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Quality Improvement Practices in Minnesota Businesses and Industries

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INTRODUCTION

Traditionally, quality control was thought of as the sole responsibility of a selected group of specialist such as engineers who developed product specifications, statisticians who determined acceptable product variability, and inspectors who monitored production processes. Furthermore, much of the quality control emphasis was focused on production or manufacturing environments, with little attention paid to the management and support of those environments. In addition, service companies were conspicuously void of a quality focus. When a company did implement quality practices, quality control was considered another separate department like finance, engineering, or procurement. The responsibility and accountability for the company's quality was then thought to be in the hands of the quality department, not in the individual departments that were served.

The total quality concept movement promoted by such authorities as W. Edward Deming, Joseph Juran and Philip Crosby emphasizes quality as everybody's business within the company. Total quality involves products and services, all corporate functions and departments, and is one of the primary responsibilities of management.

Total quality embraces the concept of continuous process improvement. In his introduction, Dixon (1990) defines the total quality concept by stating:.

> What exactly is total quality? Here's one view. When Masaaki Imai was a young man in the 1950's, he worked for the Japan Productivity Center in Washington, D. C. His principal responsibility was escorting Japanese businessmen through U. S. manufacturing facilities to study "the secrets of American productivity."
>
> For a lot of Americans, the tables, of course, have turned. What is the secret of Japan's world-beating success at producing innovative low cost, high quality products? As Imai explains, *kaizen*, or the all-embracing philosophy of continuous improvement, differs profoundly from many U.S. management and production

practices. It reflects a "process-oriented" way of thinking rather than the U.S. results-oriented approach" (p. 1).

Since the late 1970's, and into the 1980's, the total quality movement has become a tool for United States manufacturing and service businesses which is used to secure their future success and/or survival. Businesses have become motivated to implement the total quality improvement process due to the fear that they may no longer continue to exist if they do not change their operational methods. This fear has been brought on by (a) back-to-back recessions, (b) deregulation, (c) a growing trade deficit, (d) low productivity, (e) layoffs, which required firms to do more with less, and (f) an upward spiraling consumer awareness and sophistication.

These crises are not germane to a particular kind of business or to a particular region of the United States. Any one of these crises can hit any area or any business at any given time. The areas, businesses, or states most likely to be affected by such crisis are ones which have not been aware of the need to continuously improve their products or services in order to compete in the ever expanding global economy.

On August 20, 1987, the Malcolm Baldrige National Quality Award was created through Public Law 100-107. The stated intent of the award included (a) acting as a stimulus to improve quality and productivity, (b) providing recognition and successful quality examples to other companies, (c) establishing criteria and guidelines for companies to evaluate their own quality improvement efforts against, and (d) providing detailed information to other companies from those which had experienced successful quality improvement efforts. Of course, another goal of the award was to provide an incentive to use a proven method which could lead American companies to increased market share and profits.

On an individual level, states were also becoming involved with this "quality revolution". In November, 1985, the Governor of Minnesota commissioned a group of people with the task to explore and investigate the current economic status of Minnesota and what the impact of the expanding global economy would have on the economic future of Minnesota. The governor also

asked this group of individuals to develop recommendations for improving Minnesota's economic future.

The commission realized the importance of a quality focus for Minnesota business. The final report, issued in 1987, noted that the Minnesota population as a whole poorly understands and in some cases misunderstands "...the inextricable relationship between productivity and quality." (Governor's Report, 1987, p. 62) The report emphasized the importance of educating the people of Minnesota about issues of quality and productivity so that a competitive edge might be gained. The Governor's Report (1987) recommended the development of,

> ...an organization to centralize quality and productivity efforts. Broadly construed, the organization should have as its goal the increase of quality and productivity in Minnesota and among Minnesotans. It should engage in demonstration projects on productivity improvement in the state as well as other states and nations. (p. 64)

This report led to the creation of the Minnesota Council for Quality in 1987. On October 1, 1990, the Minnesota Council for Quality initiated the first Minnesota Quality Award. The Council patterned the award after the Malcolm Baldrige National Quality Award. The award was initiated to encourage Minnesota organizations to become more aware of the current quality condition and to encourage them to work on continuous improvement. Also, the Council used the award to recognize outstanding quality efforts within the state of Minnesota. However, the Minnesota Council for Quality still had not developed a method to monitor the state's quality and productivity improvement progress as well as the progress of other states and nations.

