

Out of the Crisis by Edwards Deming

Summary

1. This book teaches the transformation that is required for survival. A company cannot buy its way into quality - it must be led into quality by top management. Everyone doing his best is not the answer. It is first necessary that people know what to do. The first step in the transformation is to learn how to change: 14 points and to cure themselves of the diseases. Management will in time be judged not by the quarterly dividend, but by plans and 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.

Key Takeaways

1. 14 Principles for transformation of Western management
 1. Create a constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs (innovation, focus on research and development, and education)
 2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change
 3. 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
 4. 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.
 1. How can a supplier be innovative and develop economy in his production processes when he can only look forward to short-term business with a purchaser? A second source, for protection, in case ill luck puts one vendor out of business temporarily or forever, is a costly policy. There is lower investment and lower total inventory with a single vendor than with two. A company that adopts the recommendations made here will have wide influence. The suppliers that serve one company also serve other companies, and will deliver to all of them better and better quality with better economy. Everybody will come out ahead
 5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs. Focus must be on lowest total cost, not lowest initial cost. A steady, dependable source, responsive to needs, on a long-term arrangement, is more important than price. Make a partner of every vendor and work together with them on a long-term relationship of loyalty and trust
 6. Institute training on the job. Management needs training to learn about the company, all the way from incoming material to customer. A central problem is need for appreciation of variation

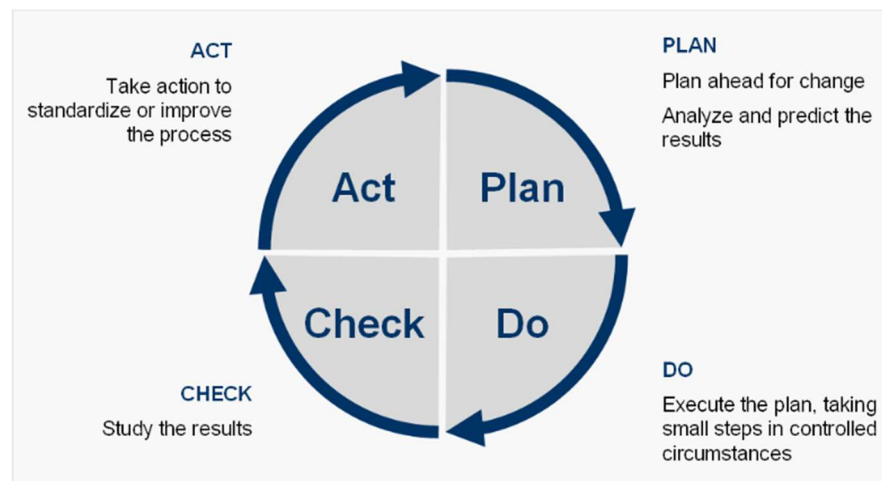
1. A man in Japanese management starts his career with a long internship (4-12 years) on the factory floor and in other duties in the company. He knows the problems of production. He works in procurement, accounting, distribution, sales
2. A big problem in the US arises from a flexible standard of what is acceptable work and what is not
3. The greatest waste in America is failure to use the abilities of people
4. Training for a job must teach the customer's needs
7. Adopt and institute leadership.
 1. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers
 2. Focus on outcome must be abolished, leadership put in place
 1. Remove barriers so hourly workers can do their job with pride in workmanship
 2. Leaders must know the work that they supervise and empowered and directed to inform upper management about concerning conditions that need correction
 3. Work on improving the system, not on special causes
 4. Foremen who know the production process, who touch the medium and whom the operators respect. He must have a voice in selecting and training his people
8. Drive out fear, so that everyone may work effectively for the company
 1. No one can put in his best performance unless he feels secure. Secure = without fear/care
 2. Western industry requires knowledge yet people today are afraid of knowledge. Pride may play a part in this resistance and fear of finding out failings. People must not fear doing what is best for the company, even if it hurts quotas for a day
 3. Management's first step should be to discover by calculation, not by judgment, whether this category is out of control with respect to the others. If yes, then this category requires his special attention and help. He must also work on the system to reduce all complaint
9. 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
 1. Each area must intimately know the people and processes in the rest of the company or else there will be losses in productivity. Each area can optimize their own work but not working as a team for the betterment of the company
 2. There must be ways for customer service, engineering, etc. to report back complaints to production
 3. The credit department may be the earliest source in the company to learn about troubles that customers have for shortage, late delivery, damaged, goods, and poor quality. The credit department can help to put out first by

