
IMPROVING QUALITY AND ORGANIZATIONAL EFFECTIVENESS GO HAND IN HAND THROUGH DEMING'S MANAGEMENT SYSTEM

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Abstract

This study was undertaken to investigate the perceived effects of Deming's management system on employee job satisfaction, productivity, quality and overall organizational effectiveness. Three published, validated instruments on organizational characteristics were used to gather data, and extensive, open-ended interviews were conducted with production and operation managers for each of the eight firms in the study. Survey and interview results bolster the claims of proponents of Deming's quality improvement ideas that these ideas improve employee perceptions of their own job satisfaction and organizational quality. Furthermore, the results show a positive impact of Deming's management system on employee perceptions of their own productivity and overall organizational effectiveness and industrial competitiveness.

Introduction

W. Edwards Deming, who has been affectionately called the "Messiah of Management," has been highly critical of American corporations for their shortsightedness and for a lack of quality in their products and services. He believes that it is quality that has a major influence on market share and the ability to compete domestically and abroad. Foreign competitors have moved in and capitalized on the United States' quality weaknesses. Deming is credited with institutionalizing a system of strategic manufacturing which is responsible for the formidable Japanese presence in the world market (Yoshida 1989). His advice to Japan made Mr. Deming the leader of a generation of specialists on product durability and reliability. After the application of his methods brought enormous commercial success to some Japanese companies, the Japanese created a Deming Prize, for companies that made striking advances in quality.

Dr. Deming's principles were based on the premise that most product defects resulted from management shortcomings rather than careless workers, and the inspection after the fact was inferior to designing processes that would pro-

duce better quality (Yates 1992). He argued that enlisting the efforts of willing workers to do things properly the first time and giving them the right tools were the real secrets of improving quality — not teams of inspectors (Holusha 1993).

In spite of Deming's success in Japan, he claims that most American firms still don't really understand the concepts of improving quality through better control of the production system. He insists that American managers are still content to hang on to the "destructive" notions of "management by objectives" and "results-oriented management" (Yates 1992). Deming denounced management procedures like production quotas, performances ratings and individual bonuses, saying they were inherently unfair and detrimental to quality. He said customers would get better products and services when workers were encouraged to use their minds as well as their hands on the job (Persico 1990).

The prevailing sentiment in American industry during the 1960's and the 1970's was that more quality meant more cost and that consumers did not want to pay for higher-quality products. That attitude began to change when Japanese products with brand name Sony and Panasonic drove the American consumer — electronics industries almost out of business while reliable, fuel efficient Toyotas and Hondas gnawed away at the domestic auto industry (Holusha 1993).

The United States is now engaged in an all out quality awareness alert. Xerox Corporation is but one organization that has been strongly influenced by the Deming philosophy. Xerox sees customer satisfaction and commitments to quality as their main goals. Through a total quality drive, Xerox reduced their manufacturing costs while developing equipment much faster and improving the reliability of products (Norman 1991). Ford Motor Company was also among the first to invite Deming to help transform its operations. In 1992 the media celebrated the fact that Ford Taurus outsold the Honda Accord to become the leader in domestic sales. Former CEO Donald Peterson stated:

The work of Dr. Deming has definitely helped change Ford's corporate leadership... Dr. Deming has influenced my thinking in a variety of ways. What stands out is that he helped me crystalize my ideas concerning the value of teamwork, process improvement and the pervasive power of the concept of continuous improvement (Dean and Evans 1994).

As Ford's success became obvious, demand for Mr. Deming's services grew. Among the companies that turned to Mr. Deming and his disciples were Dow Chemical, Proctor & Gamble, American Telephone & Telegraph and the New York Times (Holusha 1993).

There are several individuals who are also regarded as quality gurus. Each has developed a set of guidelines, principles, or philosophical statements to describe or explain the beliefs they advocate. Some of these giants in the field of total quality management/control are Joseph M. Juran, Armand V. Feigenbau, Kaoru Ishikawa, and Philip B. Crosby. The works of Deming are perhaps the most highly regarded of the total quality management systems (Brocka 1992).

As indicated earlier a wide range of quality implementation strategies exist, many of which have serious pitfalls. For example, at Florida Power and Light, John L. Hudiburg drove hard to win the Deming Prize in Japan, but created a large bureaucracy in which morale fell as workers and managers had to compile hundreds of pages of analysis. The new CEO reduced the scope of the quality effort. Alcoa's CEO scrapped the company's decade-long continuous improvement strategy, calling it a "major mistake" and focused instead on "quantum" improvements (Dean and Evans 1994).

