he can somehow arrange to assemble this group today. I'm very privileged.

Chairman: We'll have a short break.

Dr Deming: Break?

Chairman: Short break?

Dr Deming: No break! ... Oh, all right. Let's have a little break, so we can discuss — and cuss!

Question and Response Session

Chairman: Dr Deming wishes to summarize the main issue he addressed before we broke, and then he will deal with questions.

Dr Deming: I drew a system, a flow-diagram, devoid of complications (Figure 1). Then I put rings around different components (Figure 2). Now they've become competitive, in conflict with one another. That comes from MBO, performance appraisal. Certainly you need to know how people are doing: of course you do. You'd better know how things are going. Yes, but you don't rank people, because ranking (people, divisions, plants) breaks up the company into components that are competitive. Then you don't have a system: so you have no chance to optimize. Nobody could measure the losses, the cost. But we have to manage them: we'd jolly well better manage these things. It's only a matter of survival, I'd say.

I'd be pleased if you'd ask questions, or remind me of a point or two as we move along. Let's make it public. Let's say we just came here to chat. We have to make the best use of this time: it's precious. I wanted to have this be a conversation; I didn't mean to do much talking. I'd like questions, comments, doubts: they all help everybody. It's so easy to get a wrong impression.

Delegate: What are the reasons for the Japanese readily accepting your approach of optimization of the system, whereas the Europeans and Americans are struggling and not succeeding with it?

Dr Deming: A Japanese is never too old or too successful to learn. They're in a learning mode all the time. That's the only explanation I can offer.

Some people say that they listened and learned because they were in a crisis. We're in a worse crisis. At one of my seminars, somebody from the aircraft industry said: “We and our competitors in the United States have 70% of the world's market for aircraft. Where's the crisis?” My answer was: “You and your competitors are not in a crisis. But on you falls the heaviest responsibility of anybody here to improve. You have a chance to improve, for you're going to be here a while. You have an obligation to improve, and to help the whole world to improve.”

The Japanese were in a crisis, and they knew it. We're in a worse crisis, for it's not visible. A fish does not know that it's in water: it doesn't give a hoot about water. A duck doesn't know that it's raining. We're in a worse crisis. Its effects will take some time. But if we don't get busy on it, we'll be overwhelmed; we don't have forever. It will take time and patience. And I

don't know of any group in this world with the power that is in this room. Think how you could help the whole world. What you've got to learn to manage is these things. I know the visible figures are far easier to manage: easier, not easy — there's your problem.

Delegate: A lot of commentators believe that international long-term success of Japanese companies derives from the Darwinian struggle raging in their home market. If this is a valid statement, is it compatible with what you are saying?

Dr Deming: It is not a valid statement; no, no, not at all. The Japanese know something about cooperation. They could not live on that island (well, island sprawl) without cooperation: it's natural to them.

Let me tell you another little anecdote to illustrate (it's in my book [4] as it was originally told by G. Ouchi [5]). There was a meeting of a trade association with representatives from the United States and Canada. They were meeting in one of those beautiful resorts north of Miami. They met for three days. Just think of it: three days. First day, all day — till noon! Think of it. What a day! Then they went out fishing. Second day, all day till noon. Had lunch, went out for golf. Third day, all day till noon. Then out for hound-racing. Dr Ouchi was the keynote speaker the first morning. He has nothing against golf — he plays a little himself now and then. Nothing against fishing: he likes to go fishing. Well, he told them something: “While I was in Tokyo a month ago, I attended meetings of your direct competitors, 200 companies working together — in cooperation, making sure that no company went out of business. It would not be good to put people on the street: that would not be good for the country. They worked to find jobs for all those people. They worked on design of product, export policy, how each one could best fit into the system, every one of the 200 companies, the tiny ones, the giants. They worked 13 hours a day, five days a week, for a month. They came out with optimization of the whole system by cooperation; they all gained — everybody came out ahead. And the country gained.”

But it seems we can't learn it. We in North America just can't think that way (I hope you don't mind my relating to North America). Cooperate like the Japanese? How would you like to play poker with me when you've forgotten all the rules? But America has not forgotten the rules — they never learned them. They don't know coope-

ration. Oh, there are thousands of examples of cooperation. One example is the time: it's now 15.37 and 43 seconds, 44 seconds, 45 seconds ... , based on Greenwich Mean Time, used the world over. There's the date: 11 July, fixed by the international date-line. There's the metric system. I could go on and on. Here's this little magnifying glass with a light-bulb in it. If I need batteries, I buy two AAA batteries — and I can buy them anywhere in this world. And they'll fit. Standardization. There are lots of examples of cooperation by which everybody wins. We could sit down here and write down 100,000 examples of cooperation. We use cooperation, but we don't understand it as a system, as a way of life. The Japanese have learned it. They grew up that way; they know nothing else. It's easier for them. Do we have a chance? Can we learn?

Delegate: Could I ask you a specific question about that meeting of 200 companies in Japan? Who organized that meeting? Was it MITI?

Dr Deming: It could have been MITI (the Ministry of International Trade and Industry). I don't know. I could ask Dr Ouchi. I ran across him not long ago: I asked him how many times he went through the calculations, when he was trying to find out the optimum distribution for everybody. He said he didn't remember: he said that may be he never did know. He drew up a table: the 200 companies in one direction, options in the other direction. They tried to choose options which would give maximum benefit to everybody. It's so easy; you could illustrate it with some figures. I won't take time to make up some right now; I don't have any in my pocket. So easy to see. It's a game that you can play in the fourth or fifth grade. Take a loss in your competitive position, and yet get a whole bagful of money out of it by optimizing the whole system. Maybe they ought to teach that game in the schools.

Delegate: Perhaps the greatest leader ever seen on this planet was not able to guide his disciples into interaction with other human beings without competition, political infighting, conceit, selfishness. How can mere managers achieve this state of supportive harmony that you advocate?

Dr Deming: Well, we know now what our job is! It's worth thinking about it. I've thought about it, too.

Delegate: How does Taguchi's philosophy fit into your own theory?

Dr Deming: It's all I've been talking about!

Taguchi used the loss function (Figure 5) [2]. The loss function will be a parabola at the bottom. It can be steeper on one side and not so steep on the other side. But the two halves will be parabolic at the bottom. So we don't need to have precise optimization. Don't worry, we'll never have it. If we had it, we'd not know it. If we move away from optimization, right or left, a little bit, then the loss is imperceptible, too tiny to measure. We only need to come close to optimization.

But when we fail to do that, we lose — everybody loses. That was Taguchi's theorem. I was there, in September 1960, when he read his paper in Tokyo. This is exactly what I've been talking about. "How does Taguchi's philosophy fit into your own theory?" It's the same thing!

Delegate: The Japanese system is successful, and it is based on competition and ranking ...

Dr Deming: It is not! No, this is misunderstanding. The Japanese system is based on cooperation, not on ranking. Read the paper by Dr Yoshida [6].

Do you know the difference in pay between somebody that went through university in Japan and somebody that didn't get into university? It's something like three dollars a month. It's trivial.

Sure, the Japanese have examinations in education. But a Japanese child is never humiliated — never, either at home or in school. His teachers are supportive; the Japanese support people. That is why, when a Japanese child fails, he feels he's let down his family, he's let down all his friends, he's let down his teachers. That's the reason for their high suicide rate. That's not good; no, no. But it's because people supported him: he feels he's let them down.

That's a big difference.

Think of the thousands of children in North America (I can speak of our cities). School's out at, say, 4 o'clock in the afternoon. Thousands of them have no place to go to. Home? What's home? There's nobody there. Often there's nobody that can read. Empty: not a shred of newspaper. A Japanese home is crowded with books, and every Japanese child has a home (apart from obvious exceptions: there'll be orphans in anybody's country). In our country, there are thousands of boys and girls that don't have a home, a single-family home. Maybe just a place to sleep in, or a floor to sleep on. Nothing more. Think of the contrast.

When I came home from school, my father was waiting for me, to go over the lessons of the day. He helped me. I remember his words. For example, the calculation of interest: "Add the interest, subtract the payment." To save my soul from Hell, I couldn't get it straight! But he pressed it into me. I got it. And other mathematics. He was so interested. And then Latin, and Greek. He went over it all with me. What a difference! I'm very thankful, very thankful.

Delegate: In your table of gains and losses you include the ranking of plants as a loss. But, of course, benchmarking is a useful tool, isn't it?

Dr Deming: Benchmarking? That's not ranking.

Delegate: But, once you benchmark, you automatically make a ranking. For instance, we have several factories and, in order to give a positive aim, a target, we issue a kind of ranking which is a benchmarking. I can't see any negative approach in that. It is being positive. It is a kind of positive race toward a target. Do you understand

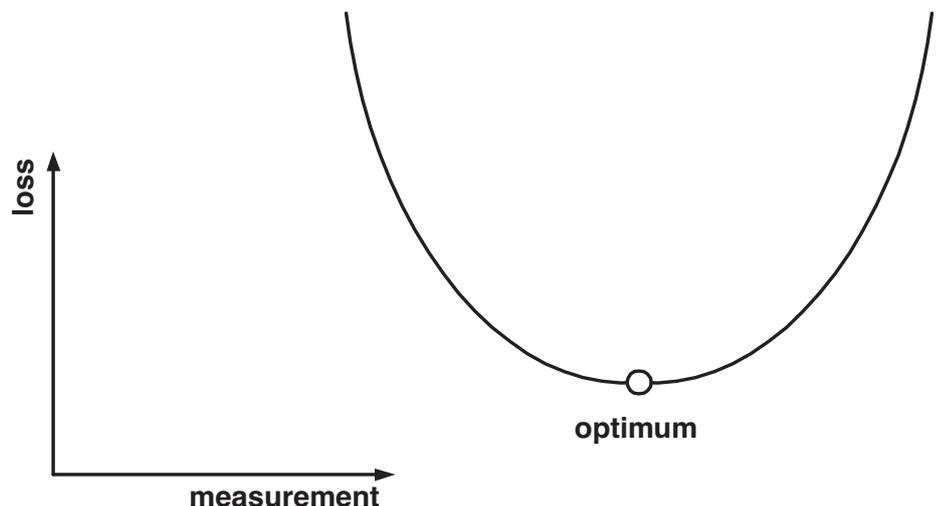


Figure 5: The Taguchi Loss Function

this?

Dr Deming: No, it is not. Of course it's not. It's destructive — that's my message — destructive. Read the paper by Nolan and Provost [7]. It's a matter of understanding variation.

You see, I don't know what we're going to do about this. There are, say, 26 of us here. With any measure whatever, one of us will be highest and one will be lowest. What are we going to do about it? We'll have to repeal a lot of laws: that's one of them! It doesn't mean a thing — of course not. As I remarked when we went over it, there's no substitute for knowledge. No substitute for knowledge. This group can accomplish nothing without knowledge. We've started on it today.

Delegate: I understand that benchmarking is one of the tools developed in Japan by Tsuda. (I ask; I am not sure.)

Dr Deming: I don't believe it. I think this is a misunderstanding. I know him well: he's a brilliant man. I don't think the Japanese do that. How could they? How could they? They're supportive.

Chairman: I think, Dr Deming, it may be that benchmarking is used not to rank but to see where you might improve. Certainly some people, as Peter Bonfield explained, use benchmarking to find out what is the best their competitors have achieved in various areas, so they learn what is the gap between what they're doing and what they might do.

Dr Deming: Well, I think it's a waste of time. In any case, there are some things you can't benchmark. But that's not what I'm talking about here. Think of the man-years that are wasted in worrying about competitors, getting figures on the competition, showing trends — the competition going this way, we going that way. Think of all the time lost. All that effort could be put to better use. People worry about the competition. Better to forget them; they have their own problems. And the competition is part of the system: what is best for you is best for them. Now, if they are lousy, there isn't much you can do for them. As Albert Poulitz said on just about any day of his life (I worked for Mr Poulitz thirty years in consumer research): "Nothing can do you so much harm as a lousy competitor." Isn't that right? Nothing can do you so much harm. How could you include him in your system if he's lousy? It would be pretty difficult. He could do you a lot of harm. He's part of the system that you work

in. Yes, we've got a lot to learn.

Delegate: Dr Deming, if you reverse that and say that a good competitor is a good part of the system, is that the explanation for Japanese success: that their companies have, within Japan, a lot of good competitors?

Dr Deming: Yes, a good competitor is a help to you. They have some good competitors. But they also work together, as Dr Ouchi told us.

Delegate: If MBO is bad, should a company set a budget?

Dr Deming: They'd damned well better set a budget! But MBO asks somebody to do what is outside the system. It comes from failure to understand a stable system. Anybody can make anything happen — if you don't count the cost. Figure 6 shows a stable system. Its ability, its capability, is defined by the lines.

MBO consists of asking for the point, the target, which may well be outside the system. Anybody can make it happen. He'd better make it happen, or he won't have a job. He makes it happen — at impairment or destruction of the company in some other part. It'll happen: it's his job to make it happen. If you want this result, the only safe way to get it — the only way you can afford to do it — is to improve the system so that you include this result. This is management's job. It's all right to have a numerical goal, but only the method will get you there: it's only the method that counts. Anything else will mean loss. All you have to do is walk around and see it. Think of the losses from MBO — because people do not understand variation and do not understand the capability of a system. They've never heard of it.

Now, of course, a manager has figures: he knows how things are going. Those are the visible figures. Of course, he should know that he has a system. His job is to try

to discover who is outside the system, in need of special help — and he has the figures to do it with. And he uses the figures to try to help him improve the system. He should carry on a conversation of, say, four hours at least once a year with every one of his people — not for judgment, not for criticism, but to talk about the work, personal problems, whatever is bothering them. Sure, he knows how things are going; but he doesn't do it to rank people. That all comes from misunderstanding. People play tennis: you win, I lose. We knew at the outset that there will be one winner, only one. Play poker: there'll be one winner. Horse race: one wins. Beauty contest: one wins. But we carry this into industry, and into education, to our detriment. It's limiting: it limits the winners. Management is not playing games: management is serious. Mistakes count; we can forgive mistakes, with everybody doing his best under stress, under great push. Yes, but there's no substitute for knowledge. We can forgive ignorance, but we can't doubt the penalty.

Now, one more? Or doubts, emotions?

Delegate: I'm taking more than my share, but I would like to ask one more question on the 200 companies, and the optimization of their overall system. You said, Dr Deming, that a fourth grade student could do the arithmetic to optimize the system. Yet the economists in most of our Western countries seem unable to set an industrial strategy of optimization. If a fourth-grade student could do the optimizing, why is it that the economists can't?

Dr Deming: I don't know. They've taught us competition; they've told us that cut-throat competition solves problems. No, it creates problems. It's destroying us. And nobody has any fun out of it. Man is entitled to joy in his work, and joy in learning.

Chairman: I'm afraid, Dr Deming and gentlemen, that our joy in learning has come

● Target, Objective

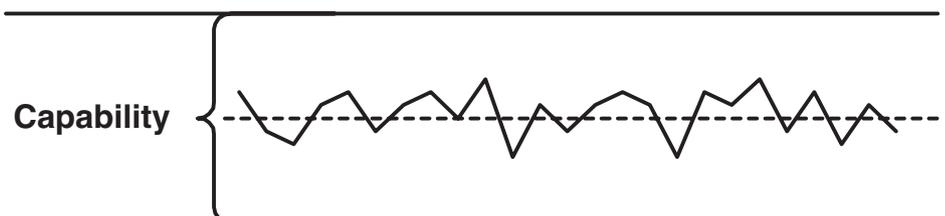


Figure 6: Target Outside of Stable System

to an end because 4 o'clock, the deadline, is reached. I hope that today has whetted your appetite for learning and for understanding many of the things which Dr Deming has been talking about. Thank you, Dr Deming, for sharing with us your learning from the last forty years and more. Thank you very much.

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The Four Pillars of Wisdom

A System for 21st Century Management

by Noel C. Spare

The purpose of this paper is to question the ability of current management practices to transfer scientific and technological advances efficiently for the greater good of mankind. The case is argued for transformation to a knowledge based management approach that would result in greater efficiency and less waste. The scientific methodology developed as long ago as the 1920's and operationalised in post war Japan is examined in detail.

Summary

A retrospective look at the 20th century progress of mankind which questions whether the prevailing methods of western management have done justice to the amazing advances of fundamental scientific understanding and its resultant technologies. Or, has the transfer of knowledge for the greater good of mankind been less than efficient. Could we learn from the scientific methodology pioneered as long ago as the 1920's?

Parallels are drawn between the advance of the fundamental sciences, particularly physics - the understanding of processes in nature and the pioneering work of Walter A. Shewhart, a mathematical physicist working on the understanding of man-made processes and systems.

In the 1920's as the structure of the atom was being revealed, Shewhart was combining mathematics and classical philosophy in order to gain insight into processes and systems. It is a commonly held belief that processes and systems can be understood with „common sense“ but, as Shewhart discovered, this only leads to the wasteful and expensive mistake of „inappropriate action“. This does not only affect industrial process but the whole of society from government down. Shewhart's work was truly revolutionary. His resultant dis-

coveries were profound and his solution for understanding process behaviour, simple enough that almost anyone can use. Tragic then that in the west it was misunderstood, misused and abused so that to this day, the superstitious interpretation of data leads to „inappropriate action“ on a grand and costly scale.

Two men had the mutual good fortune to meet in the mid 1920's. They were Shewhart, retiring by nature and virtually unheard of, and a remarkable scientist by the name of W. Edwards Deming. The effect of Shewhart's work and his on-going teaching, mentoring and friendship, had a profound impact on Deming who explored the ramifications of Shewhart's thinking in terms of its wider application in society as a whole.

The opportunity to put Shewhart's theoretical work into action came in the late 1940's, early 1950's when, more by luck than judgement, Deming, then known only as a prominent statistician, found himself leading a census in Japan. Japanese industry was in ruins and Deming began working with them and teaching them his operationalised approach of Shewhart's fundamental scientific work. The results were remarkable; from a base of having only shoddy goods with a poor reputation for

quality in 1950, within 4 years, high quality Japanese goods were beginning to sweep the world.

Deming went virtually unnoticed in the west and not least in his own country, the USA., where quantity not quality were the order of the day. That was until the end of the 1970's early 1980's when America had lost its competitive position and much of its traditional market share - it faced a crisis. Only by some remarkable investigative work and a television programme, „If Japan Can... Why Can't We?“, was Dr Deming discovered. He was to spend the rest of his life until his death in 1993, in his 94th year, teaching America and the world his method of management.

In 1990 he provided a defining statement or structure - a method, no less, for how he considered management needed to be transformed. It was to be his legacy to the world; he called it - „A System of Profound Knowledge“.

Knowledge is conditional on learning; it is not a quick fix. If Europe is to maintain a position as a major economic power block with all its citizens sharing a better future we should begin the learning process in earnest - not wait for a crisis.

20th Century Advance of Science

Looking back from this first year of a new century it is perhaps difficult for us to comprehend that 100 years ago arguments still raged over whether the atom was real. What subsequently happened was to propel mankind forward at a pace that was breathtaking in the rate that fundamental science and the technologies that it spawned, changed our lives. From the profound understanding of the processes of nature itself, gained in those early years of the 20th century, mankind has been engaged on building a new civilisation. Whatever our visions of the future, it is essential for us not to forget that science, from the Latin word for knowledge, is a gift and the consequences of science must be used for the greater good of mankind. It also behoves us to ensure that the process of transferring scientific knowledge and technological advancement for the greater good should not suffer from the forces of entropy and be wasteful of our birthright.

The technologies that have been built upon the foundation of fundamental scientific understanding are put to use for the benefit of mankind in the form of energy, goods, services, transportation, communication, information, education and health-care, which are all instrumental in the way we live today. The transfer process has evolved into complex social, political, administrative and business systems that have one thing in common - they all have to be managed. How well they are managed is a crucial factor in ensuring the efficiency of the transfer process.

As we look back though, we might ask ourselves whether we did the advance of science justice or have we been guilty of squandering the colossal legacy provided by the scientific pioneers of the 20th century? Squandering is perhaps too strong a word, of course we made progress and it would be silly to deny it but was „the greater good“ as great as it might have been? Hunger, poverty, social exclusion and a growing „underclass“, are very much with us and show no sign of being alleviated. What are the origins then of this shortfall of expectations and how might we improve the transfer of knowledge more efficiently for the greater good?

Scientific discovery does not happen by accident or chance, nor does it switch irrationally from one subject to another. It has a very definite and identifiable method. It

is a partnership between science and philosophy. A veritable cathedral of knowledge is in the process of being built, one building block at a time, each block being thoroughly tested for its suitability for carrying the next. We know it as „test of hypothesis“ and it depends on disclosure, transparency and collaboration. It asks questions, formulates theory then subjects the theory to rigorous testing. The truth of a theory is not the issue at stake; indeed truth is regarded as a pretence, a tentative truth yes, which suffices to support the next building block and another set of questions. The real progress is therefore not to be found in answers but in conceiving the right questions.

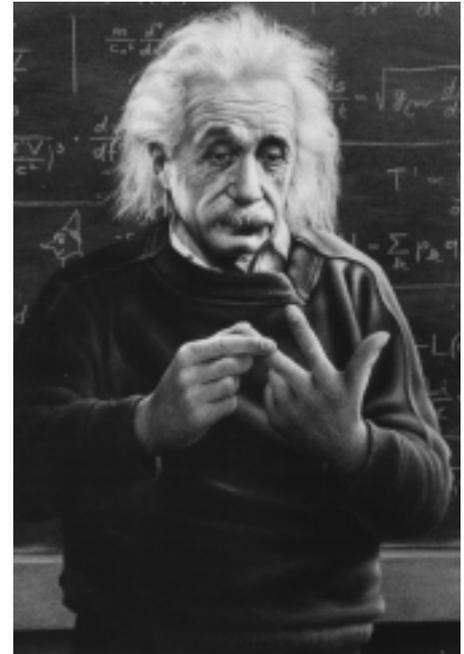
The Divergence of Scientific and Management Methodologies

Scientists make their discoveries then go on to conceive more questions in order to make further discoveries. Scientists are not responsible for the exploitation of the knowledge-base they create for the greater good of mankind. It is left to governments, industries, business, commerce, services and the management thereof to exploit the cathedral of knowledge.

Here lies the great paradox. Far from learning from the methodology that has served science so well, management went off at a tangent. It ignored how the great building blocks of science are put into place and started worshipping false idols, institutionalising waste and losing its respect for the human resource that is supposed to be the beneficiary. All of this gets in the way of efficient transfer of scientific knowledge into adding value and creation of wealth for the greater good.

Most of what passes as management today does not bear close scientific scrutiny - does not even come close to the methodology of the great scientific pioneers. Hierarchy (*the tree of blame*), meeting arbitrary numerical targets (*wishes, hopes, dreams and fantasies*), working to specification and standards (*not enough*), competition (*at any cost?*), grading (*can't be done*), benchmarking (*the search for examples*), lean management (*or anorexia*), pursuit of excellence (*empty babble*), empowerment (*abdication*), do not represent a unified method of management and leadership [1].

Had science been based on the institution



Albert Einstein (1879-1955) is generally recognized to be the greatest scientist and philosopher of the 20th century. He Changed our perceptions of the processes in nature from those developed by Newton more than 200 years earlier.

of myths, hunches, gut feeling, intuition and knee-jerks etc, without a method of verification, the progress of mankind would have been stalled in the 1900's.

Perhaps we should accept that there is no synergy between the progress of science and a method of management. Current „methodology“ is the best available - it might not be very efficient but at least we have made progress and we are successful. Those who argue that way are confusing success with success. An inefficient methodology that short-changes mankind of its birthright does not deserve to be branded a success. And, in any case, there is a better way....

The Early Work on Understanding Process Behaviour

So what evidence is there that the methodology of fundamental scientific discovery could find any application in management? Plenty; and to find it we have to go right back to early in the 20th century when the likes of Curie, Einstein, Planck, Rutherford, Thomson, Moseley, Chadwick, Boltzmann, Bohr et. al. were creating the masterpiece of physics. A mathematical physicist by the name of Walter A. Shewhart [2, 3, 4] who worked for Bell Laboratories was requested by the management of one of their manufacturing operations, the Haw-

thorn Plant of Western Electric, to help solve their acute production problems. Not exactly atomic physics but Shewhart was soon to find that he needed the same disciplines as the fundamental physicists in order to gain insight into processes.

When he commenced his work at Western Electric, Shewhart already had a reputation as an outstanding statistician and a pioneer of the application of Statistical Method to quality. The processes he observed were not suffering from management neglect, on the contrary, the management of the processes was diligent and purposeful and took action immediately at the first sign of trouble. The problems however kept coming, they were never free of them, improvements were short-lived and indeed frequently, actions taken to improve processes actually made them worse. The processes were totally unpredictable; no one knew when the next problem would come, only that it would come [3, 5].

Processes are all around us and affect every aspect of our lives. The problem with processes is that, contrary to popular belief, they are fiendishly difficult to understand. Part of the problem is that by far the majority of people believe that they can be understood simply by the application of "common sense". When we think that way we are already in trouble and sub-optimisation and waste will flourish. Processes do not proceed in a common sense way and to understand them we have to go beyond common sense. Shewhart examined the one thing that all processes have in common - they all vary over time. He measured specific characteristics of the observed processes and the products they produced and sought ways to analyse the resultant data. His problem was that when he tried to gain understanding mathematically, that did not work either - their understanding is even beyond a purely mathematical approach. Had he not been a man of incredible integrity it would have been easy for him to make the data fit his desired solution (see F. W. Taylor) his frustration did however come to the surface when he referred to processes as "schizophrenic".

When the great physicists of the 20th century were trying to understand the processes of nature, it was only possible when they assumed the mantle of philosopher. Einstein was as much philosopher as he was physicist and so it was with Shewhart who founded his methodology for understanding processes as much in the philosophy of Clarence Irving Lewis [6] as he did in his understanding of mathematics.

A Methodology is Developed

Crucial to Shewhart's eventual solution was his theory that there are, in effect, two types of variation and that each type requires a fundamentally different response in order to bring them under control and restore predictability. Only when predictability is restored can there be any sensible process improvement.

He then set himself the task of characterising the two types of variation and to develop a method of separation that was robust yet simple enough for most people to be able to use. He placed all his data for a measured characteristic together with an average of the data on a horizontal time series, the resultant chart showing the variation or dispersion of the characteristic over time. From the measured data he estimated the dispersion statistic sigma (or standard deviation, σ) and then placed two filters or limits on the chart at positions of 3 sigma (σ) units either side the mean.

It is fascinating to reflect that just as Heisenberg was describing the Principle of Uncertainty with, in the atomic world, the limits of uncertainty being bounded by Planck's quantum, Shewhart was describing the uncertainty in processes being bounded by his famous $\pm 3 \sigma$ limits. All measurement data falling within the limits he characterised as „common cause variation“. They satisfy all the criteria for randomness and we must never invest any certainty to the causes of the variation of any specific measurement. In today's parlance we refer to this as „noise“. All processes contain „noise“ but some processes contain „noise“ and have measurements falling outside the $\pm 3 \sigma$ limits; these he referred to as having „assignable“ causes (later these were referred to as „special“ causes or, in today's parlance, „signals“).

Costly Misunderstandings

Here then, Shewhart had found the source of colossal waste. In all good faith management had been reacting to all variation as if there were a certain cause. This only made processes more unpredictable because there is no causal certainty to be attached to any variation occurring between the limits. Reacting in this way is known as „tampering“. Only to variation occurring outside the ± 3 Sigma limits could cau-



Walter A. Shewhart, 1891-1967, Mathematical Physicist. In the 1920's pioneered procedures for understanding the complex behaviour of man-made processes and provided an economic method for continual process improvement.

ses be assigned.

Why 3 σ , why not 2 σ or 4 σ ? This was the position, Shewhart determined, which almost unerringly separates noise from signals and therefore minimises the economic loss of taking inappropriate action by confusing noise for signals and missing signals believing them to be noise.

Now for the first time we had a method for achieving process improvement. First, find and eliminate the special causes so that they can never return. These are often, but not always, relatively easy to find since they are usually clear deviations from the normal process procedure. Operator error is often the cause. Once that is done a state of stability and predictability has been achieved. It may however remain a process which is off target and highly variable, sometimes described as „a stable system of trouble“. Now the approach to improvement is quite different since we are tackling „noise“ - the variation that is built into the process or system, which we can only reduce by tackling the process or system as a whole, by modifying it or changing it in some fundamental way. This will be beyond the responsibility of the operators or the people who work in the system; this is the responsibility of management - the people who work on the system [2, 3, 5].

Shewhart became crucially aware that whilst variation in the characteristics of processes is a nuisance it is also, to some degree, inevitable and will always have a

cost. The really big cost however, arises when inappropriate action is taken due to confusion between the two different types of variation. It is the error of inappropriate action that racks every aspect of society from government to the corner shop and leads to sub-optimisation and waste on a grand scale. Shewhart's genius was to provide us with a method, so simple in its application almost anybody can use it, that allows us to see beyond the complexity of processes and therefore avoid the devastatingly costly error of inappropriate action [7, 8, 9].

With this insight Shewhart's aim of achieving economic quality through uniformity of product became achievable and a clear basis in scientific methodology for the continual improvement of process and product was established [10, 11].

Just as we cannot see into atoms we cannot see into processes. We can only get insight into both by examining the evidence they leave behind. The window we look through to see an atom is provided by analysis of x-ray emissions. The window into processes is provided by the analysis of data by use of Shewhart's control chart. Only with this insight can we make prediction. Without prediction management is doomed to failure and the cost of failure is manifested in waste. The magnitude of the cost is unknown and unknowable; astronomical is a word that comes to mind. But worse than that, it severely inhibits the transfer of the benefits of fundamental scientific discovery and technological innovation to mankind.

It is profoundly disappointing to reflect that whilst Heisenberg's discovery provided another building block for the cathedral of knowledge in the scientific world, Shewhart's great contribution to management proved to be misunderstood, misinterpreted, under-utilised and widely ignored. As a direct result of this ignorance the superstitious interpretation of data still blights our organisations and leads to waste of unimaginable proportions.

The Bridge to Deming

The history of the world is punctuated by some remarkable coincidences that profoundly affect the course of history. Walter Shewhart worked tirelessly for the advancement of what he called „Statistical Method“, he was retiring by nature and therefore much of his influence took place behind the scenes. It was a style that sui-



W. Edwards Deming, 1900-1993, Mathematical Physicist, Management Visionary. Operationalised the work of Shewhart in post war Japan and consolidated his philosophy of management into „A System of Profound Knowledge“, in the early 1990's.

ted his nature and it was highly effective, but he was never the evangelist. In 1925 and 1926 - during his work at Western Electric, he was joined by a remarkable 25-year-old scientist, a mathematical physicist, by the name of W. Edwards Deming [3]. Shewhart became his teacher, mentor and friend and exerted an influence over him which was to last until Shewhart's death in 1967. The whole subject of the use of the control chart and the insight they give towards the understanding and characterisation of variation in processes had a profound impact on Deming which was to change his life and have a major impact on the industrial development of the world. We can gauge the esteem with which Deming held Walter Shewhart that in 1986 he was moved to write, „another half century will pass before the full spectrum of Dr Shewhart's contributions has been revealed in liberal education, science and industry“ [4].

Deming however continued his career as a scientist working for the US Department of Agriculture and the National Bureau of the Census and became prominent for his work as a statistician. One can only assume that during this time the impact of Shewhart's work and influence led him to start thinking deeply about the subject of management. If this was a gestation period it was to last for more than 20 years.

Operationalising the Method, the Remarkable Rise of Japan

By another remarkable twist of fate (or luck as Deming later called it) he was, in 1947 seconded by General Douglas MacArthur's force of occupation to head a population census in post-war Japan. The impact of Japan in those days on Deming cannot be overestimated. As he stood amongst the ruins, the cruel irony cannot have been lost on him that the cathedral of scientific knowledge, so firmly based on the rejection of dogma, had now been turned to such destructive purpose in order to fight against dogma. Perhaps what he was to subsequently do was a kind of atonement, how could we know, but we can say that Deming went to Japan as a scientist but rapidly became a management guru.

What happened in Japan was, by any stretch of the imagination, remarkable [1, 4, 5, 12]. He worked with the Japanese for ten years making some 27 visits and he was able to command the attention of most of the leaders of Japanese industry. They came in their thousands to hear him speak. The mentoring with Walter Shewhart began to pay dividends. He taught them statistical method and the use of Shewhart's great concept, the control chart, for getting insight into processes. He taught them the embodiment of scientific method, the famous improvement cycle - Plan, Do, Study, Act (PDSA) and perhaps most importantly, „Appreciation for a System“. It was the latter that Deming himself considered being the most instrumental in the ultimate success of post war Japan.

They must think of their organisations as systems, not hierarchies. Systems thinking would bring success as long as they did not artificially impose competition within organisations nor compete unnecessarily between organisations. Failure to do this would sow the seeds of their own emaciation. Only one part of the system is more important than any other and that is the customer. No part of a system must gain at the expense of another; every part of a system must gain from the system. A system is sustained by the interdependencies running throughout. People working together towards an aim; every system must have an aim otherwise it will self-destruct. Systems and processes could be stable - predictable, or unstable - unpredictable. Without a means of determining this state the-

re could be no prediction and without this knowledge, no basis in method for their improvement. Only Shewhart's control chart could make this distinction.

At the famous meeting at the Industry Club in Tokyo on the 13th July 1950 [4], Deming spoke to a group of industrial leaders that represented 80% of the wealth in Japan. They were not told or ordered to come, Deming was there at their invitation. He told them that if they persevered with this philosophy of management, their goods would, within five years, begin to sweep the world. The audience did not believe him, why should they? Their goods had a reputation for shoddiness and could never compete on quality. They were all wrong - Deming's prophesy took only 4 years to begin to come to fruition.

The quality movement was born - carried on a philosophy of management rooted in classical scientific methodology. Indeed it would surely have been called „Scientific Management“ had not the term already been hijacked and erroneously applied to the management philosophy of Frederick Winslow Taylor half a century before.

Deming had, in effect, operationalised the scientific approach to management.

Later, in 1960, he was to be honoured by the Japanese Emperor with the award of the highest honour that can ever be bestowed on a non-Japanese citizen. A grateful nation indeed that had learned well from Dr Deming's knowledge [4, 12].

Inertia in the West - the Barren Years

So, Dr Deming went back to America and started teaching his philosophy there... No, he was ignored - a prophet without honour in his own land. When the only manufacturing capacity left intact in the world was in America what did they need with quality? It was quantity which counted and there were willing buyers for all of it. Management methods in America became ever more bizarre, and to make matters worse they exported much of it. Not to Japan of course but certainly into Europe. We still practice it - with a passion that is more appropriate to Lemmings than to the human species.

Wake-up Time in the USA

The wake-up call came late in the U.S.A. [12]. Only when, by the late 1970's early 1980's, high quality Japanese goods had

cut a swathe through western countries and the U.S. had lost more than half of its market share in a vast range of key product areas, came the sudden realisation that America was in crisis; something had to be done. But for a brilliant piece of investigative reporting by a television producer, Clare Crawford-Mason in 1979/80, Dr Deming might have languished in relative obscurity. Her discovery that he was still alive and living only half an hour from the White House and her subsequent television programme, „If Japan Can... Why Can't We?“, changed all that.

Corporate America woke up; ever hopeful of course that this was the quick fix, silver bullet or latest management fad they had been waiting for to turn around their fortunes. Those that thought that way were to be bitterly disappointed. The transfer of knowledge on such a scale into a chronically dysfunctional system would, Deming knew, take years. However he set about his task with an energy which belied his 80 years, to teach America and the world the philosophy which was conceived 50 years earlier during his work with Shewhart on the Western Electric production line. His work went on until just 10 days before his death, in his 94th year, on the 20th December 1993. It has been estimated that in those last 13 years of his life, a total of 250 000 people [13] attended his famous 4 day seminars [14]. And the task was only just beginning!

Not that his work was only confined to travelling around the country giving seminars, he was also hired as a private consultant by many of America's largest corporations. For example, Ford hired him in 1980, the year they made a loss of \$1,6 billion - the first time they had posted a loss since going public in 1956. With his guidance, by 1984 they posted a record profit of \$4,3 billion and were operating with annual costs reduced by \$4,5 billion, a reduction of \$12 million per day [12].

A System of Profound Knowledge

Around 1990 Dr Deming was able to encapsulate his scientific approach to management in a defining statement or structure. It was to be his legacy of wisdom to the world and he called it „A System of Profound Knowledge“ [1, 3, 5, 11]. The interdependencies within the system are stressed so that no part is more important than another:

Appreciation for a System (*How we need to think of our organisations*)

Knowledge about Variation (*Tackling the EUR '000.000.000.000 waste problem*)

Theory of Knowledge (*How we learn - epistemology*); and

Knowledge of Psychology (*Understanding people and human behaviour*)

The synergistic whole, built on these Four Pillars of Wisdom, provides both a method for management and a lens through which to look at organisations from the outside. Eminence in any one of the topics is not necessary, indeed it may be a hindrance.

And Europe?

Here lies the key to how management needs to be transformed. The dissemination of this methodology into management will, Dr Deming said, take years and it will take more years yet. Historically the philosophy has made its most rapid progress in times of crisis. This is not an ideal condition to establish an environment of learning that is essential for the philosophy to take root and the benefits reaped. Since the dark days of the early 1980's things have become better in America. And what of us in Europe? Will we be able to compete and remain a major economic power block with all its citizens sharing in a better future?

The prognosis is not optimistic [15, 16]. It cannot be done without knowledge and not without a method. The method is established, it has been around for half a century, so is the knowledge, we know it works. We need to make progress, not an illusion of progress.

It is time for learning!

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The Swiss Deming Institute

<http://www.deming.ch>

The Deming Dimension: Management for a Better Future

by Henry R. Neave

On the occasion of his inaugural professorial lecture Prof. Neave takes the opportunity to look back at the lifetime's work of Dr W. Edwards Deming. He traces the development of Dr Deming's unique and profound understanding of the process of management from its origins in the 1920's through to the 1990's and the pinnacle of his work, "A System of Profound Knowledge". Prof. Neave argues that in a world growing ever more complex, the need for learning of this rich legacy of wisdom becomes increasingly appropriate if all its citizens are to share in a better future.

Author

Prof. Dr. Henry R. Neave is W. Edwards Deming Professor of Management at the Nottingham Business School of The Nottingham Trent University.

This paper was presented by Henry R. Neave on 2nd March 2000 at his Inaugural Professorial Lecture at this university.

Professor Neave assisted at all of Dr. Deming's celebrated Four-Day-Seminars held in Britain and elsewhere in Europe from 1985 through to Dr. Deming's death in December 1993. His popular and comprehensive book, „The Deming Dimension“ [1] was described in 1998 in a publication of the American Society for Quality as „The best overall theoretical yet practical explanation of the Deming philosophy“. In addition to his teaching in the UK, Professor Neave has also lectured in Ireland, Sweden, Norway, Holland, Spain and Singapore.