- rapid referral of such complaints to the right people in customer service, and to salesmen, and to people in manufacturing
4. One way would be to encourage switches of personnel in related departments
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as 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
1. Posters are aimed at the workers and they have little say regarding improving quality and productivity. They are asked to do what they are unable to do. The effect is fear and mistrust of management. It is the job of management to fix the system if there are problems
11. Eliminate work standards (quotas) on the factory floor. Substitute leadership. Remove management by objective. Eliminate management by numbers, numerical goals. Substitute leadership
1. A quote is totally incompatible with never-ending improvement
 2. The operator's job is pride in service, not to meet quota
 3. Leaders must have a good understanding of the job and what the job truly is. Set incentives to meet that job and allow the operators to have pride in workmanship
 4. If you have a stable system, then there is no use to specify a goal. You will get whatever the system will deliver. A goal beyond the capability of the system will not be reached
 5. To manage, one must lead. To lead, one must understand the work that he and his people are responsible for. Who is the customer (the next stage), and how can we serve better the customer? An incoming manager, to lead, and to manage at the source of improvement, must learn. He must learn from his people what they are doing and must learn a lot of new subject matter. It is easier for an incoming manager to short-circuit his need for learning and his responsibilities, and instead to focus on the far end, to manage the outcome - get reports on quality, one failures, proportion defective, inventory, sales, and people. Focus on outcome is not an effective way to improve a process or an activity.
 6. Only when it is life or death may you manage by numbers. By this point, it is likely too late anyway
12. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality. Remove barriers that rob people in management and in engineering of their right to pride in workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective
1. How can anyone on the factory floor take pride in his work when he is not sure what is acceptable workmanship, and what is not, and cannot find out? What is their job?
 2. All morale and hopes wither away where the management is not ready to take action on suggestions

3. Absenteeism is largely a function of supervision. If people feel important to a job, they will come to work. People are not commodities and this scary line of thought has overtaken management lately. He will feel important to the job if he can take pride in his work and may have a part in improvement of the system
4. Should institute a system so that employees may report trouble with machines or with materials and by which these reports will receive attention
5. People can face almost any problem except the problem of people
6. Give the work force a chance to work with pride and the 3% that apparently don't care will erode itself by peer pressure
13. Institute a vigorous program of education and self-improvement
 1. Study that is directed toward immediate benefit may not be the wisest course
 2. People require in their careers, more than money, ever-broadening opportunities to add something to society, materially and otherwise
14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job
 1. Here is what I can do for you. Here is what you might do for me.
 2. I could do a much better job (fewer mistakes) if I knew what the program is to be used for. The specifications don't tell me what I need to know
 3. Follow the Deming Cycle as a change or test may enhance our degree of belief prediction

This is a visualization of the Deming Cycle

Deming Cycle



2. Diseases and Obstacles
 1. Lack of constancy of purpose to plan product and service that will have a market and keep the company in business, and provide jobs

2. Emphasis on short-term profits: short-term thinking (just the opposite from constancy of purpose to stay in business), fed by fear of unfriendly takeover, and by push from bankers and owners for dividends
 1. An annual report that claims value added, as benefit to a community or to society, is rare
 2. In Japan, large businesses are run primarily for the benefit of the employees, they are the beneficial owners. With this, labor-management trust comes naturally
3. Evaluation of performance, merit rating, or annual review. Substitute with education in leadership
 1. It nourishes short-term performance, annihilates long-term planning, builds fear, demolishes teamwork, and nourishes rivalry and politics.
 2. This is simply a system to avoid the problems of people. This type of rating is management downstream, managing the outcome, too late
 3. Merit rating rewards people that do well in the system. It does not reward attempts to improve the system. It is also meaningless as a predictor of performance. The trouble lies in the implied preciseness of rating schemes
 4. It puts an emphasis on counts and counts area easy and relieve management of the necessity to contrive a measure with meaning
 5. It stifles teamwork as it is hard to define who did what
 6. A useful criterion for recognition of outstanding performance is unquestionable demonstration of improvement year by year over a period of 7 years or more, in skill, knowledge, leadership
 7. A leader, instead of being a judge, will be a colleague, counseling and leading his people on a day-to-day basis, learning from them and with them. Everybody must be on a team to work for improvement of quality in the four steps of the Deming Cycle (Plan – Do – Check – Act)
 8. A leader will discover who is outside the system on the good side, outside on the bad side, belonging to the system (acting in ways which aren't easily measured or captured but helpful, or not)
 9. Simple monetary rewards with nothing else may be counterproductive
4. Mobility of management; job hopping
 1. Mobility causes prima donnas looking for quick results
 2. Mobility in labor is also a large problem. Absenteeism and mobility are largely creations of poor supervision and poor management
5. Management by use of only visible figures, with little or no consideration of figures that are unknown and unknowable
 1. The most important figures are those which are unknown and unknowable - downstream effects of happy vs. unhappy customers, improvement in quality and productivity from morale/focus/constancy in purpose, loss of productivity and morale from annual ratings, etc.
 2. Better way to study advancements:
 1. Removal of barriers to pride of workmanship for hourly employees
 2. Reduction in number of suppliers
 3. Number of parts made today by one supplier compared with the number a year ago