Patten (1992), believes that Total Quality Management systems require a new set of skills and learning, including interpersonal awareness and competence, team building, empowerment and continuous improvement as a way of life. The process must begin by creating a set of feelings and attitudes that lead to lasting values.

Deming's management system has been credited with helping to improve morale, reduce costs, improve quality, increase productivity, and improve organizational effectiveness and competitiveness (Moen 1989; Munroe 1991; Walton 1990; Whitley 1989; Yates 1992). The claims by proponents of Deming's management system and Total Quality Management principles suggest the following research questions that might be very useful to pursue in these early stages of investigation of the relationships between Deming's management system and organizational effectiveness – satisfaction, productivity and quality:

1. Does Deming's management system achieve its stated objectives of influencing and enhancing employees' of job satisfaction?
2. Does Deming's management system seem to contribute in any measurable extent to perceptions of higher levels of organizational productivity?
3. Does Deming's management system achieve its stated objectives of improving quality of products and services?

This study investigates these three research questions and evaluates the impact of implementing Deming's Management System on organizational effectiveness.

Research Methodology

A survey was used, with open-ended interviews, to examine the relationships between Deming's management system and organizational effectiveness. Survey respondents were general managers (operations), production, middle managers and lower level managers employed by large and medium-sized organizations presently operating in the mid-western United States.

The sample consisted of eight corporations presently engaged in manufacturing and production of consumer products. The sample of firms were cho-

sen from the United States Chamber of Commerce, the U.S. Department of Commerce, and the Department of Commerce and Community Affairs in Illinois. Most of the selected firms were large and medium-sized corporations with 500 or more employees which had been in business for at least four years. All eight firms in this study had been adopting Deming's quality improvement ideas for at least three years.

The total number of general managers, production, middle level managers, and lower level managers in the eight selected organizations was 720. A representative sample of twenty percent was chosen, based upon recognized tables (Krajcie and Morgan 1970) for a total of 144 managers. Due to cost limitations, and being an exploratory study in nature, only 144 managers were chosen among the total population in this study.

Ninety-two managers returned questionnaires, resulting in a 64 percent response rate. Twenty-two questionnaires were not acceptably completed, thus reducing the response rate to 49 percent (70 managers). Demographic characteristics of the respondent, and surveyed organizations are shown in Table 1.

Interviews were also conducted with at least one general manager and production manager in each of the eight organizations in the study to obtain a deeper understanding the company executives perceptions of Deming's management system effectiveness. During the interviews, the questionnaires were used initially as a guide. Three instruments used for this study were Likert's (1967), Profile of Organizational Characteristics, Mott's (1972), Characteristics of Effective Organizations, and a third instrument designed to tap a wide range of Deming's management system facets with measures derived from Deming's 14 points (Deming 1986). Likert's questionnaire was used because it emphasized the relationship between management systems and organizational effectiveness. Mott's questionnaire was used to assess overall productivity and as a reinforcement for the data gathered from Likert's instrument. Response scales ranged from one (to a very little extent) to five (to a very great extent) for all measures.

Although Likert's indices of management systems and organizational effectiveness have been tested for validity and reliability by Taylor and Blowers (1972), a reliability test was conducted for these indices to enhance their credibility. Cronbach's alpha (1951), was calculated for each index in these instruments. The results of this test indicated that all indices were above 0.78 (alpha) criterion for adequate scale reliability.

Several variables were identified as being significant for the purpose of this study. First, there were the elements used to measure the independent variable – Deming's management system – which include Deming's quality improvement dimensions; second, there were the elements used to measure the dependent variable – organizational effectiveness – which include job satisfaction, productivity, and quality. The definition of the variables used in this study are explained in the Appendix.

Table 1
Demographic Characteristics of the Respondents and their Organizations*

<u>Demographic Characteristics</u>	<u>Percent Respondent Sample</u>
<u>Sex</u>	
Male	70
Female	30
<u>Age</u>	
Under 30	40
31 – 40	38
41 – 50	16
over 50	6
<u>Education</u>	
High school or less	8
Two years college	30
Baccalaureate degree	46
Graduate degree	16
<u>Job Status</u>	
General manager (operations)	6
Production manager	24
Finance manager	12
Marketing manager	14
Human resource manager	8
Training and development manager	16
Lower level managers & supervisors	20
<u>Years Experience at Firm</u>	
1 to 4	8
5 to 7	49
8 to 10	38
over 10	5
<u>Number of Employees at Firm</u>	
500 to less than 1,000 employees	48
1,000 to less than 1,500 employees	36
over 1,500 employees	16
<u>Sales</u>	
\$10 to less than \$20 million	25
\$20 to less than \$30 million	12
\$30 to less than \$40 million	14
\$40 to less than \$50 million	20
\$50 to less than \$100 million	18
over \$100 million	11