In the fall of 1990, University of Minnesota professor Richard A. Swanson invited Jim Buckman, the Director of the Minnesota Council for Quality, and other interested quality professionals to a meeting on November 20, 1990, to discuss the development of a measurement tool to survey the state's quality improvement progress.

A literature review and analysis discovered a minimal amount of available literature or formal documentation involving the measurement of quality improvement efforts or the means for measuring the effectiveness of such improvement efforts on a state by state basis. Furthermore, this literature review uncovered no formal documentation of specific or related surveys which measured the quality improvement efforts of Minnesota Businesses and Industries in particular. The Minnesota chapter of the American Society for Quality Control members indicated knowledge of some consultant-developed quality marketing surveys. However, these surveys only measured potential business opportunities for the consulting firms.

Nonetheless, specific national quality surveys and studies involving either specific industries or management styles have been conducted. Gavin (1988) compared the quality efforts of Japanese companies with American companies in the air conditioning industry. Ouchi (1981) compared the quality management styles of American managers with those of Japanese managers.

Despite the lack of formal documentation on specific quality improvement measurement efforts of Minnesota Business and Industries, the literature review did find sources which emphasized the overall importance of quality improvement measurement.

In a recent magazine article, Bemowski (1991) discusses an "International Quality Study" conducted by the American Quality Foundation and the consulting firm of Ernst and Young. Bemoski quotes Joshua Hammond, president of the American Quality Foundation, stating that, "[t]he study will take the guess work out of what this quality business is all about by replacing anecdotal information with fact-based information...It will also start a systematic process for linking quality to financial business performance." (p. 33)

It is important to note that the process or method used to measure quality improvement is not simple. Measuring the impact of quality improvement is not simply a matter of tracking scrap costs, cycle times, and customer satisfaction. Measuring the progress of quality improvement is a complex process. It involves basically two measurements: the hard measures, such as reduced scrap, and the social issues involving people's attitudes and beliefs. Rollefson (1991) states:

> [t]here is no simple way to measure the dramatic and pervasive effects that a successful TQ process can have on an organization. Many of the hard measures that appeal to the rational manager do not capture the behavioral changes that occur when an organization shifts from a more traditional management style toward a TQ style.
>
> In addition, many people don't feel the link between the hard measures and what they experience on the job daily. Without this tangible link, it is much more difficult for people to discuss and judge whether the TQ process has been successful at changing the organization. Hard measures notwithstanding, people who do not perceive improvements in the way things get done will not agree with a decree that the process has been a success. (p. 54)

Rollefson (1991) discusses a process to conduct a total quality appraisal survey which is felt to link the hard measures and "what people experience on the job daily." However, the survey design is intended for customized internal company use and would not serve as a template for a state or nation wide measurement instrument of continuous improvement progress. The measurement of continuous improvement is discussed, but there does not seem to be a universally accepted standard process to perform the measurement. Current articles discuss the concept of continuous improvement measurement, but they do not appear to be able to provide a data base of actual actions and results. Measurement of continuous improvement actions still appears to be in a developmental state.

Statement of the Problem

The initiation and implementation of Total Quality Management's continuous improvement processes and strategies are vital to our national and local businesses' economic survival and growth. However, the initiation and implementation of such processes or strategies may be of no value if

there is no means to measure the efficiency and effectiveness of such processes or strategies. Measurement is a key component of continuous improvement. To continuously improve, a company or business must measure performance, much like the long distance runner who measures his or her performance in order to establish a base line which then serves as a means for future comparisons. If businesses do not measure efficiency and effectiveness of a TQM continuous improvement process, then it is quite possible that many of those businesses will find their TQM efforts failing like previous American productivity and quality improvement "projects". American businesses have become known for projects which carry the connotation of beginning and ending, but never continuing or having long lasting positive effects. There is a need to establish a process to assist various companies in measuring the continuous improvement progress of their Total Quality Management process.