Summary:

Author: Noel C. Spare

In this short lecture, Prof. Neave provides but a glimpse of the lifetime of Dr W. Edwards Deming. He sets the scene at the

beginning of his long personal association with Dr Deming by describing the occasion of his first experience of assisting at a four-day seminar held in London in 1980. He was to learn early on, that much of what Dr Deming had to say was fundamentally and radically different to the prevailing concepts of traditional management. For the audience it was an extraordinary learning experience.

The journey of Deming's life begins from his birth in the American Mid-West on the 14th October 1900 in modest circumstances, to his award of a Doctorate in Mathematical Physics from Yale in 1928. As a student in 1926 and 1927, he had the good fortune to take a vacation job at the Hawthorne Plant of Western Electric. Here he met and worked with Dr. Walter A. Shewhart, then pioneering his definitive work on the understanding of variation in processes and the development of the "control chart". The profound nature of this work, which provides the essential first step towards the continual improvement of processes, was not lost on Deming. In this collaboration with Shewhart can be found the origins of system thinking, operational definitions and the famous "improvement cycle", Plan-Do-Study-Act. Shewhart brought a new dimension to quality, far wider than even current interpretation of the word, and Deming was there.

In the 1930's and 40's Dr. Deming became prominent as a statistician working for the U.S. Department of Agriculture and the National Bureau of the Census.

The 1950's and 60's are characterised by Prof. Neave as "The Theory of a System and Cooperation", to sum up the emphasis that Dr. Deming placed on his teaching to the management of manufacturing organisations in post W.W.II Japan. From its roots in his association with Shewhart, Deming had tied the pursuit of quality inexorably to a new system of management. Now, system thinking and cooperation were the prerequisites for a system of management that shifted the focus from the individual

to the system and the continual improvement of the system. Prof. Neave examines the component parts of system thinking in detail.

The 1970's were a depressing time for Dr. Deming. Despite the self-evident post war success of Japanese industry, he witnessed his own country drifting into crisis. He knew he had something to offer, he wanted to help but no one would listen. Finally, the search for answers to the crisis by the media bore fruit and in 1980 Dr Deming was "discovered" and appeared on the NBC television programme, "If Japan Can, Why Can't We?" 30 years after the start of the Japanese "miracle", America and the West began to listen.

Dr. Deming embarked on a continual programme of teaching in the USA. and the West. It was a gruelling undertaking for anyone, let alone a man in his 80's but despite failing health he pursued his goal for the remaining 13 years of his life. By the second half of the 1980's his approach had been broadened and deepened and he began talking about "A New Climate" in which the gain of all components of a system was stressed and innovation was given as important a role as continual improvement. And, not forgetting people, he stressed the part of management's job that is to give people back pride in their work.

In his 90's, Dr Deming consolidated the whole of his philosophy of management into one extraordinary phrase - "A System of Profound Knowledge". Appreciation for a System, Theory of Variation, Theory of Knowledge and Psychology were the interlinking and interdependent components of the total system. A priceless, timeless legacy of wisdom which Prof. Neave invites us to study further if we are to make a better future, materially, socially and mentally, in an increasingly complex world.

Dr Deming died at his home in Washington DC. on the 20th December 1993.

Introduction

It was an unexpected honour to become a Professor at the Nottingham Trent University. But mine is an almost-unique honour: this particular title, named after William Edwards Deming (born 14 October 1900, died 19 December 1993). I know of only one other person who bears this title, Barbara Lawton of the University of Colorado at Denver, and she is someone who worked very closely with Dr Deming for many years. She wrote to congratulate me on my appointment, so I believe she has no objection to sharing her title with me!

However, the fact that this is the title of my Chair seemed to me to choose the subject of my inaugural lecture automatically. It just had to be an introduction to Dr Deming's life and work - which is ambitious for just a short talk, but I shall try.

Let us begin with the quotation which most of you will have seen in the publicity for this talk:

“Dr W Edwards Deming has a lot to answer for. He has been responsible for turning the writer's life upside down.”

These two sentences were written by a Nottingham Trent University student in September 1998. They were the opening words of the project which he wrote after attending my introductory course on Dr Deming's work. And in his second paragraph he spoke of “many nights of frustrated reading related to Dr Deming and his work”. So, be warned: this could be damaging to your health!

To help you understand where I am coming from, and why, let me give you a ...

Brief Autobiography

In the late 1960s I became the first full-time Statistics lecturer in the Mathematics Department just up the road at the University of Nottingham. Before long there was an impressive and thriving Statistics Group there, headed in the 1980s by Professor Adrian Smith, well-known to some of you in the audience, and I stayed full-time with the Group for nearly 20 years. But, without doubt, the most important thing which happened to me during all that long time was in 1980 when I found myself (much more through great good luck than virtue) carrying out some consultancy work for the British subsidiaries of the first American company to start taking Dr Deming's work at all seriously. As a result of that connec-

tion, about five years later (quite out of the blue) I suddenly received a letter telling me that Dr Deming was coming to London for the first time that summer to present what in America had already become his very famous four-day seminar for management (whose title was “Quality, Productivity, and Competitive Position”). The letter invited me to become one of his two main assistants at that seminar. (The other assistant was an American who had served in this capacity several times already: Bill Scherkenbach, who at that time was Director of Statistical Methods in the Ford Motor Company - recommended to them by Dr Deming.) I accepted the invitation, albeit a little nervously. And so began the unique privilege - and responsibility - of working with Dr Deming on all of his visits to Britain and elsewhere in Europe for the remaining nine years of his life.

Two years later I reduced my involvement at Nottingham University to a fairly small part-time contract, to give me time to help launch the British Deming Association (BDA). The BDA was set up not as a consultancy but as a non-profit educational organisation having the stated aims of spreading awareness of Dr Deming's work, helping to deepen understanding of that work, and generally to help in whatever ways it could (within the non-profit context) both organisations and individuals who became interested.

Five years later (1992), the time came when I no longer wanted to continue with even the small amount of Mathematical Statistics with which I was still engaged, and so I moved on to full-time leave of absence from academic life. And that continued until 1996, which is when Professor Tony Bendell invited me to join the Quality Unit here at Nottingham Trent as a part-time Principal Lecturer.

Why Four Days?

I mentioned Dr Deming's four-day management seminar. That might sound a somewhat luxurious amount of time. At least, that is what I thought when I first heard of it. But Dr Deming had the right idea about a lot of things - including the length of time needed to give a good introductory presentation on his work! And, when I first enjoyed the experience of a four-day seminar in London in June 1985, I soon realised why he had insisted on that length of event.

You see, back then, very few of the delegates had any idea of what was coming. It

wasn't that they were new to ideas and approaches and schemes for “achieving quality” (whatever that might mean). No, “quality” was already all the rage. You may know of people like Tom Peters, Philip Crosby and Joseph Juran: they were already making quite a name for themselves back then. You may know something about Japanese-sounding things like Kaizen, quality circles, and TQM and TQC - they were around, too. And there was of course the Great British invention: BS5750 - which, if you are very young, I should explain, is what later became ISO9000. (I should hasten to add that you do not need to know anything about any of what I have just mentioned to follow the rest of this talk: in fact, come to think of it, they might be more of a hindrance than a help.)

And now, in 1985, Deming was coming to London. So, in many companies, the Quality Manager was sent off on his travels again, this time to find out what Deming was all about.

No wonder therefore that, when Dr W Edwards Deming (now of course in his mid-80s) slowly hobbled out onto the stage of the Connaught Rooms, in Queen Street in London, those delegates were, to put it mildly, unprepared! I think I have never seen so many open mouths and expressions of utter incredulity, and heard so many sharp intakes of breath and mutterings of disbelief - total astonishment - as there were on the opening day of that four-day seminar. For when they heard what Dr Deming had to say, he wasn't just contradicting most of what they had always experienced so far in their working lives as regards ideas about management, and quality, and productivity, and people, and work, relationships with suppliers, performance appraisals, targets, inspection, standards, lowest-tender contracts, and lots more besides - he was even contradicting much of what was coming from those other quality “experts” and techniques and approaches that I have just mentioned - and at that time the delegates were only just beginning to learn about them! And Deming was saying that they were wrong.

So it was small wonder that, at that time, it was not unusual for some fraction of the audience - say 10% - to go home after just the first day. That rather upset me, and so I raised the matter with Dr Deming. Was he upset? Was he annoyed? Did he regard it perhaps as an insult? After all, this 85-year-old had flown all the way over from his home in Washington DC just to present this seminar. Not a bit of it: there was

no blame, no anger. A touch of sadness, yes. He just said to me, very gently, with a little shake of his head: “Henry, they’re not ready yet.”

Then we came to Day 2. And, for the 90% or so that were left, things began to change. Some things were beginning to sink in: the *great good* sense of what Deming was saying - hugely different though it was - was beginning to register. And now there began to be positive vibrations around the room, rather than the negative or at best neutral ones of the first day. And then, by the third day, the delegates were really beginning to get into it. And on the Friday, they realised they were nearing the end of an extraordinarily important learning experience.

I saw that pattern acted out several times. Why am I telling you all this? It is an important part of setting the scene. It is also a warning for you not to expect too much from me just now. If Dr Deming needed four days to introduce his management philosophy (even with his very special talent of being able to pack a mountain of meaning into just a very few words), it would be impertinent of me to think I can do much in one short talk. I am very fortunate in that most of the seminars on Dr Deming’s work that I have been asked to present in recent years, including here in the Quality Unit at Nottingham Trent, have been for between two and five days, not just an hour or so.

I could think of no better way to structure the presentation from now on than to simply relate the story chronologically, from his life’s beginning to its end, and then to take a brief look into the future. For those of you who are completely new to this, I will give advance warning that the only slightly tough thinking will be in the 1920s and 1950s - and it won’t last very long!

So first, for the record ...

The Early 1900s: The Story Begins

As I said, William Edwards Deming was born with the century, in 1900. His family was not well off, and moved several times as his father tried to find satisfactory employment. They finished up in Wyoming, and Deming received his Bachelor’s degree from the University of Wyoming in 1921, majoring in Electrical Engineering. He then went to teach Physics in Colorado, where he obtained his Master’s degree. His doctorate came from Yale in 1928, in Mathemat-

tical Physics.

The 1920s: New Statistics in Manufacturing

Just like many students these days, Mr Deming (as of course he still was at the time) had to “work his way through college”: He had to find holiday jobs to raise money to finance his studies. And that led to a most incredibly fortunate coincidence, without which the industrial history of the world during our lifetime might have been very different.

For, in 1925 and 1926, Mr Deming took summer vacation jobs at the Western Electric Company in Chicago. What was so fortunate about that? Well, it was in the Western Electric Company at this very time that Dr Walter A Shewhart was developing his theory of what we nowadays refer to in such terms as the *statistical control of processes*, along with the associated tool of the *control chart*, and the understanding of the two fundamentally-different types of *variation* in processes, variation due to what Deming later called *common* and *special* causes. Deming just happened to be there, at the Western Electric Company, just at the right time.

“Understanding variation.” Why is that important? Well, let us consider when you buy a product, or a service, or you are engaged in a service operation, or a manufacturing process, or an administrative process, etc.. Does it always work smoothly, the same way, take the same amount of time - so that you can either do, or experience, a perfect job? That would be very rare. Or does it work fine one day, but have nasty surprises for you the next? That’s *variation*, or *variability*. Variation is nasty: it makes things difficult, unpredictable, untrustworthy: **bad quality**. **Good quality** is very much related to reliability, trustworthiness, *no* nasty surprises. In a big way, *bad* quality means too much variation, *good* quality means little variation.

And Shewhart’s *breakthrough* in understanding variation (for it was nothing less) proved to be the foundation-stone of W Edwards Deming’s lifetime’s work. Shewhart became not only Deming’s teacher but his *mentor*, somebody he found he could trust and respect, and therefore learn from with confidence. For the rest of his life (a long while!), Deming repeatedly attributed the source of much of his most important learning as being Walter Shewhart.

And not just for these statistical aspects of the Deming philosophy, but much else besides, including (a) systems thinking, (b) operational definitions (i.e. defining unambiguously how something is to be measured or assessed, and really getting to grips with *if* and *why* it should be done that way), (c) the famous improvement cycle: Plan-Do-Study-Act (which many call the *Deming Cycle* but to which he always referred as the *Shewhart Cycle* - as proof, here it is in his own handwriting, Figure 1) and much more.

But let me quote Deming directly from his dedication in the 1980 reprint of Shewhart’s famous 1931 book: „Economic Control of Quality of Manufactured Product“ [2]. He refers to Shewhart there as “the father of modern quality control”, and Deming praised certain chapters of that book as being “a masterpiece on the meaning of quality”. He continued:

“To Shewhart, quality control meant every activity and every technique that can contribute to better living ... His book emphasises the need for continual search for better knowledge about materials, how they behave in manufacture, and how the product behaves in use. Economic manufacture requires achievement of statistical control in the process and statistical control of measurements. It requires improvement of the process in every other feasible way.”

Even today, I think you will agree that most people’s interpretation of the word “quality” is still hopelessly narrow and limited compared with Shewhart’s understanding

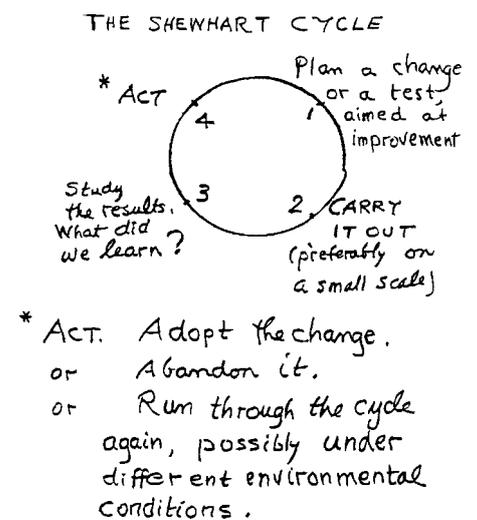


Figure 1 The Shewhart Cycle for Continual Improvement in Deming’s own Handwriting

in his great book of nearly 70 years ago.

Now, we need to know something of the circumstances in which Shewhart's great discoveries took place, for only then can we properly understand the prime purpose of those discoveries. The sad, and costly, fact is that - despite the amount of time which has elapsed - the true purpose and hence the potential of Shewhart's work is still greatly undervalued.

The Western Electric Company at that time were heavily involved in the development of telephone technology and related equipment. They were investing massively to increase their knowledge and ability. For some considerable time their improvement efforts had paid handsome dividends. But gradually that improvement activity began to "run out of steam": it was achieving less and less. They were still working as hard, if not harder than before, spending much money, time, effort - every kind of resource - on trying to make things better.

I will quote you a fragment of the speech which Dr Deming made at the launch of the French Deming Association in 1989 [3]. It should be no surprise that he was talking about *reducing variation*:

"... the harder they tried to achieve consistency and uniformity, the worse were the effects. The more they tried to shrink variation, the larger it got. They were naturally also interested in cutting costs. When any kind of error, mistake, or accident occurred, they went to work on it to try to correct it. It was a noble aim. There was only one little trouble - their worthy efforts did not work. Things got worse. ..."

As he explained it just a little later in the same speech:

"... they were failing to understand the difference between common causes and special causes, and that mixing them up makes things worse. ... Sure we don't like mistakes, complaints from customers, accidents—but if we weigh in at them without understanding, then we make things worse."

Not just fail to make them better, but make them worse.

These ideas about the two types of variation may be new to you, so I'll give it to you in just three sentences! I'll talk in terms of variation in a *process* - which could for example be some administrative process, manufacturing process, service operation - basically, anything which happens over a period of time, so that we may have a chan-

ce to improve it.

What Dr Deming called *common-cause* variation is the *routine* variation to be expected because of what the process is and the circumstances in which it exists and is operating. *Special-cause* variation is anything noticeable over and above that routine variation. (Some people find it useful to think in terms of the analogies of common-cause variation as *noise* and special-cause variation as *signals*.) And, surely, very different actions are called for depending on whether something is routine (i.e. there all the time) or exceptional (perhaps just one-off). That's it. Not exactly rocket science! But still so little understood over 70 years later.

And so, Shewhart created the tool called a *control chart* whose purpose was to provide *guidance for improvement*. What kind of actions, and what kind of interpretations of data, will help you improve? But there is a lot of bad teaching around on this. To a lot of people who know what control charts are and perhaps use them, this emphasis on their use for *improvement* is still very new. Most people who use the control chart at all use it for what I call *monitoring purposes*, as a sort of *early-warning* device. If all the data lie within two horizontal lines which are called the *control limits* (and are computed by simple formulas from data from the process), and continue to stay there, all is regarded as being well, and people may relax and think of other things. But if the process, say, starts to wander in some way, the control chart signals the onset of trouble, so that corrective action may be taken before the trouble becomes too serious. This is how most people use control charts. Now, I am not saying that it is wrong to use the control chart in that way. Of course not. It works very well in that early-warning role. I'm simply saying that if that is *all* you are using the control chart for, you are missing out on the main purpose for which Shewhart created it, which was to provide guidance for the type of things to do which will lead to improvement, to making things better - not to just keep things as they are, which is all that the monitoring use of the control chart provides - and all that it is intended to provide. To merely maintain things as they are, or to improve: that's the difference.

And that is a *major* difference in purpose. Deming's life's work was all about providing guidance for how to improve, to make things better, and to stop doing things which cause harm and make things worse.

Shewhart's discovery of the two types of variation and his creation and intended use of the control chart were the first great steps on that long journey toward the Deming management philosophy (or theory, or approach - whatever you wish to call it).

The 1930s to the 1940s: New Statistics in Non- Manufacturing

So, it did all start in the 1920s with some new statistical thinking and methods in a specifically manufacturing context. Regrettably, more than 70 years later, some people still seem to think that that was all that Deming's work was about, and all that it is relevant to. Nothing could be further from the truth. For one thing, Deming was never employed in a manufacturing environment, except for his holiday jobs at Western Electric. For his first permanent employment he joined the United States Department of Agriculture (which, I suppose, *is* manufacturing, but of a rather different kind). His appointment there was as a Mathematical Physicist (for that was the subject in which he was mainly qualified). Twelve years later, in 1939, he was appointed Head Mathematician and Adviser in Sampling at the National Bureau of the Census - again, hardly manufacturing! His work there, particularly with the 1940 American census, turned out to be supremely successful, and it was in that connection that he first attracted some international attention. In fact his first visit to Japan, soon after the Second World War, was primarily to work with those who would be involved with the first Japanese post-war census.

The 1950s to the 1960s: The Theory of a System, and Cooperation"

Remember that description of this era: you will see in a moment where it comes from.

A second visit to Japan, again to work with the census people, was planned for Summer 1950. By this time, Dr Deming's name and reputation had become known to Kenichi Koyanagi, Managing Director of JUSE, the Japanese Union of Scientists and Engineers, an organisation set up soon after the war ended, having the aim to help Japanese industry get on its feet again. Koyanagi issued an all-important invitation for Dr Deming to also teach concepts and methods for the achievement of quality in *in-*

dustry. During that visit his teaching not only reached hundreds of engineers, plant managers, research workers, and so on: it also reached *top management*. A particularly famous meeting was held in July 1950 with the 21 top industrialists of Japan present, a meeting later described as the occasion at which Dr Deming had in that one room 80% of the industrial capital of Japan right in front of him. Deming regarded that as the breakthrough: that those *top* people came to listen and learn from him.

Japan has, of course, been going through some difficulties in recent years. And there are some who point to those difficulties and say: "There you are. I told you so. This Japan stuff, or this quality stuff, or this Deming stuff. Doesn't work, does it?" I think there are two brief facts worth pointing out. First, Deming's teaching in Japan was almost entirely to manufacturing industry (in addition to the Census), *not* to the financial sector nor to government. Second, his main teaching to the Japanese was in 1950 - 1952. To point, nearly 50 years later, to problems which (as I understand it) have primarily been caused by parts of the Japanese picture on which Deming had little or no influence even that long while ago, and claim that consequently "Deming doesn't work" does seem to me to be a trifle unreasonable.

Let me quote from another Nottingham Trent University student:

"Looked at in today's light, with the collapse of Japan and the other Tiger economies, is this message still relevant? With world recession staring us in the face, it is probably more relevant than ever".

The reason for Japan's recession is to be found in *Doctor's Orders* when Deming says:

"Financial wizards ... what have they been doing? ... letting the company go to ruination, that's what - permitting expenditure on the wrong thing at the wrong time."

(*Doctor's Orders* was an ITV programme about Deming, first screened in 1988.)

„Investment mistakes on a grand scale combined with a large amount of fraud and government mismanagement has created this crisis."

Can you really blame Deming for them?

„However, the Japanese have come back from worse."

So yes, Japan's industrialists, including those at the top, listened and learned some

good sense from Dr Deming. And it wasn't just his reputation, and the fact that he was an eminent scholar (which I think has always earned rather more respect in Japan than in some Western countries). Another reason they did so was well-expressed by Koyanagi [4] as follows:

"Most of the Japanese were in a servile spirit as the vanquished, and among Allied personnel there were not a few with an air of importance [which I imagine was something of an understatement]. In striking contrast, Dr Deming showed his warm cordiality to every Japanese whom he met. ... His high personality deeply impressed all those who learned from him and became acquainted with him. ... The sincerity and enthusiasm with which he did his best for us still lives and will live forever in the memory of all concerned."

Deming treated the Japanese with warmth and respect and humanity. In a short piece of film from post-war Japan shown in *Doctor's Orders*, Dr Deming provided the following "voice-over", showing genuine sympathy and understanding:

"Japanese top management, and anybody in Japan, could understand that Japan was in a crisis. They could not continue to receive food from the American army for ever. They needed new equipment, having no resources. Industry was on the ground. Twisted steel where there had been a factory: was now a rice-field. They were in a crisis. They knew that."

So what did he teach them, to help them out of that crisis? Was it just statistics (as some claim)? I do not think so. First let me

show you this entry from his diary [5], dated 10 July 1950:

"The lectures are being held at the Japan Medical Association in Ochanomizu. ... Over 600 men had applied, and the limit was finally overstrained to 230. Professor Masuyama and assistants will teach the statistical control of quality in the afternoon. I shall teach during the forenoon the theory of a system, and cooperation."

There you are: that is where the title of this section comes from: *his own diary*. Deming was content, on this occasion and others, to leave the teaching of statistics to assistants, while he concentrated on the *really* important matters.

What did he mean by "the theory of a system, and cooperation"? Here is an abbreviated version of his own seven-point summary of his teaching in Japan during that summer:

A summary of Teachings to Top Management and to Engineers in Japan

1. The Organisation has to be Viewed as a System.

This first point was the famous flow diagram, his simple but profound picture of an *organisation viewed as a system*. He regarded this as the most important diagram he ever drew in his life (Figure 2). I call it the "Page 4" diagram, because that is where it appears in his 1986 book: „Out of the Crisis“ [6]. „Out of the Crisis“ is a big, fat book! The fact that this appears so early indicates how fundamental he consi-

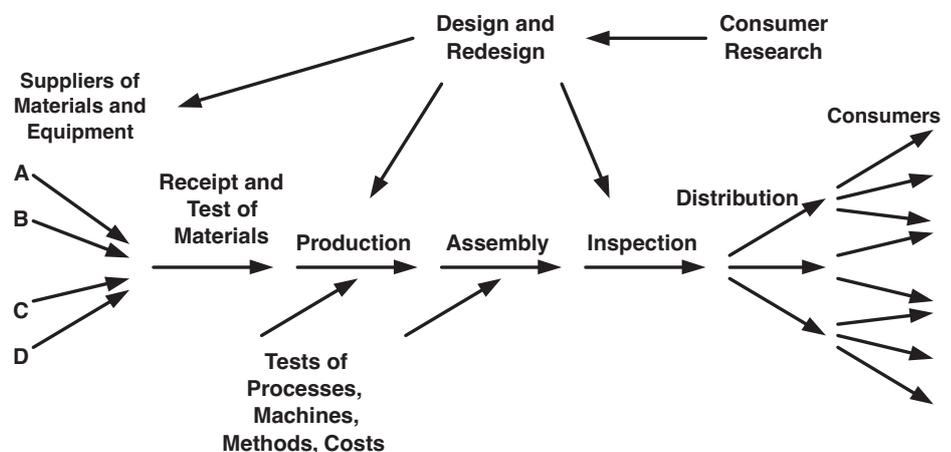


Figure 2 The Organisation Viewed as a System. Deming considered this to be the most important diagram he ever drew in his life

dered it to be: right up front.

It is also well worth quoting from his final book: „The New Economics for Industry, Government, Education“ [7]. A section titled with the question: “What ignited Japan?” reads as follows:

“The flow diagram was the spark that in 1950 and onward turned Japan around. It displayed to top management and to engineers a system of production. The Japanese had knowledge, great knowledge, but it was in bits and pieces, uncoordinated. This flow diagram directed their knowledge and efforts into a system of production, geared to the market - namely, prediction of needs of customers. The whole world knows about the results.

This simple flow diagram was on the blackboard at every conference with top management in 1950 and onward. It was on the blackboard in the teaching of engineers.

Action began to take place when top management and engineers saw how to use their knowledge.”

What is so special about the flow diagram? Two main things, I think. Firstly, it is an all-important *horizontal* view of how the work needs to get done - what actually happens, and what *needs* to happen - in an organisation, rather than the familiar *vertical* view, which is just the power structure, the conventional *organisation chart* (Figure 3):

And it is a very neat perspective that this *vertical* structure is so often *obstructive* to the *horizontal* flow. But it is *that* which is all-important regarding what the organisation actually *does*. And secondly, whereas the *doing* is represented by the arrows going from left to right in the flow diagram, the organisation should be continually improving - because of the learning and feedback represented by the arrows along the top going from right to left. And the *vertical* structure can be pretty effective at getting in the way of that as well!

So that is the big one. But now, the other

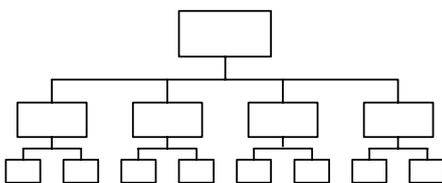


Figure 3 Conventional Organisation Chart as a Contrast to Deming's System View

six of the seven points.

2. Quality is determined by the management. Outgoing quality can not be better than the intentions of the management.

I so often heard him say, simply, “Quality is *made* in the Boardroom”.

3. The consumer is most important. What will help him in the future? Strive for long-term relationships with your customers.

What will help the consumer in the future - not just *now*? ... Strive for *long-term* relationships. The consumer was at the right side of the Page 4 diagram (Figure 2). At the left is the supplier - who should be your *partner*, working together, *long-term*, in trust and cooperation. Why? Not “just to be nice”. Supplier and customer will both be better off - that's why:

4. Your supplier is your partner. Make him your partner. Work together on continual improvement of quality. Develop a long-term relationship with a supplier in a spirit of mutual trust and cooperation. Supplier and customer will both win.

5. Supreme quality initiates a chain reaction of positive effects just as inferior quality produces a chain of adverse effects.

There is a second famous diagram dating from 1950: the *chain reaction* (Figure 4). “Improve quality” (in the big sense in which Deming meant it) leads to “improve productivity” leads to “expand”. Note “jobs and more jobs”: he *loathed* unemployment - he saw it as such a waste of humanity and human potential:]

6. Need for trust and cooperation between companies.

7. Development of trust and respect.

I think you can see some common themes running through that list! And it's hardly just statistics! And it's hardly just for manufacturing companies!

(The uncut version of Dr Deming's summary of his teachings in Japan can be found in Chapter 3 of „The World of W Edwards Deming“ [8].)

It is not surprising that there should have been such a development of emphasis in Deming's teaching. When you get into it, an *inevitable* consequence of Shewhart's understanding of those two types of variation is that the great majority of problems (or, thinking positively, of opportunities for improvement) lie in the *common* causes - the *system*, as Deming called it. When so-

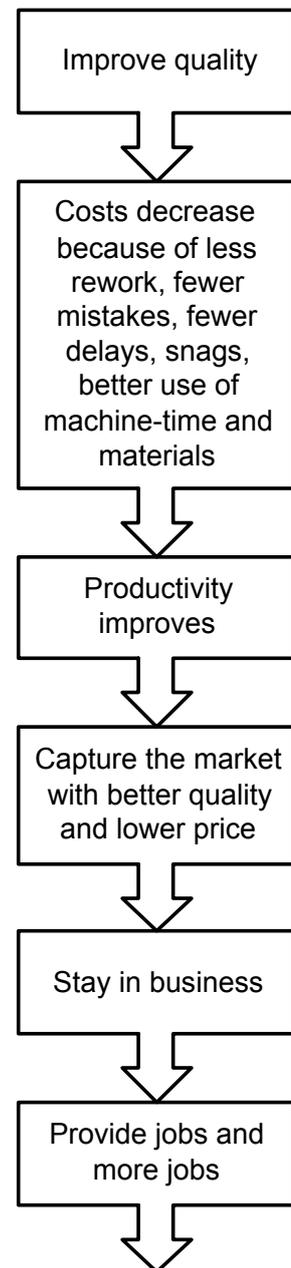


Figure 4 „Deming Chain Reaction“: The second most effective diagram for the astonishing success of Japanese Products on the World Market.

something goes wrong, the fault rarely lies in individuals. Looking round for a scapegoat, someone to blame, is the *last* thing that management should do. The fault wholly or primarily lies in the system: the environment, the circumstances, the working conditions, the values, the “company culture” within which individuals live, work, try to succeed, try to *survive* - yet so often it is that very culture which repeatedly and consistently obstructs their aims and desires.

So *Deming's* thinking, as a natural consequence of *Shewhart's* thinking, leads to a vast change of emphasis from what is still commonplace in so much of modern mana-

gement - and indeed, even more sadly, of modern government. It is still commonplace, often increasingly so (and you know it), to be focused on blame or praise, punishment or reward, *judgment* - of the *individual*. Deming had already, half a century ago, come to realise that that focus is misplaced.

You see, to repeat, he had concluded that the vast majority of performance, behaviour, results - whatever - comes from the *system* within which people live and work rather than from the individuals themselves. And, *if* that is true, then of course what can be achieved by such focus on judgment of the individual is *trivial* compared with what can be achieved by focusing instead on improvement of the system within which the individual works and lives. This in large part explains why Deming was so critical of managing and judging - with reward and punishment involved - related to the achievement (or otherwise) of numerical targets and quotas and objectives and numerical goals. And of performance-related pay and ranking and rating and league-tabling. It's a long list: you could add more.

Now, there is no time to get into those contentious issues here: and in fact it would be irrelevant to try. Why? Because it would be putting the cart before the horse (which is either unproductive or dangerous, depending on whether you are on the level or on a slope). The fundamental question, from which all those issues I've just mentioned and many others then follow, is: *could* it be true that most behaviour and performance come from the system, not the individual? I will tell you that for a long while I did not believe it. We are just not brought up to believe that, to think that way.

And then I got thinking like this. I invite you to try it too. Think slowly, and think carefully.

Just imagine, you personally, how *your* performance, behaviour (what you do and how you do it) would change according to whether

- ♦ you are living in a time of peace or a time of war;
- ♦ you live in one of the industrialised nations, or you live in a third-world under-developed country;
- ♦ you are extremely rich, or you are poverty-stricken;
- ♦ your work is greatly fulfilling and ex-

citing, or it is dull and demoralising;

- ♦ you had lousy schooling, or you had a brilliant education;
- ♦ you had great parents, or you suffered abuse of various kinds throughout your childhood;
- ♦ you trust your colleagues at work, or you distrust them;
- ♦ you trust your spouse or other partner, or you distrust him/her;
- ♦ all around you are back-biters and points-scorers, or they are supporters and helpers;
- ♦ you are in an environment of conflict, competition, winners and losers; or of genuine mutual cooperation so that everybody gains.

Of course your behaviour would change - a *lot* - depending on these different circumstances. But *you* are still the same person. It is changes in the system around you, and the *effects* of those changes on you, that change your behaviour and performance.

It is time to move on. But to where?

The 1970s: ?

A question mark. Because we have relatively little knowledge of what was happening with Deming during this decade.

He was still working very hard, lecturing regularly at the New York universities, still publishing research papers, visiting Japan for the annual Deming Prize ceremonies (though I do not know how regularly). And that is in spite of the fact that effectively the Japanese had stopped learning anything significant from him years earlier. And there was no sign that the rest of the world, including his home country of America, had any interest in what he could do for them either. Even in his secretary's biography of him, a section listing his "International Activities" has many entries in the 1950s, fewer in the 1960s, and then only two for the 1970s: that he lectured in Argentina in 1971 and, interestingly, that he was a consultant to the China Productivity Center in Taiwan in 1970 and 1971. And then: nothing.

Let me tell you what I believe. I believe (and this would hardly be surprising in the circumstances) that he suffered some depression. Two particular personal incidents support that thought. First, when I was one of a group of about 30 people having a

Study Weekend with him in 1988, we got him talking about his life. And he said a lot about the 1950s and, to an extent, the 1960s. But when we asked him about what had happened in the 1970s, after a long pause he just muttered: "Oh, nothing much." He just didn't want to talk any more. The other incident was when I was studying some of the music he had composed. I found music composed in the mid-1970s which I can only describe as deeply and distressingly unhappy. I believe he felt that the great learning with which he *could* help the Western world, if only we would listen, would die with him. He had reached that kind of age.

Thankfully, as we know, that was not the case.

The 1980s (first half): The West Awakens

Through Japanese contacts, an American Chief Executive did at last discover Deming in 1979, and began to listen and learn. This was William E Conway of the Nashua Corporation. Deming's involvement with Nashua began in just sufficient time to become known to the NBC television producer, Clare Crawford-Mason, who at that time had begun to prepare a documentary which was first screened in June 1980, a programme with the title: *If Japan Can, Why Can't We?*. That was the breakthrough. As Deming's secretary later wrote [9]:

"American industrialists who watched the programme not only grasped more fully the enormity of the problems that they were facing, but they also realised that answers were available. Perhaps more importantly, W Edwards Deming was introduced to the audience as the man with effective answers. It was an introduction that would change his life irrevocably" (and, she might have added, the lives of countless others).

Here is a transcript of several short extracts from *If Japan Can, Why Can't We?*:

Lloyd Dobyns (narrator): We have said several times that much of what the Japanese are doing *we* taught them to do. And the man who did most of the teaching is W Edwards Deming, statistical analyst, for whom Japan's highest industrial award for quality and productivity is named. But in his own country he is not widely recognised. That may be changing. Dr Deming is working with Nashua Corporation, one of the Fortune 500, a company with sales last year of more than \$600,000,000. De-

ming was hired in late 1979 by Nashua's Chief Executive, William E Conway.

Bill Conway: And of course our major supplier of copier machines was a Japanese company. And so we saw the advantages of how many things the Japanese companies were doing. And we heard about Dr Deming. And so we got off and got under way with our quality program with Dr Deming.

Dr Deming: They realised that the gains that you get by statistical methods are gains that you get without new machinery, without new people. Anybody can produce quality if he lowers his production rate. That is *not* what I am talking about. Statistical thinking and statistical methods are to Japanese production workers, foremen, and all the way through the company, a *second language*. In statistical control you have a reproducible product hour after hour, day after day. And see how comforting that is to management: they now know what they can produce, they know what their costs are going to be.

Bill Conway: Many of these programmes on statistics have died in American companies because they didn't get the top management support. Now, why top management does not believe that this is the way the Japanese have improved their industry over the last 30 years I don't know.

Dr Deming: I think that people here expect miracles. American management thinks that they can just copy from Japan - *but they don't know what to copy!*

Lloyd Dobyms: But one part of Deming's program is not likely to please them. He insists that management causes 85% of all the problems.

Dr Deming: I ask people in management what proportion of this problem arises from your production worker. And the answer is always: *All of it!* That's absolutely wrong. There's nobody that comes out of a School of Business that knows what management is, or what its deficiencies are. There's no-one coming out of a School of Business that ever heard of the answers that I'm giving your questions - or probably even thought of the questions.

Now, compared with what I have shown you concerning Deming's teaching in Japan 30 years earlier, you may have noticed a strangely narrow emphasis in those extracts: he was mainly back to just talking about statistical methods in a manufacturing context again - just where things had been 55 years earlier! Several years later,

when I had begun to appreciate the much greater breadth and depth of his teaching, I asked him why he had reverted to such a narrow focus in that TV programme. I remember his answer well. He said: "Because, Henry, I thought that, at the time, that was all that people would be able to take." He had judged that his American audience would not be able to stomach what he had been teaching the Japanese 30 years earlier: he had to take things more carefully with them. Some new statistics in manufacturing: yes, perhaps Westerners could cope with *that*. He was deliberately using that narrow focus as a "thin end of the wedge", hoping that, having made that start, the breadth and depth could grow.

But, however hard he tried to contain himself, his frustration with American management would often come to the boil. It was now more than 30 years since the "Japanese miracle" had begun, and the Americans were still so *wrong* and still so *slow* to learn. His final words on Encyclopaedia Britannica's video: *Management's Five Deadly Diseases* (released in 1984) were:

"With a storehouse of unemployed people - some willing to work, a lot of them willing to work, with skills, knowledge, willingness to work; and people in management unable to work through the merit system, annual rating of performance, not able to deliver what they're capable of delivering. When you think of all the under-use, abuse, and misuse of the people of this country, this may be the world's most underdeveloped nation. Number One - we did it again! We're Number One - for underdevelopment. Our people not used, mismanaged, misused, and abused, and under-used by management that worships sacred cows: a style of management that was never right, but made good fortune for this country between 1950 and 1968 because the rest of the world, so much of it, was devastated. You couldn't go wrong, no matter what you did. Those days are over, and they've been over a long time. It's about time for American management to wake up!"

The 1980s (second half): A New Climate

By the late 1980s, Deming's teaching had indeed greatly broadened and deepened. "A New Climate" was the phrase which repeatedly came to my mind. He was now strongly emphasising "Cooperation: Win-Win", as he coined the phrase (just as in Japan 35 years earlier) - not cooperation

for some sacrificial, magnanimous, altruistic purpose but simply so that all concerned could gain, and be better off in all respects than if they carried on in the old mode of conflict and destructive competition.

And, in a world which is changing ever-faster, he spoke increasingly of the need not just for improvement but for *innovation* - in process, in product, in service. How right. And so he would study the kind of management climate in which innovation could flourish. Rather obviously, it would not be the familiar climate of management by fear, conformance, "right first time", punishment if anything goes wrong. Most innovation *does* go wrong, but if management cannot accept wrong innovation, they won't get right innovation either.

And for a third strong feature of the "New Climate", here are Dr Deming's opening words in Central ITV's *Doctor's Orders*. Before he'd been speaking for even 30 seconds, Deming had come up with what was, to many people, a somewhat unexpected view of the "job of management":

"Just think what this country could be - think what North America could be - if half the people, even make it 25%, could take pride in their work, could take joy in their work. Things would be a whole lot different from what they are now. Why not give that satisfaction to everybody? That's the job of management!"