* Number of respondents 70 managers at 8 firms

This study employs Likert's (1967) Model of Human Organizational Dimension known as system four as its major conceptual framework. Likert's, conceptualization of the management system and his advocacy of the participative management approach are based on his research efforts over many years. Likert believes in the importance of the interaction – influence process, work group communication participation in decision making and the team approach to management. Likert's thinking is easily recognized in many articles (Persico 1990; Wren 1987) dealing with Deming's management philosophy and Japanese management techniques such as quality circles and participative management.

Hypothesis

The following major hypothesis guided the study:

A positive relationship exists between Deming's management system and organizational effectiveness in some of the firms investigated.

This hypothesis was stated to reflect the claims made by Deming's management system proponents. It was also stated in a way that seeks to determine linear relationships.

Results

Data Analysis

One major objective of this study was to examine the relationships between Deming's management system and organizational effectiveness as perceived by respondents in the firms studied.

The Pearson Product-moment Correlation (r) was calculated for Deming's management system dimensions and effectiveness dimensions – job satisfaction, productivity and quality – to measure the strength, direction and statistical significance of relationship between the independent and dependent variables with groups, each company represented a group in this study as a unit of analysis. Table 2, presents the result of this analysis, which clearly indicates a positive relationship between all measures. It is therefore, appropriate to accept the main hypothesis, and to state, with more than 95 percent confidence that a positive relationship was found between Deming's management system and organizational effectiveness.

The results of this analysis also indicate that the highest relationships are found between measures of organizational effectiveness and employee participation in problem solving and decision making, extensive communication among management and lower level employees, extensive education and training, and support from leadership in that order.

Further analysis and evaluation of the relationship between Deming's management system and organizational effectiveness were done with the use of multiple regression analysis. This analysis determine the proportion of variance in organizational effectiveness scores explained by the scores of the Deming's management system.

Table 2: Pearson Correlation Coefficients for Demings Magements System Dimensions and Effectiveness Dimensions

Deming's Management Dimensions*	Effectiveness Dimensions			
	Satisfaction (A)	Productivity (B)	Quality (C)	Effectiveness (A+B+C)
Corporate Strategy				
<u>Point 1</u> Create constancy of purpose for the organization "clear mission"	0.45	0.42	0.38	0.43
<u>Point 2</u> Adopt the new philosophy the never-ending improvement	0.50	0.52	0.40	0.58
<u>Point 14</u> Involve everybody in the organization "employee participation"	0.62	0.45	0.45	0.68
Human Resource Management				
<u>Point 8</u> Drive out fear among employee "motivation"	0.46	0.39	0.57	0.48
<u>Point 9</u> Break down organizational barriers "communication"	0.57	0.69	0.49	0.66
<u>Point 12</u> Facilitate and promote pride of workmanship "promote excellence"	0.69	0.44	0.69	0.58
Measurement of Results				
<u>Point 10</u> Eliminate arbitrary numerical =goals – "quality vs. quantity"	0.54	0.39	0.32	0.46
<u>Point 11</u> Use statistical methods for improvement– "SPC..."	0.43	0.24	0.56	0.44
Training and Supervision				
<u>Point 6</u> Institute modern methods of training "on the job training"	0.48	0.39	0.50	0.43
<u>Point 7</u> Focus more on supervision "Supportive leadership"	0.58	0.69	0.57	0.64
<u>Point 13</u> Institute extensive education and training for all	0.59	0.54	0.62	0.65
Quality Assurance				
<u>Point 3</u> Replace mass inspection with statistical monitoring at all phases	0.46	0.47	0.42	0.50
<u>Point 5</u> Constant improvement through "team building"	0.36	0.54	0.59	0.55
Purchasing Policies				
<u>Point 4</u> Stop awarding business on basis of price – quality vs. price	0.47	0.35	0.43	0.56

*All P<.05

Some of these statements and design of the company quality profile based upon Deming's fourteen points and were adapted from Motwani, Sower and Rosenfeldt (1989). 'Operationalizing the Process of Quality Improvement: An Exploratory Field Study of A Company Quality Profile,' Southern Management Association *Proceedings*, pp. 385.