This study represents the first step in the establishment of such a process. The goals of this research are to (1) sample the quality practices of a broad range of businesses in the state Minnesota, and to (2) provide a baseline by which the progress of those practices can be monitored though further study. This research will serve as the first in what is expected to be a series of studies into the state of quality management in Minnesota. The research conducted here will be repeated at approximately four year intervals in order to build up a longitudinal analysis of the successes, the failures, and the dynamics of quality practices within the state. The second round of surveys is currently underway.

Research Methodology

The general research methodology for the study was a mail survey sent to a scientific sample of Minnesota businesses and industries. The details of the methodology are presented within the following discussions of the development of the instrument, the population and sample, and the data collection and analysis.

Development of the Instrument

The survey instrument was developed under the guidance of the Training and Development Research Center Quality Project Advisory Board (Appendix A). The board members included:

John Anderson	Management, University of Minnesota
Jim Buckman	Minnesota Council for Quality
Kevin Dooley	Mechanical Engineering, University of Minnesota
Rick Gilreath	Alliant Techsystems
Sharon Loubert	Process Management International
Twila Lussier	GML Inc.
Gary McLean	Training and Development, University of Minnesota
Lou Schultz	Process Management International
Barbara Swanson	Process Management International
Richard Swanson	Training and Development Research Center, University of Minnesota

The advisory board met six times over a four month period for the purpose of assisting the researchers in developing the framework for the study and developing the Minnesota Quality Improvement Practices Survey (1991) instrument (Appendix B). Several fundamental decisions were made by the Board that provided the framework for the instrument. They included:

- The survey should be a census type instrument on quality improvement practices in Minnesota business and industries
- The core of the instrument should be written so that the questions could be repeated for future studies to asses change over time.
- Differences in practices among standard industry groups should be explored.
- The Malcolm Baldrige National Quality Award examination categories should be used as the basis of the core of the instrument.

- The instrument should asses company effort expended and company attainment of quality improvement practices.
- A special and unique aspect of quality improvement issues should be examined each time a state-wide survey is conducted.
- The survey instrument should not be long or overwhelming.

The Minnesota Quality Improvement Practices Survey (1991) contained three parts: Part A - Background Data, Part B - Quality Improvement Practices, and Part C - Special Topic Questions. Parts A and B of the original instrument were drafted by Dr. Richard A. Swanson and they were reviewed in detail by the advisory board. Suggestions from the Board were incorporated into the instrument. The Malcolm Baldrige Award Criteria became the template for the core questions on quality improvement practices as contained in Part B. Thus, the content validity of the Minnesota Quality Improvement Practices Survey is based on the seven (7) categories and thirty-two (32) criteria of the Baldrige Award. The categories and the number of criteria in each were:

- Leadership (4)
- Information and Analysis (3)
- Strategic Quality Planning (2)
- Human Resource Utilization (5)
- Quality Assurance of Products and Services (7)
- Quality Results (3)
- Customer Satisfaction (8)

Self assessment questions in terms of effort being expended by the firm and the status of the firm's attainment of the criteria were added to the items. The following is an example of the question format used in Part B:

3.0 Strategic Quality Planning
(integrates quality improvement into overall business planning)

Effort Level	Items within Strat Quality Plan category	Status Level				
low-med-high		None	Awareness	Planning	Action	Attainment
L M H	3.1 Strategic Quality Planning Process	___	___	___	___	___
L M H	3.2 Quality Leadership Indicators in Planning	___	___	___	___	___
L M H	Overall Assessment of these 3.0 Strategic Quality Planning category practices	___	___	___	___	___

Comments:

The Part C - Special Topic Questions on "New Product and Service Development Process" were developed by Dr. Kevin Dooley. As with the other two parts of the instrument, the Board reviewed and revised these items several times to assure the content validity of Part C. The underlying goal of Part C was to obtain a deeper understanding of innovation in relation to quality improvement practices in Minnesota businesses and industries.

