ABSTRACT
        W. Edwards Deming called for the transformation to a
new style of organizational management based on greater cooperation
between managers and employees. This transformation could be achieved
by introducing "profound knowledge" into the system. This paper is a
presentation outline that was used to introduce the basics of
Deming's theory of organizational improvement to a group of teachers
and administrators associated with the Association of Bilingual
Schools of Honduras. Because Deming's Fourteen Points for Management
embody the components of profound knowledge, application of the
points is necessary for achieving system transformation and more
effective management. The aim of transformation is to change the
prevailing style of management. Profound knowledge is composed of
four interrelated concepts: (1) organization members' appreciation
for systems thinking; (2) knowledge about variation within systems;
(3) a conceptualized theory of knowledge; and (4) an understanding of
psychology. Five figures that were used as overhead transparencies to
highlight key concepts are included. Appendices summarize Deming's
theoretical perspective. (Contains 6 references and a list of 32
related readings.) (LMI)

Deming's System of Profound Knowledge:
An Overview for International Educators

by

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# INTRODUCTION

The presentation outlined in this paper served to introduce teachers and administrators in schools comprising the Association of Bilingual Schools of Honduras to the basics of Deming's theory of organizational improvement and effectiveness. Deming's conception of Profound Knowledge was of central interest and, indeed, the focal point of this presentation to which other concepts/themes connected. This three hour presentation relied chiefly, though not exclusively, upon material contained within Deming's books <u>Out of The Crisis</u> (1986) and <u>The New Economics</u> (1993).

The overview that follows served as the speaker's notes. These notes were punctuated with italicized/bolded key concepts and included references to figures and appendices which, as overhead transparencies (pp. 8-24), visually highlighted the most important points. The figures and appendices focused audience attention aiding to generate large group discussions and to contextualize reflective insights/comments. References (p. 25) used throughout this presentation are included along with a listing of related readings (p. 26).

# OVERVIEW OF DEMING'S THEORY

Deming's book, <u>Out of The Crisis</u> (1986), presented a number of valuable insights that a change oriented organizational leader in education as well as business or industry would do well to consider. His powerful ideas were restated with greater integration, and hence, clarity in a subsequent book, <u>The New Economics</u> (1993).

In his writings, Deming has called for the transformation to a new style of organizational

management based on greater cooperation between managers and employees. Deming identified the means for achieving this transformation as the introduction into a system of what he termed Profound Knowledge (Appendix A). Profound Knowledge is comprised of four interrelated concepts: "(1) appreciation for a system; (2) knowledge about variation; (3) theory of knowledge; and (4) psychology" (Deming 1993, p. xi). Deming's 14 Points for Management (Appendix F) embody the components of Profound Knowledge. Thus, the application of the 14 Points for Management, Deming contended, should achieve the transformation from the present style of management to one more effective.

It is worth repeating that the aim of a system of Profound Knowledge is to *transform the prevailing style of management*. The desired outcome is an organization's adoption of a system. "The individual components of the system, instead of being competitive, will for optimization reinforce each other for accomplishment of the aim of the system" (Deming 1993, p. 94). Profound knowledge must be introduced into the system since a system can not understand itself. Hence, the system of profound knowledge will provide a lens enabling individuals to: (a) judge their own decisions, (b) understand their organizations, and (c) ultimately optimize their organizations.

An Appreciation For A System

Employees and managers alike must develop an appreciation for a system (Appendix B). Deming (1993) defined a system as "a network of interdependent components that work together to try to accomplish the aim of the system" (p. 50). Systems must have an aim because without one, no system exists. The aim of the system must: (a) be clear for everyone in the system, (b) include plans for

the future, (c) be a value judgment, and (d) be defined in terms of activity or methods.

Deming (1986) illustrated the *production process viewed as a system* (Figure 1) noting "improvement of quality envelops the entire production line, from incoming materials to the consumer, and redesign of product and service for the future" (p. 4). In general, Deming recommended the *Shewhart Cycle* (Figure 2) as a guide toward organizational learning and improvement of a product or the preceding requisite processes. "Use of the flow diagram provides a feedback loop for continual improvement of product or service, and continual learning" (Deming 1993, p. 59). The implication for leaders/managers is to use systems thinking to determine their companies' futures -- not to be victims of circumstance. After preparing employees to become life-long learners, they will *constantly scan* "the environment (technical, social, economic) to perceive need for innovation, new product, new service, or innovation of method" (Deming 1993, p. 55 (Figure 3)).