4. Accomplishments toward teamwork with the chosen supplier.
Number of teams thus at work on critical parts
 5. Tightening of distributions of a selected number of parts or assemblies made by this division during the past year
 6. Other evidence of improvement in processes
 7. Better training of people that come into the company
 8. Education for employees
3. Technology alone will not be the savior. It is people working with technology - the big gain is not the \$500 saved but that these men can now take pride in the improvement. They feel important to the job and to the company. Moreover, the improvement brought forth better quality, productivity, and morale all along the line. This improvement cannot be quantified. It remains as one of the invisible figures, so important for management.
6. Excessive medical costs
 7. Excessive costs of liability, swelled by lawyers that work on contingency fees
3. Special vs. Common Causes
 1. A fault in the interpretation of observations, seen everywhere, is to suppose that every event (defect, mistake, accident) is attributable to someone, or is related to some special event. The fact is that most troubles with service and production lie in the system. Sometimes the fault is indeed local, attributable to someone on the job or not on the job when he should be. We shall speak of faults of the system as common causes of trouble, and faults from fleeting events as special causes. Deming estimates that 94% are common (system) causes and 6% are special. No amount of care or skill in individual workmanship can overcome fundamental faults in the system. That is management's main job – fix the system when needed.
 2. A statistical chart detects the existence of a cause of variation that lies outside the system. It does not find the cause. A run chart is not an instant indicator but will usually indicate a special cause. The first step in the examination of data is accordingly to question the state of statistical control that produced the data – start and look at the data and see if there are any errors in the data or how it was measured.
 3. Experience without theory teaches nothing. In fact, experience cannot even be recorded unless there is some theory, however crude, that leads to a hypothesis and a system by which to catalog observations. Sometimes only a hunch, right or wrong, is sufficient theory to lead to useful observation
 4. To people in management, the system consists of: style of management, management and employees, the people in the country (their work experience, education, the unemployed), government (taxes, reports, tariffs, impediments to trade and industry, requirements to fill positions by quota and not by competence, quotas for import and export), foreign governments (quotas for import and export, manipulation of currency), customers, shareholders, banks, environmental constraints
 5. Supervisors commonly make the mistake of over adjustment when they direct to the attention of one of their people any mistake or defect without first ascertaining

that the worker was actually responsible for it. Was the worker or the system responsible for it?

6. One should search at once for a special cause, once it is detected, before the trail grows cold. Discovery of a special cause of variation, and its removal, are usually the responsibility of someone who is connected directly with operation that yields data for the control chart. Some special causes can be removed only by management (machinery repair, vendors, etc.)
7. Any rules have to be made in advance, for use in the future. Any rule, as a practical matter, must be constructed in the absence of full information about the future. One must state in advance what the rules are for indication of a special cause. One can always concoct a pattern that will indicate anything desired, once the chart is in hand.
8. A stable process, one with no indication of a special cause of variation, is said to be in statistical control, or stable. It is a random process. Its behavior in the near future is predictable. All special causes so far detected have been removed. The remaining variation must be left to chance – that is, to common causes – unless a new special cause turns up and is removed. Improvement of the process can be pushed effectively, once statistical control is achieved and maintained. Sound understanding of statistical control is essential to management, engineering, manufacturing, purchase of materials, and service. Stability, or the existence of a system, is seldom a natural state. It is an achievement, the result of eliminating special causes one by one on statistical signal, leaving only the random variation of a stable process
9. Most control charts, even if used correctly, are used too late – too far downstream to be of any substantial benefit.
10. Control limits, once we have achieved a fair state of statistical control, tell us what the process is, and what it will do tomorrow. The control chart is the process talking to us
11. The aim in production should be not just to get statistical control, but to shrink variation. Costs go down as variation is reduced. It is not enough to meet specifications. Specification limits are not action limits. In fact, severe losses occur when a process is continually adjusted one way and then the other to meet specs
12. Examples of common causes (the responsibility of management): poor design of product or service, failure to remove barriers that rob workers of pride in work, poor instruction and poor supervision, failure to measure the effects of common causes and reduce them, failure to provide production workers with information in statistical form that shows them where they could improve their performance and the uniformity of the product, incoming materials not suited to the requirements, procedures not suited to the requirements, machines out of order, machines not suited to the requirements, setting of the machines chronically inaccurate, poor light, vibration, inappropriate humidity, mixing product from streams of production, uncomfortable working conditions, shift in management's emphasis from quantity to quality, back and forth, without understanding how to achieve quality, defective items fed into one operation (external or internal) are demoralizing as the operator has no chance to make good product