A new climate indeed!

Dr Deming was, of course, now getting quite old - and ill. Indeed he was developing a collection of medical conditions which would have killed off most people much earlier than they did him.

But he knew he was dying. And consciously or unconsciously he knew he must try to develop something which would help those who live after him to understand and continue to develop his life's work. It was toward the end of 1989 that we first heard this extraordinary phrase:

1990 to 1993: A System of Profound Knowledge

Extraordinary, yes - but accurate. This was his attempt, sometimes only with the wisdom of hindsight, to summarise the guts, the core, the essence of his whole life's work. His work *is* to do with knowledge, understanding, learning - no kidding! And it *is* profound, it *is* deep - it's not superficial. And its *implications* are profound. And

it is a *system* - in an exactly analogous way to how he wanted us to consider *organisations* as systems: i.e. containing many, many components, but with its strength lying in the understanding of how all those components fit together, how they interlink, how they are interdependent, how they integrate. With my own wisdom of hindsight, I know that one has not *begun* to comprehend the Deming philosophy of management until that integrated nature of his work becomes predominant in the way that one thinks of it and understands it.

I like very much the following representation of Deming's System of Profound Knowledge, constructed by one of my many great American friends, Peter Scholtes (Figure 5):

The System of Profound Knowledge is comprised of the four major parts: Appreciation of a *System* (as I have been describing it); Theory of Variation (right back to where it all started with Shewhart's breakthrough so long ago); Theory of Knowledge (how do we know things, how do we learn things, how do we *improve* that learning and knowledge?); and Psychology (the understanding of people and the way that they interact with all that surrounds them). This is a very *human* philosophy. And what is so good about Peter's representation is that it illustrates so well that not only are the four parts so important in their own right: again the strength of this system is the way that those parts interlink, inter-relate, and inter-depend. This is a *rich* legacy.

W Edwards Deming died on 19 December 1993, at his home in Washington where he had lived since 1946, and just ten days after completing his final four-day seminar in California. I would estimate that at least a

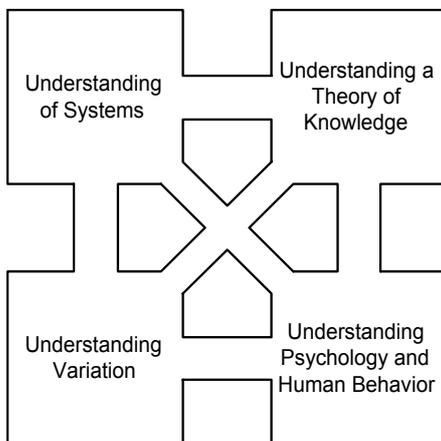


Figure 5 Schematic Visualisation of „The System of Profound Knowledge“, the Legacy of W. Edwards Deming to the World

quarter of a million people attended his celebrated four-day seminars between 1980 and 1993. As we know, the economic outlook in America has improved in recent years - a lot. How much of that has been due to those quarter of a million people? How would I know?

I do know that there was a lot of excitement in quality management circles when Bill Clinton and Al Gore took office. As just one example, the major feature in the December 1993 issue of *Quality Progress* (the monthly magazine of the American Society for Quality) was “How the Federal Government Is Reinventing Itself”, subtitled “Vice President Gore’s National Performance Review report might just be *the* quality book of the year.”

Poignantly enough, as I just said, December 1993 was also the month when Dr Deming departed this life. I wonder if, in those final days, he may have recalled what he had said just ten years previously, in an interview reported in *The Washington Post*, January 1984:

Question: You’ve been very successful in attracting people to these seminars. Isn’t that encouraging to you?

Dr Deming: I don’t know why it should be. I want to see what they’re going to do. It will take years.

Right again! And so, finally, what of ...

1994 and onward: The Future

As the world grows ever more complex, and often more cruel, and as technology increasingly provides opportunities to do greater good but, if misused, can also do greater harm, do we not increasingly need the help of the Deming philosophy - its values, its principles, its logic, its *practical guidance*? If you feel interested by what you have learned in this short summary, I invite you to examine and study further Dr Deming’s unique work, and then see if you agree with me. Take a little time over it. (Misquoting the TV commercial:) it’s worth it!

Dr Deming’s work is, I believe, hugely important, literally priceless, literally timeless. It is a real source of help and hope for making a better future, materially, socially, and mentally. That was the purpose of Dr Deming’s life’s work. What better purpose could there be?

I shall end by transcribing a couple of mi-

minutes’ dialogue from another video, this time made around the time of Dr Deming’s 90th birthday: *The Deming of America*. In this video, Dr Deming can be seen as I knew him to be, rather different from what is seen on most other video material. At heart he was a modest and humble man, with a great warmth for humanity, both individually and collectively. And, to his death, he was regretful that he could not have done more in his blessedly long life, particularly for his fellow-countrymen in America and the rest of the Western world. During the following extract the interviewer, Priscilla Petty, asked him to show her the Second Order Medal of the Sacred Treasure, awarded him in Japan in 1960. It was a rare honour. But, despite all that he had accomplished for Japan, and had begun to accomplish for the West in the latter years, he suggested that, after all, maybe it had just been “a matter of luck”. Finally, look out for what he said when she asked him what he thought of a medal awarded him by the American President in 1988.

Priscilla Petty: I asked Dr Deming to show me the medal he received from the Emperor of Japan for his contribution to their economic recovery after World War 2.

Narrator: In 1960, the Prime Minister of Japan, acting on behalf of Emperor Hirohito, awarded Dr Deming Japan’s Second Order Medal of the Sacred Treasure. The citation on the medal attributes Japan’s industrial rebirth and its worldwide success to W Edwards Deming. No honour among businessmen and industrialists in Japan is more coveted.

Priscilla Petty: How did you feel when he gave that to you?

Dr Deming: Oh, totally unworthy.

Priscilla Petty: You felt unworthy?

Dr Deming: Yes.

Priscilla Petty: Why?

Dr Deming: Oh, it was a matter of luck.

Narrator: Quite obviously, a grateful Japanese people don’t share Dr Deming’s humble view that it was only “a matter of luck”. Each year, since 1951, the Japanese have awarded a medal named in Dr Deming’s honour to those companies which have attained the highest level of quality. His presence at an award ceremony like this one to the Kajima Corporation is considered the ultimate honour.

And it’s a strange paradox that this American, who is a national hero in Japan, until

recent years was virtually unknown in the United States - a prophet without honour in his own country.

Priscilla Petty: I asked about another medal from our President.

Dr Deming: Well, the medal from the President of the United States came 28 years after the medal from the Emperor of Japan. "28 years later" - that is all he had to say about it. Yes, it was *very* late in life that the Western world began to appreciate the genius of this man. But, as the saying has it: "Better late - than never."

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What are the Duties of Managers towards Quality?

After Japan and the U.S.A., Europe too needs the learning of William Edwards Deming.
by René Bondt

(Dr. René Bondt is Historian and Editor; he is Deputy to the Editor-in-Chief of the "Zürcher Oberländer" Newspaper.)

(Translation from German to English by Noel C. Spare)

At the end of the Second World War with their country lying in ruins, Japanese industry learned quickly from American teaching. The Asian nation succeeded in manufacturing products that became the hallmark for quality the world over. Here lies a paradox on two counts. Firstly, it took 30 years and an economic crisis for the U.S.A. to take up the methodology employed so successful in post-war Japan. And secondly, this Far Eastern triumph was based firmly on American ideas.

Summary

The technological development of world-wide industry after 1945 led to the rationalisation of working procedures and the creation of wealth from the primary sector (agriculture), the secondary section (industry), to the tertiary sector (service). Since the 1970's, these structural changes in the industrialised nations have become intrinsically linked with an increase in unemployment. In 1980, the mounting crisis in the U.S.A. was analysed by William Edwards Deming and articulated in his best-seller "Out of the Crisis", in which his recommended solution was - the improvement of quality of products and service.

Overnight, the book and its author became the subject of nation-wide debate. As Deming commented, "It required a different way of thinking in order to make survival possible". An organisation cannot buy its way to better quality. Only management can achieve better quality. If the leadership of a firm is asked how they think that quality and productivity can be improved - mostly the answer comes - by everyone doing his best. This is not the answer, said Deming. "Everyone must, first of all, know what it is that they have to do. Transformation is necessary and Management must know how this transformation

can be brought about". To this aim Management must be able to understand, the Fourteen Points, The Seven Deadly Diseases and The Seven Barriers to Progress. "The time will come when Management is judged, not by the quarterly dividend, but by plans and innovation with the aim to stay in business, to protect investment, to insure future dividends, and to provide jobs and more jobs through improvement of product and service for the future."

The enormous quality effort in manufacturing and service industries in the U.S.A. and Japan has set the standard by which the competitiveness of Europe is measured. Today, they do not bare comparison. European industry is not competitive - and does not have a solution. Demings solution, which allowed America to find the way, could also be Europe's way "Out of the Crisis."

Deming's Influence on Japan

At the end of the Second World War, of all the developed nations only the U.S.A had its production capacity left intact. The rest of the world struggled on until, in the early 1950's, the Marshall-Plan allowed Europe to start rebuilding its industries. Japan

found itself in a much worse situation. Industry was in ruins, they had no trust in Government and their self-confidence was broken. Lacking in natural resources, the Asian Empire had the lowest indigenous raw materials of all the developed nations. The single resource they had was people. Their first efforts at post war manufacturing however produced only "junk" - cheap and nasty - quality did not figure in its manufacture.

In 1931, Walter A. Shewhart, through his book, "Economic Control of Quality of Manufactured Product", had established quite different priorities for industrial managers. From Shewhart's perspective of quality improvement came the Deming Chain Reaction, which he subsequently used at the beginning of all his lectures to the leaders of Japanese industry in the 1950's. The consequences of improvement in quality can be compared to the links of a chain. Quality improvement leads to cost saving through less rejects, less rework, less raw material, less interruptions and better use of capacity. This in turn leads to improved productivity. The resultant reduced costs allow the capture of new markets which, in turn, ensures the survival of the company and the creation of more jobs. With this William Edwards Deming directed a whole nation towards a common aim - the creation of world markets through

competitive quality of products and services. The aim was achieved.

Who was Deming?

William Edwards Deming (1900 - 1993). Awarded a Doctorate in mathematical physics at Yale University in 1927. His first position as a physicist found him at the U.S. Department of Agriculture. He studied for a time under Ronald Fisher in London and with Walter Shewhart whilst he was producing his ground-breaking work on the quality control of manufactured product. The close working relationship to both of these scientists laid the foundation for Deming's progress to world-wide authority on quality management. With the benefit of his learning Japan progressed to becoming an economic super-power. Ironically this was also the reason, with great delay, why America was able to stem the tide of high quality Japanese imports.

The Discovery / The Story Continues

Whilst Deming was not the only American in the post war era to give advice to the Japanese on industrial production, it was the former President of the Union of Japanese Scientists and Engineers, who attributed to Deming most of the credit for turning his country around. The emissary from the U.S.A. had, on the basis of theory and practice, created a new and highly successful system of management. Many Americans later undertook the Asian pilgrimage to discover the secrets of the Japanese turn-around but they did not know what to look for. They saw Quality Circles and believed that here lay the secret of Japanese success. They copied procedures without understanding the theory behind them. They instituted Benchmarking.

In 1979 Deming came to the attention of a television journalist, Clare Crawford-Mason. She was to make a documentary film that investigated the burning question the whole of America was asking, "What has gone wrong with American ingenuity?" What were the causes if the inability of the U.S to stem the tide of high quality Japanese imports? It was a thorny subject, finding answers proved to be far from easy and the key figures from American Industry she interviewed were of little help. Then, the breakthrough, she heard of Deming - the American who had worked with the Japanese for many years - Crawford - Mason had uncovered incredible material.

On the 24th June 1980 NBC transmitted "If Japan Can... Why Can't We?" The programme came as a bolt from the blue on corporate America. The incredible image of the life's work of one of their own countrymen in far-off Japan shook the Americans out of their complacency and instantly elevated Deming to the most sought-after management consultant in the country. One of the first organisations to seek the help of Deming, now in his 80's, was the Ford Motor Company, then in dire straights. Within 10 years Ford had succeeded in closing the gap on its Japanese competitors in terms of production methods and quality. At an age when many of his contemporaries were sitting in old peoples' homes, Deming set out for the remaining years of his life to give seminars, which taught Americans his method for higher productivity and less unemployment which led to the industrial comeback of the U.S.A.

Deming's Legacy

Deming's message was often uncomfortable for the listener. He told American managers that "Quality begins in the Boardroom, not in the workplace - it is nonsensical to make a foreman responsible for product quality. He has no responsibility for product development, for choosing a supplier, for determining the price, or marketing the product."

Delight, knowledge, experience and a stupendous proof through overwhelming economic success marked Deming's message. The thesis was heard in corporate America, understood and put into practice. With his four-day seminars he reached the leaders. The circulation of his books and video recordings together with the publications of close colleagues sold in their millions. The American Army followed the Deming method. Most companies committed to long-term partnerships with their suppliers (single supplier policy). The pursuit of continual improvement permeated the whole hierarchy. Even firms that had become ISO certified as their first step to quality control, continued to develop their systems based on Deming's ideas. It is clear that by awakening America's interest in quality, by the end of the decade, the dream of economic growth had returned.

In 1993 the W. Edwards Deming Institute was founded to spread the Deming message to a world-wide audience. To this end, the Institute established unions with like-minded organisations and acted as a fo-

rum for the exchange of ideas and experience. These organisations are now active in nearly every State in America together with Australia, China, Great Britain, France Russia, Sweden and Switzerland.

Deming Philosophy

Deming's view of people could be described as Biblical when he demands that people should be allowed to take pride in their work. In 1936 whilst studying at the New York State university, Einstein had taken a similar viewpoint. "Joy in work, joy in the results of work for the benefit of mankind must be the most important motive for our educational efforts and our later professional life. The most important task for schools is to awaken and strengthen the intrinsic motivation of young people."

Nothing in nature or in human behaviour works faultlessly. But, just as in nature in which organisms are equipped with self-healing functions, so in man-made systems, variation should trigger the improvement process. Improvement means solving problems. Deming's teacher and advisor, Shewhart, in his second book ("Statistical Method from the Viewpoint of Quality") outlined a problem solving model which is now regarded as the pinnacle of his work. The model encompassed the functions of production, control and specification but Deming widened this to mean that everything that people do, think, feel and sense to be part of a process. Everything varies. That is not new - people have always understood that this is a part of living. What was new was the proposition *that understanding variation through the use of statistical process control* should be the basis for organisational leadership.

Best efforts will not achieve the aim if they are not accompanied by *profound knowledge*. What is not understood cannot be improved. The basis for understanding, Deming incorporated into an intellectual framework that he described as a System of Profound Knowledge. Many are of the conviction that this represents Deming's most valuable legacy for present and future generations. The System of Profound Knowledge consists of four elements: Appreciation for a System, Understanding the Principle of Variation, Knowledge and Psychology.

Appreciation for a System

People find it difficult to think in terms of a network. This leads to problems. Frequently, one part of a system is seen as

under-performing whilst another is seen as satisfactory. What goes unnoticed however is that the interaction between the components is just as important as the components themselves. Finally the bigger the system the more time is required for changes to work-through and for the system to respond.

Understanding of Variation

Variation causes uncertainty and uncertainty causes loss. Variation can have random causes or special causes that require a quite different response. Only an understanding of what are random and what are special causes will lead to healthy treatment - also in organisations.

Knowledge

Management is about prediction and prediction is about experience or theory. Both are dangerous: theory without experience is worthless and experience without theory is expensive. Blind trust in experience or blind trust in theory can both lead to fatal consequences. Therefore every statement should be tested for its suitability to convey meaning. In this sense management is as demanding as scientific research. A wrong decision not only threatens a theory, it jeopardises customers, suppliers, workers and shareholders. A manager should not give direction without the certainty that it functions. (In the Theory of Knowledge there is no certainty nor are there any true values. We can only make prediction at risk of being wrong! Once certainty rules, the world goes to hell.) Check, check and recheck.

Psychology

Goods and services are created by people. Each person is unique with enormous energy, thirst for knowledge and creativity. However, this intrinsic motivation becomes destroyed once the barrier of frustration is placed in its way.

Seven Deadly Diseases...

Deming identified two categories of obstacles which stand in the way of the continual improvement of organisations. He called them the Deadly Diseases and the Barriers to Progress.

1. Deadly Disease: Lack of Constancy of Purpose

It is the job of management to set the aim of the system and to communicate it. Everyone must know it: shareholders, workers, suppliers and customers. Projects without planning and a review procedure are wishes and dreams. Today's unsolved pro-

blems are tomorrow's problems. Through inability to urgently distinguish and work on the most important problems management becomes lost in fire-fighting.

2. Deadly Disease: Short termism

Through job-cuts, disposals, acquisitions, mergers, reevaluation of assets and currency transactions combined with "creative accounting", a firm on the brink of collapse can show positive figures. To stay in business and be successful over the long haul requires a new way of thinking based on Deming's lifetime endeavour.

3. Deadly Disease: Evaluation of Performance, Merit Rating or Annual Review

Evaluation of performance, pay for performance, success awards and bonus systems are part of the ABC of modern management. People are marked like school children. It does not change the system by having people categorised as above average, below average or average. It has never been established that incentives and rating leads to improved individuals over the long term. On the contrary, people will manipulate the judgement process in their favour. Young genius is seldom seen. Most people have no choice but to continually improve themselves. It is strenuous, it needs time, direction and guidance. People have a right to education, training and further development. Employee interviews should reveal knowledge, special talents, personal ambitions and experience. The performance of people should not be evaluated by steps on a marking scale but to establish who falls outside the system so that they can be given special attention or transferred to a more suitable job.

4. Deadly Disease: Job Hopping

Deming gives the example of the "White Knight Syndrome". A White knight rides into a badly run firm, makes lots of changes, shows results, pockets the rewards and rides off into the sun-set before the long-term consequences of his actions appear.

5. Deadly Disease: Management by the Numbers

Figures are important for the accounts - monitoring turnover, paying of suppliers and salaries and calculating taxes. But a firm cannot be run on the visible figures alone. Much more important are the invisible figures - the value of a happy customer or the negative value of an unhappy customer, the value of the high morale of a work-force that work in teams and co-operate between Development, Production,

Sales and Marketing Departments. Visible figures reflect past performance, it is like driving a car by only looking in the rear-view-mirror. Management should work on the process. Visible figures should be used to analyse the variation in processes by the use of control charts to separate special and common causes in order to determine the correct action required to reduce variation and thereby continually improving the process.

6. Deadly Disease: Excessive Medical Costs

William E. Hoglund, manager of the Pontiac Division of General Motors cited the Health Insurance Company, Blue Cross as being their "second biggest supplier" at a cost of about \$400 per car. In order to make products and services competitive in world markets the cost of healthcare must be reduced. Deming showed how the use of statistical control could, for example, reduce the cost of rehabilitation.

7. Deadly Disease: Excessive Legal Costs

In Western industrial nations, concluding business with a handshake is the exception. An open agreement sealed with a handshake establishes a close relationship that brings responsibility and mutual trust. It is much harder to break relationships based on pride than to break a written agreement bound up in legal verbosity and the very expensive services of lawyers. The return to corporate relationships based on mutual trust is an important element of Deming's vision for the future of corporate relationships.

...Seven Obstacles...

1. Obstacle: Hope in Quick-Fixes

Many managers believe that quality can be installed, like a new machine. In quality there is no "Quick-Fix". Improvement in quality is the result of continual effort, not the result of a process with the name of quality.

2. Obstacle: The Supposition that Solving Problems, Automation, Gadgets and New Machinery will Transform Industry

Most increase the variation in processes because they react to single data measurements and not to data collected over time and analysed by statistical method.

3. Obstacle: The Search for Examples

Every organisation strives to improve quality and productivity. Out of a feeling of

helplessness they seek out firms that are ostensibly successful. But without theory, works visits are useless. Without theory the visitor does not know what questions to ask. The copying of methods used by “the best in class” leads, at best, to misunderstanding and frustration. Quality is only achieved by understanding of the System of Profound Knowledge - Appreciation for a System, Understanding Variation, Knowledge and Psychology.

4. Obstacle: Our Problems are Different

When this maxim becomes institutionalised, every attempted improvement will die on the vine. Only when the reasons for the difference is understood and actively applied to the solution of problems can the improvement process begin.

5. Obstacle: Obsolescence in Schools

Business schools are complicit in the problems being faced by industry. The MBA programme should prepare students for management. The intelligent and enterprising students expect to find employment in a management job in which they can use and apply in the real world what they have learned in the school. They know nothing of the product, the manufacturing process or marketing. They have no appreciation for a system, understanding of variation nor of knowledge or psychology. All that is left is the practice of management by the visible figures alone, described above as the fifth Deadly Disease.

6. Obstacle: Teaching of Statistical Methods

Deming stressed that everybody in the organisation should have some knowledge of statistics - managers, researchers, engineers, quality personnel, auditors, accountants, purchasers, sales and marketing personnel and market researchers. Statistics alone provide understanding of the principle of variation, one of the cornerstones of the Deming philosophy. Sufficient statistical understanding in this context can be learned without the necessity for eminence in mathematics.

7. Obstacle: Specifications

It is the generally accepted practice to apply specifications to manufactured products. It is almost impossible to express, in the form of a specification, all the characteristics of a product. The concept that everything within the specification is correct and everything outside the specification is wrong is not the reality. Holding to specification alone is expensive and does

not ensure that the product is a success in the hands of the customer. A car owner is unconcerned whether the same part in a gear-box meets specification. What is important for the owner is that the gear-box performs trouble-free during the lifetime of the car. The quality of the end product benefits from the partnership between the supplier and the development process.

...And 14 Points for Management (Obligations)

The seven deadly diseases and the seven obstacles are a clear statement of Deming's intention. His 14 points or obligations on management are a clear and practical assembly of statements based on knowledge and experience that reflect the Deming philosophy.

Point 1: Constancy of Purpose

Create constancy of purpose for continual improvement of products and services, allocating resources to provide for long term needs rather than short term profitability, with a plan to become competitive, to stay in business and to provide jobs.

Point 2: The New Philosophy

Adopt the new philosophy. We are in a new economic age, created in Japan. We can no longer live with commonly-accepted levels of delays, mistakes, defective materials and defective workmanship. Transformation of Western management style is necessary to halt the continued decline of industry.

Point 3: Cease Dependence on Mass Inspection

Eliminate the need for mass inspection as the way of life to achieve quality by building quality into the product in the first place. Require statistical evidence of built-in quality in both manufacturing and purchasing functions.

Point 4: End Lowest-Tender Contracts

End the practice of awarding business solely on the basis of price tag. Instead, require meaningful measures of quality along with price. Reduce the number of suppliers for the same item by eliminating those that do not qualify with statistical and other evidence of quality. The aim is to minimise *total cost*, not merely initial cost, by minimising variation. This may be achievable by moving towards a single supplier for any one item, on a long-term relationship of loyalty and trust. Purchasing managers

have a new job, and must learn it.

Point 5: Improve Every Process

Improve constantly and forever the system of planning, production and service, in order to improve every process and activity in the company, to improve quality and productivity, and thus to constantly decrease costs. Institute innovation of product, service and process. It is management's job to work continually on the system (design, incoming supplies, maintenance, improvement of equipment, supervision, training, retraining, etc.).

Point 6: Institute Training

Institute modern methods of training for everybody's job, including management, to make better use of every employee. New skills are required to keep up with changes in materials, methods, product design, machinery, techniques and service.

Point 7: Institute Leadership of People

Adopt and institute leadership aimed at helping people to do a better job. The responsibility of managers and supervisors must be changed from sheer numbers to quality. Improvement of quality will automatically improve productivity. Management must ensure that immediate action is taken on reports of inherited defects, maintenance requirements, poor tools, fuzzy operational definitions and all conditions detrimental to quality.

Point 8: Drive out Fear

Encourage effective two way communication and other means to drive out fear throughout the organisation so that everybody may work effectively and more productively for the company.

Point 9: Break-Down Barriers

Break down barriers between departments and staff areas. People in different areas, such as Research, Design, Sales, Administration and Production, must work in teams to tackle problems that may be encountered with products or service.

Point 10: Eliminate Exhortations

Eliminate the use of slogans, posters and exhortations for the work-force, demanding Zero Defects and new levels of productivity, without providing methods. Such exhortations only create adversarial relationships; the bulk of the causes of low quality and low productivity belong to the system, and thus lie beyond the power of the work-force.

Point 11: Eliminate Arbitrary Numerical Targets

Eliminate work standards that prescribe quotas for the work-force and numerical goals for people in management. Substitute aids and helpful leadership in order to achieve continual improvement of quality and productivity.

Point 12: Permit Pride of Workmanship

Remove the barriers that rob hourly workers and people in management, of their right to pride of workmanship. This implies, *inter alia*, abolition of the annual merit rating (appraisal of performance) and of Management by Objectives. Again, the responsibility of managers, supervisors, foremen must be changed from sheer numbers to quality.

Point 13: Encourage Education

Institute a vigorous programme of education and encourage self-improvement for everyone. What an organisation needs is not just good people, it needs people that are improving with education. Advances in competitive position will have their roots in knowledge.

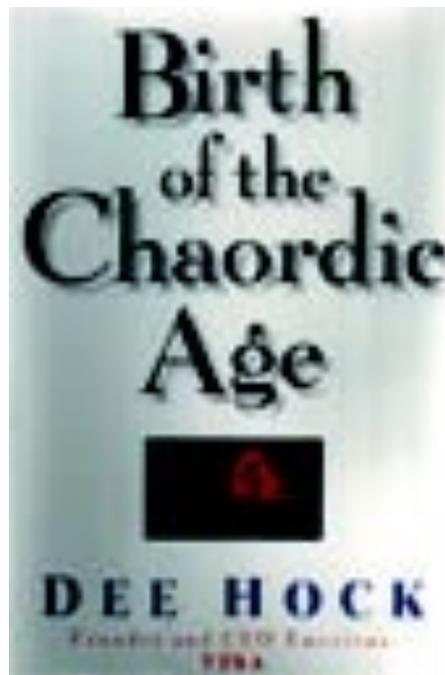
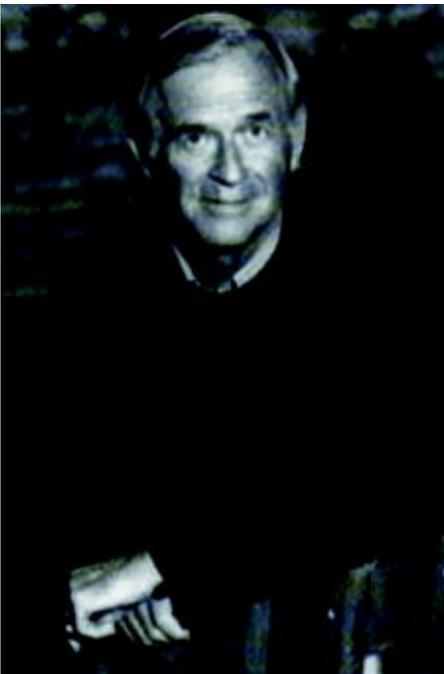
Point 14: Top Management Commitment and Action

Clearly define top management's permanent commitment to ever-improving quality and productivity, and their obligation to implement all of these principles. Indeed, it is not enough that top management commit themselves for life to quality and productivity. They must know what it is they are committed to - that is what they must do. Create a structure in top management that will push every day on the preceding 13 Points and take action in order to accomplish the transformation. Support is not enough: action is required.

Birth of the Chaordic Age *)

Dee Hock, Founder and CEO Emeritus of VISA

Book Review by Noel C. Spare



We are at that very point in time when a 400-year-old age is dying and another is struggling to be born - a shifting of culture, science, society, and institutions enormously greater than the world has ever experienced. Ahead, the possibility of regeneration of individuality, liberty, community and ethics such as the world has never known, and a harmony with nature with one another and with the divine intelligence such as the world has always dreamed.“

Dee Hock

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Few of us have stopped to wonder what is behind the VISA logo. Three quarters of a billion people use VISA products in 200 countries and territories. It straddles language, culture and religion. It is the world's biggest commercial undertaking with an annual volume of \$1.4 trillion and growing. This is the story of the man who created and nurtured this unique organisation and his profound philosophy, born out of a lifelong distaste for our Industrial Age, hierarchical, command-and-control institutions. And VISA is only the beginning...

*) Dee W. Hock, „Birth of the Chaordic Age“, Berret-Koehler Publisher, 1st Edition November 1999, ISBN: 1576750744

For anyone who has wondered why our institutions and organisations seem less and less able to deliver on the purposes for which they were created, there can be no better place to start to find answers than in this book.

Dee Hock is probably best known as the man who founded and ran VISA, the world's largest commercial organisation, but do not think that this book is a turgid trawl through the world of high finance and consumer credit by a man with a passion for credit cards. Nothing could be further from the truth. Neither is it a 1-2-3 management book - easy steps on the road to management salvation; it is much more than that. It is an incredible story of human endeavour by a man passionate and unwavering since childhood, in his belief that our present concept of "Organisation" has outlived its usefulness. Worse still, it is now on such a frenzy of consumption that it is feeding off itself and plunging human life and the biosphere that supports it into irreversible decline.

This is a book about the triumph of the human spirit, which refuses to be bowed by the dysfunctional machinations of what passes today as organisation. Of a man unable to shake off his convictions and loosen the shackles of his ever questioning "Old Monkey" rational mind - and does this Old Monkey know how to ask questions? After more than half a lifetime spent as a "bloodied sheep" - failure upon humiliating failure and deep depression with only nature and a family that he has difficulty supporting to hold him in the real world - he falters. He takes up what he describes as the most popular career choice in modern organisations - "retirement on-the-job". So begins an odyssey that even a fiction writer would be hard put to imagine.

What emerges from the pages is a philosophy explained with candour and clarity with the noble purpose of liveable lives for our children and their descendants. That does not make it easy however, the difficulty being in the mindset of the reader, confined as we are by the iron cages of hierarchy and bureaucracy. Sounds hard? Well, to begin to understand this book it may be necessary to suspend some long-held beliefs to enable us to penetrate the prevailing concept of organisation, buttressed as it is by dogma and protected by an encircling moat of platitudes. To think thoughts that the prevailing tyranny ensures remain suppressed in our sub-conscious.

Hock places the origin of organisational methodology with René Decartes, 400 years ago. He is hard on science, perhaps it is deserved, it never explained itself very well. But science did change from its Cartesian / Newtonian approach. Perhaps no one expressed that change more eloquently than William James did almost a century ago. It is the management of our institutions and organisations that did not change and leaves us with old Industrial Age Taylorian frameworks trying to support information age, industrial, commercial and social administrative systems.

Scientific methodology that believed that all things could be explained with a logical, linear, precise, orderly, mechanistic rationale began to be undermined by Karl Friedrich Gauss before 1800. From then on all measurements and all perceptions would be "fuzzy", with the fuzziness delineated by Gauss's immortal curve - science moved forward - in harmony with uncertainty, recognising that an exact picture of the physical world was unattainable. Nowhere was this more beautifully illustrated than by Ludwig Boltzmann with his descriptive formula that delineates between order and disorder in the atomic world. But Boltzmann had to endure the tyranny of his peers and, believing the battle to be lost, committed suicide in 1906. Yet, without Boltzmann, it is unlikely that Dee Hock, 70 years later, would have even been able to contemplate the world-wide transfer of value on a stream of ordered charged particles.

Hock is not averse to using scientific metaphors in his quest to penetrate the nature of organisation and leadership. To dissect words to arrive at meaning and to find the most fundamental particles of organisation so that we may restart and build a new model, not like it was, or is, or might become, but like it ought to be.

The search for harmony between opposites is at the crux of this book - hence it's title. Agreement, disagreement; order, chaos; pride, humility; independence, interdependence; competition, collaboration. Hock invokes nature to demonstrate the delicate harmonic balance that exists in an undisturbed eco-system and the seamless blending of opposites. But the concept is universal - literally. The Universe is, to use his word, "chaordic".

The framework for future organisation, Hock advocates, is community, based on a strong shared purpose and values that enables people to use their intrinsic motivation and powers of self-organisation to

produce extraordinary results. Sceptical? See VISA. Many readers of this website will already be familiar with the expression "Extraordinary results from ordinary people". Some may have even been privileged to witness it. Too often however, it is no more than a tantalising glimpse. It never seems to last very long. It often comes about when we have our backs to the wall and conventional wisdom relents, allowing creativity and self organisation to flourish long enough for the crisis to be averted before the iron cage closes and the status quo is restored. The second law of thermodynamics - order tends to vanish - is unrelenting.

For some readers the idea of self-organisation might seem laissez-aller. This would be a mistaken impression however, which Hock allays as he describes the rigour with which Purpose, Principles, People, Concept, Structure and Practice need to be addressed in order to establish the framework of community. In other words organisation will be no less demanding, probably it will be even more demanding since we will have to learn a new paradigm whilst battling against the restraints of the old. It might be a lot more fun though, working in an environment in which behaviour is induced and not compelled.

Scholars and students of Shewhart and Deming may, at first, be more than a little miffed by Hock's invective against measurement, uniformity and control. It seems a far cry from Deming's, "The right quality and uniformity are foundations of commerce, prosperity and peace". At the same time there seems total unison in the assertions that "There is no true value of anything", "There is no such thing as zero defects" (No absolutes), "Without an aim there is no system" and "The most important figures in any organisation are unknown and unknowable". What lies at the bottom of this apparent dichotomy? Are we not back here to opposites? Dichotomy and paradox are very often evidence of a higher truth, a truth that both honours and at the same time elevates two seemingly contradictory concepts into a greater principle for integration and more optimal operation. We have to remember too, that Hock is describing prevailing organisation not as it might be, or, as many visitors to the site will believe, it ought to be, but as it is. He eloquently explains how we are caught in such a tide of data that we have ever diminishing possibilities of converting even a small proportion of it into knowledge and therefore, have to fall back

more and more on mechanistic command and control as a substitute for knowledge.

Perhaps, more than 70 years ago, Walter Shewhart had the key. By a partnership between science and philosophy he founded a methodology which separated raw data into that to which we could and should react in a linear, mechanistic way and that to which we could not and should not react linearly and mechanistically (most of it). In other words, when we should leave processes and systems alone. What happened? Few understood or even listened and for more than a century we have been on an orgy of institutionalised tampering (or tinkering, to use Hock's expression). We have pursued this "endeavour" with such abandon and total disregard of the consequences and have even conspired, somehow, to make it a virtue. It sits at the high altar of organisation - above logic, above people, above knowledge, so that now, even as the very planet rebels, we seem unable to comprehend that liveable lives for our descendants hangs in the balance. We are truly sitting on a "knife's-edge".

No one should have to be an apologist for Shewhart, the full realisation of his work is still, by Deming's estimate, a few decades off, but why did he use the word "control"?

Why do great men use inappropriate words? No amount of semantic argument can ever undo the consequential misunderstanding and even abuse of a conceptual philosophy that uses the word "control" in its title, when "behaviour" or "understanding" or "insight" would, with hindsight, have served its purpose better. It played right into the hands of the despots. Likewise, what possessed Max Weber, the German sociologist who produced perhaps the defining work on bureaucracy, to describe it as "Ideal" when it was a methodology that he clearly hated? When Dee Hock rails against bureaucracy it is like listening to Max Weber talking nearly a century before.

What then of the word "Chaordic"? Let us hope that by the fusion of "chaos" and "order" its uniqueness will ensure that robbers will not want to steal it.

Perhaps we should finish with Weber on bureaucracy, in a rare moment when he lets his objectivity fall: -

"No one knows who will live in this cage in the future, or whether at the end of this tremendous development entirely new prophets will arise, or there will be a great re-

birth of old ideas and ideals or, if neither, mechanised petrification embellished with a sort of convulsive self-importance. For of the last stage of this cultural development, it might well be truly said 'Specialists without spirit, sensualists without heart; this nullity imagines that it has obtained a level of civilisation never before achieved'".

"New prophets"? Dee Hock may just be one. We in this Institute highly recommend this book to all its visitors and even if, like us, you find some of its concepts hard to grasp at the first reading, it's still a damn good read. And it can always be read again when the breadth of Hock's inspired message becomes increasingly more profound.

Noel C. Spare

(The author wishes to thank Ernst C. Glauser of the SDI for his translation and Matthew Cross of the Management Alliance for his helpful comments and suggestions.)

The Competitiveness of European Industry

Can the competitiveness deficit be recovered?

by Ernst C. Glauser

Summary

“Between Europe and its main trading partners and rivals - the USA and Japan -, there exists a recurrent and apparently intractable competitiveness deficit.”

So reported the European Commission to the Special European Council in Lisbon, 23rd to 24th March 2000 [1]. The EU has lower growth than the USA, unacceptably high unemployment and too many of its citizens are excluded from employment. Simply, it is not as dynamic as its main competitors.

Currently, around 10% of the workforce is unemployed (15 million people), poverty and social exclusion are colossal. The Commission estimates that the under use of available human resources and the wider costs of wastage in the economy (including ill-health, crime and related costs) could be between one and two thousand billion ECU per year (12 to 20 % of GDP). This is a cancer at the heart of European society - wasted resources crying out to be more productively used.

The report addresses itself to

- the unused employment potential,
- the unbalance of employment between males and females,
- the service gap,
- the marked regional imbalances of employment,
- the long term structural unemployment,

- the education and skills gap,
- the differences of employment patterns in age groups,
- the development of employment rates in the EU, the US and Japan over the past 40 years,
- suggested measures to remedy the problem.

The Commission suggests the establishment of a sound macro-economic framework, industrial reform, preparation for the knowledge economy and stronger investment in people. Besides the legislative process the Commission recommends the advantages of "Bench Marking" and "Peer Groups".

Nowhere does the report mention that Europe has a pronounced Quality deficit between itself and the USA and Japan and the consequences that this may have on lack of productivity.

The methods for improving productivity are known and are such that everybody can learn them - and they must be learned if Europe is to have a desirable future. Sustainable competitiveness will only be achieved when old-fashioned management practices are put behind us. A fundamentally new way of management thinking is necessary if we are to achieve competitiveness of products and services.

ess of products and services.

There is no more important resource in any undertaking than the creativity, initiative and energy of its people. Some of the most successful undertakings on earth are driven by nothing more. Backwardness and poverty are not compulsory, not least for Europe.

Introduction

The President of the European Commission, Romano Prodi, delivered a remarkable address to the Special European Council Meeting in Lisbon on 23rd to 24th March, 2000, calling for the industrial and social renewal of Europe [1]. The following is a summary of the central themes of this report together with comments and the recommendations for removal of the deficits.