Knowledge of Variation

Knowledge of variation will lead one to understand that *variation exists in all aspects of a process* (Figure 4). The concept of variation can inform individuals about the functioning of a process and the people working within it. Leaders should seek to bring a system within statistical control because only then does a system have a definable capability due to its predictable performance. To achieve statistical control of a system, the leader/manager must remove the special causes (fleeting events) and improve the common causes of trouble (faults of the system) as much as possible. When special causes are confused with common causes the system operates at a loss. "The action required to find and eliminate a special cause is totally different from the action required to improve the process"

(Deming 1986, p. 319) (Appendix C). After achieving statistical control, the next step is to improve the process. On this point, Deming reiterated frequently that quality must be built in at the design stage which precedes the production stage.

The importance of having a knowledge of variation is highlighted by the *85/15 Rule* and the *Pareto Principle* (Figure 5). Concerning the 85/15 Rule, Dr. Joseph M. Juran discredited the idea that an organization would have few, if any, problems if only workers would do their jobs correctly (Deming, 1986). Improving systems through which work is done, not changing the workers, holds the greatest potential for eliminating mistakes. One can use the rule of thumb that 85% of problems are correctable only through changing the systems (which is under management control) leaving only 15% of the problems for workers to control. Widespread recognition that systems create the majority of the problems should end the blaming of workers. Once achieved, workers will be encouraged to seek out the true systemic sources of problems and correct them.

The other statistical concept that Dr. Juran offered was the Pareto Principle sometimes referred to as the 80/20 rule (not to be confused with the 85/15 Rule discussed above). The Pareto Principle stated that 80% of the organization's trouble comes from 20% of the problems. Thus, mangers/leaders should concentrate on the critical few sources of problems and not be distracted by the various other sources of lesser importance (Scholtes, 1988). This parallels Senge's (1990) idea of seeking "leverage" to solve organizational problems in pursuit of increased organizational effectiveness.

Theory of Knowledge

A leader/manager must come to conceptualize a theory of knowledge in order to *modify his or*

*her management style* and effectively *transform an organization* towards development into a system (Appendix D). Deming (1993) stated that "management in any form is prediction (p. 104)" and that "Rational prediction requires theory and builds knowledge through systematic revision and extension of theory based on comparison of prediction with observation" (p. 105).

Psychology

The application of Profound Knowledge will lead to the transformation of management and thereby enable the leader/manager to transform his organization into a system. However, Deming (1993) claimed that today's management style itself is in a stable state. For the leader/manager to transform management and subsequently his or her organization, he or she must have learned "the psychology of individuals, the psychology of a group, the psychology of society, and the psychology of change" (Deming 1993, p.98 (Appendix E)). The leader/manager must be aware that everyone differs from one another, identify these differences, and use them for *optimizing everyone's talents and preferences.* For, example, individuals learn in different ways and at different rates. Deming (1993) purported that, "The most important act that a manager can take is to understand what it is that is important to an individual" (p. 115). When leaders/managers do this, individuals and units within the system will function in cooperation to reinforce one another, thereby, optimizing the system's potential.

Moreover, Deming (1993) stressed that to transform management and organizations, a new method of reward must be brought forth which will produce the promised, profound results. In short, instead of judging people, leaders/managers should create the conditions by which individuals maximize the use of their abilities to optimize the system so that everyone involved gains.

## CONCLUSION

Following the transformation of management, *new roles* for the leader/manager will emerge (Appendix H) the exercise of which will promote the transformation of existing organizations into learning organizations despite the *organizational diseases* (Appendix G) that stand in the way. Hence, leadership that is proactive in its problem-solving orientation and that values creativity at all organizational levels is essential for increasing the organization's readiness to cope with new changes and opportunities. Stata (1989) viewed organizational learning as the principle process for management innovation and commented that "the rate at which individuals and organizations learn may become the only sustainable competitive advantage, especially in knowledge-intensive industries" (p. 63). Our educational institutions as "knowledge-intensive" industries could benefit greatly by accomodating into their local contexts ideas reviewed in this presentation.