13. Two basic uses of control charts: as a judgement (backward looking), as an operation (ongoing)
14. The important problems of improvement commence once you achieve statistical control. Removal of special causes, while important, does not improve the process – it only brings the system back to where it should have been in the first place
15. Benefits of stable systems: performance is predictable, costs are predictable, regularity of output, productivity is at a maximum (costs at a minimum), relationships with vendors are simplified, effects of changes in the system can be measured with greater speed and reliability
16. Statistical control of a process is not an end in itself. It could still produce a high proportion of defective items. Once statistical control is established, serious work to improve quality and economy of production can commence.

4. Other

1. Failure of management to plan for the future and to foresee problems has brought about waste of manpower, of materials, and of machine time, all of which raise the manufacturer's cost and price that the purchaser must pay - the inevitable result is loss of competitiveness, employment, and market.
2. Management must have some rudimentary knowledge about science - in particular, something about the nature of variation and about operational definitions. Failure to appreciate the two kinds of variation, special causes of variation and common causes, and to understand operational definitions brings loss and demoralization. Management must constantly reduce variation from common causes
3. Without a constancy of purpose to stay in business by providing product and service that have a market, there will be further downturns and more unemployment. Dependence on protection by tariffs and laws to "buy American" only encourages incompetence.
4. Productivity and quality are not at ends with each other - improving one improves the other as there is less need for rework and less waste and provides intangibles such as pride in workmanship. The result is a chain reaction - lower costs, better competitive position, increasing market share, happier people on the jobs, happier customers, improved profit, improved capacity, jobs, and more jobs
5. Quality should be aimed at the needs of the consumer, present and future
6. Any substantial improvement must come from action on the system - must define what is acceptable and what isn't (help people work smarter, not harder - with the same men, machinery, processes, and no investment, you can substantially increase quality)
7. Reduction in variation is the name of the game. The central problem of management in all respects is to understand better the meaning of variation, and to extract the information contained in variation
8. Measurements tell you what has gone wrong in the past but not how to solve them
9. The most important figures for management of any organization are unknown and unknowable
10. The Japanese have a system which can't help them but grow and evolve their systems - they learn the theory of what they wish to make, and then improve on it

11. Best way for students to learn is to go to work at some good company, under masters, and get paid while he learns
12. Most of the possibilities for improvement lie in action on the system - improvements on an individual level are naturally limited. It is not sufficient to improve just processes though. There must also be constant improvement of design of product and service, along with introduction of new product and service and new technology.
13. Profit in business comes from repeat customers, customers that boast about your product and service, and that bring friends with them
14. The Japanese strongly believe that an atmosphere of cleanliness adds to quality
15. Mere allocation of huge sums of money for quality will not bring quality. There is no substitute for knowledge.
16. Improvement of the process includes better allocation of human effort. It includes selection of people, their placement, their training, to give everyone, including production workers, a chance to advance their learning and to contribute the best of their talents. It means removal of barriers to pride of workmanship, both for production workers and for management and engineers. Putting out fires is not improvement in the process. Neither is discovery and removal of a special cause detected by a point out of control. This only puts the process back to where it should have been in the first place.
17. Some leaders forget an important mathematical theorem that if 20 people are engaged on a job, 2 will fall at the bottom 10%, no matter what. It is difficult to overthrow the law of gravitation and laws of nature. The important problem is not the bottom 10%, but who is statistically out of line and in need of help (greatness is achieved by a place in the top 25%). You must find ways to bring the lower half up to the median or at least reduce to half the proportion below the median
18. The only communicable meaning of any word, specification, instruction, proclamation, or regulation is not what the writer thereof had in mind, but is instead, the result of application. How does the instruction work in practice? What happens?
19. In Japan, when company has to absorb a sudden economic hardship such as a 25% decline in sales, the sacrificial pecking order is firmly set. First the corporate dividends are cut. Then the salaries and bonuses of top management are reduced. Next, management salaries are trimmed from the top to the middle of the hierarchy. Lastly, the rank and file are asked to accept pay cuts or a reduction in the work force through attrition or voluntary discharge
 1. *This honors the 4 laws of war - everybody comes home, leaders must fight the "dragon", no your guts and his glory, officers eat last*
20. One Japanese executive turned around an ailing American business in 3 months - "It is simple. You treat American workers as human beings with ordinary human needs and values. They react like human beings." Once the superficial, adversarial relationship between managers and workers is eliminated, they are more likely to pull together during difficult times and to defend their common interest in the firm's health
21. Chapter 5 has some great questions to consider when looking to apply some of these principles and improve your operation