Europe's Employment Potential

Currently, unemployment in Europe is around 10% representing some 15 million people. However, if Europe matched the employment in the USA, then an additional 32 million people would be in work - more than twice as many as those currently unemployed. This is Europe's "full employment potential" (Figure 1). Another comparison is useful:

The 152 million people employed in Europe in 1999 contributed 7'600'000 million ECU to GDP. By comparison in the same year, the 133 million employed in the USA contributed 7'800'000 million ECU to GDP, a per employee contribution 17% higher than in Europe.

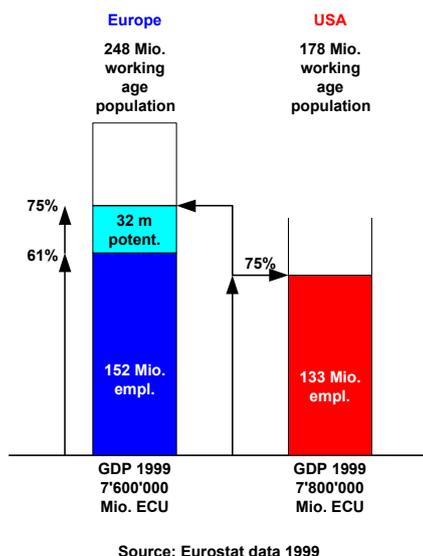


Figure 1 Europe's huge potential for additional employment: 32 million jobs must be generated in Europe in order to reach the 75% degree of employment of the USA. Moreover, the productivity per employee in the USA is 17% higher than in Europe.

The Gender Gap

Another remarkable difference between Europe and the USA lies in the employment levels of women. If the employment levels for European women were as high as in the US then a further 22 million women would be in employment (Figure 2). This is to be compared with the total of 15 million people unemployed in Europe.

The Services Gap

Comparison between the USA and EU of the numbers of people of employment age employed in agriculture and industry are shown to be almost identical. A major difference however, occurs in service industries where 15% more people are employed in the USA than the EU. The difference in the service industries alone would amount to 34 million new jobs in the EU (Figure 3).

Marked Regional Imbalances in Unemployment

EU unemployment is concentrated in Germany, France, Italy and Spain and is highest in the south, outlying regions and declining industrial areas (Figure 4).

Long term structural unemployment is defined as people out of work for more than 12 months.

Figure 4 also shows unemployment levels by country, for people out of work for more than 12 months as a percentage of total

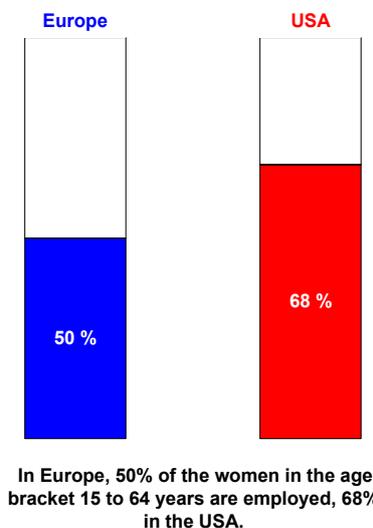


Figure 2 Employment rate of women between 15 and 64 years of age in Europe and in the USA

unemployment. This ranges from 66.3% in Italy to 27.2% in Denmark. For the EU as a whole, 50% of those out of work have been so for more than 12 months.

An Education and Skills Gap

Enquiry shows that Europe has only an extremely modest interest in further education. Paradoxically, it is workers that have the keenest interest in further education but as a rule, this is given less preference than investment in management training (Figure 5).

The other chart (Figure 6) shows how, in the course of the last three centuries, as life expectancy has increased so the development of new technologies has increased even faster.

Our fathers learned a profession that lasted them a whole lifetime. Little more needed to be learned than that which sufficed our grandfathers. These times are past. Not only are technologies changing but also the industrial, social and political climate is changing with breathtaking speed. Our children may have to relearn their skill-sets five to eight times during their professional careers. It is no longer only basic education but new knowledge that must be acquired in order to ensure professional success in the future.

Figure 6 shows clearly, what requirements our school system has to meet. Our descendants must become lifelong continuous learners. Creating a yearning for

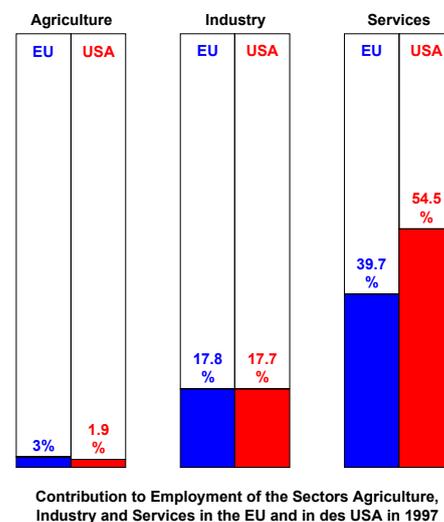


Figure 3 Employment rate in Agriculture, Industry and Service Industries in Europe and in the USA

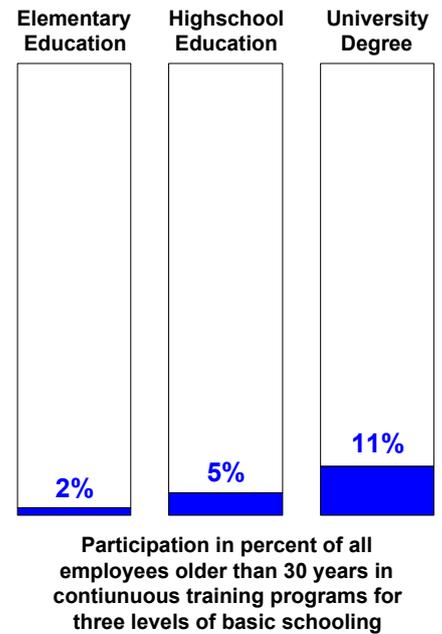
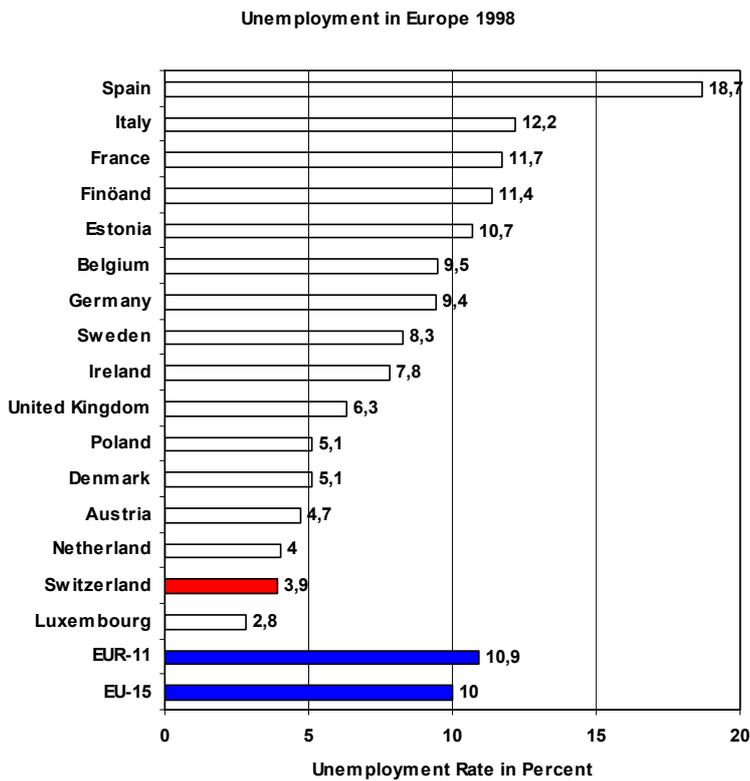


Figure 5 Participation of employees 30 years and older with different levels of education in programs of continuous education and training

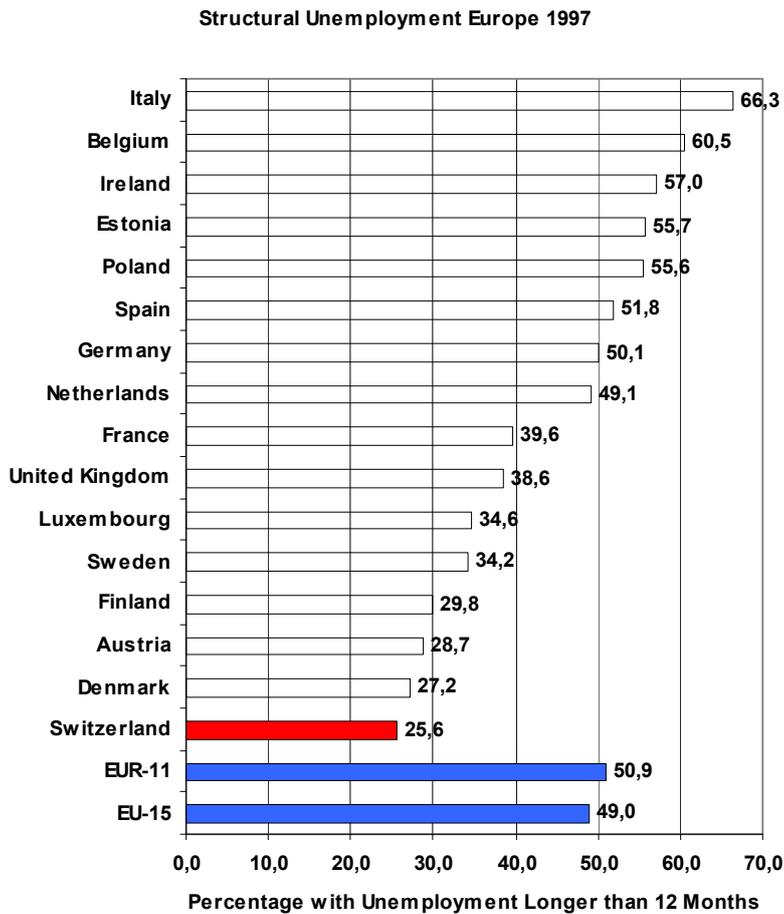


Figure 4 Both unemployment (upper diagram) and long term structural unemployment (lower Figure) vary considerably from country to country.

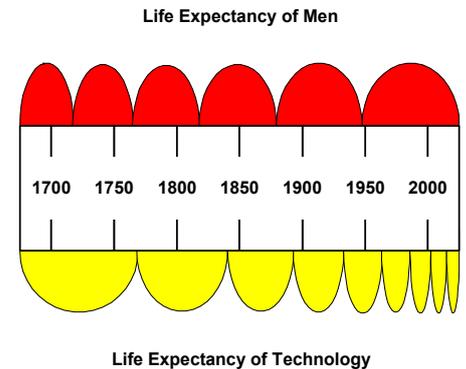


Figure 6 Contrary development of human life expectancy and periods of technological development over the past 3 centuries

learning should be the primary aim of education. An educational system which kills the thirst for knowledge is a menace to a nation's survival. The next generation should, above all, learn how to learn. Our task is to mediate their experiences so that they enhance their learning potential. This may be done in a variety of ways, in a variety of environments (not just a school) and with a variety of subjects (not necessarily existing disciplines). The objective of each interaction should be the same - increase the learner's ability and desire to learn.

It is a puzzle, how Europe, with this attitude to further education, can survive in the globalisation of the future.

Discrepancy in the Age Structure

In its use of human resources Europe looks like a desolate waste. Only for men in the age group 25 - 54 is the exploration of the human potential anything like in the USA. Young people in the age group 15 - 24 have considerably less opportunity for early practical training. As has been said earlier, the potential of women is generally less utilized in Europe than it is in the USA. The situation in the age group 55 - 64 is particularly desperate. Europe has no use for 64% of the people in this category, what a waste of creativity, knowledge, experience and energy!

Comparison of Employment in the EU, Japan and the USA

Figure 8 shows the development of employment in Japan, the USA and in Europe over the last 40 years.

Employment in Japan has maintained consistently high levels of between 70% and 75%. Japan swept the world with products

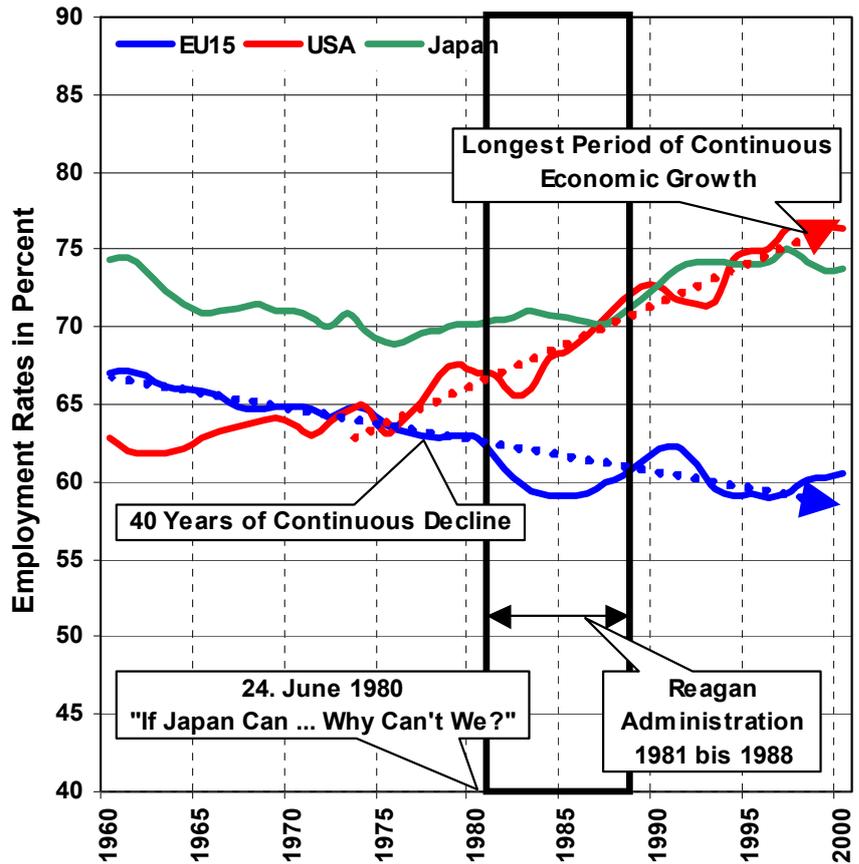


Figure 8 Development of the employment rates in Europe, the USA and Japan from 1960 until 2000 as the measure for a nation's success to reduce unemployment. The reasons for the astonishing growth of employment in the USA is indicated: The emission of the NBC production „If Japan Can ... Why Can't We?“ and the business friendly politics of the Reagan Administration, 1981 until 1988.

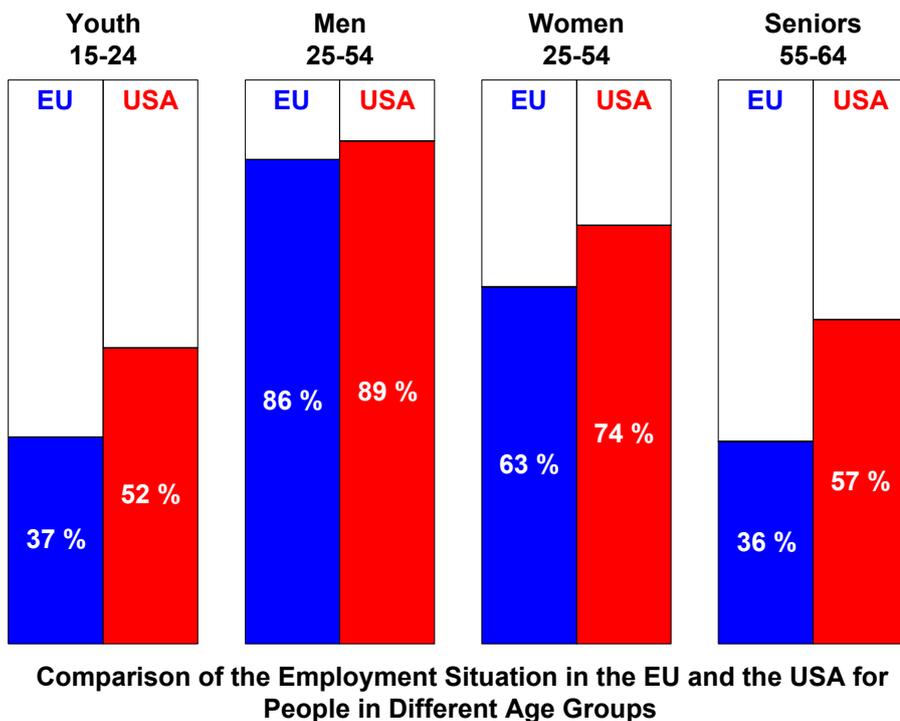


Figure 7 Differences in employment of people with different genders and in different age groups in the EU and in the USA

of superior quality and in consequence put the industries of the USA and Europe into touch. In these 40 years they created an annual surplus of approximately 3% of GNP (1997 appr. 4,8 Billion (10¹²) US Dollars). At the same time, the Japanese share of the total assets of the 50 of the worlds largest banks grew from 18% in 1970 to 27% in 1980 and to 48% in 1990.

The invasion of Japanese products affected America more than Europe. As a consequence, in the 1970's, some of America's key industries were on the edge of ruin and unemployment reached its highest post-war levels. American industry faced a crisis. On the 24th July, 1980 at 09.30 pm. a bomb was detonated. The NBC screened a document film, "If Japan Can ... Why Can't We?" America was shaken out of its complacency and lethargy and W. Edwards Deming became the most sought after management consultant in America. The American public were amenable to the ideas, thoughts and concepts which 30 years earlier had been grasped in the Far East with over-

whelming success but which in other industrial nations had been misunderstood and poorly applied. Until his death on the 19th December 1993 at the age of 93, Deming had carried his message, in the form of his four day seminar, given on average 30 times a year, to the leaders of hundreds of thousands of US companies. America was turned back from recession to an industrial comeback with higher productivity and higher employment. The exceedingly business friendly politics of the USA's 40th President - Ronald Reagan, between 1981 and 1988 was critical for the US business recovery. It is clear from papers in the US Library of Congress that the Reagan Administration heard and understood Deming's message and allowed it to influence its political thinking.

Development in Europe were somewhat different. The invasion of Japanese products was never so strong as to set off a significant quality movement. Little by little though, its traditional markets became eroded by Japanese competition. Even this did not wake Europe from its self-righteous slumber. In 1987 a series of quality standards - ISO 9000 - were released and in 1988 the European Foundation for Quality Management E.F.Q.M. was established. In 1991 the first European Quality award was formulated. Any success for these measures is not recognisable.

Europe's Quality Deficit

The quality of a product or service is not a question of good or bad. The products from Switzerland and Germany were once in big demand world wide because they were better than those from other sources.

The reconstruction after WWII resulted in a big demand for industrial products. Quality was not a question, people bought what manufacturers made. Quality and productivity were considered incompatible. "Quality improvement causes production bottle-necks, higher productivity damages quality".

In the past fifty years world-wide business was totally rearranged. An unexpected player took to the field claiming a bigger share of what was once undisputedly shared among Western industrialized nations. One nation began to dominate the market, not just through innovative ideas, but because they did it noticeably better than the others. The products from Switzerland and Germany were not worse because of that. The demand turned to better pro-

ducts at a lower price. It is a law that all businessmen are aware of.

On 14th October 1931 the symbol for Swiss products was established - the cross-bow, the "trade-mark" for Swiss quality and service. Who knows the meaning of this symbol today? Quality has long since ceased to be the exclusive symbol of Swiss products. The Swiss watch making industry used to be the Crown of Swiss industry but had to learn a painful lesson. It had to learn the revolutionary idea of thinking of watches as fashion accessories and prestige objects.

On Wednesday evening, 9th February, 2000, ARD (Association of the Broadcasting Corporation of Germany) screened a remarkable documentary film with the title "The Fairy-Tale of "Made in Germany" [2]. A newspaper review made the following comments: "At the beginning of the 1990's a study showed that Toyota made their Lexus with the same number of men that Mercedes were using to correct their cars after they had been made. The film showed how German companies with sloppy and expensive procedures and poor customer relations are shunting the previous world champion exporter into a siding". Gunter Ederer shows examples of the top Japanese and American companies and how, through the superior quality of



Figure 10 The Cross-Bow, installed in 1931 to become the „Trade-Mark“ of Swiss superior quality

their products and services they secure markets and create new ones.

The film closes with a little song that says a lot about the situation in Europe and Germany in particular, the text is as follows.

“Good night Germany, only a single star shining, Are you in the descendency too?

Without you, how will our great industrial nation,



Figure 9 The Video Production: The Fairy-Tale of "Made in Germany", a candid and blunt picture of Germany's inferior product an service quality [2]



Figure 11 The Video Production: The Fairy-Tale of „The Customer; the King“, a depressing descriptin of the way customers are treated in German business [3]

*ever find salvation,
from the chaos that surrounds you.*

Good night Germany, when will you understand?

That industrial perfection,

Requires a new direction."

(Liberally translated from the Lyric of Nick Benjamin.)

The Fairy Tale of King Customer was passed on in Germany from generation to generation. Moreover it can be passed on in different ways as the business journalist and the best selling author Günter Ederer demonstrates with examples from Japan and the USA [3].

At the same time, service in Germany is indescribably poor with the market being distorted by subsidies and excessive regulation where the rules are more important than the market. No wonder the customer is not King - only a petitioner.

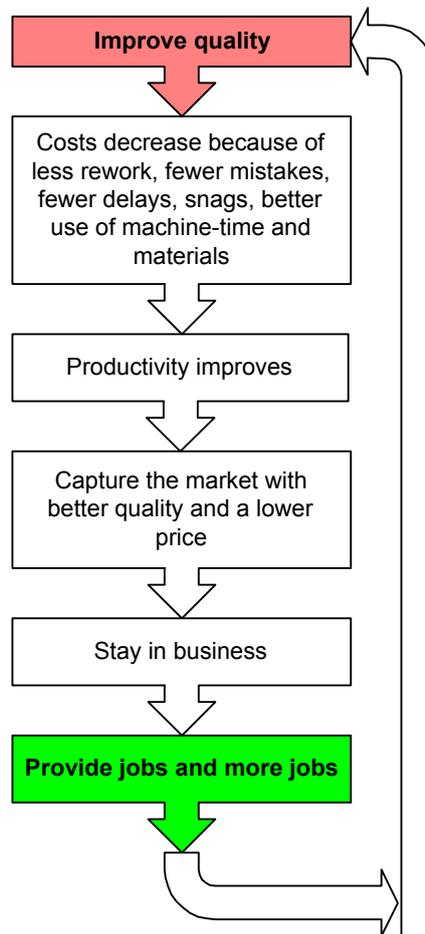
Quality, Full Employment, Prosperity and Peace

It is astounding that the report of the European Commission never mentions the importance of quality of products and services for the restoration of competitiveness of European business. The report says that the following political targets must be achieved:

- Establishment of an inclusive, dynamic and knowledge based economy
- Production of accelerated and sustained economic growth
- Restoration of full employment as the key objective of economic and social policy, and reduce unemployment to the levels already achieved by the best performing countries
- Modernization of our social security systems

A method for achieving these targets was not provided.

An aim without a method is only a pipe dream and will bring nothing. At the beginning of the quality revolution in Japan stood the Deming Chain Reaction and the compelling consequences of quality improvement. At the end of this chain is the creation of jobs or, the removal of the cancer which eats at Europe's heart. In 1950 this knowledge focused the attention of a nati-



[3] Günter Ederer, "Das Märchen vom König Kunde, Service in Deutschland", Video-Production, 44 minutes playing time, Verlag Moderne Industrie, www.mi-verlag.de

Figure 12 Deming's world famous Chain Reaction, which focussed an entire nation back in the fifties on one single goal: to conquer world market with products and services with unrivalled quality.

on with a single aim - to conquer world markets with products and services of unrivalled quality, not as an end in itself but in the interest of full employment, prosperity and peace of a whole nation.

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[1] The European Commission, "The Lisbon European Council - An Agenda of Economic and Social Renewal for Europe, Contribution of the European Commission to the Special European Council in Lisbon, 23 - 24 March 2000", The report can be read from the website of Romano Prodi, http://europa.eu.int/comm/commissioners/prodi/lisbon_de.htm, from where it can also be downloaded as a pdf-File.

[2] Günter Ederer, "Das Märchen vom Made in Germany, Neues aus der Service-wüste", Video-Production, 54 minutes playing time, Verlag Moderne Industrie, www.mi-verlag.de

Turmoil in the Swiss Quality Scene: A Missed Opportunity!

Interview with Prof. Dr. Søren Bisgaard, Professor of Quality Management at the University of St.Gallen

Ernst C. Glauser and Noel C. Spare

Summary

Only after two years of teaching and research at the University of St. Gallen, Prof. Bisgaard left the university and returned to the United States. He surrendered to the abuses and the medieval management style at the Institute for Technology Management ITEM-HSG. With this step the hopes of the Swiss and the European quality community for the contemporary teaching of scientific principles in quality management are set back considerably. After the depressing report of the European Commission towards the competitiveness of European Industry, this would have exactly been the methodology Europe has a desperate need to learn. Professor Bisgaard explains in this interview the reasons for his abrupt retreat and describes his view on the way Quality Management is being taught and practiced in Europe.

The interview is conducted against the background of the competitiveness deficit of the EU as expressed at the meeting of the Special Council of Europe in Lisbon on 23rd, 24th March 2000 [1]. A situation vividly underlined in two videos of television programmes screened by the German broadcaster ARD [2, 3].

High unemployment, "the cancer at the heart of the European Community" will not be alleviated until goods and services are of world class quality. Only quality improvement as expressed by the Deming Chain Reaction will lead to increased productivity, reduced cost, increased market share, survival and the creation of more jobs.

ISO 9000 Quality Standards and E.F.Q.M Assessments are inadequate means of achieving this aim. Certificates and quality prizes are just gimmicks. There is no conclusive proof of the holding of a quali-

ty certificate leading to improved customer satisfaction, higher productivity and the creation of more jobs. Real quality improvement leads to sustainable profitability from improved market position, which alone justifies the effort.

The road to quality always begins with humility, modesty and preparedness to learn the basic principles of quality management, to effect change and leave the old ways behind. Quality demands cooperation within the organisation and between organisations.

W. Edwards Deming said *"Stop fighting against each other for a bigger piece of the pie. Instead, work together to make the pie bigger. Then everybody will win."* What could be achieved in politics if politicians and the political parties adopted this principle in the interest of the prosperity of a whole nation?

Europe needs a scientifically based quality offensive to be brought to all areas of modern society.

Europe's quality and employment problems can be solved but it requires a new management culture and a fundamentally new understanding of the scientific basis for modern Quality Management.

Introduction

On 1st January 1999, Professor Bisgaard took up the seat of Quality Management at the University of St. Gallen as the successor to Prof. Dr. Hans Dieter Seghezzi.

The quality scene in Switzerland was very fortunate to have acquired Prof. Bisgaard being one of a small group of worldwide statisticians and quality professionals. Finally Switzerland and Europe would have a scientific and technological resource for the facilitation of modern Quality Management.

It was a great personal sacrifice for Prof. Bisgaard to give up his life's work and professorship at the University of Wisconsin and move with his wife to St.Gallen. Nevertheless he believed that the challenge of Europe's quality and service wasteland made it a worthwhile sacrifice.

Yet, after two years, the enthusiasm, hopes and expectations have evaporated, only to be replaced by disillusionment, frustration and indignation. Finally, in the face of the abuses of a medieval management style, he was forced to surrender. Poor Switzerland, poor Europe, when the dream of world class quality, prosperity and peace for all, can be brought to nothing by ambition, greed and egoism.

Meanwhile, the household effects of the Bisgaard family wend their way back to the U.S.A. as Prof. Bisgaard finds new challenges to meet.

When the voice from the seat of Quality Management at the University of St.Gallen falls silent, the least we can do in the interests of Quality Management is to bring this matter into the public domain so that we can learn lessons from the experiences of Prof. Bisgaard. Accordingly Ernst Glauser and Noel Spare of the Swiss Deming Institute met up with Professor Bisgaard prior to his departure from Switzerland and the following report is a record of these discussions.



Who is Prof. Soren Bisgaard?

Professor Bisgaard began his career as an Engineer and graduated from the Technical University of Denmark, Copenhagen with a MSc in Industrial and Production Engineering before beginning a long association with the University of Wisconsin in 1980. He studied Statistics and graduated in 1982 with an MSc and was awarded his Doctorate in Statistics in 1985. He became a full Professor of the Department of Industrial Engineering, Manufacturing Systems Engineering and in 1994 the Director of the Centre for Quality and Productivity Improvement at the University of Wisconsin.

He has contributed an enormous body of research and has established a world-wide reputation in the field of applied statistics in the cause of quality and productivity improvement. He is the author and co-author of two books, 35 refereed articles and many other written contributions too numerous to mention. Amongst many Honors and Awards, he became a Fellow of the American Statistical Association in 1997 and was awarded the Wilcoxon Prize in 1998. He has consulted for many of the Worlds leading Corporations and founded the chair of the European Network for Business and Applied Statistics, ENBIS.

He took up the position of Director of the Department for Quality Management and Technology and Professor at the Institute of Technology Management (ITEM-HSG)

at the University of St.Gallen in January 1999.

Questions and Answers

You and your wife are about to leave St. Gallen to settle again in the United States only about two years after your appointment as a full Professor of Quality Management and Technology at the University of St.Gallen. The Swiss Quality community was very happy about your appointment expecting that finally the scientific approach to quality would be taught in Switzerland. Your sudden decision raises many questions. What made you leave your tenured academic position at the University of Wisconsin in order to take up the teaching assignment at the University of St.Gallen in the first place?

Several years ago my predecessor, Professor Seghezzi, came to Madison, Wisconsin, to encourage me to apply for his job once he retired. At that time I said no because I was very comfortable in my job at University of Wisconsin-Madison. Then a few years later I met Professor Seghezzi at a conference and he again encouraged me to apply for his job. After some discussion with my wife, I decided to visit the University of St. Gallen. By this time Professor Seghezzi had retired and the negotiations were held with Professor Boutellier, the leader for the Institute for Technology Management (ITEM-HSG) and Professor Schuh.

I was in particular encouraged by Professor Boutellier's vision for the institute. Upon my return to the United States I talked over the situation with my wife and we agreed to accept an invitation from Mr. Boutellier to come for a second visit to St.Gallen. During this weeklong visit, we perceived an opportunity to make a real difference in Europe and were very encouraged.

In my negotiations with Professor Boutellier we discussed several times a vision of making ITEM a leading European research institute for Technology Management. A recurring theme in our discussions was that my approach to Quality Management was different from ISO 9000, the prevailing approach to Quality in Europe and Professor Seghezzi's teaching. In fact, I said to Mr. Boutellier, "are you sure you want someone like me?" His response was that it was precisely because I represented a different approach to quality management that he and Professor Schuh wanted me to take over the chair of Quality Management. Both

Mr. Boutellier and Mr. Schuh said it was time for a change and that they needed an approach focused on improvement and competitiveness and not the endless bureaucracy, certification and quality assurance characteristic of ISO 9000.

This all sounded interesting to me and the kind of challenge I like. After almost 20 years in United States, I had still maintained my Danish citizenship and felt very much as a European. To try to help Europe at this critical time of integration and free market economy to become more competitive sounded to me like something I wanted to be part of. Moreover, during the red carpet reception we received, I was let to believe that ITEM had a strong, coherent team of faculty, staff and students that were all behind a vision of creating a leading European research center for Technology Management including Quality Management. With my wide international network of professional connections, my research record, my consulting experience with leading companies such as Hewlett Packard, Lucent, Philips, Glaxo, General Motors, Ford and Chrysler, and my previous experience as the Director of the highly regarded research Center for Quality and Productivity Improvement at University of Wisconsin, it seemed very feasible to create a world class research center at University of St.Gallen. I had learned a great deal about research and the business and management of research during my more than 15-year of close collaboration with Professor George Box in Madison and felt ready for this challenge.

What Objectives and Goals did you set fourth when accepting your new position and by what method did you want to accomplish them?

My vision and objectives were broken down into four main elements:

1. To establish St.Gallen as one of the worlds leading research centres for Quality management and Technology.
2. Attract the best students from all over the world to St.Gallen.
3. Interact with the worlds leading scholars in the field.
4. Promote and develop sustainable cooperation with Swiss industry.

The implementation of these ambitious objectives would be built on three pillars:

1. Work on issues within the University and in particular on the ITEM in-

frastructure. I felt a need for developing a new curriculum at the university to teach the students about modern quality management principles both in overview form for a large cross section of students and in depth for students with specific interest in quality. I also wanted to introduce the students to the power of industrial and business statistics. I wanted to establish a weekly research seminar as a main forum for discussion on research and collaboration with the students. Further I wanted to establish a research library, a technical research report series and work with students, staff and faculty on publishing in international refereed journals. I also wanted to create a web page and a brochure for ITEM in English, publish the institute's annual report in English and schedule international workshops and seminars.

2. To work within Switzerland, I wanted to establish contact with the Swiss Quality Society and begin consulting and research contracts with Swiss industry.
3. Internationally, besides my close contacts with scholars in the US, I was invited to collaborate with quality professionals from all over Europe and in particular with an international team - the European Network for Business and Industrial Statistics, ENBIS (for more see www.ibisuva.nl/ENBIS). This is an organization with now well over 280 members from more the 20 countries and still growing. A primary purpose of this latter initiative was to encourage the use of statistics for quality improvement in European business and industry.

Why did things finally not turn out as expected? Was it the University, the student body or what you were expected to teach that made you take this drastic decision?

No, No. The students at St.Gallen are very good, eager to learn, internationally inclined and hard working. I have only had very good experiences with them! Neither was it the University of St Gallen or the teaching body. I suppose your direct question requires an honest answer.

The problem was with the institutional culture of ITEM-HSG. Without going into too many details, it was the classic organizational problem of a sick body rejecting a healthy heart. Things began to go wrong

from the very first day when Prof. Boutellier told me that he had already taken the job as CEO of SIG (Schweiz Industrie-Gesellschaft, Neuhausen). Since he was the person I had negotiated with and clearly the intellectual leader of ITEM-HSG, this was a major blow. It was soon apparent that in the Institute there was no open culture of cooperation and Prof. Schuh opposed every change that might impair his consultancy activities.

Things, however, turned from bad to unacceptable with the politically motivated appointment of Mr. Fritz Fahrni, former CEO of Sulzer, as professor and administrative head of ITEM-HSG. It was soon clear that there would be no democratic leadership of the Institute and he wanted me to teach the management philosophy of my predecessor. In fact, soon after he started, he and Mr. Seghezzi called me to a meeting and warned me in no uncertain terms that , "I would have a lot of trouble" if I did not. Thus I was now expected to compromise my beliefs, for which I had given up my successful life in the USA, and teach a philosophical approach to quality management that was a complete anathema to me. I felt like Galileo Galilei in front of the Pope!

Ironically the very Institute chartered with teaching future generations of managers about quality management applied none of it to its own operation. It is an ancient academic tradition that professors are all equal, do not order each other around and have the kind of academic freedom and independence I enjoyed at the University of Wisconsin. A further problem was that whilst I had responsibility for carrying out reareach projects, I was not allowed to choose my own co-workers. I had not given up my professorship in the United States to bow down under the constraints of a medieval system.

Now I am telling you this, not because of what happened to me. I will find another job. I am in the world market and have a choice. It is now all history.

The important point is that Switzerland is not well served by what is going on here. Switzerland's future depends on new generations of bright young people attending the university eager to learn and becoming good managers. Nineteen-century style dictatorial management is not a good example to teach and not conducive to research.

In particular, I am seriously concerned about the many young doctoral students

that are caught up in an abusive environment but too scared to speak up and not learning what they could. As a Quality professional trained in diagnosing quality problems, I feel obligated to bring these observations forward. Sweeping unpleasant bad news under the rug will only perpetuate the problem. To succeed in the modern competitive world economy, intellectual assets are important. To manage these requires a modern, open, fair and democratic management environment, not the command-and-control approach of the past.

This is indeed a shocking picture. Where do you think we are going wrong in the way quality is being taught in Europe in general and in St.Gallen in particular?

To answer the latter part of your question first, I think that somewhere in the upper administration at St. Gallen there must be a positive appreciation for quality. Otherwise I don't think I would have been hired in the first place. The problem lies in the management of ITEM and its politically motivated agenda.

Now to provide an answer to the first part of your question, I think the current way quality is taught in most parts of Europe with a heavy emphasis on certification and auditing and not focusing on genuine improvement is getting what it deserves, namely superficial interest from upper management. We, as quality professionals, need to show management at all levels that a real understanding of quality is worthwhile. The real quality award is not some government sponsored Quality Medal or certificate. These are just gimmicks. Bottom line profitability and improved competitive position is the ultimate quality award. It is surprising to many, but you can actually reduce cost and improve quality at the same time. This sets off the Deming Chain Reaction leading to sustained profitability and the creation of jobs. That is what the Japanese did and what leading American and a few progressive European companies have done by pursuing a strategy of scientific quality improvement.

You are aware that The European Union tries hard to compete in world markets. In 1987 the family of ISO quality standards was first issued and presently a totally revised standard ISO 9001 - 2000 is being published. In 1991 the European Quality Award was set up and respective prizes are being awarded annually since 1992. Despite all these efforts, Romano Prodi presented the following discouraging analy-

sis of the present state of the European economy to the Special European Council in Lisbon, March 23 to 24, 2000:

"The EU's growth rates have consistently been less than the US, unemployment remains unacceptably high and too many people are excluded from society. The European economy is simply not as dynamic as some of our major competitors. At present, around 10% of the European workforce (15 million people) is unemployed. The costs of underemployment, poverty and social exclusion are colossal. The Commission estimates that the under-use of available human resources and the wider costs of wastage in the economy (including illness, health, crime, and related costs) could be between one and two thousand billion Euro per year (12 to 20% of GDP). These are cancers at the heart of European society, wasted resources crying out to be more productively used."

What is wrong with good old Europe? What has to be done to reverse this trend and return to technological leadership, high productivity and social welfare?

Yes, I think the productivity issue is a serious problem and tragic, of course, for the millions of people that are unemployed. Management of both public and private European organizations still largely ignore fundamental aspects of the philosophy behind modern quality management that helped the Japanese conquer large world market shares in electronics and automobiles and played a crucial role in the return of the US economy to the longest period of steady growth in the early eighties.

Frankly, part of my motivation to come back to Europe was to provide, as best as I could, a helping hand to try to change this situation. Part of the answer is a scientific approach to quality improvement. The tragedy is that the ISO 9000 series of quality standards represented a noble effort launched with good intentions. However, it did not work and many of us predicted that already back in the mid 1980's when the draft standards were circulated. Certification, documenting procedures and so on does not necessarily lead to improvement of productivity and quality. At best it may serve as a minimum. But most often ISO 9000 is used to codify the current, not necessarily very good way of doing things and in practice there is little if any emphasis on improvement, satisfying customers and reducing costs. It is a command-and-control system that stifles innovation and a genuine quality spirit. Indeed it often

breeds a cynical attitude towards quality. Instead of satisfying the customers with better products and services, the effort frequently is entirely focused on satisfying the auditors.