FIGURES

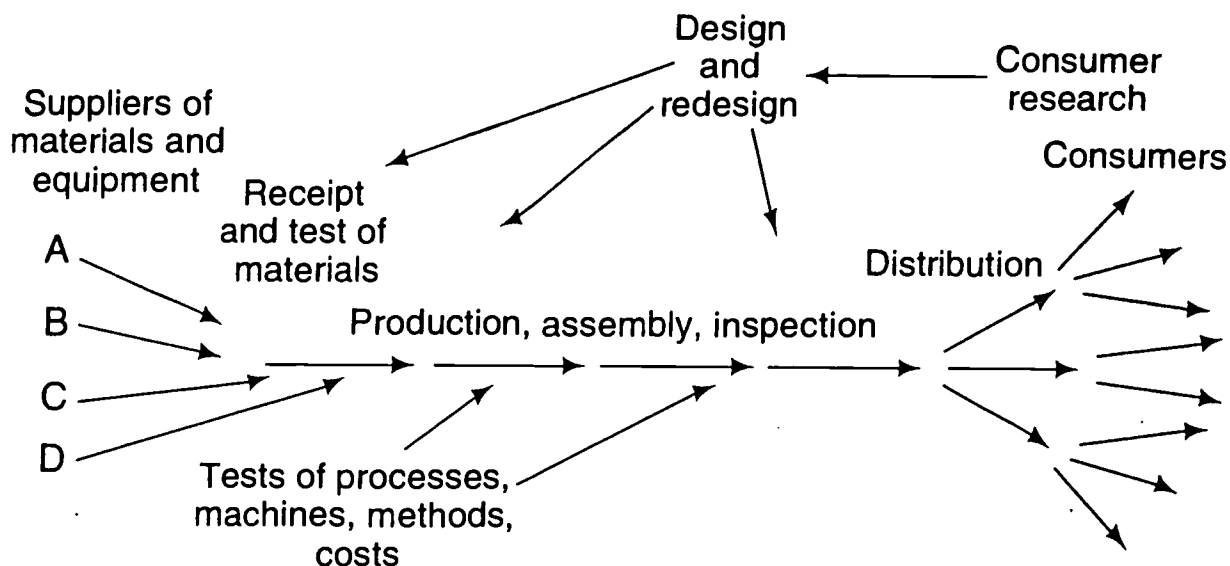Highlighted Concepts As Overhead Transparencies

FIGURE 1

The Production Process Viewed As A System



Fig. 6. Production viewed as a system. Improvement of quality envelops the entire production line, from incoming materials to the consumer, and redesign of product and service for the future. This chart was used in Japan in August 1950. In a service organization, the sources A, B, C, etc., could be sources of data, or work from preceding operations, such as charges (as in a department store), calculation of charges, deposits, withdrawals, inventories in and out, transcriptions, shipping orders, and the like.
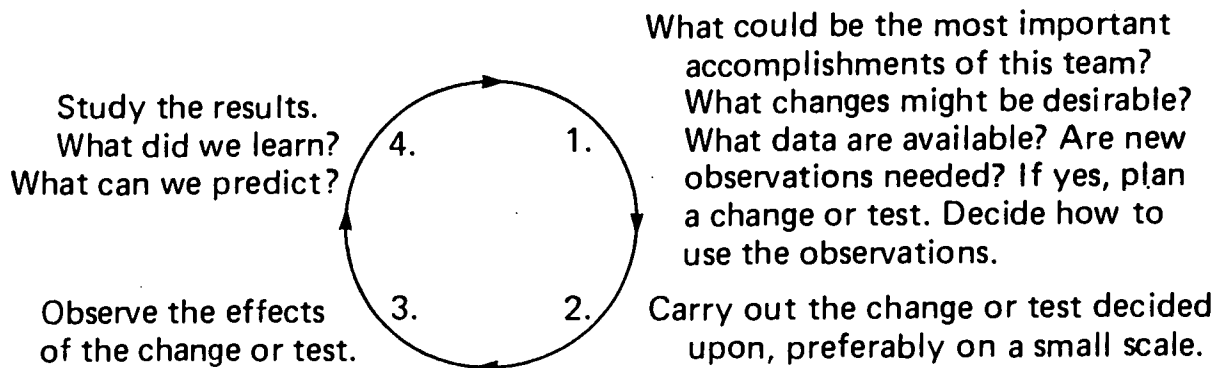
Source: Deming, W. E. (1986). Out of the crisis. p. 4, Cambridge: M.I.T.