With the content of the Minnesota Quality Improvement Practices Survey established through the use of the expert review by the Board and the reliance on the Baldrige award criteria, the face validity and reliability of the survey was investigated. Eight managers and quality improvement personnel from a local corporation were administered the survey. One question was repeated in the survey for the purpose of determining rater reliability of the instrument. Using the data on the two repeated items, it was found that the survey had a .82 rater reliability coefficient (See Appendix D). In addition, the managers were asked to comment on the readability and face validity of the instrument. Their comments were almost all positive along with some small suggestions for improvement that were incorporated into the final instrument.

In addition to the Minnesota Quality Improvement Practices Survey instrument and a Malcolm Baldrige Award Information sheet, a separate cover letter of encouragement was included from Governor Arnie Carlson to the business leaders being surveyed. This cover letter can be found in found in Appendix A.

Population and Sample

The population for the study included all private sector businesses and industries in the state of Minnesota having 50 or more employees. Twelve different directories listing organizations within Minnesota were analyzed according to how comprehensive the information was on individual businesses, how up-to date they kept their records, and how well they followed the demographics of businesses as set down by the Census Bureau (See Appendix B). The Contacts Influential directory listing was chosen because it could provide:

- 92% of the businesses which the census bureau listed.
- The names of companies.
- The addresses of companies.
- The phone numbers.
- The sizes of companies.
- The standard identification code (SIC #).
- A top executive contact within each company.
- A database listing of the companies chosen.
- Mailing labels for each company.

The database received included 32 fields of information on each company. This project used only the information listed above.

Minnesota has 108,359 businesses and industries and 6,389 such firms having 50 or more employees. These firms can be classified in one of the nine Standard Industrial Classification (SIC) categories. For the final survey sample size of 260, there were 30 companies for each of the eight

SIC and 20 for the low population mining group. A sample of 388, 260 plus replacements, was produced by Contacts Influential.

The Contacts Influential database is organized through the use of 255 numbered zip code "buckets". Businesses of various sizes and standard industrial codes are placed according to their respective zip code into the numbered zip code buckets by Contacts Influential to form the data base.

For example, using zip code 56098, if there were 300 businesses in that zip code area, Contacts Influential would place the first business it randomly picked from the 300, no matter what SIC or size, into zip bucket number one and continue placing the remaining businesses with the zip code 56098 which were randomly picked from the collection of 300 into the numbered zip buckets in sequential order. After reaching the last zip bucket number 255 and still having 45 businesses with the zip code 56098, Contacts Influential would begin again with zip code bucket number one and continue placing the remaining 45 businesses with zip code 56098 into the sequentially numbered zip buckets until reaching zip bucket number 45. Contacts Influential would then continue on to the next grouping of businesses regardless of SIC or size having the zip code number of 56099 and again randomly pick a business from the group and place it into zip bucket number 46. This process would continue until all 56099 businesses had been picked and placed into a zip bucket.

For the Minnesota Quality Improvement Practices Survey, Contacts Influential was directed to randomly sample from its data base 50 Minnesota businesses and industries with 50 or more employees from each standard industrial code.

Contacts Influential used the following selection process for selecting the population sample for the survey. For an example, using the SIC number 100 for mining, Contacts Influential searched zip code bucket number one for businesses which had a SIC of 100 and 50 or more employees. All businesses meeting this criteria would then be selected from zip bucket number one. The selection process would continue on through the remaining zip buckets in sequential order until either all 50 mining firms had been selected or until the last zip bucket had been reached. In the SIC category for mining, only 21 Minnesota firms with 50 or more employees were found by Contacts Influential in the data base of zip buckets 1-255. If all 50 mining firms had been found in zip bucket number one

the selection process would the have moved on to zip bucket number two looking for 50 companies with 50 of more employees meeting the SIC of 200 for construction firms.

Although the process is not purely random, it does provide a representative and scientifically selected sample. A systematic sampling bias was not found in this procedure. The precise breakdown of the population and samples are shown in Figure 1.