Table 3 presents the results of the multiple regression analysis which indicates a positive relation ship exists between the measures of Deming's management system and organizational effectiveness. The results indicate that 44 percent of the variation in job satisfaction, 60 percent of the variation in productivity and 62 percent of the variation in quality were explained by Linear regression on Deming's management system dimensions. The F-ratios of 8.50, 5.25, 6.45, and 12.25 for satisfaction, productivity, quality and effectiveness respectively indicate that these linear relationships are statistically significant at the .05 level.

Table 3
Multiple Regression Analysis For Evaluating The Dependence Of Measures Of Effectiveness On Deming's Management System Dimensions

Dependent Variable (Effectiveness)	Multiple Regression	Regression Square R ²	F-ratio
Satisfaction (A)	0.68	0.44	8.50
Productivity (B)	0.74	0.60	5.25
Quality (C)	0.78	0.62	6.45
Effectiveness (A+B+C)	0.76	0.72	12.25

Findings from Interviews

The purpose of this section is to obtain a deeper understanding of Deming's management system effectiveness as perceived by general managers and other management representatives in the eight selected firms, and report the interview findings.

Corporate Strategy. Ten out of the sixteen general and production managers interviewed in this study expressed strong support for Deming's management system, and they claimed that the Deming's quality improvement ideas were making a great contribution to their organizational effectiveness. They also indicated that the dollar savings and indirect benefits generated by the Deming's quality improvement ideas were greater than the costs of implementing these ideas. Deming's management principles were believed to help enhance morale and job satisfaction; to contribute to organizational goals of increased productivity, reduced costs; and to improve the quality of the operation and the products. The interviews and discussion with operation managers within the eight firms indicated a sincere desire to improve the quality of their operations and the products. They also stressed the point of creating constancy of purpose for improvement of product and service with the aim to become competitive.

The remaining six general and production managers indicated that Deming's management system failed to achieve its stated objectives of improving quality and productivity in their organizations. They also indicated that failure was due to the fact that little real empowerment was given and what was given was not supported in actions. Another reason for failure was that senior

management were not personally and visibly committed and were not actively participating.

Human Resource Management. Exchange of information and openness to employee suggestions seemed to be the dominant characteristics of the majority of the eight firms in this study. Most of the managers interviewed (eleven managers) expressed strong support for participatory activities such as employee participation in problem solving. In five of the eight firms, participatory programs such as quality circles, autonomous work groups, and employee-management forums had already been formed and very active in solving organizational problems. By breaking down organizational barriers between management and lower level, employees fear of informing superiors of any problems in their organizations was eliminated according to a majority of interview respondents. Concurrently, participatory activities and communication contribute to the organizational goals of increased productivity and improved quality.

Measurement of Results. Twelve of the sixteen interviewed managers considered control charts, statistical methods, progress reports and encouragement programs superior to setting numerical goals and using posters and slogans in an effort to motivate workers to increase productivity and improve quality. One production manager remarked that his company was able to save \$1.5 million in reject-related costs in one year alone due largely to the statical process control program that it had implemented. Additionally, he stated that his company had reduced its reject rate from 24 percent to less than 12 percent by implementing Deming's quality improvement ideas.

Training and Supervision. Eleven of the interviewed managers indicated that almost all training within their organizations was on-the-job. They also indicated all employees from top management to lower level employees were trained in the same manner, and continuing education is always a means of improvement. This education should consist of new skills, the corporation's goals and methods of achieving these goals. Training in statistical methods and problem-solving techniques was provided to both top management as well as lower level employees according to twelve managers interviewed in this study. Only five of the interviewed managers indicated that no training in statistical methods was provided to top managers and line managers. Engineering and quality control staff were relied upon to handle most of quality problems in their organizations. Most of the interviewed respondents (sixteen managers) indicated that effective and supportive leadership would help eliminate many of the barriers between management and lower level employees.

Quality Assurance. Catch phrases like "Total Quality Management," "Quality Is Job One," "Smarter, Not Harder," "Quality Means Jobs," "Quality – Is Way of Life," are being implemented by most of the eight firms in this study. Ten out of the sixteen managers interviewed also reported that quality of products and services had improved dramatically since their organizations incorporated Deming's quality control methods. They also indicated that their suppliers and vendors used the same processes and controls. At the same time eight manag-

ers— indicated that some statistical control techniques were used to monitor the production processes. However, most of the interviewed respondents (twelve) indicated that more emphasis should be placed on improving the process and manufacturing products correctly the first time.