Activity: In small groups, discuss the "product" that your school creates and the various processes involved. Who are your customers? What should be taught? Who cares about what is taught?

FIGURE 2

<u>The Shewhart Cycle</u>

PRINCIPLES FOR TRANSFORMATION

What could be the most important
accomplishments of this team?
Study the results.          What changes might be desirable?
What did we learn?   4.      1.   What data are available? Are new
What can we predict?              observations needed? If yes, plan
                                  a change or test. Decide how to
                                  use the observations.

Observe the effects   3.      2.   Carry out the change or test decided
of the change or test.             upon, preferably on a small scale.

Step 5.   Repeat Step 1, with knowledge accumulated.
Step 6.   Repeat Step 2, and onward.

Fig. 5. The Shewhart cycle.

Source: Deming, W. E. (1986). <u>Out of the crisis</u>. p. 88, Cambridge: M.I.T.

<u>Activity</u>: After identifying the processes involved in educating your school's children, characterize how
each process could be conceived as a Shewart cycle. Discuss how *value* is added to the children's
education by each process.

FIGURE 3

Prevention Vs. "Fixing" Mistakes
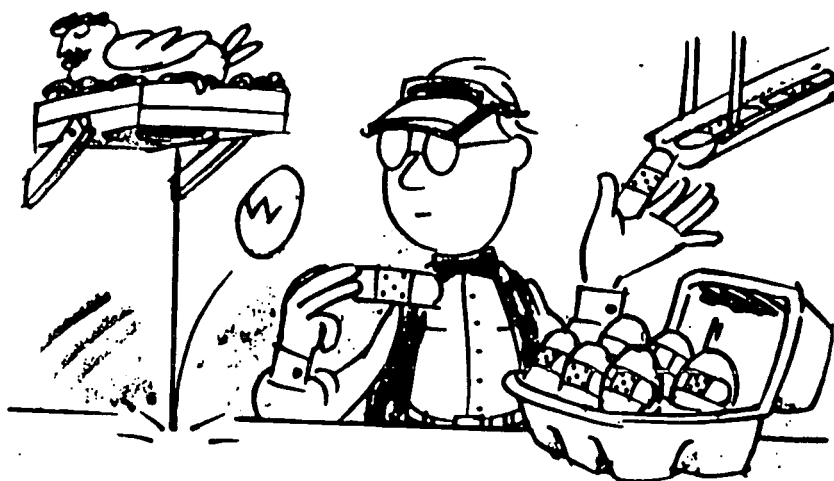


Source: Scholtes, P.R. (1988). The team handbook. Joiner Associates: Madison, WI.

Activity: Identify processes in your school that "fix" mistakes rather than add quality. Propose means to improve such processes.
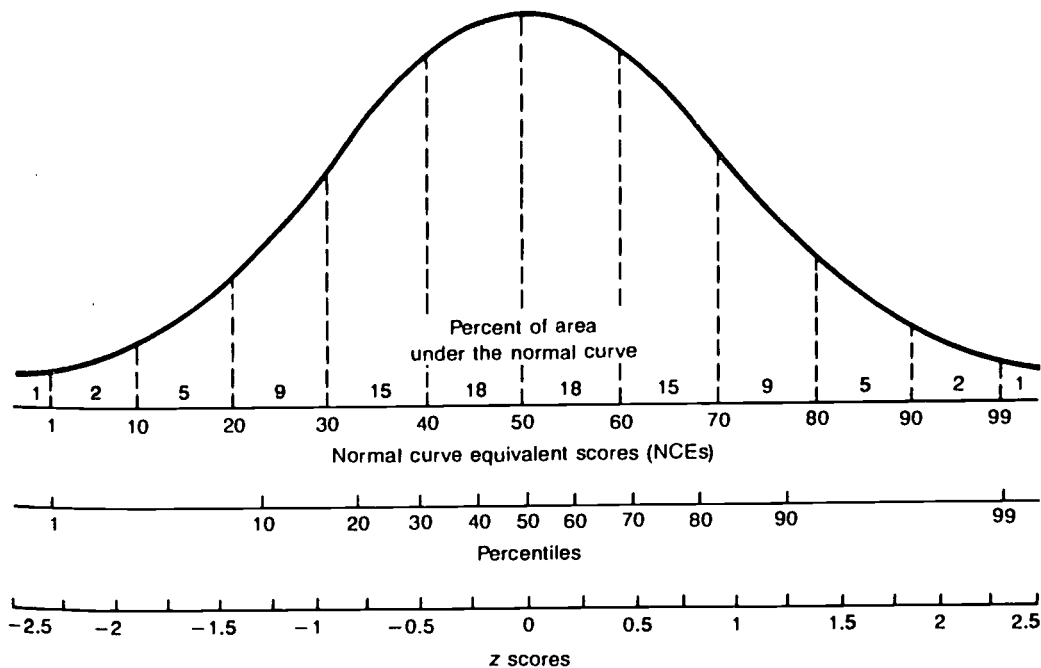
FIGURE 4