Figure 1

Survey Population and Sample

Industry Classification	Number of Minnesota Organizations Having 50+ Employees	Scientific Sample	Final Scientific Sample	Survey Sample Size	Completed Surveys	Percent Return
Mining	21	20	20	20	10	50%
Construction	338	50	47	30	25	83%
Manufacturing	1,473	50	49	30	28	93%
Trans. Comm.	262	50	44	30	28	93%
Wholesale Trade	445	50	47	30	25	83%
Retail Trade	1,612	50	44	30	22	73%
Finance, Ins.	440	50	46	30	25	83%
Services	2,013	50	46	30	24	80%
Ag., Forestry	47	47	45	30	26	86%
Totals	6,389	418	388	260	213	81%

The computer resources of the Academic Computing Services and Systems at the University of Minnesota were utilized for data analysis. The competed surveys were submitted to computer resources for data compilation of Parts A, B, and C of the questionnaire.

Part A Survey Results - Background Data

The entire questionnaire appears in the Appendix and should be referenced when needed. Part A consisted of seven questions designed to gather background data on the respondents and also gather some very general information on the quality efforts of the organization. Of the individuals who filled out the questionnaire, only 10% had quality or process job titles. Nonetheless, 56.8% of the firms responding indicated that their company had a formal quality improvement effort, as shown in table A1. An overwhelming majority of those firms with a formal quality improvement effort have the critical elements for its success in place, such as designated leadership, training, financial commitment, and regular reporting.

Table A1

Does your firm have a formal* quality improvement effort?
(N = 213)

56.8%	Yes
43.2%	No

Of those responding yes,

80% have designated leadership
68% have financial commitment
79% have training
65% have regular reporting

* a defined plan of cultural change and process study -- including senior management leadership, training of employees in problem solving and statistics, and financial commitment.

Table A2 shows the distribution of firms by SIC codes with quality improvement efforts. The percentages are the proportion of total respondents in that category.

Table A2

Percent of Firms with Formal Quality Improvement Efforts by SIC Code.

SIC	Frequency	Total Responding	Percent
300 - Manufacturing	23	28	82%
100 - Mining	08	10	80%
900 - Agriculture & Forestry	17	26	65%
400 - Transportation & Communication	18	28	64%
500 - Wholesale Trade	16	25	64%
800 - Services	12	24	50%
700 - Finance & Insurance	11	25	44%
600 - Retail Trade	08	22	36%
200 - Construction	08	25	32%

For the majority of businesses surveyed, the establishment of a formal quality improvement effort is a relatively recent event. Over half of the programs in the sample were started between 1989 and 1991.

Table A3

What year did you establish a formal quality improvement program? (N = 98)

1946	00.9%	••
1963	00.9%	••
1970	00.9%	••
1972	00.9%	••
1975	00.9%	••
1978	00.9%	••
1980	05.2	••••••••••••
1981	02.6%	••••••
1982	01.7%	••••
1983	01.7%	••••
1984	02.6%	••••••
1985	03.5%	••••••••
1986	05.2%	••••••••••••
1987	06.1%	••••••••••••••
1988	14.8%	••••••••••••••••••••••••••••••••••
1989	16.5%	••••••••••••••••••••••••••••••••••••••
1990	18.5%	••
1991	16.5%	••••••••••••••••••••••••••••••••••••
	100.0%	

Under half of the firms surveyed credited a single individual with being the first champion of their quality improvement effort. For those firms who did have such a champion, the majority of them came from top management.

Table A4

Is there a person who is credited with being the <u>first</u> champion of the quality improvement effort in your firm? (N=210)

44.8%	Yes
55.2%	No

Of those responding yes,

74.7%	Top Management
24.2%	Middle Management
1.1%	Worker

The responses were very similar when firms were asked if there was a person who is now credited with being the quality improvement champion.

Table A6

Is there a person who is now credited with being the champion of the quality improvement effort in your firm? (N=209)

50.2%	Yes
49.8%	No

Of those responding yes,

61.7%	Top Management
37.2%	Middle Management
1.1%	Worker

Within the entire sample of respondents, the majority of companies did not develop and retain systematic documentation of their quality improvement efforts. When the focus is on those firms indicating that they have a *formal* quality improvement effort, however, we find that 67% keep such documentation.

Table A5

Distribution of all firms who develop and retain systematic documentation of their quality improvement efforts.

46.2%	Yes
53.8%	No

Distribution of all firms with "Formal Quality Improvement Efforts" who develop and retain systematic documentation of those efforts.