22. The difficulty in defining quality is to translate future needs of the user into measurable characteristics, so that a product can be designed and turned out to give satisfaction at a price that the user will pay. This is not easy, and as soon as one feels fairly successful in the endeavor, he finds that the needs of the consumer have changed, competitors have moved in, there are new materials to work with, some better than the old ones, some worse; some cheaper than the old ones, some dearer
23. The consumer is the most important part of the production line. You cannot know everything about what the consumer needs but the foremost principle is that the purpose of consumer research is to understand the consumer's needs and wishes, and thus to design product and service that will provide better living for him in the future. A second principle is that no one can guess the future loss of business from a dissatisfied customer. The cost to replace a defective item on the production line is fairly easy to estimate, but the cost of a defective item that goes out to a customer defies measure. The main use of consumer research should be to feed consumer reactions back into the design of the product, so that management can anticipate changing demands and requirements and set economical production levels. Consumer research takes the pulse of the consumer's reactions and demands, and seeks explanations for the findings. Communication between the manufacturer and the user and the potential user gives the public a voice in the design of product and in the delivery of service. It gives to him product and service better suited to his needs, at less cost. Democracy in industry, one might say.
24. Quality must be measured by the interaction between 3 participants: the product itself, the user and how he uses the product, how he installs it, how he takes care of it, what he was led to expect; instructions for use, training of customer and training of repairman, service provided for repairs, availability of parts
25. The aim of leadership should be to improve the performance of man and machine, to improve quality, to increase output, and simultaneously to bring pride of workmanship to people. The leader also has responsibility to improve the system – to make it possible, on a continuing basis, for everybody to do a better job with greater satisfaction
26. Nobody should be blamed or penalized for performance that he cannot govern. Violation of this principle can only lead to frustration and dissatisfaction with the job, and lower production
27. There is no harm in a lottery, so far as I know, provided it is called a lottery. To call it an award of merit when the selection is merely a lottery, however, is to demoralize the whole force, prize winners included. Everybody will suppose that there are good reasons for the selection and will be trying to explain and reduce differences between men. This would be a futile exercise when the only differences are random deviations, as is the case when the performance of the 50 men form a statistical system.
28. There may be nothing more important for transaction of business than use of operational definitions as it puts communicable meaning into a concept. It is one that reasonable men can agree on and do business with. Everyone must be on the same page on what you are doing, looking for, trying to improve. Don't assume

anything is well-understood until you define it. Standards and regulations must have statistical terms to have meaning. A regulation or standard that is not so expressed will be devoid of meaning. A regulation without meaning can have no legal force