Just like a new drug is tested before it is marketed, a scientific approach would demand empirical evidence from a pilot study showing significant benefits of ISO 9000 before the system was implemented on a broad scale. That never happened! There exists to the best of my knowledge no empirical evidence showing that companies using ISO 9000 standards have more satisfied customers, greater market share or have created more jobs than those that did not. Modern quality improvement as developed over decades in Japan and United States under the philosophical leadership of Dr. Deming, Dr. Juran and Dr. Ishikawa on the other hand have been tested again and again and has shown significant evidence of results. The Six Sigma movement, popular these days in United States and promoted in particular by Jack Welch, the high profile CEO at General Electric, incorporates major elements of this philosophy and has shown empirical evidence of bottom line results.

The late Dr. Deming said many times, "Quality cannot be installed" - What did he mean by that?

You can buy a new computer, install it and immediately draw benefits from the use of it. Quality does not work that way. Fundamentally, it requires a mindset and a deep understanding of quality management philosophy - in many ways a cultural change.

For example, coming back from the United States a few months ago, Swissair lost my suitcase. The next morning they woke me up at 7:00 am triumphantly announcing that they had found my luggage and were going to bring it out between 10:00 and 11:00 am. By five o'clock that afternoon, not being able to leave the house and after several phone calls to Swissair, the driver called and told us he could not find our home, mind you situated right in the centre of St. Gallen on a major street. "I am at the Esso filling station, can you collect me from there?". I collected the suitcase myself from the entrance to the station's shop.

Now who is to blame? The driver of course! No, that is fundamentally the wrong answer. If anyone is to blame it is the Swissair management. They hired a driver but did not give him a map and did not teach him how to do his job. They could have provided him with a GPS system. Quality

is not like plugging in a computer, it needs a new way of thinking, a new way of managing and a transformation of the prevailing management culture.

The, so-called, "Quality Movement" began in Japan in the 1950's; are there any of the essential features of that movement you feel we have not yet benefited from in Europe? If so, are they still relevant to 21st century organisations?

Absolutely! I would even say that quality will be more important in the future than it has been in the past. In a free market economy, well-informed customers have the freedom to choose their suppliers worldwide and will with the modern information technology know the market price. Quality will therefore be the key competitive factor. The essential feature missing in European discussions of quality is a focus on improvement of quality. ISO 9000 is essentially a defensive and bureaucratic approach focusing on quality assurance, maintaining status quo and often practiced by inspection. That is expensive and ineffective. Quality is not about inspection! And I don't think the ISO 9001 - 2000 is going to do anything but providing the consultants an opportunity to come back and charge a fee once again for a new certification (known in the trade as "double-dipping").

EFQM's approach, focusing almost exclusively on assessment also appears misguided. Assessment is only a small part of quality management. Focusing exclusively, as EFQM appears to do, on teaching people how to make elaborate audits, allocates too many resources to something that is only a small part of quality management. Instead a major part of the resources should be devoted to teaching how to improve, and specifically how to diagnose and solve problems that eventually result in satisfied customers, lower costs and a better competitive position.

The Japanese and the Americans have focused much more on improvement and on providing people with skills on how to improve. There is little emphasis on using statistical methods for improvement in Europe. I think that is a major mistake. That is why we started ENBIS. Statistics provide a powerful set of tools that with the internet based information explosion and easy-to-use software provides enormous potential for improving quality and customer satisfaction, reducing costs in traditional manufacturing as well as service.

What do you think are the major new are-

as for development of quality principles?

I think we live in a very exciting time. Quality in service and in particular information service is an important area. About 75% of the economy of modern societies, and in particular in Switzerland, is service and the quality and productivity of these have a great potential for improvement. Another area that I have been doing research in is in construction quality. Again, there is a large potential for improving current practices to the benefit of society.

After everything you have said, what advice would you give to European managers on what they should do to achieve sustainable growth of their companies thus providing more and more jobs to solve the most crucial problem of Europe?

Let me first say that I believe that there are real fundamental reasons behind the dramatic devaluation of the Euro we have witnessed over the past two years. One reason is poor productivity and its close companion, poor quality. So what should we do?

I think quality improvement initiatives provide the highest return on investment any manager could engage in. Internally within companies, the efficiency of operations can be greatly improved by reducing scrap, rework, waste, unnecessary delays, snags, excessive inventory and work in progress. As a result great savings can be achieved. Externally the customers will be delighted and purchase more from us. This should be followed up by aggressively investigating what the customers want in terms of product and service features. Thus both the top line and the bottom line will be improved, the company will be able to grow, prosper and provide more jobs. This is the Deming Chain Reaction all over again.

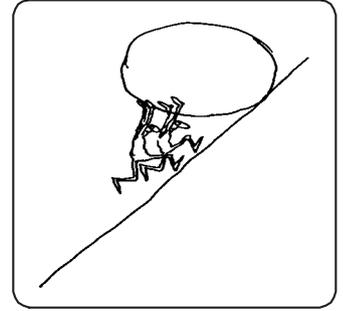
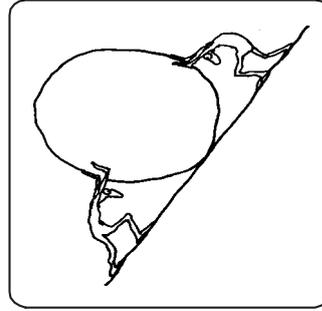
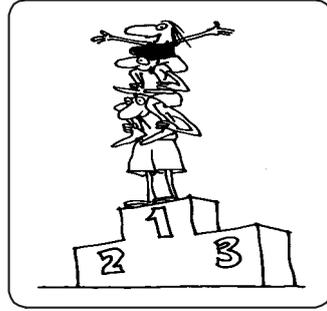
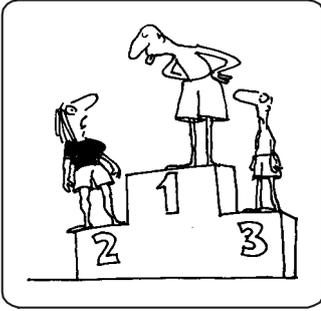
Now to get started on this I think managers will have to very carefully study the fundamentals of the quality management philosophy I referred to above. Many think they already understand. Most often however, they essentially display an attitude of command-and-control (... "if just the damn workers would do as I say") combined with an inspection mentality. Quality improvement is about defect prevention and about designing better products and services. It all starts with a humble attitude, modesty, willingness to learn and with asking how we can serve our customers better. It is then brought upstream all the way to the design of new products and services.

To be successful requires that the people from top to bottom in an organization are educated in quality tools, concepts and principles. Further it requires company wide cooperation and genuine collaboration. It even goes beyond that. Companies in the entire supply chain need to collaborate. Cooperation within organisations and between organisation is necessary. As Deming said, *"Stop fighting against each other for a bigger piece of the pie. Instead, work together to make the pie bigger. Then everybody will win."* What could be achieved in politics if politicians and the political parties adopted this principle in the interest of the prosperity of a whole nation?

We need conferences and workshops in Europe that stress this more progressive customer focused scientific approach to quality improvement. I believe that Europe's productivity and unemployment problems can be solved, but it will require a cultural transformation and a change in how we approach quality management.

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Cooperation Instead of Competition

Summary by Ernst C. Glauser

The report below represents a summary of the book by Alfie Kohn,

“No Contest: The Case Against Competition; Why we lose in our race to win”

“No Contest”, which has been stirring up controversy since its publication in 1986, stands as the definitive critique of competition. Drawing from hundreds of studies, Alfie Kohn eloquently argues that our struggle to defeat each other -- at work, at school, at play, and at home -- turns all of us into losers.

This book supports the conviction of W. Edwards Deming which appears in one of his best known quotes:

"Stop fighting for a bigger piece of the pie. Instead cooperate to make the pie bigger. Then everybody wins."

Selected Recognitions

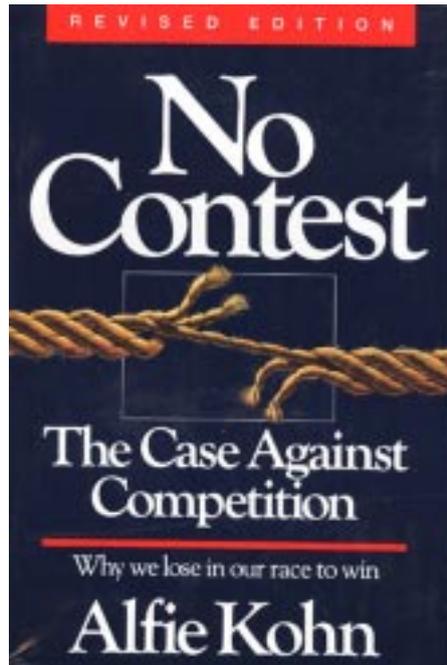
"We have been in prison from wrong teaching. By perceiving that cooperation is the answer, not competition, Alfie Kohn opens a new world of living. I am deeply indebted to him." (W. Edwards Deming, management consultant)

"A really impressive piece of work. Challenging and thoughtful, it reaches to the heart of many problems of our social life and the ideology that constrains and distorts it." (Noam Chomsky, professor of linguistics, Massachusetts Institute of Technology)

"A brilliant debunking of America's most sacred cow. Kohn demolishes the myths of competition decisively and irrefutably." (Philip Slater, sociologist, author of *The Pursuit of Loneliness*)

"Well researched and sound, *No Contest* exposes erroneous assumptions about the inevitability and value of competition. This book . . . deserves our attention." (Carl Rogers, psychologist)

"Alfie Kohn marshals the evidence that



Revised Edition, Houghton Mifflin Company, Boston and New York, 1986, 1992

[competition] is not the main spring of achievement in industry, the arts, education, or games." (Dr. Benjamin Spock, pediatrician)

"No Contest has already changed the way many of us think about competition. The second edition is even better, with a new chapter on cooperation in the classroom that is thorough, informative, even brilliant. Anyone who cares about education and children will find reading this book a necessity; it will reframe the educational debate. Even people with years of experience as educators and researchers will be challenged by this book - as I was." (David W. Johnson, Cooperative Learning Center, University of Minnesota)



Alfie Kohn

Alfie Kohn writes and speaks widely on human behavior, education, and social theory. In addition to *No Contest*, he is the author of *The Brighter Side of Human Nature: Altruism and Empathy in Everyday Life* and *You Know What They Say. . . : The Truth About Popular Beliefs*.

His articles have appeared in *The Atlantic*, *The Nation*, *The New York Times*, and dozens of other popular magazines and academic journals.

A former teacher, he now lectures at universities and to teachers, managers, and parents across the country.

Kohn was educated at Brown University and the University of Chicago. He lives in Cambridge, Massachusetts.

Summary

- "We need competition in order to survive."
- "Life is boring without competition."
- "It is competition that gives us meaning in life."

These words written by university students capture a sentiment that runs through the heart of Europe and the USA and appears to be spreading throughout the entire world.

To these students, competition is not simply something one does, it is the very essence of existence. When asked to imagine a world without competition, they can foresee only rising prices, declining productivity and a general collapse of the moral order. Some truly believe we would cease to exist were it not for competition.

Alfie Kohn, author of "*No contest: The Case Against Competition*", disagrees completely and at the same time rejects one of the most cherished "Sacred Cows" of Western economies. "*No Contest*", which has been stirring up controversy since its publication in 1986, stands as the definitive critique of competition.

Drawing from hundreds of studies, Alfie Kohn eloquently argues that our struggle to defeat each other -- at work, at school, at play, and at home -- turns all of us into losers.

Contrary to the myths with which we have been raised, Kohn shows that competition is not an inevitable part of "human nature." It does not motivate us to do our best (in fact, the reason our workplaces and schools are in trouble is that they value competitiveness instead of excellence.) Rather than building character, competition sabotages self-esteem and ruins relationships. It even warps recreation by turning the playing field into a battlefield.

"*No Contest*" makes a powerful case that "healthy competition" is a contradiction in terms. Because any win/lose arrangement is undesirable, we will have to restructure our institutions for the benefit of ourselves, our children, and our society.

Competition is a product of the antisystemic thinking pretending that total performance of an entity is the sum of the performances of its parts. In systems this is no longer true. The performance of a system is the product of the interactions of the components, which can shown to be

always better than the sum of the individual contributions. Competition destroys and cooperation activates the full potential of systems.

Managers are invited to throw over board long held prejudices and consider the well founded arguments presented by Alfie Kohn. The book may hurt at first, but give it a chance to learn for yourself, whether it does not change your world and your relationships for the better.

Introduction

Vince Lombardi, American sports icon, head coach of the first two Super Bowl champions, and the man for whom the Super Bowl trophy is named, may be best remembered for saying:

"Winning isn't everything; it's the only thing."

This quote has become the rallying cry for our competitive society.

What is not widely known is that Lombardi regretted ever having made that statement. He said about it:

"I wish to hell I'd never said the damned thing. I meant having a goal.... I sure as hell didn't mean for people to crush human values and morality."

Kohn wants the readers to examine, perhaps for the first time, the long held, culturally endorsed belief, that competition is good and competitiveness is a virtue. This may be a difficult thing to hear. Humans have been trained not only to compete but to believe in competition. Some may feel angry. They may feel attacked. They may have defined themselves with pride as "a competitor". They are accomplishing what society urges them to accomplish. They may see a challenge to the value of competition as a challenge to their own value.

Some people may be afraid of a challenge to the value of competition. Whether or not they are comfortable with or believe in competition, it is what they are familiar with and a challenge to the known often raises a fear of the unknown.

Some people find joy in a challenge to the value of competition. They may have been uncomfortable with competition but, because of societal pressures, considered themselves abnormal for not accepting and valuing competition.

Definition of Competition

Kohn defines competition as any situation where one person's success is dependent upon another's failure.

Put another way, in competition two or more parties are pursuing a goal that cannot be attained by all. He calls this "**Mutually Exclusive Goal Attainment**" (MEGA).

Kohn goes on to define two distinct types of competition. In "structural competition" MEGA is an explicit, defining element in the nature of the interaction. For instance in a game of tennis there can be only one winner. The same is true of beauty contests, presidential elections, and wars. Everyone knows they are out to beat the others though the rules of engagement may vary considerably between events.

"Intentional competition" is a state of mind, an individual's competitiveness or his proclivity for besting others. Anyone can go to a party determined to establish him or herself as the most intelligent, the most attractive, etc. Similarly, in school, the work place, and on teams people can try to beat others whether or not anyone is formally keeping score and declaring winners and losers.

One place where competition cannot exist, according to Kohn, is within oneself. Such striving to better one's own standing is an individual, not interactive matter; it does not involve MEGA. Of course some people cannot imagine pushing themselves without the possibility of "winning" or the threat of "losing", but this by no means implies that all motivation is dependent upon competitive frameworks. Throughout history countless large and small accomplishments have been achieved simply out of an individual's desire to do better without any thought of beating others. Such striving for mastery cannot be confused with competition.

The Case for Competition

The case for competition rests on the following four myths:

- Competition is unavoidable (it is human nature).
- Competition is more productive than other forms of social interactions.
- Competition is more enjoyable than other forms of social interactions.

- Competition builds character and self-confidence.

Of the three approaches we can take to reaching our goals, working independently, competitively, or cooperatively, it will be shown that cooperation is the most successful, psychologically healthy and conducive to liking one another.

Myth Nr. 1: Competition is Human Nature

This is the standard argument for the status quo. This argument removes freedom of choice and any possibility of debate. It is the argument that has been used in the past for racism and for sexism, and is the one used today for speciesism. What is most interesting about this position is that no case has been made for it. The claim rests on appeal alone.

The opposing position, that it is not human nature to compete, has several arguments to support it.

Cooperation is included in the idea of society.

The vast majority of human interaction is not competitive but cooperative. The tendency to cooperate has been found among toddlers and infants suggesting that if we are genetically competitive we are also genetically cooperative.

Natural selection does not require competition.

To be fair, since humans overlay our physiology with the powerful influence of culture, strictly looking at natural selection is inadequate. However, it is suggestive. Consider what the following zoologists have said about natural selection:

Stephen Jay Gould: "The equation of competition with success in natural selection is merely a cultural prejudice."

George Gaylord Simpson: "Struggle is sometimes involved, but usually it is not, and when it is, it may even work against rather than toward natural selection."

Marvin Bates: "This competition, this "struggle", is a superficial thing, superimposed on an essential mutual dependence."

Mens view of competition is projected to the rest of the natural world.

We tend to misuse the word and describe as "competition" the phenomena of one species displacing another in a particular environment when the former species is or becomes better adapted to changes in that

environment. It doesn't occur to us that animals tend to live in cooperative groups despite the much greater risk of spreading infections and the much greater demand on resources.

Petr Kropotkin: "...competition...is limited among animals to exceptional periods.... Better conditions are created by the elimination of competition by means of mutual aid and mutual support... "Don't compete!-competition is always injurious to the species, and you have plenty of resources to avoid it!"

That is the tendency of nature, not always realized in full, but always present. That is the watchword which comes to us from the bush, the forest, the river, the ocean. "Therefore combine-- practice mutual aid!..." That is what Nature teaches us."

Our View of competition was imposed to us by society.

We are competitive, not because we were born that way, but because we learned it. That is the conclusion of the great majority of theorists and researchers. We've learned competition: Through school where cooperative effort is equated with cheating and we use the word "cooperation" to mean "obedience". "You're not being very cooperative!" Schools enforce these structures and meanings even though when given a choice, students of all grades choose cooperative games over competitive ones and grading for cooperative effort.

In the nuclear family, we make our children compete for our attention and our love as we had to compete for that of our parents. "Who's daddy's best little girl?" We get in win/lose struggles with our children who are trying to find and understand limits. We often know better than they what is best for them, and we often convey it in a dictatorial fashion. We get our way --we win-- the child perceives it as a loss. Those two learning environments, school and family, cover most of our formative years.

Our View of Competition is self-perpetuating.

Competition is with us not because it has to be but because it is self-perpetuating. Any mode of social interaction breeds more of itself or it ceases to be a mode of social interaction.

Some psychologists, following Martin Hoffman, believe humans have an inborn "empathic distress" response. This is even seen in newborns. Two day old infants in hospital nurseries often become agitated and cry at the sound of another infant's

cry, much more so than at other sounds. Empathic distress is so unpleasant that children are driven to help others in order to reduce it.

If competitiveness was human nature, we wouldn't find non-competitive societies -- but we do! Many sub-Saharan African, East Asian, and Native American Indian societies were and are non-competitive. In fact, ours is a uniquely competitive culture. The United States is the most violent industrial country.

Margaret Mead, in *Cooperation and Competition Among Primitive Peoples* concluded:

"Competitive and cooperative behaviour on the part of individual members of a society is fundamentally conditioned by the total social emphasis of that society... That is, competitiveness is not nature but nurture. It is not the presence or absence of resources that determines a society's competitiveness, but its cultural norms."

We can conclude that competition is not necessary! The next question is, "Is it desirable?"

Myth Nr. 2: Competition is More Productive than other Forms of Human Interactions

The obvious futility of wasting one's energy preventing another from winning provides the starting point for Kohn's critique of competition's contribution to productivity. "Good competitors" don't see themselves as wasting energy in thinking about another's performance, but considerable research evidence suggests that they may be.

In the late 1970s and early 1980s a team of researchers at the University of Texas set out to identify the personality characteristics that correlated with the highest levels of professional performance. They reasoned that striving for mastery, a positive attitude toward work, and competitiveness would all correlate positively with achievement.

When the first study was run with Ph.D. scientists (achievement measured by how often their published papers were cited) the results were surprising. High levels of mastery and work orientation were found among the highest achievers, but these top achievers showed low levels of competitiveness.

To test the result, many more studies were conducted, each time using a different sample of subjects (businessmen, college students, airline reservation agents, and grade school students), and each time the same result was found. Competitiveness consistently correlated negatively with achievement. That is, those high in achievement were low in competitiveness.

But beyond the analysis of individual differences, a more important issue concerns whether competitive or cooperative structures draw out the best work from those within them.

Here again the research evidence runs contrary to popular assumptions. Kohn cites one review of 109 studies on the question: "Sixty-five studies found that cooperation promotes higher achievement than competition, eight found the reverse, and 36 found no statistically significant difference."

What we learn from these studies is that intentional competition is associated with lower performance.

A study showed that women are better managers, better bosses, because they are less competitive. They are leaders, team players, colleagues, facilitators, employee advocates and consensus builders. They treat the men and women who work for them as equals. They don't use power to control others. They listen. They encourage. They nurture.

In sum, to change the competitive nature of society will require a major step in consciousness. It is one thing to say "I don't like competition," and it is quite another to root out its origins within the psyche and to change our structures of work and play.

If these changes are to constitute the foundation of the new age, Kohn's book could be a tremendously useful tool in the work ahead. It provides a clear mirror within which to see unchallenged popular assumptions about life. It invites the reader to build a new society in thought and deed.

Why does competition fail? One reason it fails is because trying to do well and trying to beat others are two different things and they are experienced differently. Success in achieving a goal does not depend on winning over others just as failing to achieve a goal does not mean losing to others.

Competitive success is an extrinsic motivator and extrinsic motivation undermines intrinsic motivation.

Did you ever have something, maybe a hobby, that you enjoyed doing then somehow an extrinsic motivation became tied to it? Perhaps people started paying you to do it. Did it start to become less fun? Did your performance suffer?

Extrinsic motivation negatively impacts long-term performance. High performing individuals are intrinsically motivated.

High performance is voluntary. You cannot beat high performance out of someone with a stick nor tempt it out with a carrot. It is the fire in the belly, the inner drive that leads to high performance.

The performance of systems exceeds the sum of the performance of the elements. It is the product of their interactions. Closely cooperating teams, therefore, always outperform competing individuals. Cooperation enables coordination of effort and division of labour. In a cooperative environment, it is safe to explore problems, take risks, and play with possibilities.

Myth Nr. 3: Competition is More Enjoyable than other Forms of Human Interactions

Kohn begins his examination of competitive games by defining "play": something that is all about process, where outcomes matter not at all.

The master aphorist G.K. Chesterton perfectly captured the spirit of play when he said: "If a thing is worth doing at all, it is worth doing badly."

Obviously this notion of play is directly opposed to the spirit of sports today.

We "play to win" -- without the slightest sense of the contradiction inherent in the phrase.

Play is a voluntarily chosen, pleasing activity. It is an end in itself. Play frees us from seriousness. Results do not matter if we love what we are doing for its own sake.

The wit G.K. Chesterton said; "If a thing is worth doing at all, it is worth doing badly." Think about it. If a thing is worth doing at all, stop--end of clause. It is worth doing. It is worth doing good, bad, or ugly. It is worth doing, we just said it was. Play is like that. Activities we love doing for their own sake are like that.

If we associate rules with an activity, that activity becomes less playful. If it becomes product-oriented or otherwise extrin-

sically motivated, the activity is no longer play.

Bertrand Russell wrote: "It is not only work that is poisoned by the philosophy of competition, leisure is poisoned just as much."

Competition, structural or attitudinal, involves extrinsic motivation. Winning is the goal and rules are defined to determine who wins. Our leisure, when we compete, is no longer play.

Myth Nr. 4: Competition Builds Character and Self-Esteem

Research has exploded the claim that competition builds character.

Studies have found: While people look to competition to help them feel good about themselves, the research shows it doesn't work.

Why not? Competition fails to allay the self-doubt that gave rise to it because: In practice, most people lose. In most competitions in which we are involved, there are more losers than winners. Further, when we lose, we lose big since most competitions are public events. The more important winning is, the more destructive losing will be. Our society places high importance on winning. We equate losing with being a loser, and being a loser is about the worst thing you could be.

Even when we win, victory is never permanent. It is a shaky ground on which to base our self-esteem.

Winning doesn't establish competency. We can win a competition in some area, but not be competent in what we did and maybe we know we aren't competent. If others complement or recognize us for this win, we feel in some way we are lying to them. We won but we didn't do well. This sense of dishonesty negatively impacts our self-esteem.

Being number 1 with respect to a quality can never satisfy the need for which it stands. That is, we want to be assured we are fundamentally good. Temporal success in one area doesn't do it.

Society presents us with a cure-all for our neediness. Winning! If you could win, if you could be number one, you'd be popular, sexy, successful, acclaimed. Anything you could ever want.

Fortunately, by its very nature, competition limits the number of people who could

find their high in it. If you lose often when you compete, as many people will, you won't likely keep coming back to it and find yourself in the downward spiral of addiction.

Unfortunately, many of us find a vicarious thrill living through the competitive success of our sports heroes and heroines. It feels safer, we have less at stake when we are fans rather than competitors. So we fund and perpetuate this poison that is competition even though this once-removed competitiveness suffers from all the problems we have been describing.

Now let's consider another unattractive aspect of competition; its link with cheating.

Pick a field in which people are competing and we'll find there are people going outside the boundaries:

In sports, both pro and "amateur" we find steroids, point shaving, recruitment violations, little leaguers using false ages and addresses.

In politics we find smears, bribes, illegal contributions, spying, lying, wiretaps.

In business we find bribes, sabotage, price fixing and an explosion of corporate greed beyond anything that could have been imagined just a few years ago. Manager greed lost any connection to reality and turned into a competitive game for managers to see, who could squeeze more money out of ailing corporations.

Punished by Rewards

Summary by Ernst C. Glauser

How do we Train, Educate and Manage?

“Do this and you'll get that.”

"Do this or here's what will happen to you."

This is the method of "Carrot and Stick" used by our parents to train the children, by the teachers to educate the students and by our leaders to manage their employees.

The subsequent report is a summary of the book by Alfie Kohn,

“Punished by Rewards: The Trouble with Gold Stars, Incentive Plans, A's, Praise and other Bribes”

After the book *"No Contest, The Case Against Competition"* has been stirring up controversy since its publication in 1986, Alfie Kohn launches another frontal attack toward well established, traditional methods to train our children, to educate our students and to manage our workforce by convincingly exposing the destructive effects of using rewards to control children and adults. The findings of Alfie Kohn are entirely supported by W. Edwards Deming. Some of Deming's best known quotes on the subject of rewards are listed below:

The merit system will put us out of business.

Judging people does not help them.

Ranking. What does it do?

Forces of Destruction: grades in school, merit system, incentive pay, business plans, quotas.

Innovation comes from people who take joy in their work.

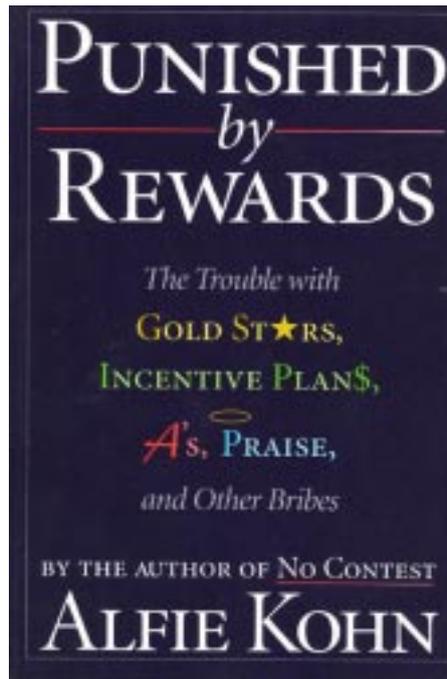
Whenever there is fear, you will get wrong figures.

The performance of any individual is to be judged in terms of his contribution to the aim of the system, not on his individual performance.

They are just doing their best. How do they know?

People are entitled to joy in work.

Monetary rewards are not a substitute for intrinsic motivation.



Houghton Mifflin Company Boston and New York, 1993

If you destroy the people of a company, you do not have much left.

Selected Recognitions

"Once again, Alfie Kohn destroys a universal myth - this time convincingly exposing the destructive effects of using rewards to control children and adults. Every parent, teacher, and manager should read this book - and hurry." (Thomas Gordon, Founder of Parent Effectiveness Training (P.E.T.))

"Unorthodox, occasionally utopian, revolutionary in its implications, this eye opening critique of behaviorist reward-and-punishment psychology will challenge and enlighten." (Publishers Weekly)

"Alfie Kohn opens a new world of living, helping the reader to clarify the heavy losses from reward - and to replace costly practices with better ones." (W. Edwards Deming, Management Consultant)

"A clear and compelling challenge to some of our most cherished assumptions about what makes people tick. Punished by Rewards will be relevant to managers, teachers, and parents - and unnerving to those who rely on the carrot and stick." (Richard M. Ryan, Professor of Psychology, University of Rochester)

"Kohn, arguing that . . . [rewards] kill



people's desire to do their best, . . . is able to back up his criticism of our motivational practices with solid, exhaustive evidence." (Los Angeles Times)

"Wonderfully clear, provocative, and satisfying. Alfie Kohn's groundbreaking exploration of the harmful effects of rewards should be mandatory reading for every parent and teacher." (Adele Faber, coauthor, How to Talk So Kids Will Listen and Listen So Kids Will Talk)

The Author Alfie Kohn

Alfie Kohn writes and speaks widely on human behavior, education, and social theory. His first book, *"No Contest: The Case Against Competition"* (1986; rev. ed. 1992), is regarded as the definitive critique of competition. He is also the author of *"The Brighter Side of Human Nature: Altruism and Empathy in Everyday Life"* (1990) as well as dozens of articles in academic journals and popular magazines, including the *New York Times*, the *Atlantic Monthly*, the *Journal of Education*, the *Nation*, and the *Harvard Business Review*.

A former teacher, he lectures and conducts workshops for educators, parents, managers, and researchers across the country and abroad. Kohn was educated at Brown University and the University of Chicago, and lives in Cambridge, Massachusetts.

Summary

Our basic strategy for raising children, teaching students, and managing workers can be summarized in six words: “Do this and you'll get that.” We dangle goodies (from candy bars to sales commissions) in front of people in much the same way that we train the family pet. In this groundbreaking book, Alfie Kohn shows that while manipulating people with incentives seems to work in the short run, it is a strategy that ultimately fails and even does lasting harm. Our workplaces and classrooms will continue to decline, he argues, until we begin to question our reliance on a theory of motivation derived from laboratory animals.

Drawing from hundreds of studies, Kohn demonstrates that people actually do inferior work when they are enticed with money, grades, or other incentives. Programs that use rewards to change people's behavior are similarly ineffective over the long run. Promising goodies to children for good behavior can never produce anything more than temporary obedience. In fact, the more we use artificial inducements to motivate people, the more they lose interest in what we're bribing them to do. Rewards turn play into work, and work into drudgery.

Step by step, Kohn marshals research and logic to prove that pay-for-performance plans cannot work; the more an organization relies on incentives, the worse things get. Parents and teachers who care about helping students to learn, meanwhile, should be doing everything possible to help them forget that grades exist. Even praise can become a verbal bribe that gets kids hooked on our approval.

Rewards and punishments are just two sides of the same coin -- and the coin doesn't buy very much. What is needed, Kohn explains, is an alternative to both ways of controlling people. The final chapters offer a practical set of strategies for parents, teachers, and managers that move beyond the use of carrots or sticks. Seasoned with humor and familiar examples, *“Punished by Rewards”* presents an argument that is unsettling to hear but impossible to dismiss.

Introduction

“Do this and you'll get that.” These six words sum up the most popular way in which American business strives to improve performance in the workplace.

And it is very popular. At least three of four American corporations rely on some sort of incentive program. Piecework pay for factory workers, stock options for top executives, banquets and plaques for Employees of the Month, commissions for salespeople -- the variations go on and on. The average company now resembles a television game show: “Tell our employees about the fabulous prizes we have for them if productivity improves!”

Most of us, accustomed to similar tactics at home and school, take for granted that incentives in the workplace are successful. After all, such incentives are basically rewards, and rewards work, don't they?

The answer, surprisingly, is mostly no. While rewards are effective at producing temporary compliance, they are strikingly ineffective at producing lasting changes in attitudes or behavior. The news gets worse. About two dozen studies from the field of social psychology conclusively show that people who expect to receive a reward do not perform as well as those who expect nothing. This result, which holds for all sorts of rewards, people and tasks, is most dramatic when creativity is involved.

Two Lucid Examples

Example 1: Tom Sawyer whitewashes the fence of Aunt Polly

Adventures of Tom Sawyer was Mark Twain's first novel. By the time Mark Twain died, it had become an American classic, and it remains perhaps the best loved of all his books among general readers.

The book was first published in 1876. The second chapter of the book describes, how Tom Sawyer solves a problem, which should have been a punishment for wrongdoing. It exposes truths about work and play, about intrinsic and extrinsic motivation, which even 150 years later are more valid than ever. The dramatic psychological problems of today's workforce are a consequence of the total disregard of thoughts and insights given to this twelve year old chap Tom by the author. Tom Sawyer, having offended his guardian, Aunt Polly,

is by that sternly-affectionate dame punished, by being set to whitewash the fence in front of the garden.

The world seemed a hollow mockery to Tom, who had planned fun for that day, and who knew that he would be the laughing stock of all the boys as they came past and saw him, set to work like a “nigger”. But a great inspiration burst upon him, and he went tranquilly to work. What that inspiration was will appear from what follows.

One of the boys, Ben. Rogers, comes by and pauses, eating a particularly fine apple. Tom does not see him. Ben. stared a moment, and then said:

“Hi- yi ! You're up a stump, ain't you!” No answer. Tom surveyed his last touch with the eye of an artist, then he gave his brush another gentle sweep and surveyed the result, as before. Ben ranged up along-side of him. Tom's mouth watered for the apple, but he stuck to his work.

Ben said: “Hello, old chap, you got to work, hey?”

Tom wheeled suddenly and said: “Why, it's you, Ben! I wasn't noticing.”

“Say -- I'm going in a-swimming, I am. Don't you wish you could? But of course you'd rather work -- wouldn't you? Course you would!”

Tom contemplated the boy a bit, and said: “What do you call work?”

“Why, ain't that work?”

Tom resumed his whitewashing, and answered carelessly: “Well, maybe it is, and maybe it ain't. All I know, is, it suits Tom Sawyer.”

“Oh come, now, you don't mean to let on that you like it?”

The brush continued to move.

“Like it? Well, I don't see why I oughtn't to like it. Does a boy get a chance to whitewash a fence every day?”

That put the thing in a new light. Ben stopped nibbling his apple. Tom swept his brush daintily back and forth -- stepped back to note the effect -- added a touch here and there -- criticized the effect again -- Ben watching every move and getting more and more interested, more and more absorbed.

Presently he said: “Say, Tom, let me whitewash a little.”

Tom considered, was about to consent; but

he altered his mind: "No -- no -- I reckon it wouldn't hardly do, Ben. You see, Aunt Polly's awful particular about this fence -- right here on the street, you know -- but if it was the back fence I wouldn't mind and she wouldn't. Yes, she's awful particular about this fence; it's got to be done very careful; I reckon there ain't one boy in a thousand, maybe two thousand, that can do it the way it's got to be done."

"No -- is that so? Oh come, now -- lemme just try. Only just a little -- I'd let you, if you was me, Tom."

"Ben, I'd like to, honest injun; but Aunt Polly -- well, Jim wanted to do it, but she wouldn't let him; Sid wanted to do it, and she wouldn't let Sid. Now don't you see how I'm fixed? If you was to tackle this fence and anything was to happen to it -- "

"Oh, shucks, I'll be just as careful. Now lemme try. Say -- I'll give you the core of my apple."

"Well, here -- No, Ben, now don't. I'm afeard -- "

"I'll give you all of it!"

Tom gave up the brush with reluctance in his face, but alacrity in his heart. And while the late steamer Big Missouri worked and sweated in the sun, the retired artist sat on a barrel in the shade close by, dangled his legs, munched his apple, and planned the slaughter of more innocents. There was no lack of material; boys happened along every little while; they came to jeer, but remained to whitewash. By the time Ben was fagged out, Tom had traded the next chance to Billy Fisher for a kite, in good repair; and when he played out, Johnny Miller bought in for a dead rat and a string to swing it with -- and so on, and so on, hour after hour. And when the middle of the afternoon came, from being a poor poverty-stricken boy in the morning, Tom was literally rolling in wealth. He had besides the things before mentioned, twelve marbles, part of a jewsharp, a piece of blue bottle-glass to look through, a spool cannon, a key that wouldn't unlock anything, a fragment of chalk, a glass stopper of a decanter, a tin

soldier, a couple of tadpoles, six fire-crackers, a kitten with only one eye, a brass door-knob, a dog-collar -- but no dog -- the handle of a knife, four pieces of orange-peel, and a dilapidated old window sash.

He had had a nice, good, idle time all the while -- plenty of company -- and the fence had three coats of whitewash on it! If he hadn't run out of whitewash he would have bankrupted every boy in the village.

Tom said to himself that it was not such a hollow world, after all. He had discovered a great law of human action, without knowing it -- namely, that in order to make a man or a boy covet a thing, it is only necessary to make the thing difficult to attain. If he had been a great and wise philosopher, like the writer of this book, he would now have comprehended that Work consists of whatever a body is obliged to do, and that Play consists of whatever a body is not obliged to do. And this would help him to understand why constructing artificial flowers or performing on a tread-mill is work, while rolling ten-pins or climbing Mont Blanc is only amusement. There are wealthy gentlemen in England who drive four-horse passenger-coaches twenty or thirty miles on a daily line, in the summer, because the privilege costs them considerable money; but if they were offered wages for the service, that would turn it into work and then they would resign

The boy mused awhile over the substantial change which had taken place in his worldly circumstances, and then wended toward headquarters to report.

Example 2: Harassment by Young Rascals

The key, then, lies in how a reward is experienced. If we come to view ourselves as working to get something, we will no longer find that activity worth doing in its own right.

There is an old joke that nicely illustrates the principle. An elderly man, harassed by the taunts of neighborhood children, finally devises a scheme. He offered to pay each child a dollar if they would all return Tuesday and yell their insults again. They did so eagerly and received the money, but he told them he could only pay 25 cents on Wednesday. When they returned, insulted him again and collected their quarters, he informed them that Thursday's rate would be just a penny. "Forget it," they said -- and never taunted him again.



Can Monetary Rewards Motivate?

Even if money matters more -- and to more people -- you can think of, that is by no means tantamount to showing that it motivates people. By one definition, nothing can meaningfully be said to "motivate" people.

Various devices can be used to get people to do something, but that is a far cry from making people want to do something. Seminars and articles with titles like "How to Motivate Your Employees" should be avoided at all costs: not only is the basic premise psychologically misconceived, but the prescriptions are likely to involve attempts to control people and therefore to make things worse in the long run.

You could not ask for a crisper contrast with behaviorism, which assumes that all behaviour is ultimately initiated by the external environment (in the words of one proponent).