66.6%	Yes
33.3%	No

Among all firms surveyed, most indicated that there was no "critical event" that initiated their quality improvement efforts. Half of those firms with formal quality improvement efforts did indicate that such an event existed, however. Some examples of those events are given in Table A7.

Table A7

Distribution of firms indicating a critical event initiated a quality improvement effort?

29.1%	Yes
70.9%	No

Distribution of firms with "Formal Quality Improvement Efforts"indicating a critical event initiated that effort?

49.0%	Yes
51.0%	No

Sample events included:

- Product quality problems
- Customer relations problems
- New president
- Financial crisis
- Government requirements

Discussion of Part A Results

One finding that is prominent among this data is that the practices of firms with "formal" quality improvement efforts is substantially different from those firms with more informal practices. Companies who have formal quality improvement efforts tend to have:

- Dedicated financial resources for such an effort
- Support in the form of leadership and training
- Systematic documentation and reporting

Additionally, firms with formal efforts seem to have been responding more often to changes both within and without the organization instead of pursuing quality for quality's sake.

Some surprises are that construction ranked so low and mining ranked so high in terms of the percentage of companies with formal quality improvement efforts. Additionally, considering the importance of monitoring and documenting quality improvement efforts, it is noteworthy that only 46% of all companies responding and only 67% of those companies with *formal* quality efforts kept such records.

Part B Survey Results - Quality Improvement Practices

The purpose of Part B of this survey was to investigate the effort exerted by companies on various quality improvement practices and also to study the level of achievement (herein referred to as "status") of those practices. Due the nature of the questionnaire, these measures reflect perceived levels only and may not be entirely indicative of true levels of performance. Nevertheless, we assume that these self reports will serve as a good first approximation to actual levels of effort and status within the population under consideration.

As mentioned in the introduction, Part B was divided into seven subsections based on the Malcolm Baldrige Award Criteria. Each subsection consisted of several individual questions about practices germane to that topic and one question that asked for an overall assessment. For every question within a subsection, the respondent was asked to give an effort level (Low, Medium or High) and a status level (None, Awareness, Planning, Action, or Attainment). A space was provided at the end of every section to give the respondents a chance to add any comments they might have. The reader is encouraged to refer to the appendix for a complete copy of the survey.

In order to summarize the data, effort level was converted to a number that ranged from one to five, with one corresponding to "Low" effort, three corresponding to "Medium" effort, and five corresponding to "High" effort. In a similar fashion, status level was converted as well, with one corresponding to "None" and five corresponding to "Attainment". The reader should note that effort level was originally on a three point scale. Effort level was scaled to a five point scale so that comparisons could be made more easily between effort and status level.

Let us begin by looking at some general findings. Table B1 shows the overall ranking of the nine industry groups in terms of self reported quality improvement effort and status attainment.

Table B1

Overall ranking of the nine industry groups in terms of self-reported quality improvement effort and status attainment.

Effort Expended for Quality Improvement by Industry*		Status of Quality Improvement Practices Attained by Industry	
1. Mining**	4.03	1. Mining**	3.71
2. Manufacturing	3.98	2. Manufacturing	3.53
3. Trans. & Communication	3.98	3. Retail Trade	3.37
4. Retail Trade	3.82	4. Finance & Insurance	3.19
5. Finance & Insurance	3.72	5. Trans. & Communication	3.13
6. Agriculture & Forestry	3.67	6. Agriculture & Forestry	3.11
7. Wholesale Trade	3.65	7. Services	3.10
8. Services	3.58	8. Wholesale Trade	3.08
9. Construction	3.58	9. Construction	2.97

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

**Mining has the smallest number of industries in Minnesota with 50 or more employees (n=21) and only 53% of those surveyed responded versus 81% across all industries.

In terms of effort expended, Mining, Manufacturing and Transportation & Communication stand out in the "top tier" of all industry groups. The rest of the industry groups are clustered together with no statistically significant difference between them. When we look at self reported *status*, Mining clearly stands out as the leader. Manufacturing and Retail Trade also make significant showings, with the rest of the groups clustered well behind them. It should be remembered that status level varies in terms of levels of action (None, Awareness, Planning, Action, and Attainment). Consequently, this data could be interpreted as suggesting that Mining and Manufacturing companies within this sample are closer to taking action, whereas the rest of the industry groups are still predominantly in the planning stages of their quality improvement efforts.