## Variation And The Normal Curve



**FIGURE 5.11**
Positioning of NCEs, percentiles, and z scores for the normal curve

Source: Hinkle, D. E., Wiersma, W., and Jurs, S. G. (1988). Applied statistics for the behavioral sciences. (2nd ed.), p. 99, Houghton Mifflin Company: Boston.

Activity: To recreate the phenomena of a normal distribution, each individual should roll a pair of dice five times and record the results. The pattern of a normal curve should appear after: (a) compiling each observed value for the whole group, and (b) plotting these values against the cumulative frequency for each possible value ( i.e., "2", "3", "4", ... "12").

FIGURE 5

Pareto Principle
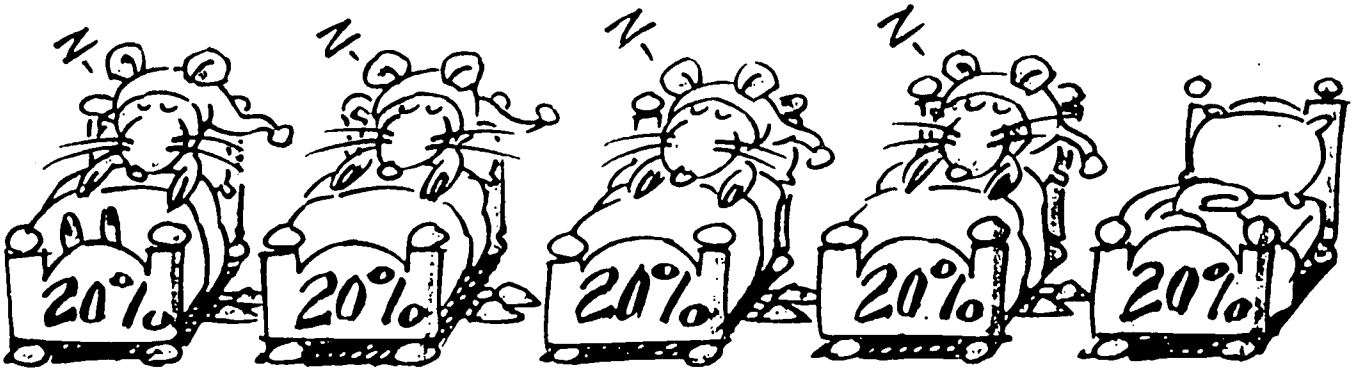


Source: Scholtes, P.R. (1988). The team handbook. Joiner Associates: Madison, WI.

Activity: Identify sub-optimal processes within your school upon which other processes depend. Propose the means to "leverage" a solution to the existing situations.

APPENDICES

Highlighted Speaker's Notes As Overhead Transparencies

# APPENDIX A

## Introduction to Deming's System of Profound Knowledge

In his writings, Deming has called for the transformation to a new style of management through greater cooperation. The means for this transformation is comprised of four interrelated parts which taken together Deming calls *Profound Knowledge*.

*Profound Knowledge* is: "(1) appreciation for a system; (2) knowledge about variation; (3) theory of knowledge; and (4) psychology" (Deming 1993, p. xi).

The aim of a system of profound knowledge is to transform the prevailing style of management. "The individual components of the system, instead of being competitive, will for optimization reinforce each other for accomplishment of the aim of the system" (Deming 1993, p. 94).