Intrinsic motivation is typically placed between quotation marks by Skinnerians as though to call its very existence into question. For the rest of us, who find it meaningful to distinguish between intrinsic motivation (where the task itself is experienced as appealing) and extrinsic motivation (where the task is seen as a means to an end, a prerequisite for receiving a reward or avoiding a punishment), the question then becomes not "How motivated are people at our organization?" but "How are our people motivated?"

It is not the amount of motivation that matters, but the type. Hence we might agree (by a looser definition) that someone could be motivated by money, but then immediately add that this would probably signal a major problem, a motivational orientation that isn't associated with a high quality of work or quality of life.

Effects of Rewards

Effect Nr 1: Rewards Deteriorate Quality

About two dozen studies in the field of social psychology conclusively show that people who expect to receive a reward do not perform as well as those who expect nothing. The result, which holds for all sorts of rewards, people and tasks, is most dramatic when creativity is involved.

Are rewards as ineffective inside the workplace as they are outside it? Apparently

so. Despite decades of widespread reliance on pay-for-performance schemes, no controlled study demonstrates that rewards improve the quality of performance on a long-term basis.

At a Midwestern manufacturing company, for example, an incentive system that had been in place for years was removed at the request of the welders' union. Now, if a financial incentive motivates people, its absence should drive down production. And that is exactly what happened -- at first. But after the initial slump, the welders' production rose and eventually reached a level as high or higher than before.

Of course, these studies -- no matter how numerous -- are hard for us to accept. After all, "Do this and you'll get that" is part of the fabric of American life. From gold stars to candy bars, we have faith in rewards' redemptive power.

Effect Nr 2: Rewards Punish

Even executives who understand that coercion and threats destroy motivation may fail to recognize that the same is true of rewards. Punishments and rewards are not really opposites. They are two sides of the same coin, and the coin does not buy very much.

Like punishments, rewards are manipulative. "Do this and you'll get that" is not very different from "Do this or here's what will happen to you." The reward itself -- a bonus, say -- may be desired, but it is contingent on satisfying terms someone has imposed. Sooner or later, this sense of being controlled feels punitive.

Rewarding people is similar to punishment for another reason. When people do not get the rewards they were hoping for, they feel punished. And the more desirable the reward, the more demoralizing it is to miss out.

Effect Nr 3: Rewards Rupture Relations

Research and experience show that excellence depends on teamwork, both because of the exchange of ideas it fosters and the climate of social support it creates. But the scramble for rewards -- particularly when they are made scarce, creating competition -- destroys this valuable cooperation.

Relationships between supervisors and workers, too, can collapse under the weight of incentives. If a supervisor wields sanctions, of course, employees will be about as glad to see that person coming as they would be to glimpse a police car in

their rear-view mirror.

But even if the supervisor is a rewarder, the effect is essentially the same. Incentive-driven employees will not ask for help when they need it. Instead, they will conceal problems to appear infinitely competent, or they will resort to flattery.

Effect Nr 4: Rewards Ignore Reasons

To solve productivity problems, executives must understand the causes. Are workers unable to collaborate effectively? Is long-term growth being sacrificed for short-term gain? Each situation calls for a different response. But incentive plans offer a one-size-fits-all answer that ignores what lies behind the questions.

Rewards do not require any attention to the reasons that the trouble developed in the first place.

You don't have to ask why the child is screaming, why the student is ignoring his homework, why the employee is doing an indifferent job. All you have to do is bribe or threaten that person into shaping.

A sudden deterioration in performance frequently turns out to be due to problems at home. A chronic record of mediocre performance, meanwhile, may indicate, among many other possibilities, that there is something wrong with the job itself or with an organizational structure that holds employees responsible for things that they are power-less to control.

Effect Nr 5: Rewards Deter Risk-Taking

When people are offered incentives they are less inclined to take risks, explore possibilities, play hunches or attend to anything whose relevance to the problem at hand is not immediately evident.

In a word, the No. 1 casualty of rewards is creativity. The proof: a dozen psychological studies showing that the more people are led to think about rewards, the more they prefer easy tasks. Why? Not because of laziness, but because incentives encourage concern about what one is going to get.

In short, "Do this and you'll get that" makes people focus on the "that," not the "this."

Do rewards motivate people? Absolutely! **They motivate people to get rewards.**

Effect Nr 6: Rewards Undermine Interest

Rewards undermine interest. Loving what you do is a more powerful motivator than money or any other goody. No surprise

there. What is surprising is that goodies actually undermine personal motivation. The more an executive gets employees to think about what they will earn for doing their jobs well, the less interested they will be in what they are doing.

Edward Deci, a University of Rochester psychologist, did pioneering studies on this effect in the early 1970's; his findings have been corroborated many times since then.

How does this happen? One explanation is that rewards are controlling. If people are led to think about getting a bonus, they start to feel their work is no longer freely chosen and directed by them. And to feel controlled is to lose interest. Another explanation is that the reward makes the work seem distasteful. "If they have to bribe me to do it," a person might figure, "it must be something I don't want to do."

Whatever the reason, rewards turn play into work and work into drudgery. Worse, when rewards corrode intrinsic motivation, workers have no other reason to put out an effort. This pattern, in turn, confirms supervisors' beliefs in the need for incentives. It is a self-fulfilling prophecy.

What to do Instead?

Small wonder, then, that a growing number of executives are scratching their heads over the failure of their reward programs. Typical is an August article in a leading human resources journal: "Why No One Likes Your Incentive Plan."

Unfortunately, most executives believe the problem lies in the particulars of their program, and so they devise new variations on the same behaviorist theme. Countless consultants live handsomely from devising yet more ways to compute bonuses, for instance. Others persuade employers that team incentives are the way to go, or that they need to reward quality, not quantity.

But all these fixes miss the point. Trying to correct the trouble by revising a pay-for-performance program makes as much sense as treating alcoholism by switching from vodka to gin.

The problem is not with compensation, per se, but with pushing money into people's faces by offering more of it for this or that. The more closely pay is linked to achievement, the more damage is done.

If rewards do not work, what does? Kohn recommends that employers pay workers well and fairly and then do everything pos-

sible to help them forget about money. A preoccupation with money distracts everyone -- employers and employees -- from the issues that really matter.

Those issues might be abbreviated as the three C's of quality: Choice, Collaboration and Content.

- Choice means workers should participate in making decisions about what they do.
- Collaboration means they should be able to work together in effective teams.
- Content refers to the job's tasks. To do a good job, people need a good job to do.

Doing these things is much more difficult than dangling goodies in front of workers. But manipulating behavior by offering rewards, while a sound approach for training the family pet, can never bring quality to the workplace.

A Case Study

An example of a company that took this advice is Marshall Industries, a huge electronic components distributor based in southern California. Long locked into a pop-behaviorist sensibility, myopically concerning itself with the "dos and don'ts of financial incentives," they finally realized that none of this advice seemed to help and that the problem was with the premises on which the use of any financial incentive was based. It was the very existence of sales commissions and other rewards that was preventing the company from moving forward. Only when this light bulb clicked on did things begin to change. After a full year of listening, reflecting, and "losing sleep," CEO Rob Rodin and his associates first got rid of all contests and other practices that set employees against each other, then eliminated management incentives, and finally replaced sales commissions and everything else smacking of pay-for-performance with a base salary.

The result: turnover (one of the many hidden costs of reward systems) was reduced by 80%; morale soared; salespeople began coordinating their efforts more effectively; and sales, along with profitability, grew dramatically. About five years ago, when Marshall began its deincentivizing process, its stock was about \$8 and its annual sales were at \$575 million; today, its stock trades in the \$30-\$40 range and annual sales have hit \$1.3 billion.

The Toyota Phenomenon

How come the world's second largest automobile manufacturer grows continuously and makes large profits whilst its biggest competitors fight for survival?

Ernst C. Glauser

Summary

After the Second World War, the distribution of World economic power was totally rearranged. Before the war, Europe and the USA ruled the world market. The management of Western companies was based on the "Scientific Management" by Frederick Winslow Taylor (1856-1915) and on "Modern Sociology" by Max Weber (1864-1920). This intellectual basis characterizes the begin of industrialization, led to mass production and to tremendous productivity increases.

Yet after the war, new players appeared on the playground, whose work was based on a philosophy, on methods and rules unknown before. Whilst Western managers turned to short-term thinking to satisfy shareholders and to endless restructuring, the new actors concentrated on continual improvement in the quality of products, uniformity of processes and qualification of employees.

Toyota is one of these new players, which despite the fierce competition due to excess production capacity in the automobile industry of around 25 % outperforms Western competition in every aspect, in technological innovation, in customer satisfaction, in continuous growth and in profit. In 2004 Toyota passed Ford to become the second largest automobile producer. Before long, Toyota will overtake General Motors becoming the biggest car company in the world probably having no less than 15% of the world market. Toyota will prevail. Most others will have the choice between shrinking or sinking.

This paper tries to shed light on the root causes of the Toyota Phenomenon, which for some reason or another Western companies find so hard to understand and much less on how to apply, despite their struggle for survival.

Introduction

Some of the headlines in recent editions of the influential news and business publication "The Economist" indicate that the European and American automobile industry finds itself in deep trouble. Here are just a few samples:

- General Motors pays FIAT to walk away
- Raw nerves in Motown: Making money remains tough for America's big three carmakers
- Divorce Italian-style: Is Fiat's marriage to General Motors coming to a bloody end?
- Stuck in the rough: America's car giants, General Motors and Ford, find Europe hard going
- Detroit's big three in the slow lane
- The three Fs: Ford, Fiat and Failure
- The also-rans: Mitsubishi and Mazda struggle, despite Western partners
- The End of Detroit: Shape up or ship out
- One hell of a birthday, Bill: Ford celebrates its 100th anniversary, fighting for survival
- Extinction of the car giants: Why America's car industry is an endangered species

In 2004, Volkswagen with its brands VW, Skoda and Bentley lost • 44 millions. During the same period, the Volkswagen group including also Audi, Seat and Lamborghini lost in North America alone • 907 millions. Bernd Pischetsrieder, CEO of Volkswagen, attributes these problems to the economic slump in Europe resulting in a low demand for cars, the fierce price fights with huge discounts and incentives in the US and so on. Are these indeed the true reasons or is it deliberate self deception or a justification for blunt mismanagement?

Despite the fierce competition among the

automobile producers due to excess production capacities of around 25 %, Toyota outperforms its competition in every aspect, in technological innovation, in customer satisfaction, in continuous growth and in profit. In 2004 Toyota passed Ford to become the second largest automobile producer. Before long, Toyota will overtake General Motors becoming the biggest car company in the world probably having no less than 15% of the world market. Toyota will prevail. Most others will have the choice between shrinking or sinking.

Toyota will continue to focus on patient execution of sensible, but ambitious plans to expand their sales. They will continue to develop a steady stream of new models and make them with remarkable efficiency: there are no takeovers, no dramas or miracle cures, just relentless, grinding professionalism with, increasingly, an enticing dash of design flair to boot. And when they hit one target, they immediately set another.

However, there is one extra ingredient that is somewhat mystical, if not exactly magical. There is such a strong corporate culture that every employee knows the "Toyota way" of doing things. Put it down on paper and it sounds as flaky as a typical mission statement. But Toyota preaches to the converted and it works.

Since the fifties, an uncountable number of Western automobile production specialists visited Toyota to find out the secret behind the success. Since they did not have a method, they did not know what questions to ask. They copied what they believed essential but were unable to advance to the core of Toyota's truly extraordinary company culture even after Toyota started to produce automobiles in the American backyard in December 1984 in a joint venture with General Motors (New United Motor Manufacturing NUMMI). Even though Western Automobile producers turned out better products, they are still far behind Toyota and the gap widens.

The intellectual foundation for Toyota's success was laid from 1950 onward by W. Edwards Deming. In June 1950, Deming

presented to the very top managers of the Japanese industry his view on what must happen to make Japan successful in the world market. Kiichiro Toyoda, the founder of Toyota Motor Company, was among the audience. The managers listened, understood and went straight to work. They did not have a choice.

In no more than five years, Japan flooded the world with products of unparalleled quality. Western economies did not and still do not possess the means to withstand.

Observing the complacency of the West, Deming formulated his First Theorem: "Nobody gives a hoot about profit." With profit, he meant long-term profit. The West talks about it, but does not do anything about it. Deming's Second Theorem was: „We are being ruined by best efforts, doing the wrong thing.“

The following paper uses the automobile industry as an example to show that there is no substitute for leadership and quality to survive. Fortunately, survival is not compulsory.

Automobile Industry and its Problems

The industry as an Indicator for Welfare and Success

The industry produces nearly 60 million cars and trucks a year and employs millions of people around the world. Its products are responsible for almost half the world's oil consumption, and their manufacture uses up nearly half the world's annual output of rubber, 25% of its glass and 15% of its steel. No wonder the car industry accounts for about 10% of GDP in rich countries.

But the industry that has pioneered the forms and weathered the storms of 20th-century capitalism is now over 100 years old and struggling. Average profit margins have declined from 20% or more in its youth in the 1920s to around 10% in the 1960s and less than 5% now, and some volume carmakers have actually been losing money.

A century ago the car industry more or less invented modern industrial capitalism. The car started life in Germany, and early development of the industry began in France (hence automobile, originally a French word) in the 1900s, but it was in America that it came of age.

The World's Top Ten Car Manufacturers 2003

	Global vehicle units sold in millions	Sales in billion USD *Year ending March 2004	Latest Market Capitalisation in billion USD	Latest Market Capitalisation per units sold in USD
General Motors	8.59	185.5	23.3	2'712
Toyota	6.78	153.1*	136.4	20'118
Ford	6.54	164.2	24.8	3'792
Volkswagen	5.02	98.4	12.2	2'430
DaimlerChrysler	4.36	171.9	41.8	9'587
PSA/Peugeot Citroën	3.29	61.2	14.3	4'347
Hyundai Automotive	3.05	38.9	9.0	2'951
Nissan	2.97	65.8*	47.1	15'859
Honda	2.91	77.2*	46.4	15945
Renault	2.39	42.4	22.1	9'247

Sources: Automotive News, Company Reports, Thomson Datastream

Figure 1: The World's ten largest automobile manufactureres in terms of number of units sold, sales and market capitalisation

Henry Ford's adaptation for car making of the moving assembly line he had seen in Chicago slaughterhouses marked the birth of mass production. But Mr. Ford applied those techniques to a vehicle that resembled a horse-drawn carriage, with a body laid on to a separate chassis.

Modern cars have a monocoque steel body in which the strength is built into the pressed steel floor, sides and roof. It was invented by Edward Budd, taken up by Dodge and then by Citroën in Europe, and then by all volume carmakers.

Around the same time as modern car manufacturing was born in the mid-1920s, Alfred Sloan's ideas for running General Motors provided the model for the great corporations that grew up to dominate the second half of the 20th century. GM soon swept past Ford as Mr. Sloan revolutionized the young car industry and Ford has never regained the dominance it enjoyed in the infancy of mass production.

The car industry has been ahead of its time in many respects. Peter Drucker, a management writer who first made his name with a study of GM in 1945, coined the phrase "industry of industries". The company was also the leader in "planned obsolescence", the frequent changes in design that tempted customers to switch to a new model every year or so. It was the first to feel consumer anger with the publication in the 1960s of Ralph Nader's attack on the safe-

ty record of the Big Three Detroit manufacturers, "Unsafe at Any Speed".

In the 1970s, as the oil price quadrupled, the industry found itself under attack from environmentalists outraged by its products' gas-guzzling habits. It was also among the first to come under careful government scrutiny, from safety concerns to environmental issues to antitrust worries in the days when General Motors had 60% of its domestic market and could snuff out competitors with a few well-chosen price cuts. But it also received more welcome government attentions. When small, economical and reliable Japanese cars started to eat into Detroit's market share, the American government imposed restraints on those imports. Soon afterward, the industry in Europe came under similar pressures.

The car industry also found itself at the cutting edge of capitalism in another sense. As mass production techniques developed in the 1920s and 1930s, its workers increasingly pushed for unionization. At times, it seemed as though the car factories of the Detroit area, the British Midlands or the huge plants around Paris were the main battleground of the class war. Even today, the United Auto Workers union (UAW) still dominates Detroit, even though trade union membership in America's private sector as a whole is well below 10% of the workforce.

Today the motor car is the epitome of mass production, mass marketing and mass consumption, with some of the strongest brands in the world. For most households in rich countries, it is the second-biggest purchase after a house or flat. Few other consumer-goods industries depend so heavily on a thriving second-hand market for their products. And yet there are powerful forces at work that could profoundly change the industry.

Limits to Growth

Right now, though, the biggest force for change is the fact that most of the volume-car industry is broke and needs fixing. The market in America, Europe and Japan, where over 80% of the world's cars and trucks are sold, has been running out of growth.

In America the arrival of European, Japanese and South Korean makers has created overcapacity. Moreover, as America's own carmakers constantly improve their productivity to catch up on these new rivals, their greater efficiency itself increases capacity by about 3% a year.

In Germany and France, rigid labor laws have inhibited the closure of redundant old factories, although Renault has set a good example, and Ford Europe and GM Europe have been trying to follow it.

In Japan, the close industrial partnerships known as keiretsu have proved too rigid for some manufacturers. Only Toyota and Honda remain in purely Japanese hands. The smaller Japanese producers make little or no profit at home and are struggling to get into the black in Europe. Even for the big companies America provides the best hopes for growing profits.

All the car companies think that if only they try harder, they can somehow regain growth at the expense of rivals. But in reality they are like Scott Fitzgerald's "boats against the current, borne back ceaselessly into the past". Add the growing pension and health-care bills of traditional producers such as America's Big Three and the Europeans, and it is easy to see why the industry is feeling under siege.

Today Toyota leads a select band of volume car manufacturers that make real profits; the others are Nissan and Honda. Even when GM, Ford, the Chrysler end of DaimlerChrysler and European firms such as Renault and Volkswagen are in the black, they usually do not earn more than the cost of their invested capital.

But the worldwide market is a cruel place.

There is capacity in place to produce about 80 million cars and other light vehicles (pick-ups, SUVs and so on). Yet production is running at barely 60 million a year, so the factories are only three-quarters full in an industry where utilization rates need to top 80% to ensure decent profits. It is not much of a gap, but the effect on weaker carmakers is painfully evident.

Of course, much of this excess capacity is being installed in China and other parts of the Asia-Pacific region in anticipation of growth prospects that are awesome. According to a forecast by PriceWaterhouseCoopers, the region will account for almost half the increase in world car output (over 18%) that is forecast by 2011.

But too much of excess capacity lies in North America and Europe, where too many producers are producing too many cars and selling them at too little profit. Detroit keeps its factories at full tilt only by offering huge discounts and other sales incentives to "move the metal", as they say there. Hence the profitless prosperity offered by strong car sales in recent years. The same is increasingly true in Europe.

The End of Detroit

Micheline Maynard's crisply written book, "The End of Detroit: How the Big Three Lost Their Grip on the American Car Market" [1], coolly analyses the causes of the latest fall of Detroit.

Many in the American car industry have been slow to appreciate how serious the

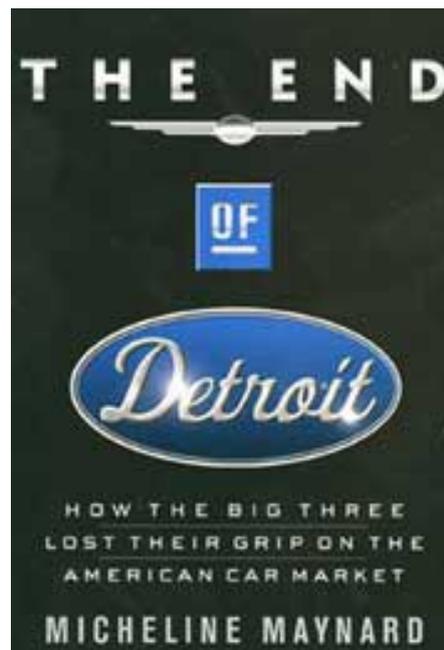


Figure 2: Cover of Micheline Maynard's book, „The End of Detroit, how the big three lost their grip on the car market“

problem really is. The big three manufacturers were used to hard times; they just hoped to make more money in booms than they lost in busts. But their current problems are different.

Car sales are still at historically high levels; it is just that Detroit's share of these sales has slumped. Japanese, South Korean and German models (whether imported or made in the 17 car factories that foreigners have opened in America in the past 20 years) account for half of car sales, and are advancing on Detroit's last redoubt—the gas-guzzling minivans, sport utility vehicles and pick-ups so beloved of suburban cowboys.

In 1960, GM alone had 60% of the American market; today it can count on barely half that and the foreigners' share of the light-vehicle market is already 40%.

Ms Maynard pinpoints the difference between the men who run the big three and the leaders of successful foreign car companies. She contrasts the financial background of those at the top of GM and Ford with the car knowledge of Toyota's boss, Fujio Cho, who cut his teeth running one of the company's first American factories.

But there is more to Detroit's weakness. The big three manufacturers have to deal with the powerful United Auto Workers Union, which has won its members great benefits while employers are saddled with pension and health-care costs that top \$1,200 per vehicle.

Ms Maynard concedes that Detroit is fighting back, with a new emphasis on the quality and attractiveness of the products. But she still sees Toyota becoming the biggest car company in the world, overtaking GM, and probably having no less than 15% of the world market, its stated aim. She is right: Toyota will prevail. Detroit's choice is between shrinking or sinking.

Fiat's Struggle for Survival

The recent controversy between GM and Fiat Auto illustrates the desperate struggle the Western automobile industry finds itself in.

In 2000, GM had bought 20% of Fiat Auto for \$2.4 billion. In return, Fiat took a 6% stake in the American car giant. At the time GM feared being left behind in the merger wave that was sweeping the car industry. Since the DaimlerChrysler merger in 1998, the industry had consolidated rapidly. To become a global force, GM felt it needed

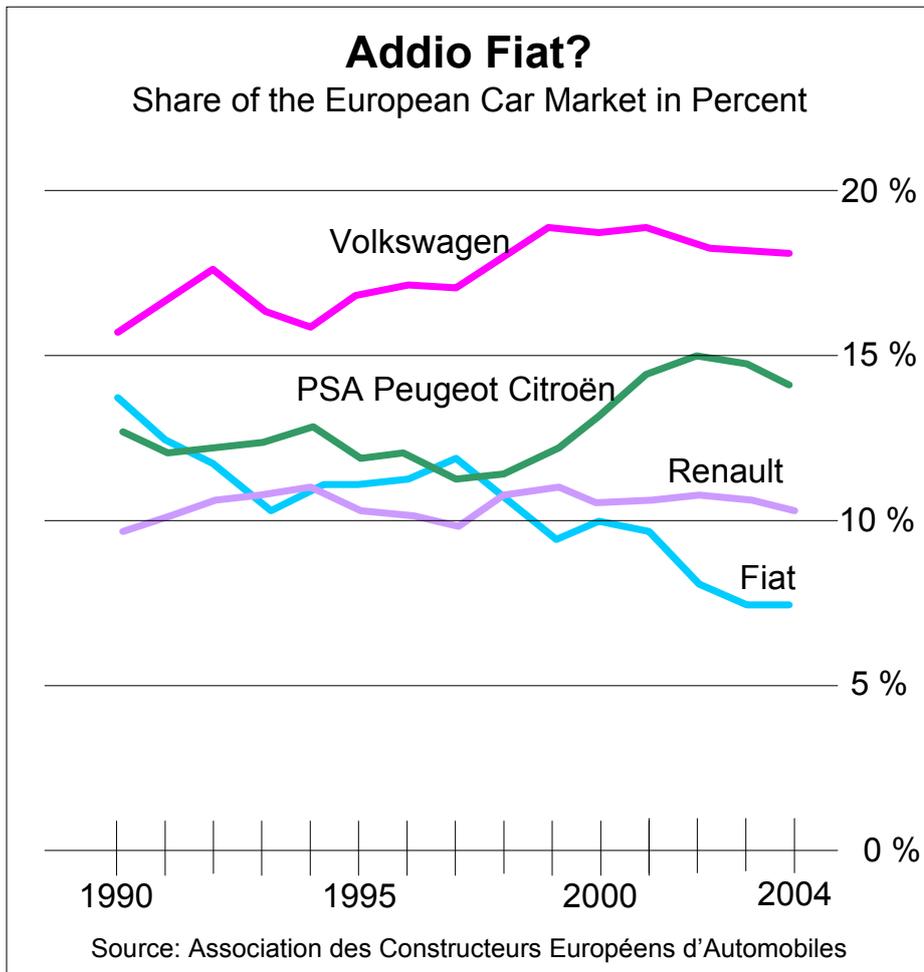


Figure 3: The contribution of Volkswagen, PSA Peugeot Citroën, Renault and Fiat to the European car market

the expertise of foreign companies to satisfy the differing tastes of the world's car buyers and to share development costs. GM's greatest rival, Ford, was building a global network. In Europe it eventually acquired Jaguar, Volvo and Land Rover. Renault had teamed up with Nissan. DaimlerChrysler would go on to forge alliances with Hyundai of South Korea and Mitsubishi of Japan.

Since GM took a stake the problems have mounted. Greater foreign competition in Italy, Fiat's biggest market, arrived as government schemes to help Fiat faded away. Fiat's high costs and the lack of success of the Palio (Fiat's "world car") and the Stilo, a bigger and supposedly more profitable model, proved a drag, sucking money from Fiat's successful truck and tractor business.

In 2002 Fiat was forced to seek refinancing in the form of €3 billion in convertible loans from banks. The souring relationship with its American partner was exemplified by GM's refusal to contribute. Fiat also sold its stake in GM and its financing arm to raise cash. This diluted GM's holding in

Fiat to 10%, which according to GM invalidated the put option.

GM has also had its share of troubles since its link-up with Fiat. In January 2000 its shares were worth over \$80 and it made a profit of \$5 billion that year. Its shares now trade at around \$37 and although it made \$3.6 billion in 2004, \$2.9 billion came from its finance arm. GM's bonds are at a record low, hovering just above junk status and it has been saddled with mounting "legacy" costs from its employee health-care and pension plans.

European and Asian producers dominate America's luxury-car market and the increasingly bold and innovative South Koreans are attacking the market for cheaper cars.

On Sunday, February 13th, 2005, it was decided that GM will pay Fiat €1.55 billion (\$2 billion) to cancel a "put" option that

the firms had agreed as part of a tie-up that was concluded in happier times for both GM and the Agnelli family, the founders of the Fiat industrial empire.

Management Compensation

This issue has stirred up much controversy during past years. Since this topic, besides being of general interest, is also linked to the performance of automobile manufacturers, it must be addressed here too.

Over the past few years, the salaries of managers in Europe and the US have gone out of control. They became so outrageous, insane and beyond common people's imagination, that the Swiss business magazine "CASH" of February 25th, 2005, simply called this development "The New Insanity".

It is especially shocking for the public to realize, that the salaries are not linked to the quality of leadership and company performance, which again are directly related to the capability of a company to meet customer expectations.

Daniel Vasella, both chairman of the board and CEO of a Swiss pharmaceutical company was able to multiply his salary tenfold up to a stratospheric level of \$ 18 million per year, whilst on the other hand the return to the shareholders stalled.

The Hay Group, a consultancy, reckons that a European chief executive's basic salary is much the same as that of his counterpart across the Atlantic. According to a recent study by a human-resources consultancy, German executives are the best paid in Europe, but the component of their bonuses linked to short-term targets is higher even than that of their counterparts in America. This has put pay and performance out of line. In one case, while DaimlerChrysler's market value fell by 60%, its top executives' pay rose by 40%.

In the US the differential between the pay of top executives and their workers has grown. In 1991 the pay of the average American large-company boss was about 140 times that of the average worker; by last year, it was over 500 times, and growing.

Executive compensation packages in Japan, where pay scales are also largely determined by tradition, are much more down to earth. In Japan, the CEOs, on average, get only 17 times what the workers earn. Even in companies employing up to 400'000 people, the salaries of CEOs are typically

less than \$ 1 million a year. Indeed the median in these huge companies lies somewhere between \$300'000 and \$ 600'000 a year. Even when receiving retirement allowances, these CEOs would be fortunate to take much more than an extra \$ 1.5 million home with them.

It is believed that this issue has tremendous implications on employee motivation, trust of potential customers and respect paid by the public. Who wants to work for or buy a product from a company whose top management demonstrates over and over again that its actions are diverted from the customer and the employees by selfish greed.

Management sets the standard with respect to every aspect of corporate behavior. Countless examples have shown in the past that managers, which do not live up to these standards as observed by both the employees and the public damage and even ruin a company. In any case, the damage will be a multiple of what a management claims in excessive compensation.

Toyota Motor Corporation

The Ultimate in Manufacturing Excellence

It will be an important moment in industrial history: in only a few years Toyota will



Hiroshi Okuda, Chairman

Toyota is turning challenges into business opportunities by accelerating the pace of its innovation to achieve new growth.



Fujio Cho, President

We intend to raise corporate value by pursuing even higher levels of growth and efficiency.

Figure 4: Hiroshi Okuda, chairman of the board and Fujio Cho, President of the Toyota Motor Corporation and their policies for the future development of the company

Toyota Motor Corporation Annual Report 2004

Fiscal Years ending March 31st

	in million USD except share data	2003 vs 2004 Change in Percent
For the Year 2004		
Net Revenues	163'637	+11.6 %
Operating Income	15'772	+31.1 %
Net Income	10'995	+54.7 %
Return on Investment	15.2 %	+11.6 %
Per Share Data		
Net Income (Basic)	3.24	+62.3 %
Cash Dividends	.43	+25 %
Shareholders' Equity	23.24	+19 %
At Year-End		
Total Assets	208'537	+9.4 %
Shareholders' Equity	77'383	+14.9 %
Share Performance (March 31)		
Price per Share	36.71	+47.2 %
Market Capitalisation	132'527	+47.2 %

Figure 5: Key figures showing the performance of the Toyota Motor Corporation for the year beginning 1st April and ending March 31st

topple General Motors from the number one slot among the world's carmakers, as it grows relentlessly towards 15% of the global market. It makes a net profit far bigger than the combined total for Detroit's Big three; its market capitalization towers above them; its productivity has grown sevenfold in the past 25 years, twice as much as Detroit's finest, despite their efforts to keep up.

The financial performance of Toyota is enormous (Figure 5).

There is the world car industry, and then there is Toyota, the outstanding pheno-

menon. Since 2000 the output of the global industry has risen by about 3 million vehicles to some 60 million. Of that increase, half came from Toyota alone. While most attention over the past four years has focused on a spectacular turnaround at Nissan, Toyota has undergone a dramatic growth spurt all round the world. Japan's industry leader will soon be making more cars abroad than at home. It has overtaken Ford in global production terms and is set to pass Chrysler in sales to become one of America's Big Three. In an industry strewn with basket cases, where hardly any volume producer makes a real return on its capital, Toyota is exceptional in that it consistently makes good returns.

Toyota's ebullient chairman Hiroshi Okuda has made little secret that he wants the company to win 15% of the global car market, snatching leadership from General Motors. Having reached Global Ten (10% of the world market) Mr Okuda has his eyes focused on his new goal. "It's just to motivate employees," says Fujio Cho, Toyota's more downbeat president. "Somehow news of the banners in our factories leaked out," he says disingenuously, as if you could keep such a secret after it has been blazoned to 264'000 workers around the world.

Market capitalization says it all (Figure 1). Toyota is worth more than the American Big Three put together, and more than the combination of its successful Japanese rivals, Nissan and Honda. Last year (2004)

Nissan may have outperformed Toyota in terms of operating margin, but over the long haul it has been the provincial powerhouse from Aichi prefecture near Nagoya that has consistently shown the way.

Toyota Production System TPS

First, of course, it taught the modern car industry how to make cars properly. Few had heard of the Toyota Production System (TPS) until three academics in the car industry study programme run by Massachusetts Institute of Technology (MIT) wrote a book in 1991 called "The Machine that Changed the World" [2].

It described the principles and practices behind the "just-in-time" manufacturing system developed at Toyota by Taiichi Ohno. He in turn had drawn inspiration from W. Edwards Deming, an influential statistician and quality-control expert who had played a big part in developing the rapid-manufacturing processes used by America during the second world war.

At the core of TPS is elimination of waste and absolute concentration on consistent high quality by a process of continuous improvement (kaizen). The catchy just-in-time aspect of bringing parts together just as they are needed on the line is only the clearest manifestation of the relentless drive to eliminate muda (waste) from the manufacturing process. The world's motor industry, and many other branches of manufacturing, rushed to embrace and adopt the principles of TPS.

Toyota's success starts with its brilliant production engineering, which puts quality control in the hands of the line workers who have the power to stop the line or summon help the moment something goes wrong. Walk into a Toyota factory in Japan or America, Derby in Britain or Valenciennes in France and you will see the same visual displays telling you everything that is going on. You will also hear the same jingles at the various work stations telling you a model is being changed, an operation has been completed or a brief halt called.

Everything is minutely synchronized; the work goes at the same steady cadence of one car a minute rolling off the final assembly line. Each operation along the way takes that time. No one rushes and there are cute slings and swiveling loaders to take the heavy lifting out of the work. But there is much more to the soul of the Toyota ma-

chine than a dour, relentless pursuit of perfection in its car factories.

Another triumph is the slick product-development process that can roll out new models in barely two years. As rival Carlos Ghosn, chief executive of Nissan, notes in his book "Shift" (about how he turned around the weakest of Japan's big three) [6], as soon as Toyota bosses spot a gap in the market or a smart new product from a rival, they swiftly move in with their own version.

The result is a bewildering array of over 60 models in Japan and loads of different versions in big overseas markets such as Europe and America. Of course, under the skin, these share many common parts. Toyota has long been the champion of putting old wine in new bottles: over two-thirds of a new vehicle will contain the unseen parts of a previous model. But TPS alone would not justify the extraordinary success of the company in the world market.

The "Toyota Way"

Many firms have tried to install the Toyota Production system TPS. They set up the Kanban system, which is a tool for managing the flow and production of materials in a Toyota-style "pull" production system. They plug in the andon, which is a visual control device in a production area that alerts workers to defects, equipment abnormalities or other problems using signals such as lights, audible alarms, etc. Finally, with all these devices the workplace looks like a Toyota plant. Yet over time the workplace reverts to operating like it did before.

And this is exactly what many Western organisations have experienced. With the set up of TPS, the real work of implementing TPS has just begun. In the Toyota Way, it's the people who bring the system to life by working, communicating, resolving issues and growing together. The Toyota Way encourages, supports and in fact demands employee involvement.

The Toyota Way is much more than a set of improvement and efficiency techniques. It's a culture depending on worker attitude to reduce inventory, identify hidden problems and to fix them with a sense of urgency, purpose and teamwork. The Toyota Production System can be copied, the Toyota Way cannot. It has to be built, maintained and refined over decades.

The roots of the Toyota Way go back to 1926, when Sakichi Toyoda (1867–1930), a brilliant engineer, later referred to as Japan's

"King of Inventors", founded Toyoda Automatic Loom Works.

His work ethics was significantly influenced by the book of Samuel Smiles, "Self-Help"[5], first published in England in 1859. The book grew out of the devotion, to help young man in difficult economic circumstances by improving themselves. The book chronicles inventors whose natural drive and inquisitiveness led to great inventions that changed the course of humanity. When looking for instance at the success and impact of James Watt, Smiles concluded, that both were not the result of natural endowment but rather through hard work, perseverance and discipline.

These few words summarize the spirit, which Sakichi Toyoda handed over to his son Kiichiro Toyoda (1894-1952), the founder of Toyoto Motor Company, his son Shoichiro Toyoda, Honorary Chairman and director of Toyota Motor Corp., and on to his nephew Eiji Toyoda (*1913), President of Toyota from 1967 to 1994.

Spend some time with Toyota people and after a time you realize there is something different about them. The rest of the car industry raves about engines, gearboxes, acceleration, fuel economy, handling, ride quality and sexy design. Toyota's people talk about "The Toyota Way" and about customers.

In truth, when it is written down the Toyota creed reads much like any corporate mission statement. But it seems to have been absorbed by Japanese, European and American employees alike.

Mr. Cho thinks that something of the unique Toyota culture comes from the fact that the company grew up in one place, Toyota City, 30 minutes drive from Nagoya in central Japan, where the company has four assembly plants surrounded by the factories of suppliers. In this provincial, originally rural setting, Toyota workers in the early days would often have small plots of land that they tended after their shift.

Mr. Cho, who made his career in the company by being a pupil of Mr. Ohno and becoming a master of production control, thinks that the fact that Toyota managers and their suppliers see each other every day makes for a sort of hothouse culture—rather like Silicon Valley in its early days.

Jim Press is boss of Toyota's sales in North America. He left Ford in frustration 35 years ago, because he did not think it handled customer relations properly and he suspected that the upstart Japanese compa-

ny making its way in the American market might do better. He was right.

Toyota shares a production plant in California with GM. Identical cars come off the line, some badged as GM, the rest as Toyotas: after five years, according to one study by Boston Consulting Group, the trade-in value of the Toyota was much higher than that of the American model, thanks to the greater confidence people had in the Toyota dealer and service network.

Mr. Press talks with a quiet, almost religious, fervor about Toyota, without mentioning cars as such. "The Toyota culture is inside all of us. Toyota is a customer's company," he says. "Mrs Jones is our customer; she is my boss. Everything is done to make Mrs. Jones's life better. We all work for Mrs. Jones."

But not even the combination of its world-leading manufacturing, rapid product development and obsessional devotion to customer satisfaction is enough to explain Toyota's enduring success. There is one more ingredient that adds zest to all these.

Tetsuo Agata doubles as general manager of Toyota's Honsha plant in Toyota City and as the company's overall manufacturing guru. The magic of Toyota's winning culture was summed up for him by an American friend who observed that Toyota people always put themselves "outside the comfort zone": whenever they hit one target, they set another, more demanding one. That relentless pursuit of excellence certainly explains much of what has been happening to the company in recent years, at home and abroad.

The strain of going global

Life started changing for Toyota when the economic bubble burst in Japan at the start of the 1990s. First it had to work hard to improve its competitiveness as the yen strengthened. Mr. Okuda, president in the mid-1990s, launched a program of cost-cutting to make the company's exports competitive even at a yen level of only 95 to the dollar. When costs fell and the yen subsequently weakened, Toyota reaped a double reward.

But the company also had to face up to a car market at home that slumped from nearly 6 million sales a year to just over 4 million. And Toyota has had to respond to renewed competition in its domestic market, after an aggressive push by Honda and the revival of Nissan. One reaction by Mr.

Cho to tough competition at home has been a further round of cost cuts that have helped Toyota re-build market share in Japan from 38% in the mid-1990s to 44.6% last year, helped partly by windfall sales after the implosion of Mitsubishi Motors.

But European imports of Volkswagens, BMWs and Mercedes cars have mopped up 7% of the Japanese market, mostly for premium models, and forced Toyota to introduce its luxury Lexus brand into Japan.