Purchasing Policies. Eleven managers also indicated that quality of raw materials was the foremost criteria for selecting suppliers. Most of these respondents also reported that standards were set when selecting a vendor. These standards were based on the quality of raw materials and not solely on price. Furthermore, they indicated that only a small number of suppliers were selected to provide raw materials in order to have good relationships with their suppliers and vendors.

Conclusions

The findings of this study support the conclusion that Deming's quality improvement principles such as team-building, employee participation in problem-solving and decision making, sharing information, providing extensive education and training at every level in the organization and supportive leadership often increase job satisfaction, productivity, quality, and over all organizational effectiveness.

The attitudinal results presented here provide support for the claims of Deming's management system proponents that the system improves, participates' morale, job satisfaction, productivity as well as the quality of their operations and the products they produce. Furthermore, the results document a positive impact of Deming's quality improvement ideas on overall organizational effectiveness. Statistical analysis of the sample data also indicates that a positive association exists between Deming's management system and organizational effectiveness in most of the firms investigated in this study. A majority of operation and production managers who were interviewed in this study expressed strong support for Deming's management system, and they believed that the Deming's quality improvement ideas in their firms were making a great contribution to their organizational effectiveness. They also indicated that the dollar savings and indirect benefits generated by the Deming's ideas in their firms were greater than the costs of implementing these ideas. However, almost one-third of operation and production managers indicated that Deming's management system failed to achieve its stated objectives of improving quality and productivity in their organizations. A major reason for such a failure was due to implementation of Deming's management system without a full grasp of its nature. Certain mistakes were made during the implementation of Deming's management system in some of the firms investigated, such as the processes were not driven by a focus on the customer, strategic business issues, and senior management.

Implications

One major implication of this study is that, to show positive results, productivity and quality improvement have to be planned, structured and carefully monitored. Lasting productivity and quality gains will be realized only through effective utilization of people and the system within which they operate. Deming's concept of "hands on management," extends to many areas of production. Included in a company's quality overhaul involves not only top management, but all level employees, customers, suppliers and investors. It must be understood that quality is a never-ending process of continuous improvement. In the past decade, a great emphasis have been put on quality. American manufacturers have finally taken notice and have begun implementation of total quality control. This process is long and tedious because quality needs to be not only taught, but absorbed, tested, and refined.

A second implication of this study is that the Deming's principles must be perceived and applied in their entirety, as a whole new way of thinking. His philosophy does not consist of separate techniques, but an organized way of life. In order to strengthen America's competitive position, education and training concerning quality must be evident not only in corporate America but also in schools. Deming puts a share of the blame on American business schools (Yates 1992). The United States has been forced to reassess the procedures of management. It is necessary therefore, for business schools to see that the students are armed with the necessary knowledge and communication skills in order regain industrial competitiveness. Japan has been very successful in implementing Deming's philosophy. This should inspire U.S. corporations to concentrate on a national movement to promote total quality management to improve this country's global competitive position.

Although many more issues remain to be investigated, this study consolidates much of the previous work into a base from which additional studies can spring. This study represents a beginning rather than an end of more research on the impact of Deming's management principles. Broader measurement of the quality of work life facets and performance outcomes claimed to be influenced by the Deming's management doctrine is needed.

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Appendix

Operational Definitions of Terms and Variables in the Study

Terms	Definitions
Deming's Management System	Refers to certain types of practices, behaviors and beliefs, as perceived by the respondents where subordinates and superiors exhibit mutual confidence and trust. Communication is extensive, decision making is widely dispersed throughout the organization. Team work is encouraged in this atmosphere. Extensive education and training provided at every level in the organization. This system mandates that a firm incorporate statistical process control and that its suppliers and vendors use the same processes and controls in order to achieve never-ending quality improvement to meet customer satisfaction (Deming 1986).
Satisfaction	Employees' satisfaction with fellow workers, jobs, superiors, their organization compared with others, pay, progress in the organization so far and chances for advancement in the future (Lickert 1973).
Productivity	Employees' perception of the quantity and quality of work done in their divisions or departments as well as the efficiency with which the work is done (Mott 1972).
Quality	Employees' perception of work done in their organization according to the requirements set to meet customer needs, and satisfaction. Quality as conformance to specifications (Crosby 1979).
Effectiveness	Effective organizations are those that produce more and higher quality products and adapt more effectively to environmental changes, at the same time maintaining a high level of satisfaction of individual members (Lickert 1973).