# APPENDIX B

## Appreciation For A System

Deming (1993) defines a system as "a network of interdependent components that work together to try to accomplish the aim of the system" (p. 50).

The aim of the system must: (a) be clear for everyone in the system; (b) include plans for the future; (c) be a value judgment; and (d) be defined in terms of activity or methods.

"Use of the flow diagram provides a feedback loop for continual improvement of product or service, and continual learning" (Deming 1993, p. 59).

After preparing employees to become lifelong learners, they will constantly scan "the environment (technical, social, economic) to perceive need for innovation, new product, new service, or innovation of method. A company can to some extent govern its own future" (Deming 1993, p. 55).

Improving systems through which work is done, not changing the workers, holds the greatest potential for eliminating mistakes. One can use the rule of thumb that 85% of problems are correctable only through changing the systems (under management control) leaving only 15% of the problems for workers to control. Widespread recognition that systems create the majority of the problems should end the blaming of workers. It is at this point that workers will be encouraged to seek out the true systemic sources of problem and correct them.

Pareto Principle states that 80% of the trouble comes from 20% of the problems. In other words, managers/leaders should concentrate on the critical few sources of problems and not be distracted by the various other sources of lesser importance (Scholtes 1988).

## APPENDIX C

### Knowledge Of Variation

To achieve statistical control of a system, the leader/manager must remove the special causes (fleeting events) and improve the common causes of trouble (faults of the system) as much as possible.

"The action required to find and eliminate a special cause is totally different from the action required to improve the process" (Deming 1986, p. 319). Deming (1986) explains statistical control:

> In the state of statistical control, 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...The next step is to improve the process, with never ending effort (Point 5 of the 14 points). Improvement of the process can be pushed effectively, once statistical control is achieved and maintained... 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 (pp. 321-322).

After achieving statistical control, the next step is to improve the process. "Improvement may be defined as: (1) Narrower variation; (2) Move the average up or down closer to the optimum level; and (3) Both" (Deming 1993, p. 181).

Regarding quality, Deming (1986) emphasized that:

> Quality control works both with the product and with the design of the product. And it is at this point that quality control begins to differ from the traditional system. To find the mistake is not enough. It is necessary to find the cause behind the mistake, and to build a system that minimizes future mistakes (p.225).

APPENDIX D

Theory Of Knowledge

Deming (1993) stated that "management in any form is prediction" (p. 104) and that "Rational

prediction requires theory and builds knowledge through systematic revision and extension of theory

based on comparison of prediction with observation" (p. 105). Deming philosophized that:

> Without theory, one has no questions to ask. Hence without theory,
> there is no learning. Theory is a window into the world. Theory leads
> to prediction. Without prediction, experience and examples teach
> nothing ...To put it another way, information, no matter how complete
> and speedy, is not knowledge (pp. 107-109).

APPENDIX E


Psychology of Individuals, Groups, Society, And Change


For the leader/manager to transform management and subsequently his organization, he must learn "the psychology of individuals, the psychology of a group, the psychology of society, and the psychology of change" (Deming 1993, p.98).


"The most important act that a manager can take is to understand what it is that is important to an individual" (p. 115).


Deming (1993) stressed that to transform management and organizations, a new method of reward must be brought forth which will produce the promised, profound results:

> We must restore the individual, and do so in the complexities of interaction with the rest of the world. The transformation will release the power of human resource contained in intrinsic motivation. In place of competition...there will be cooperation on problems of common interest between people, divisions, companies, competitors, governments, countries. The result will in time be greater innovation, applied science, technology, expansion of market, greater service, greater material reward for everyone. There will be joy in work, joy in learning...Everyone will win; no losers (p. 126).


To guide leaders/managers in this transformational process, Deming (1986) described a three point aim of leadership. First, the leader should "improve the performance of man and machine, to improve quality, to increase output, and simultaneously to bring pride of workmanship to people" (p. 248). Second, to improve the system making it possible for everybody to work better with more satisfaction, the "leader must learn... who if any of his people lie outside the system on one side or the other, and hence are in need either of individual help or deserve recognition in some form" (p. 248). Lastly, it is also the leader's responsibility "to accomplish ever greater and greater consistency of performance within the system, so that apparent differences between people continually diminish" (p. 249).

Activity: In small groups, discuss the rewards/motivation system in place at your school. Propose ways by which this system could be improved.