Until now, cars that Americans and Europeans have known as Lexuses have been sold as plain old Toyotas in Japan. Now Mr. Cho has decided, as part of a wider reorganization of Toyota's distribution network, to sell these vehicles separately with the Lexus badge and support from their own up-market retail outlets.

One of Toyota's strengths has been its army of privately owned car dealers, long organized into five competing channels, each one more or less specializing in different parts of the range. The multiplicity of distribution channels arose simply because of the rapid growth of the Japanese market and Toyota sales from the 1970s onwards. But in February 2003 Toyota administered what was called the Valentine's Day shock. It streamlined the number of channels down to four, including a new one aimed at the young people turned off by mainstream Toyota's staid image. (It is having to go even further in America with a separate sub-brand called Scion to appeal to young consumers.)

Like all car companies Toyota in Japan has had to get used to a fragmentation of the market, which means there are no longer huge runs of a few bestselling models. The boss of the Tsutsumi plant, where the firm's trendy Prius hybrid cars are made, recalls the good old days when all they had to do was churn out half a million Camrys and Coronas. Today's lines have been adapted and made flexible so that no fewer than eight different models can be manufactured simultaneously. The Prius—despite its revolutionary engine—still has to share an assembly line in the Tsutsumi plant with several conventional models.

Seeds of success

Making all these changes at home is relatively easy compared with Toyota's biggest challenge, now that it has set itself the goal of making more cars outside Japan than at home. Apart from seeking to switch production to exports, Toyota also

chased growth outside Japan by building three more plants in North America and two in Europe, starting with Derby in Britain, followed by Valenciennes in the north of France. Between 1993 and 2003, overseas production more than doubled to 2 million units, while in Japan it declined from 3.5 million to 3 million before recovering in the later years to its old level, boosted by exports; about half of domestic production is exported.

This globalization process has transformed the size and shape of Toyota. In 1980 Toyota had 11 factories in nine countries; in 1990 it had 20 in 14 countries; today it has 46 plants in 26 countries. In addition, it has design centres in California and in France on the Côte d'Azur, and engineering centers in the Detroit area and in Belgium and Thailand.

Although Japan remains its biggest single market, sales topped 2 million in North America for the first time last year, and in Europe Toyota is passing through the 1 million mark, with 5% of the market, after a long period of slow growth. The opening of plants in Turkey and France and the introduction of the European-designed Yaris small car have done much to make Toyotas more appealing to Europeans, while in America its entry (not without a few hitches) into the enormous market for pickup trucks and sport-utility vehicles has been responsible for its steady march to beyond 10% of the market. It is now breaching right down the neck of Chrysler.

Mr. Cho acknowledges that such international growth and globalization is the biggest change happening to the company. He sees his greatest challenge as maintaining Toyota's high standards in such areas as quality while it grows so fast across the globe. For Toyota has only recently started to transform the way it is run to make itself a truly global company rather than a big exporter with a string of overseas plants. Its top-heavy all-Japanese board has been drastically slimmed and five non-Japanese executives, including Mr. Press, have been made managing officers, which means that they sit on the executive committee in Tokyo, but are also left free to run their overseas operations on a day-to-day basis without deferring to head office. For Toyota, that is a big step away from centralized rule by Toyota City.

Another leap has been the creation of a Toyota Institute, not just for training Japanese managers, but also for developing groups of executives from all over the

world. The centre is expressly modeled on the Crotonville Centre that has played such a big part in the success of General Electric. By having squads of managers moving through development courses, head office can keep tabs on the potential of its people, whilst ensuring that they are thoroughly steeped in Toyota's way of doing things, whether it be in manufacturing, retailing, purchasing and so on.

But globalization and the rapid growth of production now in places such as China is also straining the learning process further down the hierarchy.

Toyota has a flying squad of line workers who move around the world to train locals at new factories or move in to help out when there is a model change going on. These line supervisors train local workers.

Toyota has also made astute use of joint-ventures to ease the strain of manning overseas operations: apart from its original one with GM in California, Toyota now has another with a local company in Turkey, with PSA Peugeot Citroën in the Czech Republic and in China, which is the fastest-expanding part of Toyota, in line with the country's rapid motorization. Toyota reckons that it will learn much about purchasing more effectively in Europe from its French partner in the new joint-venture, which is preparing to unveil a budget car for the European market at the beginning of March 2005 at the Geneva Motor Show.

But the company is finding there are limits to the number of Japanese managers and foremen who are prepared to work as expatriates, either on a temporary or permanent basis. So it has opened a Global Production Centre in a former production area in Toyota City. Here, on a given day you can see Filipino and Chinese workers being taught how to assemble Toyota cars. To get round obvious language barriers the instruction makes heavy use of video recordings and inter-active DVDs, a sort of automated, virtual version of watching how Nelly does it.

The best gets better

Perhaps the best single example of Toyota managers' aversion to taking it easy in the comfort zone is back where it started—in the mysteries of the TPS. Mr. Agata, one of the firm's manufacturing experts, regards his job as inculcating the virtues of the TPS in a younger generation. But he has concluded that the company has to raise its game. "We have always proceeded by



Figure 6: Toyota Prius, a four door limousine with a 1.5 liter four cylinder internal-combustion engine with 58 hp and an electric motor with 41 hp and a nickel-metal-hybrid battery. The car was launched in December 1997 and replaced by a new model in Spring 2003

steady improvement," he says. "But now we need to make step changes as well to keep ahead." That means finding radically different ways of manufacturing things like bumpers or doors, reducing the number of parts, and developing new machines to form parts more economically.

As GM's bonds sink towards junk status, and as Japanese carmakers steadily overhaul America's Big Three, it must be a chilling thought that Detroit's nemesis is working on ways to improve its performance. No wonder one GM planner mused privately that the only way to stop Toyota would be the business equivalent of germ warfare, finding a "poison pill" or "social virus" that could be infiltrated into the company to destroy its culture.

What else could stop Toyota? Soon it will have the scale to outgun GM. A technological revolution will not threaten it, since Toyota is leading the way with hybrid electrics en route to full-scale fuel-cell electric cars.

Toyota spends regularly around 4 % of its revenue on research and development R&D. In 2004, the expenditure on R&D amounted to \$ 6.5 billion, which is 3.94 % of this year's total revenue of \$ 165 billion. This effort was spent on R&D of anticipatory, advanced and environmental technologies with a central focus on the development of a fuel cell battery and the impact of expanding new models to promote Toyota's strength in a competitive global market for the future.

Consumer preference for exciting designs? Toyota has shown that it can play that game

also: there is a stylish edginess in recent models such as the Prius, Yaris, the new Avensis and even its venerable LandCruiser SUV. At least the man from GM put his finger on the key to Toyota's success. Provided its culture can be sustained as it goes from being an international Japanese company to a global one, then Toyota's future seems secure.

Why the future is hybrid

Toyota began development of a new car for the 21st century, which eventually turned into the Prius, as early as in September 1993. The goal was to develop a small, but nevertheless spacious car with a fuel economy better than 47.5 miles per gallon (4.95 liter per 100 kilometer).

The design efforts led to the world's first mass-produced petrol-electric hybrid car, powered by both an internal-combustion engine and an electric motor. The second-generation Prius, launched in 2003, won some of the industry's most prestigious awards—it has just been named European Car of the Year 2005—and generated a buzz out of all proportion to the car's prevalence on the roads.

The success of the Prius has taken Toyota by surprise. The average wait at American dealerships is currently six months, even though the company increased its sales target for North America from its initial estimate of 36,000 units to 47,000 for 2004.

To meet demand, Toyota announced another increase in August, saying it would push monthly global production up next year by 50% to 15,000 cars, and double its

allotment for America to 100,000 units.

While that number is still only one-quarter of last year's sales for America's most popular Toyota model, the Camry, it shows that consumers are willing to pay a premium for clean, environmentally friendly cars—as long as there is no need to compromise on performance.

Japan experimented with the combination of a combustion engine and an electric motor since the sixties. The German car manufacturers did not think this to be a serious alternative and thus did not pay attention, even after the first edition of the Prius entered the market in 1997. Experts are now convinced that ignoring this development in automotive technology can be compared to the „Worst Possible Accident“ in the nuclear field. GM Chairman and CEO Rick Wagoner now openly admits that at present hybrids are the best possible contribution of individual transportation to the protection of the environment. GM Vice Chairman Bob Lutz confesses at the Detroit Motor Show 2005 that Western manufacturers „missed the train“ and everybody present agreed.

Other carmakers are scurrying to catch up. Besides this year's new Ford Escape and Honda Accord hybrids, Toyota will add two sport-utility vehicles (SUVs) to its hybrid line-up early next year.

DaimlerChrysler recently announced that it will introduce a Mercedes hybrid within the next five years, and Porsche is considering a hybrid version of its Cayenne SUV. Even General Motors, one of the strongest proponents of hydrogen fuel-cell cars, has jumped on the hybrid bandwagon with two pick-up trucks, a sedan and several SUVs to follow. The US industry announced that it will launch at least two dozen gasoline-electric hybrid cars within next five years or so. But until these cars are ready, Toyota and Honda will continue to make the deals in the showrooms.

Ingredients of Toyota's Success

There are many books that provide insight into the tools and methods of Toyota's Production System (TPS). One of the most recent and also the most extensive book was written by Jeffrey K. Liker, Professor of Industrial and Operations Engineering at the University of Michigan in Ann Arbor, USA [4]. Ann Arbor also hosts the Toyota Technical Center (TTC), where significant portions of the Camry and Avalon sedans and

Sienna minivans for the U.S.-market are designed and engineered.

Gary Convis, Managing Officer of Toyota and President of Toyota Motor Manufacturing in Kentucky, USA, describes his personal experience in the foreword of this book as follows:

"When I joined Toyota after 18 years in the U.S. automobile business, I didn't know exactly what to expect. But I was hopeful. I knew that I wasn't comfortable with the direction that American automobile manufacturing was taking, and I felt Toyota might be different. In no time at all I noticed a fundamental difference between Toyota and my previous employers. At a Toyota/GM joint venture plant in Fremont, California, called NUMMI (New United Motor Manufacturing), I witnessed the transformation of a workforce from one of the worst in the General Motors system to one of the best manufacturing facility in the United States."

Through his research, Liker identifies fourteen principles of the Toyota Way, which he divided into the following four sections. He does not comment on whether the analogy to Deming's famous fourteen points of management is intentional or accidental.

Long-Term Philosophy

Toyota is about long-term thinking. The focus from the very top of the company is to add value to customers and society. This drives a long-term approach to building a learning organization, one that can adapt to changes in the environment and survive as a productive organization. Without this foundation, none of the investments Toyota makes in continuous improvement and learning would be possible.

The Right Process Will Produce the Right Results

Toyota is a process-oriented company. They have learned through experience what processes work, beginning with the ideal of one-piece flow. Flow is the key to achieving best quality at the lowest cost with high safety and morale. At Toyota this process focus is built into the company's DNA, and managers believe in their hearts that using the right process will lead to the results they desire.

Add Value to the Organization by Developing Your People and Partners

The Toyota Way includes a set of tools that are designed to support people continuously improving and continuously de-

veloping. For example, one-piece flow is a very demanding process that quickly surfaces problems that demand fast solutions, or else production will stop. This suits Toyota's employee development goals perfectly because it gives people the sense of urgency needed to confront business problems. The view of management at Toyota is that they build people, not just cars.

Continuously Solving Root Problems Drives Organizational Learning

The highest level of the Toyota Way is organizational learning. Identifying root causes of problems and preventing them from occurring is the focus of Toyota's continuous learning system. Tough analysis, reflection and communication of lessons learned are central to improvement as is the discipline to standardize the best-known practices.

Differences between the Japanese and Western Business Practices

Toyota's business practices differ from those of Western automobile manufacturers in a number of aspects:

- Operations are strictly governed by a sustainable business policy, which is passed on from one generation to the other and not by short-term decision making or by the attitudes of changing management teams and variable customer tastes.
- Growth comes from the inside out and not through mergers and acquisitions, in other words, growth through continual improvement of products and services and not through continued restructuring.
- Production is controlled by customer demand ("pull" system) not by production capacity ("push" system).
- Qualified employees are attracted with the possibility to participate in the company's striving to meet and exceed customer expectations with products of unparalleled quality and not with compensation schemes. Toyota employees work for a winner. Who wants to work for an employer, whose products have to be forced onto the customers with discounts and incentives? Who wants to work for a loser?
- No unions are admitted which force both management and employees to defend their own interests and by so doing distract from the shared respon-

sibility to satisfy customers.

- For more than 50 years, Toyota experienced an extraordinary history of continuous growth without major layoffs despite the ups and downs of national and global economies.
- Compensation schemes in line with training, experience and responsibility across all the ranks from top to bottom instead of skyrocketing salaries unrelated to company performance for a few.

How much do Germans like the cars they are driving?

Since 1968, J.D. Power and Associates has been conducting quality and customer satisfaction research based on survey responses from millions of consumers worldwide. We do not rely on "expert opinion", says J.D. Power. Our product and service rankings in no way reflect the opinions or preferences of the firm, and we do not review, judge or test products and services ourselves.

We represent the voice of the customer by translating survey responses into information that companies worldwide use to improve quality and customer satisfaction, as well as to help consumers make better decisions. J.D. Power and Associates has developed and maintains one of the largest, most comprehensive historical customer satisfaction databases in existence, which includes feedback on virtually all aspects of the shopping, buying, and product and service ownership experience.

Up to now, J.D. Power and Associates has conducted three studies on the satisfaction of German car owners. Studies similar to those of J.D. Power are conducted all over the world by marketing and consumer organizations.

The results are always more or less the same. Year after year, Toyota ranks first in reliability and customer satisfaction with a significant lead over other Japanese manufacturers leaving all others far behind. Over decades of consistent performance Toyota accumulated an immense capital in terms of public trust motivating customers to return and to take their friends along. Toyota does not need to offer huge discounts and other sales incentives to "move the metal". The result immediately shows up under the bottom line. Even though Toyota is not yet the biggest producer of

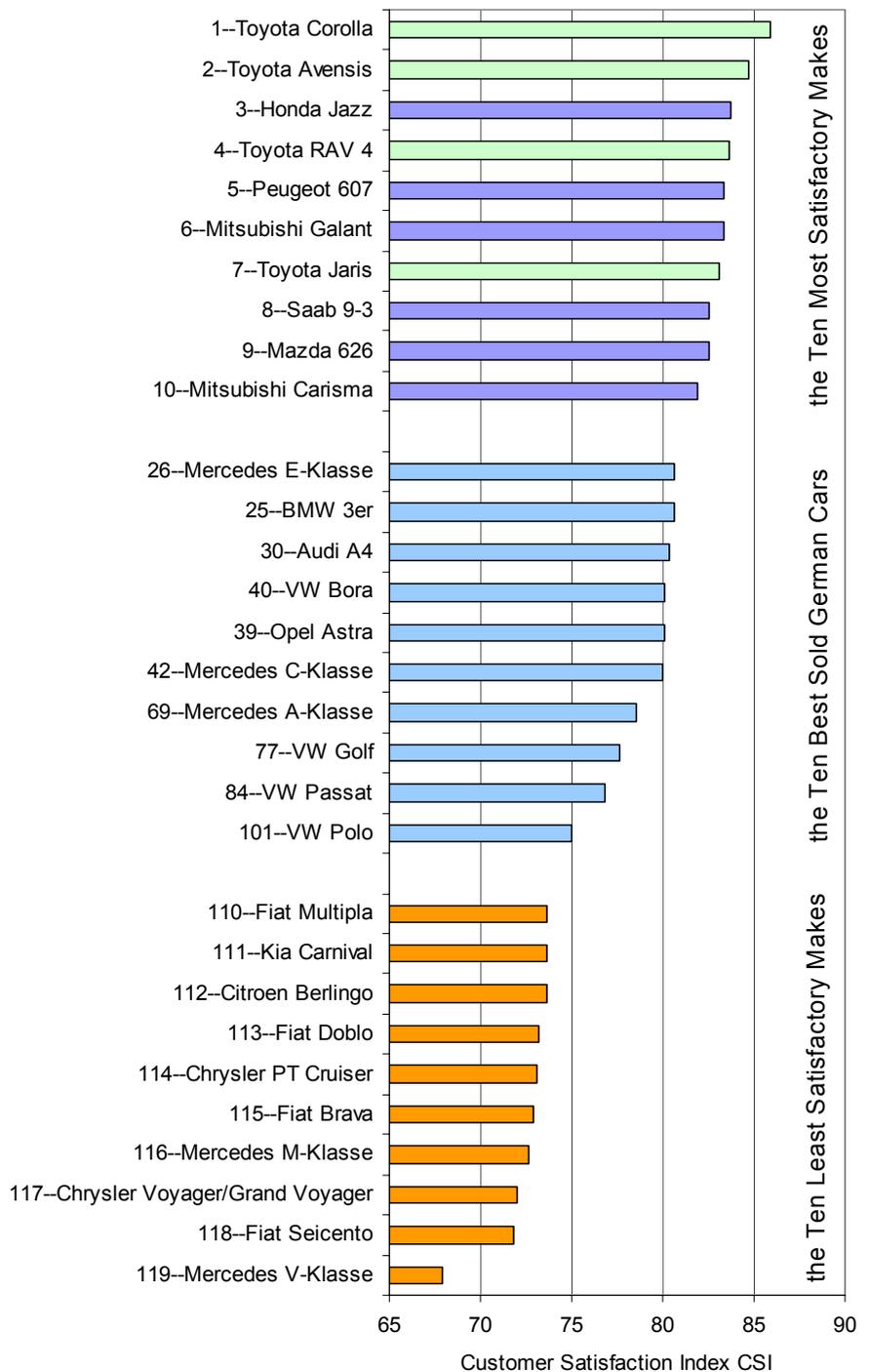


Figure 7: Extract from the JD Power Report 2004 on the satisfaction of the German car owners as expressed by the Customer Satisfaction Index CSI. Shown are the ten most satisfactory makes, the ten best sold German cars and the ten least satisfactory makes out of 119 classified models.

cars, its market capitalization stands high above all others as shown in Figure 10. Toyota ranks highest in every of the three studies conducted with German customers in 2002, 2003 and 2004. In the 2004-study Toyota models are at the top in three out of seven new-vehicle segments. Two other Japanese manufacturers, Honda and Mazda, along with Porsche and Peugeot, each have top-ranking models in one segment.

The top-ranked models in each of the seven segments are:

Small Car: Honda Jazz

Lower Medium Car: Toyota Corolla

Upper Medium Car: Toyota Avensis

Executive/Luxury Car: Peugeot 607

Sports Car: Porsche 911

MPV: Mazda Premacy

SUV: Toyota RAV4

The study analyses customer satisfaction based on responses encompassing 77 at-

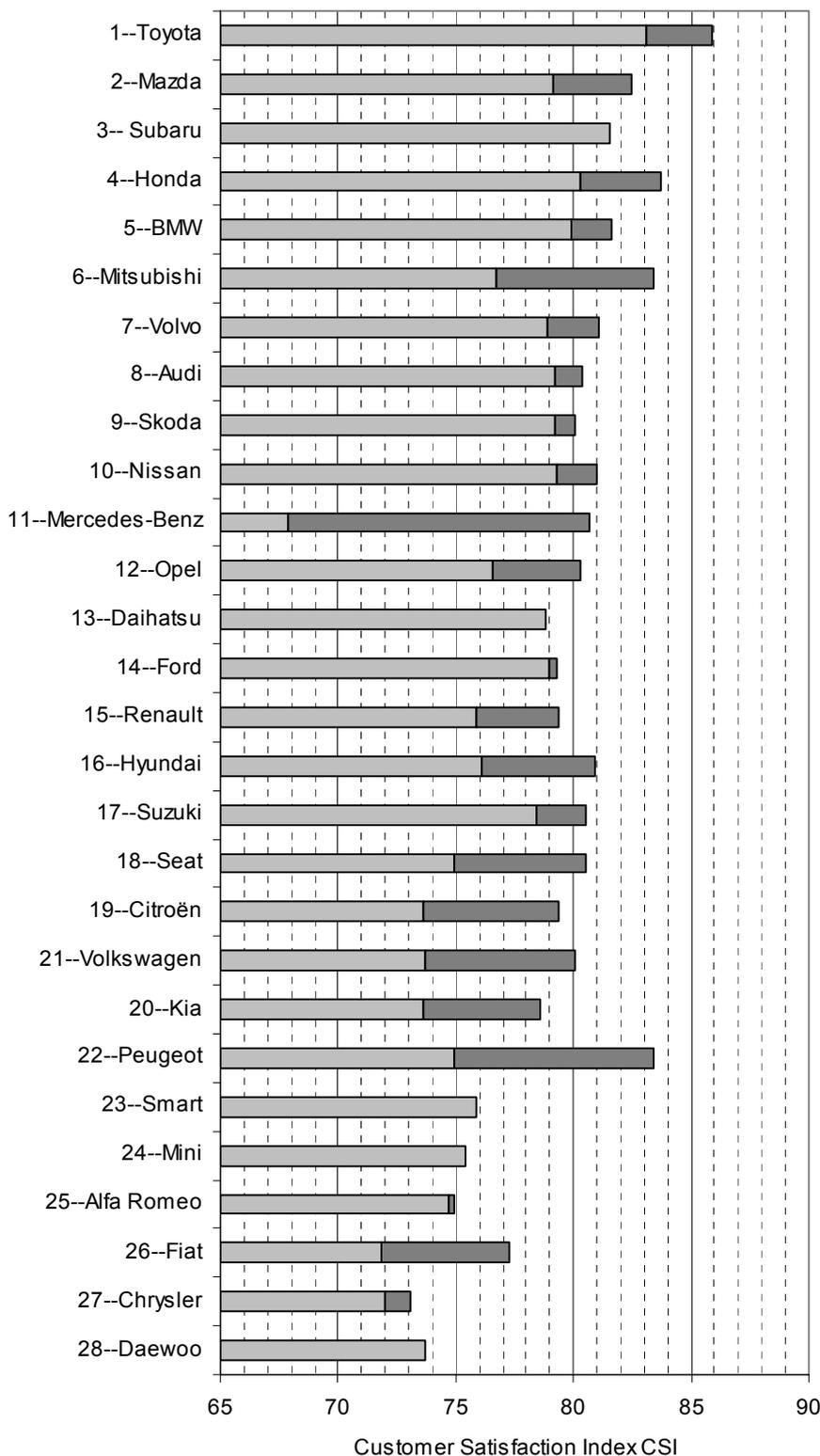


Figure 8: Extract from the JD Power Report 2004 on the satisfaction of the German car owners as expressed by the Customer Satisfaction Index CSI. Shown is the ranking of the 28 brands as considered by the study. Especially emphasized is the bandwidth of the CSI-values of each manufacturer's models.

tributes grouped into four key measures (the importance of each measure is shown as a percentage): quality and reliability (30%); vehicle appeal (25%), which includes performance, design, comfort and features; service satisfaction (23%); and ownership costs (22%), which includes fuel consumption, insurance and costs of ser-

vice/repairs. The top four brands in the overall ranking are Japanese. Toyota scores 84.4 points out of a possible 100, placing it significantly ahead of Mazda, Subaru and Honda, which score 81.6, 81.5, and 81.1, respectively. German manufacturers BMW, Audi, Mercedes-Benz and, for the first time Opel, perform above the industry

average.

The 2004 Germany CSI study is based on the responses of 24,483 vehicle owners who rated their experiences with their vehicles, their dealers and the cost of ownership after two years. In total, 28 brands and 119 models are included in the study.

J.D. Power and Associates conducts CSI studies throughout the world. In some markets, like the United States, the study is primarily focused on dealer service satisfaction.

The results of the JD Power Report 2004 give raise to some comments:

Mirror for VW's economic problems

The VW Golf, Germany's by most popular car, stands on place 77 of 119 classified makes. In 2003 the car ranked 100th of 115 classified and in 2002 82nd of 132 classified. The introduction of the brand new Golf V turned out to be a disaster. Potential customers could only be enticed to by the car with discounts and incentives unknown before. The statistics of the reliability of automobiles as established by the Swiss Drivers Association TCS 2004 (Figure 9) shows, that the reliability of VW automobiles continuously deteriorated since about 1990. With popular cars as bad as the VW Golf it does not surprise that the market capitalisation of VW is but a small fraction (8.9 %) of Toyota's worth.

What happened with Mercedes Benz?

The products of this producer are ranked 24th (Mercedes S-Class), 26th (Mercedes E-Class), 33rd (Mercedes CLK), 42nd (Mercedes C-Class), 69th (Mercedes A-Class), 78th (Mercedes SLK), 108th (Mercedes Vaneo), 116th (Mercedes M-Class) and finally as the red light on the list 119th (Mercedes V-Class). No other automobile producer has products which vary so much in customer satisfaction, say quality. Uniformity is an important aspect of quality. From this viewpoint Mercedes is indeed the worst of all.

Since the foundation of Mercedes-Benz on June 28, 1926, the cars with the three-pointed star on their hoods became objects of pride for their well-to-do owners and all those that wanted to look alike. The megalomania of Mercedes-Benz gambles with the trust of a large clientele that was built up over decades.

Not long ago, Mercedes was top in prestige and a symbol for quality and reliability. The moment a customer of a Mercedes re-

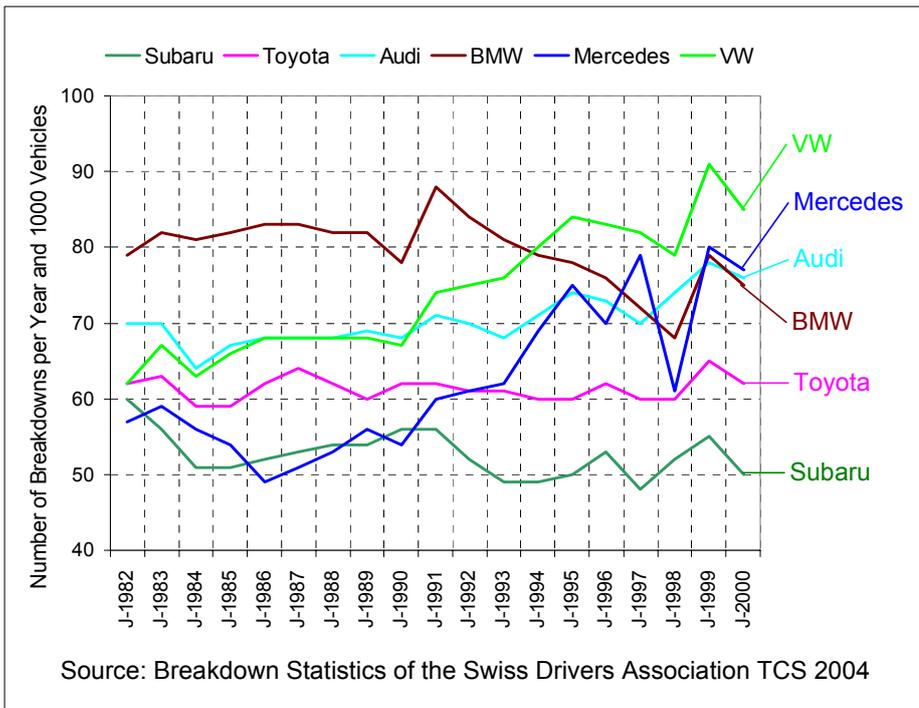


Figure 9: Extract from the breakdown statistics of the Swiss Drivers Association TCS 2004. The study only considers cars with more than four years of age. Shown are the results for Subaru, Toyota, BMW, Audi, Mercedes and VW over the period 1982-2000

ceived a new car, he had to order the next one, when he wanted to have it delivered when when turning the old one in. Discounts and other sales incentives were out of discussion.

Since Jürgen E. Schrempp founded his „Welt AG“ in 1998 to satisfy his ambition to become one of the key players in the automobile industry, not one year passed without a fire somewhere in his diverse conglomerate (Mercedes-Benz, Chrysler,

Maybach, smart, Mitsubishi Fuso and others). He had to act as a fire-fighter instead of looking after the quality of the products and the development and the launching of innovative, attractive and reliable cars.

The statistics of the reliability of automobiles as established by the Swiss Drivers Association 2004 TCS (Figure 9) shows that the reliability of the Mercedes cars deteriorated after the launching of the Mer-

cedes C-Class in 1985 and worsened dramatically since then.

On Wednesday evening, 9th February, 2000, ARD (Association of the Broadcasting Corporation of Germany) screened a remarkable documentary film with the title “The Fairy-Tale of Made in Germany”.

The preview of this documentary had the following comment:

„At the beginning of the 1990’s a study showed that Toyota made the Lexus with the same number of man-hours that Mercedes had to spend on warranty alone. The film showed how German companies are shunting the previous world champion exporter into a siding with sloppy work, expensive procedures and poor customer relations”.

The film closes with a little song that says a lot about the present situation in Europe in general and in Germany in particular.

„Good night Germany, only a single star is shining, Are you in the decadency too?”

Without you, how will our great industrial nation ever find salvation from the chaos that surrounds you.

Good night Germany, when will you understand that industrial perfection requires a new direction.”

(liberally translated from the Lyric of Nick Benjamin.)

The song describes a gloomy vision of Germany’s future. When this film was aired on ARD, nobody was yet willing to accept that this depressing scenario could ever become reality.

In the meantime, Germany’s unemployed workforce rose to 5.2 million (March 2nd, 2005). All sorts of countermeasures are being discussed, most of them merely administrative in nature. Yet nobody is willing to openly admit that the film “The Fairy-Tale of Made in Germany” revealed the root of the problem.

Obviously, the situation has to aggravate even further for decision makers to overcome their complacency and become active.

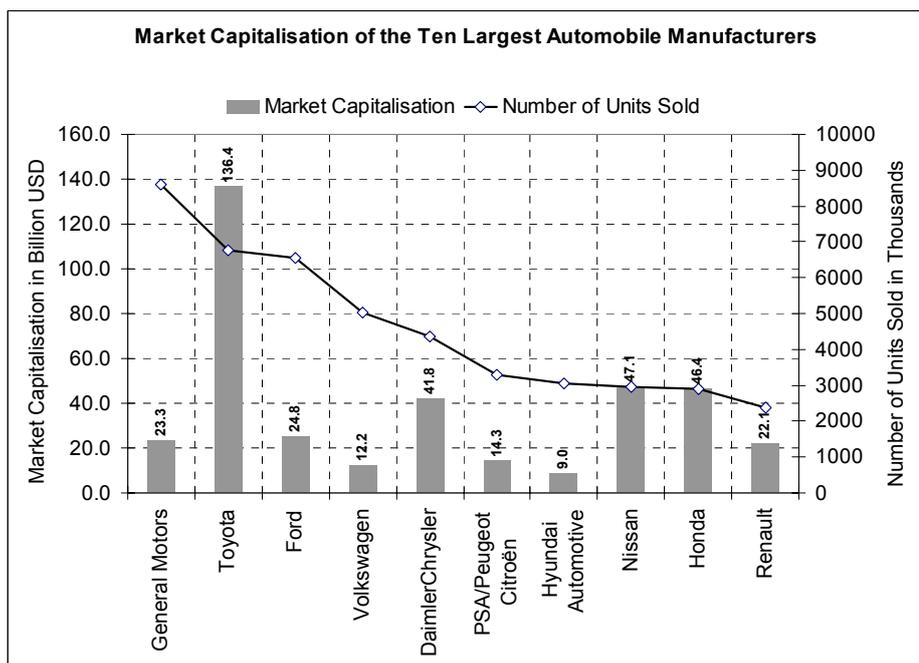


Figure 10: Market Capitalisation and number of cars sold of the world’s ten largest automobile manufacturers as a mirror for the quality and reliability of their cars

W. Edwards Deming and Toyota

Deming in the eyes of his contemporaries

At the 1991 Deming Prize ceremony, key personalities of the Japanese industry used the following words to recognize the contribution of W. Edwards Deming to the recovery of Japan after World War II.

Shoichiro Toyoda, Honorary Chairman and director of Toyota Motor Corp.: "There is not a day I don't think about what Dr. Deming meant to us. Deming is the core of our management."

Koji Kobayashi, chairman emeritus of NEC: "Deming made a great contribution to the recovery of Japan's economy after the total war. We needed his authority. He fascinated the Japanese people."

Yoji Akao, engineering professor at Temagawa University: "He's the person who introduced quality control after the devastation of the war and who was the starting point of the whole development of quality control in Japan. Japan owes a great deal to him."

The Deming Management Philosophy

From 1950 onward, Deming explained to top management in quality and productivity seminars his quality philosophy.

The impact of these seminars on the course of worldwide economy cannot be overestimated. Their influence developed to one out of the 10 most significant turning points ("History's Hidden Turning Points") in human history during the past two millennia. Apostle Paul, who carried Christianity to the Roman Empire, was the first, Deming the last.

This assessment was made by Daniel J. Boorstin, Historian, Pulitzer Prize-winning journalist, Director of the US Library of Congress from 1975 until 1987. The same opinion is expressed by John O. Whitney, Professor at the Columbia University Graduate School of Business and the Harvard Business School. [Back to Contents](#)

The Systems View

Deming taught the Japanese that production is a system and not a sequence of unrelated mechanical processes. The Japanese had knowledge, great knowledge, but it

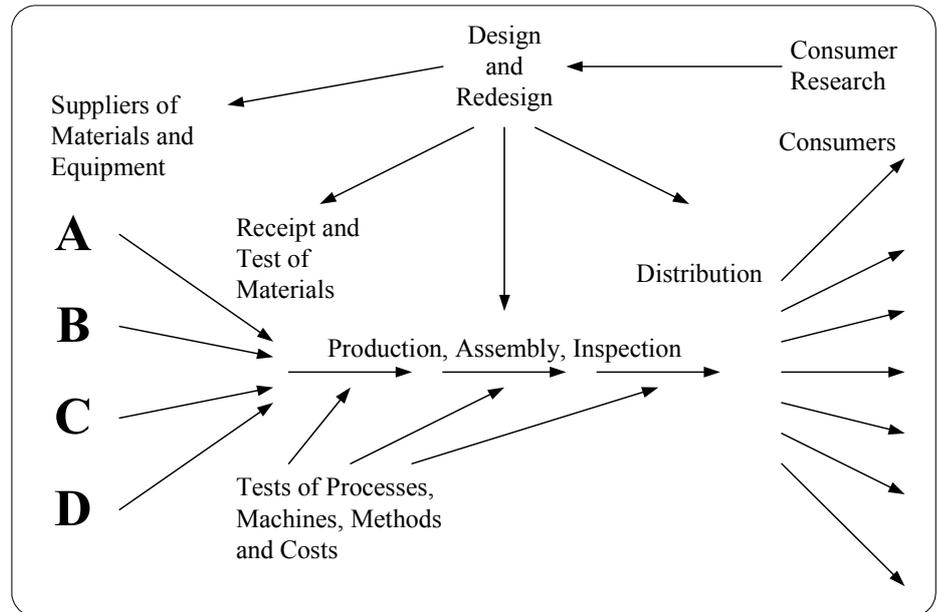


Figure 11: The revolutionary new view of looking at production as a system and not a sequence of unrelated mechanical processes was the basis for the success of Japanese products on the world market.

was in bits and pieces, uncoordinated. This flow diagram (Figure 11) directed their knowledge and efforts into a system of production, geared to the market - namely, prediction of needs of customers. The whole world knows about the results.

Supplies come in from various sources e.g. A, B, C and D. They go through various stages. They come out as a product, which might be semi-finished. The product is different from what went in. The product goes into distribution, it goes to one or more customers. Consumer research tries to discover what improvement or innovation in product or service might help the customer in the future and will entice him to buy. That may call for different inputs, design or redesign of product or service.

Everybody knows what a system is but nobody can define it.

- 1) A system is a whole consisting of two or more elements, each of which can determine the behavior of the whole.
- 2) How one element influences the behavior of the whole depends also on what other elements are doing.
- 3) No matter which way elements are grouped, every group influences the behavior of the whole.

These three definitions are included in the following statement:

The system is a whole, which cannot be split into different parts without losing its defining properties.

One of the best known systems and also

the most complex is the human body.

Systems cannot be understood through analysis, e.g. by separating the parts and looking at the parts separately, a method which served man so well over centuries.

It can be rigorously proved that improvement of the parts will not improve the behavior of the whole, since the behavior of a system is not the sum of the behavior of its parts but the product of its interactions.

Systems can only be understood through synthesis, where synthesis is the exact opposite of analysis, e.g. by looking at a system as a part of a larger system not as something which can be divided into separate parts.

Systems scientists are convinced that the step from the analytic thinking to the systems thinking means a total change of imagery comparable to the change of the image from the world being plane to being globe.

Japan proved from 1950 onward that this totally new view, the systems view, can have tremendous implications.

Based on the systems view of production, late Dr. Shigeru Mizuno and Dr. Yoji Akao developed a method called Quality Function Deployment (QFD). QFD links the needs of the customer (end user) with design, development, engineering, manufacturing, and service functions. It helps organizations seek out both spoken and unspoken needs, translate these into actions and designs, and focus various business functions toward achieving this common

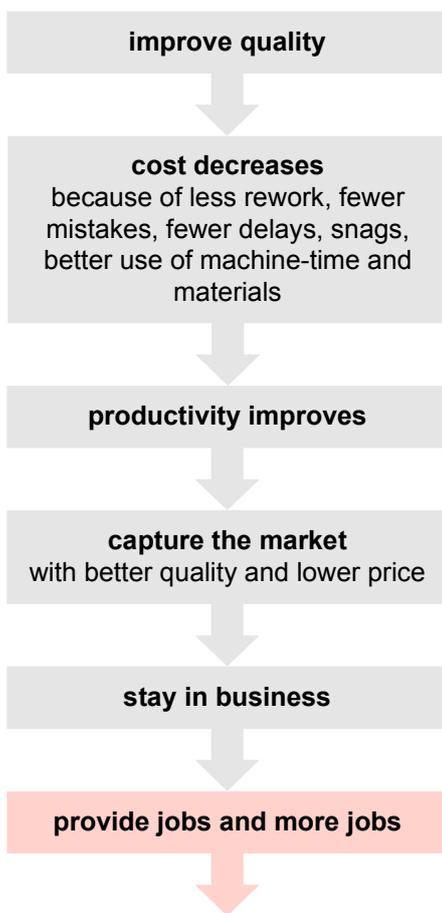


Figure 12: The „Deming Chain Reaction“ shows the conclusive consequences of quality improvement measures for the lasting success of a company.

goal.

The same systems view led Dr. Genichi Taguchi to the development of the "Taguchi loss function" or "quality loss function". The loss function estimates the social loss produced by a deviation or variability of any design parameter from the ideal or target value. The greater the deviation from target, the greater is the loss.

Taguchi devised a special methodology, now called the "Taguchi methodology", to arrive at designs which produce minimum loss to the customer. In an automobile, every defect means a loss to the owner. The extraordinary dependability of Japanese products is attributed to the systematic application of this concept to all phases of design, production and maintenance.