29. If you control an industry's standards, you control that industry lock, stock, and ledger. We must work to achieve a higher degree of harmony and order in our world; to relieve the strain of modern living by simplification; to increase the standard of living through more efficient production of interchangeable parts in a free market. We must use standards as the liberator that relegates the problems that have already been solved to the field of routine, and leave the creative faculties free for problems that are still unsolved.
30. If you cannot estimate satisfactorily the numerator or the denominator of a fraction, it is impossible to calculate the value of a fraction. This is where cost/benefit analysis often leaves us. I would not participate in any attempt to use cost/benefit analysis for design of product where possible injury or loss of life is at risk.
 1. *Anything times zero is zero.*
31. Quality by inspection never works. It must be built into the system as a whole
32. The benefit of this communication of the worker, if he perceives a genuine attempt on the part of management to show him what his job is, and to hold him responsible for what he himself can govern, and not for the sins of management, is hard to overestimate
33. Competent men in every position, from top management to the humblest worker, know all that there is to know about their work except how to improve it. Help toward improvement can only come from outside knowledge.
34. The reader has observed on page after page my plea for clarity in specifications and in instructions for jobs. The purpose of a sign along the road, for example, should be to teach, to tell the driver what to do, and its message must do so in a flash. Too often, however, signs are confusing. There is unfortunately not enough time for the driver to ponder the various possible meanings that a sign might lead to. Statistics on accidents merely show figures, not root causes.
 1. *Highways (any system) must be designed so that your most naïve, inexperienced drivers can navigate easily and quickly. If only Formula-1 type drivers can seem to manage and everyone else crashes, it is the system's fault, not the drivers'.*

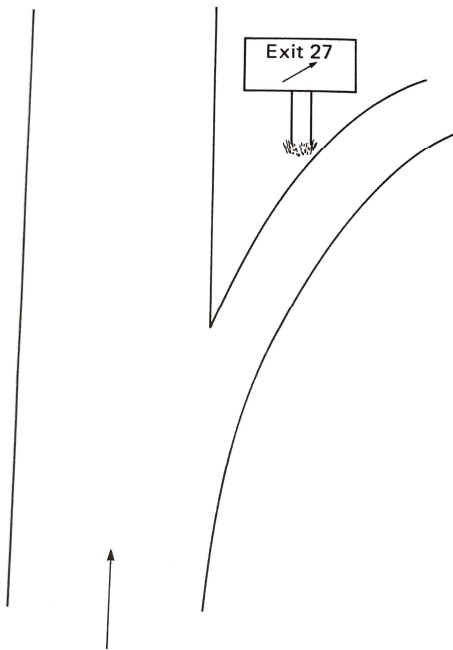


Fig. 63. This road sign is misleading to the driver that is looking for Exit 27. The first impulse that this sign conveys to the driver is that Exit 27 lies some distance ahead, and will lead off to the right. The fact is that the driver has already arrived at Exit 27. Second thoughts, a tenth of a second later, may be too late; he is on his way straight ahead, and must find a way out.

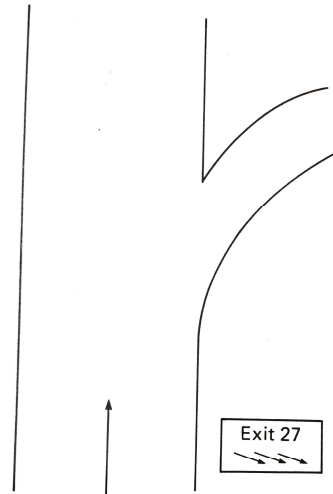


Fig. 64. Good. This sign conveys instantly to the driver the message that to take Exit 27 he must move into the right lane and exit.

and what proportion is built into and guaranteed by the system, for example, by road signs whose meaning is misleading or debatable? The answer may never be forthcoming because a controlled experiment can not be carried out. Moreover, it would be hard to find two systems of road signs that are sufficiently different, all else being equal, to provide numerical data for comparison.

The purpose of a road sign is to teach, to tell a driver what to

35. The consumer is the most important part of the production line. Management must look ahead and design new products and services

What I got out of it

1. Barriers against realization of pride of workmanship may in fact be one of the most important obstacle to reduction of cost and improvement of quality in the US. Leaders must know the work that they supervise and empowered and directed to inform upper management about concerning conditions that need correction. Work on improving the system, not on special causes. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only

create adversarial relationships, as 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. Special vs. common causes: A fault in the interpretation of observations, seen everywhere, is to suppose that every event (defect, mistake, accident) is attributable to someone, or is related to some special event. The fact is that most troubles with service and production lie in the system. Sometimes the fault is indeed local, attributable to someone on the job or not on the job when he should be. We shall speak of faults of the system as common causes of trouble, and faults from fleeting events as special causes. Deming estimates that 94% are common (system) causes and 6% are special. No amount of care or skill in individual workmanship can overcome fundamental faults in the system. That is management's main job – fix the system when needed. Any substantial improvement must come from action on the system - must define what is acceptable and what isn't (help people work smarter, not harder - with the same men, machinery, processes, and no investment, you can substantially increase quality)