APPENDIX F

A Theory For Management:
<u>Transformation Through Application of Fourteen Points</u>

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

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.

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

6.  Institute training on the job.

7.  Institute leadership (see Point 12). The aim of leadership should be to help people and machines and gadgets to do a better job. Leadership of management is in need of overhaul, as well as leadership of production workers.

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

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.

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

11a.    Eliminate work standards (quotas) on the factory floor.  Substitute leadership.

11b.    Eliminate management by objective.  Eliminate management by numbers, numerical goals.  Substitute leadership.

12a.    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.

12b.    Remove barriers that rob people in management and in engineering of their right to pride of workmanship.  This means, inter alia, abolishment of the annual or merit rating and of management of objective, management by the numbers.

13.     Institute a vigorous program of education and self-improvement.

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

Deming, W. E. (1986). Out of the crisis. Cambridge: M.I.T.

Activity:  In small groups, discuss how various of Deming's 14 Points could be implemented by policy changes in your school.

## APPENDIX G

### Diseases That Stand In The Way Of Transformation

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.

3. Personal review system, or evaluation of performance, merit rating, annual review, or annual appraisal, by whatever name, for people in management, the effects of which are devastating. management by objective, on a go, no-go basis, without a method for accomplishment of the objective, is the same thing by another name. Management by fear would still be better.

4. Mobility of management job hopping.

5. Use on visible figures for management, with little or no consideration of figures that are unknown or unknowable.

6. Excessive medical costs.

7. Excessive costs of liability, fueled by lawyers that work on contingency fees.

Deming, W. E. (1986). Out of the crisis. Cambridge: M.I.T.

Activity: In small groups, discuss existing barriers to offering quality education in your school. Propose changes that would improve your school's "production" system".

APPENDIX H

Role Of A Manager Of People

This is the new role of a manager of people after transformation:

1.      A manager understands and conveys to this people the meaning of a system.  He explains the aims of the system.  He teaches his people to understand how the work of the group supports these aims.

2.      He helps his people to see themselves as components in a system, to work in cooperation with preceding stages and with following stages toward optimization of the efforts of all stages toward achievement of the aim.

3.      A manager of people understands that people are different form each other.  He tries to create for every body interest and challenge, and joy in work.  He tries to optimize the family background, education, skills, hopes, and abilities of everyone.

This is not ranking people.  It is, instead, recognition of differences between people, and an attempt to put everybody in position for development.

4.      He is an unceasing learner.  He encourages his people to study.  He provides, when possible and feasible, seminars and courses for advancement of learning.  He encourages continued education in college or university for people that are so inclined.

5.      He is coach and counsel, not a judge.

6.      He understands a stable system.  He understands the interaction between people and the circumstances that they work in.  He understands that the performance of anyone that can learn a skill will come to a stable state -- upon which further lessons will not bring improvement of performance.  A manager of people knows that in this stable state it is distracting to tell the worker about a mistake.

7. He has three sources of power:

> 1. Authority of office
> 2. Knowledge
> 3. Personality and persuasive power; tact

A successful manger of people develops Nos.2 and 3; he does not rely on No.1. He has nevertheless obligation to use No.1, as this source of power enables him to change the process -- equipment, materials, methods -- to bring improvement, such as to reduce variation in output. (Dr. Robert Klekamp.)

He in authority, but lacking knowledge or personality (No. 2 or 3), must depend on his formal power (No.1). He unconsciously fills a void in his qualifications by making it clear to everybody that he is in position of authority. His will be done.

8. He will study results with the aim to improve his performance as a manager of people.

9. He will try to discover who if anybody is outside the system, in need of special help. This can be accomplished with simple calculations, if there be individual figures on production or on failures. Special help may be only simple rearrangement of work. It might be more complicated. He in need of special help is not in the bottom 5 per cent of the distribution of others: he is clean outside that distribution.

10. He creates trust. He creates an environment that encourages freedom and innovation.

11. He does not expect perfection.

12. He listens and learns without passing judgment on him that he listens to.

13. He will hold an informal, unhurried conversation with every one of his people at least once a year, not for judgment, merely to listen. The purpose would be development of understanding of his people, their aims, hopes, and fears. The meeting will be spontaneous, not planned ahead.

14. He understands the benefits of cooperation and the losses from competition between people and between groups.

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