Taiichi Ohno also had the systems view in mind, when he screened the entire production process at Toyota to eliminate as far as feasible all the activities which did not add to the value of the product as experienced by the customer. He identified 8 categories of such activities or waste:

- 1) Overproduction

- 2) Waiting
- 3) Unnecessary transport or conveyance
- 4) Overprocessing or incorrect processing
- 5) Excess inventory
- 6) Unnecessary movement
- 7) Defects and
- 8) Unused employee creativity.

Over 30 years of intensive planning and experimenting to improve production, the Toyota Production System TPS, evolved, which allowed the production of many different models in small quantities with unparalleled efficiency.

The inventor of TPS himself describes the system in his book, "Toyota Production System, Beyond Large-Scale Production [3].

TPS is the next major evolution in efficient business processes after the mass production system invented by Henry Ford and it has been documented, analyzed and exported to companies across industries throughout the world.

The Deming Chain Reaction

Deming explained to his audience the chain of actions and its consequences known today under the name of the "Deming Chain Reaction".

Quality improvement leads to cost decreases and improved productivity, it captures the market, keeps the company in business and provides jobs and more jobs.

It is interesting to note, that Deming stresses the social function of a company and not the interest of the shareholders. Jobs activate the creative potential of human beings, generate income and provide welfare not just for a few, but for everybody. Unemployment is a waste, a terrible waste, which no nation should tolerate. Think of what the 5.2 million unemployed Germans could do for the nation.

Quality can always be improved and improvement can only come through human ingenuity combined with action managed by competent and responsible managers, which focus on customer satisfaction and the welfare of the employees instead of their own bank account.

Deming promised his audience that whenever Japan will provide the world market with products of unparalleled quality, wi-

thin five years manufacturers the world over would be trembling and would begin to scream for protection.

Deming later was told by top management that at the beginning he was the only man in Japan who believed it. Finally, after all, Deming was wrong. Japanese industry accomplished this goal within only four years.

Other Elements of the Deming Philosophy

Much more could be said about the Deming management philosophy and its influence on the success of Japanese products in the world market.

Known the world over are the Plan-Do-Study-Act (PDSA) Cycle for continual improvement, the 14 Points for management and the System of Profound Knowledge (SoPK).

The SoPK is comprised of the four major parts:

- 1) **Appreciation of a System**
- 2) **Theory of Variation** (right back to where it all started with Shewhart's breakthrough)
- 3) **Theory of Knowledge** (how do we know things, how do we learn things, how do we improve that learning and knowledge?) and
- 4) **Understanding of Psychology** (the understanding of people and the way that they interact with all that surrounds them).

This a very human philosophy.

First the Employee, then the Product

Deming advocates that man stands at the centre of every activity, be it as an individual, the team or the organization. His creativity, his vigor, his energy cannot be replaced by anything else.

The more an organization is capable of activating the complete mental and physical potential of its employees, the more successful it will be.

Deming expressed his view on the unique value of man in the form of the following quotes:

- „If you destroy the people of a company, you do not have much left.“
- „Monetary rewards are not a substitute for intrinsic motivation.“

- „All anyone asks for is a chance to work with pride.“
- „There will be quality of work life when people take pride in what they do.“
- „People are entitled to joy in work.“
- „The transformation can only be accomplished by man. A company cannot buy its way to quality“
- „There is no substitute for knowledge.“
- „Whenever there is fear, you will get wrong figures.“
- „Innovation comes from people who take joy in their work.“
- „If someone can make a contribution to the company, he feels important.“

Toyota demonstrates through actions, not only by words, that the convictions behind these quotes are implemented.

This short extract from the commemorative speech by Dr. Shoichiro Toyoda, Honorary Chairman of Toyota Motor Corp., on the occasion of being awarded the honorary doctorate by the Asian Institute of Technology in August 2003 summarizes the values and believes Toyota Motor Corp. is based upon.

“We at Toyota have long cherished the idea that "making things" requires "developing human capability." Since it takes human beings to make things, naturally you would have to build human capability before you'd start making products.

I believe that the same thing applies also to building services, building society, and building nations. I have long been convinced that the capability for making things is the motivating force for the development of industry, the economy, and technology, and constitutes the foundation for any nation's growth.

I can cite three reasons why it is important for us to focus on making things.

First, building of products is a great source of added value for the economy and society. The bulk of human endeavors in economic fields are revolving around useful added values, primarily in the form of making things.

Second, capability for making things induces and supports technological progress. Today, many Japanese argue for devoting ever more efforts to developing sophisticated kinds of fundamental technology. In many instances, however, this

would tend to generate disregard and inattention toward the capability for making things, namely, development engineering and manufacturing technology. And I personally have grave concerns about this trend.

To begin with, technology cannot advance on a broad scale if you isolate basic technology from applied technology. These two aspects of technology must be present to work with each other; to stimulate each other; and to be fused into amalgam on occasions, while exchanging their respective needs and seeds between them, for ultimate advancement in both.

Third, making things is important because it brings excitement and joy to the people involved. Human beings are instinctively capable of perceiving beauty in products of high quality and high performance. You must not forget that the act of making things brings joy to your heart and such an act is enjoyable in itself. To exercise your mind, exert your limbs, and spend your time, all for the purpose of making new things, represent a process that you can find gratifying; and when finally the product is complete at the end of your mental and physical exercise, you will be naturally filled with a sense of joy and fulfillment.

Additionally, I would like to say that building products does build people, or help people grow. The issue we have to deal with is how to develop good people for making good products. We have to prepare people and help people develop themselves through the accumulation of experience by performing round and round of work day after day.

In other words, we are building human beings by going through the process of building products; and skilful people thus developed can then rise up to yet greater product-building challenges. This is a continuous process of building human capability through OJT, or on-the-job training.

What is important here is the fact that building human beings means more than just letting them acquire necessary skills, know-how, or techniques.

When we say we "build people" at Toyota, it doesn't just mean that we have people skilful enough to build high-quality products on a timely basis. It also means that our people will have a strong sense of responsibility so that they abide by rules for safety and honor agreements made among

team members for joint work; and it also means that every member of the Toyota organization is strongly motivated to improve oneself to aspire for ever higher skill levels.

Let me cite an example: We at Toyota have always been very attentive to what we call "Four S's." The four S's here stand for sifting, sorting, and spick and span. Thorough attention to them helps us identify glitches on shop floors and visualize troubles caused by overburdening, non-value-adding activity and unevenness.

We have made a full use of ideas and experiences of our people directly engaged in production so that we can eliminate problems arising out of disregard of the 4-S's in every part of our manufacturing operations; and as a result, we have been able to build and refine the Toyota Production System, including the "just-in-time" system which many of you may be familiar with. This type of down-to-earth approaches in manufacturing have helped us constantly improve our sensitivity to such factors as safety, quality, efficiency, and costs, and are inherited from generation to generation as the DNA, as it were, of Toyota.

Global competition is growing increasingly fierce, and we are right in the middle of it. For Toyota to maintain and improve its competitive capability as a business entity, it is crucially important that we find suitable ways to pass on our "management philosophy" firmly rooted in the idea of making things, to later generations of Toyota workers and also to share our philosophy with Toyota's local members outside Japan.

As part of the source of Toyota's competitiveness, we have selected and arranged sets of fundamental beliefs and approaches. In other words, sets of values and codes of conduct that will have to be shared by all members of Global Toyota, in the form of the "Toyota Way" for worldwide application.”

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Swiss Deming Institute Student Forum

Reflections on Thinking Differently

Noel C. Spare

The new generation of students, young university graduates and postgraduate students alike are very open to thinking differently. They accept new ideas more easily than the generation of managers running our businesses today, who, in due course, have to reject much of what they have practiced for decades. In just a few years the young generation of managers will take over and will have the chance to apply what they have learned. If they have understood the new concepts, they will be well prepared to lead their organizations through the obstacles of global competition.

In this website a management instructor and two of his students reflect on what they have learned from two outstanding contributions to management science, the paper of Myron Tribus, "The Germ Theory of Management", and David and Sarah Kerridge, "Aristotle's Mistake". Both contributions are reproduced in this new revision of this site. In doing so, the Swiss Deming Institute expects that in the future other young students of management sciences will share their view with the visitors of this website.



Noel C. Spare is a Management Consultant with international experience in the teaching and practice of the Deming philosophy. He is a Project Leader with the Steinbeis Transfer Centre for International Strategy based in Straßburg / Kehl and an active contributor to the Swiss Deming Institute. He lectures in "Managing Complexity" to Masters Degree students at the University of Applied Sciences, Fachhochschule, Offenburg, Germany and in "Understanding Variation" to degree level students at the Berufsakademie in Villingen-Schwenningen. Germany.

Reflections on Thinking Differently

Whether we seek new ways to solve old problems or old ways to solve new problems, or both, the overwhelming majority of us are looking for the same thing - peace, prosperity and harmony between ourselves and with the planet. Of course all of these desires are relative and depend on ones perspective. For many people in the world, not going hungry would be a kind of prosperity that we in the west find hard to imagine. The relativity of our aspirations has to be borne in mind as we seek solutions that are not so narrow and selfish that they benefit one part of the globe at the expense of another. Or, to believe that one culture can impose solutions on another perceived less fortunate than ourselves. Indeed, it may in fact be the supreme irony that many of the cultures that westerners regard as under-privileged are in better shape to embrace different thinking than we are.

We have become adept at creating problems and inept at solving them and both have become institutionalised. Our way of thinking has become corrupted to the extent that even the suggestion of a different way is greeted with scepticism and even downright suspicion. Yet, as Albert Einstein famously observed, "The significant problems we face cannot be solved at the

same level of thinking we were at when we created them".

Only when we begin to change our way of thinking will we make progress. By considering an apparently random selection of historical and topical events we attempt to achieve an insight that might help us on the way to begin to understanding the complex subject of different thinking and why it is so difficult.

We are grateful to Myron Tribus and David and Sarah Kerridge for allowing us to publish two of their papers on this new edition of our web-site. These papers provide a profound insight into the origins of the prevailing western mind-set and why, after 2000 years it is so difficult to shake off, or, to turn our brains around and think in a different way. "The Germ Theory of Management" and "Aristotle's Mistake" cleverly identify the problem and show that when we make the transformation in our way of thinking, mankind makes tremendous progress. Often it shakes the foundations of our World or at least, our perception of it, as it did with Galileo. Galileo Galilei had the ability to think differently and in so doing changed the way we think, not only of the world but also of ourselves and our relationship to the universe. But it is a cautionary tale, for in thinking differently he challenged the prevailing conventional wisdom and consequently faced a tyranny that cost him his freedom.

Myron Tribus subtly puts this tyranny in a more modern context by using the analogy of germ theory and how the medical profession struggled to come to terms with bacteria. His picture of the young doctor, faced with explaining to his peers that by not washing their hands before and between surgical operations they were killing their patients, leaves a lasting and haunting image. "What would you say", Myron asks. Indeed, how many of us have churned over standing in front of the boss and telling him or her that their misdiagnosis of the disease of variation and their consequent inappropriate treatment of it, based solely on superstition, will sooner or later, make the situation worse. Of course discretion dictates that you do not express it in those terms but no matter how much you are prepared to torture the semantics, you know the end result will be the same. It is not easy when there is the mortgage, the school fees, the pension, not to mention the shiny company car on the executive car park to think about. It's a "no-brainer", tell them what they want to hear, you know they will manipulate the system to make their action look good anyway - everybody wins - right? Right - for a time.

It is an excruciating dilemma and it is difficult to see how to break out of this cycle of self-delusion. In a neat twist Myron asks readers to now place themselves in the position of the revered doctors having to listen to this young upstart. It can, at times, be uncomfortable reading Tribus! In terms of management, the dilemma remains widely unresolved and we remain predominantly where the medical profession was in the 19th century.

These two outstanding papers addressing the problem are written by mature and experienced thinkers and teachers of the Deming philosophy. They eloquently place thinking differently into the modern management context. Transforming prevailing mainstream management thinking will clearly, in the face of powerful tyranny, albeit often wielded with the most benign and altruistic motives, take time and a lot of learning. What better place to start than with the students, the graduates and post-graduates who will be our business leaders of tomorrow?

In the summer semester of 2001, I was privileged to teach an introduction to Deming's System of Profound Knowledge to a group of graduate students studying for their MBA in International Business Consulting at the University of Applied Sciences, Fachhochschule, Offenburg in

Germany. The students came from all over the world, China, Thailand, India, Europe and South America. The lectures were called "Managing Complexity", they might as well have been called "Think Different" but it was unmistakably Deming's System of Profound Knowledge (SoPK). One or two students had vaguely heard the name Deming and one or two knew about "Control Charts", so previous knowledge was almost totally absent. It struck me, after the first lecture and an initial reaction of almost undiluted disbelief, how quickly they took to it. Somehow the SoPK has amazing unifying qualities. To see all of those people from so many different cultures working and learning together and finding echoes of the philosophy in their own cultures was, in a strange way, vindication of my own, slow to realise, belief that here we have a profoundly different and liberating way of thinking. The antidote, continuing with the medical metaphor, to tyranny, no less.

At the SDI we do not have information on how much the Deming philosophy of management appears formally in graduate and post-graduate courses in European Universities. We do know however, that students from all over the world visit our web-site and consider it to be an important resource. We have therefore decided to create on the site, a Students' Forum. Here, students who are just beginning to learn about thinking differently, can place papers on any aspect they like of the Deming philosophy. Hopefully it can become an "ideas exchange" and the process of learning can be mutually supporting. We are grateful to two students from FHS Offenburg for agreeing to write papers for this site revision. Both were inspired by Aristotle's Mistake and the Germ Theory of Management. We invite any student visitors to the site to make a contribution by placing their own papers there and in a spirit of co-operative learning, to contribute to a virtual discussion group.

Congratulation to the students who participated in this course and to the Fachhochschule Offenburg for including it in the syllabus.

Swiss Deming Institute Student Forum: Some Thoughts on the Germ Theory of Management

Sabine Lang



Sabine Lang is a second year student at the University of Applied Sciences, Fachhochschule in Offenburg studying for her MBA in International Business Consulting. She is also working in the regional headquarters of a major German food retailer on project management and the implementation of IT and training programmes. As well as in Germany she has studied in Belgium and England and is fluent in German, French and English. She hopes to graduate in 2002 and be able to apply Deming learning in the future.

Some Thoughts on the Germ Theory of Management

Times became harder, business becomes tougher every day and we all have to struggle to survive. But as in our personal life we tend to search for the causes for our problems outside of ourselves, in other people, the government or institutions for example. It is easy to blame something else but it doesn't help to change things if change is what we really want. By looking elsewhere instead of ourselves we achieve the opposite of what we actually want. Everything stays the same and often they get even worse because we look in the wrong places and so consequently find the wrong answers to our biggest problems. The way we think, the way we behave and the way we live has to change if we want to change things.

In business it is not the workforce that is to blame, nor the economy, nor even the government. In most cases it is the system, the way in which we do business. How we produce our products or offer our services.

But where to start? You should not expect to find the solutions to all your problems overnight but at least start by doing something that helps. What could this be? Try to think differently from before. Perhaps this sounds easy? Well, unfortunately it is not. Take the example of medicine. One hundred and fifty years ago nobody thought about germs and their consequences for the healing process of sick people. Germs were invisible and therefore non-existent for people.

Nevertheless they were there and acknow-

ledged by the pioneering bacteriologists Louis Pasteur and Edward Lister. But did the knowledge of the existence of germs change things immediately? Of course not. Famous doctors continued their work as before. They did not wash their hands when having finished an operation before starting another one or use sterilised instruments. Doctors thought such things to be a waste of time. It took years to convince the medical profession that their way of working was endangering the lives of their patients.

So why should we expect today's managers to be any different? As the doctors in the past were reluctant to change their habits and methods so are the majority of today's managers. They are convinced that they do their work properly and in the right way. It took them lots of time and effort to get where they are now and they are hardly likely to accept now that they do not understand the essence of management?

The things we are taught, the things we can see and the beliefs of the society in which we live influence us all. But change takes the will to go deeper, to question the things we do - and ourselves. It feels more comfortable to blame others for mistakes that happen but as managers are we not responsible for our actions and for our businesses? I think so. So why do we delegate this responsibility to others who are not able to do it?

The first thing to do is to find the germs in business. But where are they? And what are they? We call it variability and its virus is everywhere: in materials we use for production, in processes of manufacture, in the training of the workforce, the condition of the workplace, and so on. Just as

there is no one person like another, also material differs, processes are susceptible to interferences, people have different skills and backgrounds, which make it easy for a virus to find its way through a system and infect it badly. The virus is widely spread and it is essential to try and eliminate it in its beginnings in order to reduce the variability in further processes. Like in medicine, if we allow the virus into one place it will not stay there but tries to grow and to make the whole body (system) weaker. And as the virus of variability is invisible like germs we need certain instruments to discover it.

Walter A. Shewhart discovered such instruments and W. Edwards Deming translated them to general management. Deming realised that the majority of people "accept scrap, rework, delays and missed schedules as normal". They accept them because they don't know that it can be any different. Even if they experience the difference somewhere else, it is put down to a different culture or different circumstances, which they believe they cannot provide for their own business.

The truth is different. It's in the management not in the culture; it's in the management and not in anything else. Only if we managers understand our business, our system, our processes and their outcomes can we change and improve them. And we must be able to discover the virus of variability to be able to keep it harmless. Probably we won't be able to remove it completely. Like in medicine, germs are everywhere and some of them attack our health so we have a cold, a fever or other harmless sickness. If we do not take care of ourselves the germs will be able to infect our body in a harmful way so we get seriously ill.

The same is valid for our business. We are unlikely to get rid of the virus of variability completely but we can keep it's spread under control to avoid serious damage. And we have to learn to distinguish between "colds" (noise) and "cancer" (signals) to react in an appropriate way. Recognising variation at an early stage can rescue our business; the alternative is bankruptcy, sooner rather or later.

Walter Shewhart provided management with a simple analytical tool that provides profound insight into the behaviour of processes and systems. By separating the variation into "noise" - that which is built into the system and is the responsibility of management and "signals" - that which

comes from outside the system and is often due to operator error, Shewhart discovered the disinfectant to control the disease of variation. By ensuring that managers recognise the type of variation they are dealing with, they can react appropriately to the disease. We now have the means towards better management. There is a new definition of a manager's job:

" The People work in a system. The job of the manager is to work on the system to improve it, with their help."

If we are honest then we accept that the times are gone when we could blame our workers for doing things wrong and make them responsible for mistakes. They work in the system for which we as managers are responsible. We can ask them for suggestions and help to improve the system but it is our job to make the changes and improvements, not theirs as we work on the system. But to do this we have to know how to work on a system. For the most part we have not learned this yet and we have to find out where we can get the knowledge to do so in the future.

To make things work we need an atmosphere of trust and openness. People within an organisation need to know that they can be honest about what they think and speak without fear of losing face, or even their job. Perhaps the discovery that "whenever there is a problem 85% of the time it will be in the system and only 15% of the time it will be the worker." will help. Therefore take care not to blame your workforce for mistakes for which they are not responsible, as it can have consequences not only for your whole organisation but also for people's personal life.

Try to get rid of the idea of thinking in organisational charts. Organisations have to be treated as a whole, not as parts of things that are done by one department but which have effects on the work of other departments. Try to remove boundaries and think in terms of processes and systems whereby things get done.

Though it is important to live in the present and analyse systems here and now for the virus of variability it is also essential to do so for the future. It is not something that can be done by our workers; they are busy with the present operations. It's the task of managers and boards of directors to keep an eye on future developments to remain competitive. Again this means studying processes and emphasising worker training to make sure that variability

remains low.

As I mentioned at the beginning, times become harder, business becomes tougher. The only way to stay successfully in business is by not expecting that others change things for us but to start changing things for ourselves. Being ready to learn something different from what we were taught, training others, being an example of what we expect from others and taking our own responsibilities will be the first steps in a new management philosophy. The results will not only be reductions in time and costs because of better processes through improved quality. There will also be improvements in the quality of our lives. And is there anything in the world that counts more?

Swiss Deming Institute Student Forum

Complexity Management, the Germ Theory of Management and Applications from the World of Business

Uwe Dindas



Uwe Dindas is a final year student at the Graduate School of the University of Applied Sciences, Offenburg, studying for a Masters Degree in International Business Consulting.

He began his career serving in the German Armed Forces occupying several positions in the logistics branch. In the role of in-house consultant he specialised in the optimisation of administrative and logistic processes and gained the rank of First Lieutenant.

During his service he gained entry to the German Armed Forces University in Munich from where he graduated with a Degree in Business Administration.

A period as a consultant specialising in Accounting, Controlling and Finance preceded his decision to study for a Masters Degree.

An introduction to the Deming philosophy has given Uwe a different perspective and he affirms that the new insight it has given him into systems and processes, leads to solutions and optimisation potential that had hitherto been obscured.

After graduating he would prefer to work either in a consulting firm or in the management of a company with a strong international orientation.

Feedback: uwe.dindas@gmx.de

Complexity Management, the Germ Theory of Management and Applications from the World of Business

The purpose of this essay is:

- to discuss some key aspects of the text "The Germ Theory of Management" by Myron Tribus,
- include some issues covered on the course, and
- to integrate own ideas related to the topic.

Introduction

What do medicine and management have in common? Nothing, you think. Well, than think again. Because according to Myron Tribus, medicine and management share one thing that has a dramatic impact on the outcome of the work of doctors as well as managers: the virus. Doctors are concerned with bodies as systems, in which biological processes are running. Managers are responsible for businesses that represent also systems, but with economic processes inside. Both types of systems can become infected with a virus that causes a lack of stability in the natural equilibrium of the system.

To point this out, Tribus goes back to the 19th century, when Louis Pasteur discovered that bacilli cause diseases and developed a way to prevent contagion. This discovery led to a change in the way phy-

sicians treated their patients. Until then they never cared about cleanliness or even sterility in their work environment or their instruments. So the outcome of the treatment was pure chance. The patient got better, stayed the same or got worse.

In business managers have to deal with their own kind of virus: variability. It is not a real virus in a biological sense. It is only used in the figurative sense to explain a certain behavior of a system. And a system in today's more and more complex and dynamic world is highly susceptible to this virus.

The concept of variability is not new, but much too often neglected. Already applied in the 1920's by Walter A. Shewhart and continuously developed by W. Edwards Deming, Homer Sarasohn and J. M. Juran, it explains how management should organize and operate systems and processes to get the desired outcome.

But where is the link between medicine and management? In medicine a virus can lead to the death of the patient, thus everything has to be done to avoid contagion and to make sure that the system and the medical methods applied work in a way to get the best result, which is a cured patient. Transferred to management, this means that the environment, the system and the processes as well as the instruments used, have to be prepared and kept in a condition that enables managers to provide for an optimal result of their operations. To make this possible, in a first step variability has to be understood in order to be able to handle it in a second step.

The first step: understanding variation

For nothing in life a guarantee can be given. This is also true for any kind of process. No matter what a company produces, the outcome - this is the final product or service - will never be the same. Too many factors influence the process, so it will naturally never be possible to get the same result twice. Results will be within a certain range, and it is this range that management has to care about. It has to make sure that the system, i. e. the infrastructure for the transformation of production factors, is continually undergoing improvement to reduce the range, in order to get results that meet, if not exceed the expectations of the customers (Diagram 1).

The range of measured outcomes is determined by the upper and lower natural pro-

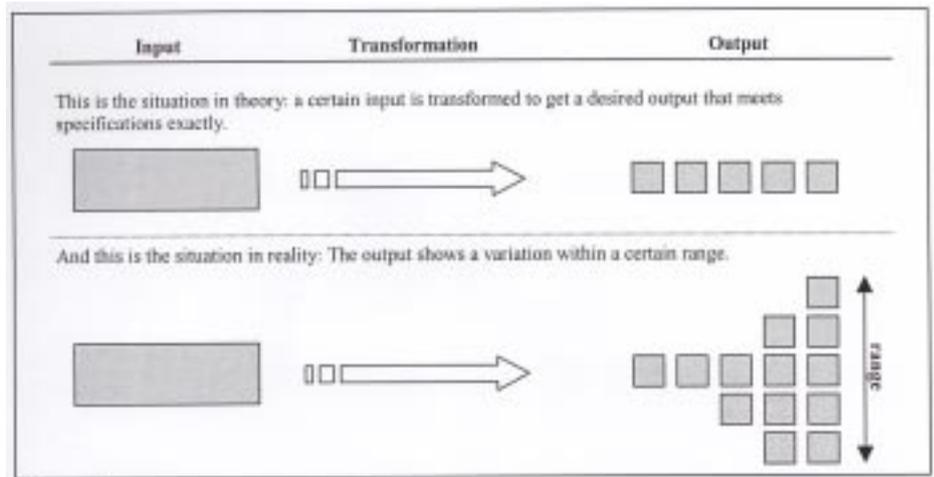


Diagram 1

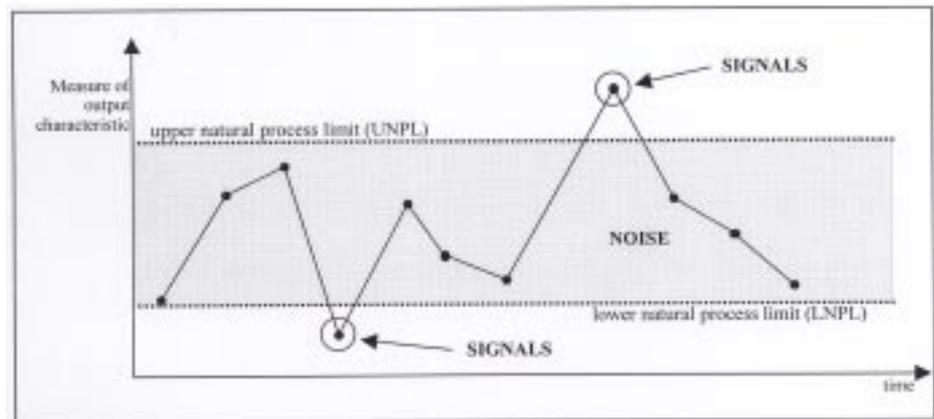


Diagram 2

cess limits. Between these limits we have a stable and predictable process, the only basis for successful and continual improvement in any company. All results that fall within these limits are called "noise" and represent the natural and predictable outcome of a stable process. The causes for the variation between individual outcomes are indeterminable (i.e. buried in the noise). Outcomes outside the limits are called "signals", and when they occur, something went wrong due to determinable causes which can often be identified and corrected by the operators or workers in the system. It is the responsibility of management to further improve the processes by reducing noise since this can only be achieved by bringing in fundamental changes or modifications to the process or system. Diagram 2 visualizes this.

This is the framework: understanding that there are two kind of variation each requiring a different approach for its reduction and the achievement of process improvement.

The second step: how to handle variation

Another important aspect is to realize that the virus of variability can come from outside the system and that it can spread within it. So the point is to find out where the variation comes from and to improve the source in a way that the system itself will not get "sick".

The management's task has to be to find out where variation comes from, how it affects the system of e. g. production and how variation can be reduced to improve the system and its results.

But what is the situation in today's real world? Most companies have a "Quality Control" which is nothing else than a way to get rid of the wrong results of a flawed process. It is taken as normal that scrap is produced, instead of asking how the process can be improved to avoid waste.

One of the main forces behind this malfunction are the accounting practices companies are following. They allow the management for instance to post overhead costs in which wrong results and waste are hidden, which are caused by variability due to

generating variants. That's the easy and thus popular way. A new and little bit more difficult approach is to find out the so called "complexity costs". These costs are caused by variants and the efforts of handling it. But unfortunately they are not calculated very often, because it takes some work to find them and they might lead to information that is not very comfortable for the management.

The consequences of variability shall be pointed out at the example of Deutsche Bahn AG. The introduction of the high speed train InterCity Express (ICE) was supposed to offer a transportation means that connects major cities in Germany in a very short time. But as most travelers experienced soon, the train was unreliable, often being late. It was and still is the same as for most other trains of the Deutsche Bahn AG.

On the other side we can take a look to Japan and - once again - learn. For several decades the Japanese railway authority operates a high speed train known as the Shinkansen Express. And if it is known for one thing, than it is for its extreme reliability. The trains are always on time and always stop at the same place in a train station. For the safety of the travelers, they are separated from the tracks by a metal barrier with sliding doors to provide access to the trains. Every day the same train stops at the same point so that the doors of the train are absolutely there where the sliding doors in the metal barrier are. Nearly unthinkable of in Germany. The ICE is often not on the same track, nor does it stop at the same place every day.

The reason for the difference in the operation of both trains can be seen in variability. The Japanese Shinkansen Express is operated on tracks that are solely dedicated to this train, and nothing else.

In Germany, the tracks are used by any other type of train one can think of. Inter-City trains, InterRegio, normal trains and freight trains use the tracks as well as the ICE. It is easy to imagine that it is extremely complicated to coordinate the schedules in a way that all trains are on time.

Deutsche Bahn AG also provides a good example for the spread of variability (Diagram 3):

A local train (A) that stops very frequently gets off schedule. As a result, the next train (B) has to wait for the passengers and will not be on time. Later on for this train (B) as well as the subsequent train (C) additional

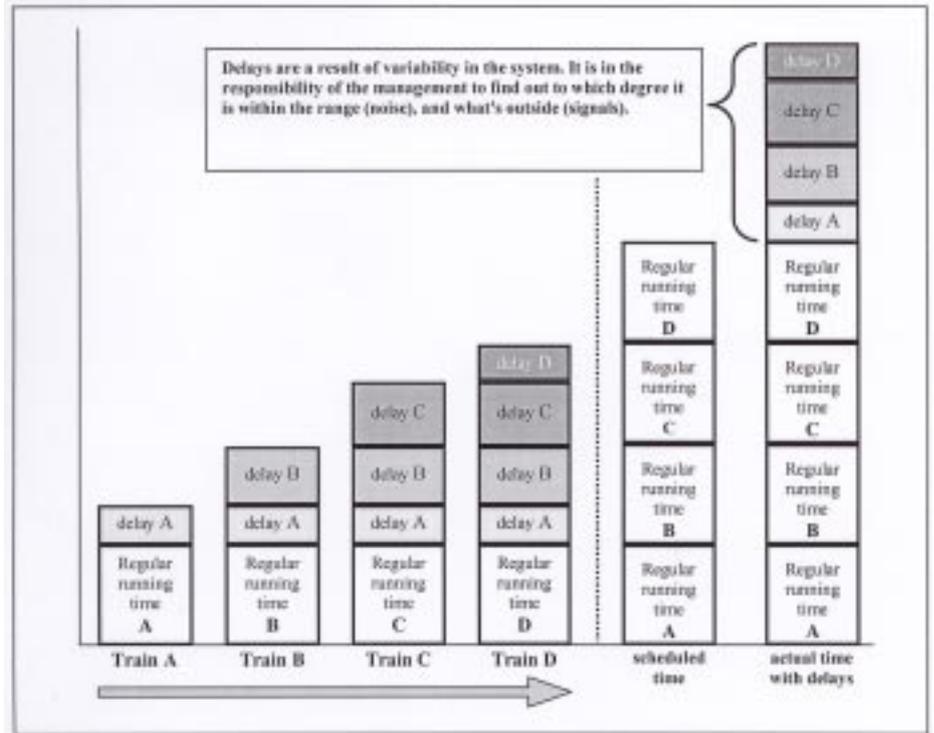


Diagram 3

delays occurs. But these trains are supposed to connect the travelers to the next big city, where they can get the ICE (train D). Now the ICE itself has to wait, leading to more time delay. After the arrival, the same goes on down to the local train. The virus gets into the system and it is infected, making customers unhappy.

But instead of simplifying things, the fault is given to anything else. The management of Deutsche Bahn AG is used to operate all kinds of trains because it is assumed that a wide variety has to be offered to customers. But it should be obvious that the voice of the customer tells two different things:

1. Provide fast and reliable train connections.
2. Provide them at a reasonable price.

Now the complexity costs move to center stage. When different types of trains are operated, it is complicated to coordinate them to make sure that the first customer need for fast and reliable connections is met. Then we have an "overhead" in the organization that costs a huge amount of money. On the other side, if the trains are not reliable and the tickets are expensive because of the overhead, travelers will not take the train, but the car instead. Business gets lost for Deutsche Bahn AG, making it necessary to distribute the costs to less customers, making the tickets more expensive, making the customers to take the car instead of the train, losing more

business... - well, you get the point.

A solution for Deutsche Bahn AG would be to change the system. The variability is so inherent in the system that there seems to be no other way.

One of the major problems when it comes to changing a system is that people are used to do their work in a certain way. They are extremely reluctant to change. In the case of Deutsche Bahn AG, the company was state-owned and thus had no obligation to shareholders. Since it is privatized, it has to follow new rules, but in day-to-day business it can be observed very often that it has a long way to go.

But who is to blame for this? Is it the management? The workers?

When we follow Tribus, the workers are only to blame in about 15% (sometimes even only 3%) of all cases when something goes wrong. The rest is caused by the system (Juran's rule). Obviously, in the case of Deutsche Bahn AG, the system is flawed, and who else is to blame than the management? The workers work in the system. They are a part of it, and consequently it is not possible for them to see the connections within the system and with its environment. That is the responsibility of the management, who works on the system (Diagram 4). They can see how the components of the system interact with each other and how the system is influenced by its environment. So it is the management's objective to change the system to enable

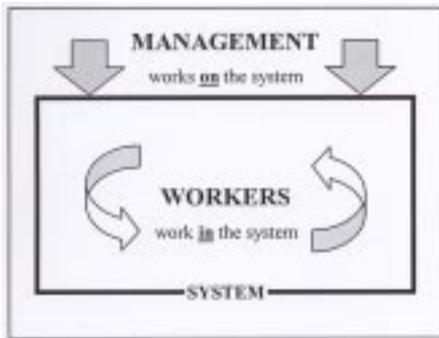


Diagram 4

the workers to do a better job. So if a train comes late, it is not the fault of the engine driver or the conductor. Maybe they are forced by the system to wait for another train that is already late.

Organizational charts prevent from thinking in processes

A lot of other companies are still managed using an organizational chart. Its purpose is to show exactly who is responsible for what, who has to be blamed if something goes wrong and who has to be pleased.

Understanding and reducing variability calls for a strict process-orientation, because the virus of variability spreads through the processes in the system. If there is anything that prevents from understanding a process, it's an organizational chart. Processes run through an organization, making the functions of the organizational chart a service provider for the process that aims at listening to the voice of the customer. The thing to use then is a process flow chart that shows how the process flows through the company and across the functions.

But once again it is very difficult to change things. People like to know their place and their function within an organization, making sure that they have a certain amount of power. They don't like the idea of giving this up and to serve a process. And more often even managers are not even aware that there are processes and how to recognize them and how to integrate them into a system. And when they do not recognize them although they are already there, they are not able to see what is wrong and how it can be fixed.

One possible approach to at least ease the problem is to split the company virtually into small businesses, with every unit being a supplier or a customer to another one. This network of internal suppliers and customers together with the interfaces to the

outside world containing the "real" suppliers and customers forces management to make sure that every unit has the best possible input to provide the best possible output. When this is achieved, the company has a clear orientation of its operations towards the value chain, which represents the core process of the company: to create value for the external customer. With this approach as a basis it is much easier to drill down into the business to recognize and analyze existing processes, and to re-engineer them to improve the overall performance of the company.

An additional disadvantage of organizational charts: numerical goals

Organizations that are managed by charts have to be controlled in a certain way. Numerical goals for organizational units have been considered as a very useful tool, even if they were more or less arbitrary and thus not necessarily in relation to the economic reality.

The problem was that different organizational units had different numerical goals, while the company itself had still another one.

These numerical goals are not always linked to each other, or they are conflicting. The result is that the organizational units try to achieve their goal without consideration of the impact of their decisions on other areas, making it impossible to reach the goal of the company.

In recent years new approaches have been developed to address this problem. Stern Stewart, a New York City-based consulting firm, came up with the so called Economic Value Added (EVA), a measure for the operating performance of a company. The idea behind it is to provide a figure with which everyone in a company can identify. Numerical goals in organizational units will become obsolete, because the main goal for every unit is to increase EVA. The question will not be if the sales department can increase revenue, but how it can make a contribution to the EVA. So a decision is in-line with the goal of the company if its impact on EVA is larger than zero.

To close the loop we can once again link the concept of the EVA with medicine. The goal of the doctor is not to reduce the patient's pain by 25% within the next 5 days, but to do everything that will support the convalescence.

New problems call for new ways to find solutions

New problems call for new ways to find solutions

The business environment has changed dramatically in the last years, and there are no signs that change will slow down in the future. To prepare and to adapt to changes, management has three major tasks:

1. Re-Think

The objective is to step out of how we have thought about how organizations work. Not the fixed structures of organizational charts, but the flexibility of flow charts that describe processes will allow us to improve the situation of the organization.

2. De-skill

Use tools provided by "hype" management-paradigms extremely careful or get rid of them, especially when they promise everything and achieve nothing. Analyze the idea behind them, it might be a response to an existing or upcoming problem. And use common sense and logic to apply or to modify it for your purpose. Understand them to make them a success in your company. The author has seen companies where "benchmarking" was understood as "copying processes from competitors", instead of "analyzing the best practices of other companies (not only competitors) and adapt according to the own operations". When such methods are applied wrongly on a regular basis, disappointment will lead to a basic reluctance of employees to use these methods. And their question is justified: what for?

3. Re-learn

To be able to handle processes within a system, the management has to get familiar with new tools that can be applied to study processes, to control them and to find out if they are flawed. To these instruments belong especially basic statistical methods. But this is not enough. When a company steps away from structures to processes, different hierarchical levels are brought together. It is the managers obligation to provide the leadership for cross-hierarchical and cross-functional teams to work in the best sense of the system.

Leadership also means that the management understands that most mistakes are caused by system failures, not by the workers. It needs qualities of leadership to admit that management itself is responsible for the system and what goes wrong.

But here a Japanese word can help: Don't look for someone to blame for the problem; fix it.

What can be learned from Myron Tribus

In today's dynamic times new ways of thinking and acting are needed to be successful. This holds especially true for companies that are more and more involved in a global, increasingly competitive market.

The expectations of the customers are also changing. In different regions of the world markets are different and customers have ever more sophisticated needs. Flexibility is one of the most important characteristics a company has to have to be able to compete and to survive. Flexibility means to redesign the organization as a system of processes that can be adjusted to changes within or outside of the system.

Processes link activities that are dependent on the work of their predecessor. The value chain can only create additional value if every step works in an appropriate way to get the expected result. It is therefore crucial for the success of a company that has transformed towards a system of processes to understand the virus of variability.

It has to be understood that the virus is there and that it influences the system. And it has to be understood as well that the system has to be observed for the virus and that steps have to be taken as the virus is detected to eliminate it as early as possible and avoid the contagion of the entire system.

Feedback: uwe.dindas@gmx.de