Table B2

Overall Ranking of the seven Baldrige Award Categories in Terms of Company Effort and Status Attainment

Effort Expended for Quality Improvement by Industry*		Status of Quality Improvement Practices Attained by Industry	
1. Customer Satisfaction	4.10	1. Customer Satisfaction	3.51
2. Leadership	3.95	2. Quality Results	3.32
3. Quality Results	3.87	3. Leadership	3.27
4. Human Resource Utilization	3.77	4. Human Resource Utilization	3.26
5. Quality Assurance	3.65	5. Quality Assurance	3.08
6. Information & Analysis	3.57	6. Information & Analysis	3.02
7. Strategic Quality Planning	3.50	7. Strategic Quality Planning	2.97

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Table B2 indicates that Customer Satisfaction is the area of quality improvement that has received the most attention from companies in the state of Minnesota, perhaps not a surprising result considering that most discussions of quality are strongly centered on this element. More interesting is that Information & Analysis and Quality Assurance ranked so low. This finding suggests that businesses might not be taking the cycle of measurement, analysis and improvement as seriously as is warranted. In order for any quality improvement effort to succeed and be sustained, benchmarks must be established and progress monitored with the use of data collection and analysis. This data suggests that companies may be focusing their energy elsewhere.

The next series of tables breaks down effort level by category and industry group. The tables will be presented in the order that the sections appeared in the survey.

Table B3

Leadership Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	4.25	2	4.27
Manufacturing	2	4.23	1	4.45
Transportation & Comm.	3	4.15	4	4.17
Finance, Insurance	4	4.05	3	4.20
Agriculture, Forestry	5	3.92	6	3.88
Retail Trade	6	3.80	5	4.02
Services	7	3.77	8	3.72
Construction	8	3.75	9	3.33
Wholesale Trade	9	3.72	7	3.83

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Leadership effort level is meant to measure to what extent senior executives create and sustain clear and visible quality value and quality management systems. Most scores ranged from 4.25 to 3.7 indicating that moderate effort is being exerted in this area. When we average the single item responses, no statistically significant difference appears between industry groups. In the single item overall assessment, Construction stands out as the lowest scorer while Manufacturing ranks number one.

Table B4

Information and Analysis Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Manufacturing	1	4.03	1	4.02
Mining	2	3.88	2	4.00
Transportation & Comm.	3	3.88	3	3.92
Retail Trade	4	3.55	4	3.42
Services	5	3.42	8	3.17
Agriculture, Forestry	6	3.40	5	3.42
Finance, Insurance	7	3.83	7	3.25
Construction	8	3.32	9	3.08
Wholesale Trade	9	3.28	6	3.27

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Information and Analysis effort level was designed to measure the extent that companies engage in purposeful data collection and data utilization underlying the quality improvement effort. Most industries ranked rather low on this scale, the average response being 3.57. Manufacturing, a consistently high scorer throughout this survey ranked highest both in the single item responses and the overall assessment. Construction once again was at the bottom.

Table B5

Strategic Quality Planning Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	4.17	1	4.17
Transportation & Comm.	2	3.83	2	3.80
Manufacturing	3	3.65	3	3.65
Retail Trade	4	3.55	4	3.52
Wholesale Trade	5	3.48	5	3.40
Finance, Insurance	6	3.37	6	3.33
Agriculture, Forestry	7	3.30	8	3.18
Services	8	3.30	7	3.25
Construction	9	3.22	9	3.17

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Strategic Quality Planning effort level measures the integration of quality improvement into overall business planning. Businesses responding indicated that this was the area in which the least effort was expended. Across industries, an average response of 3.5 was given, indicating that only moderate effort was being expended. This low level was consistent across industry groups, as there was very little statistical significance between their responses. Mining, however, did stand out as having the number one ranking.

Table B6

Human Resource Utilization Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	4.20	1	4.33
Transportation & Comm.	2	4.08	3	3.93
Retail Trade	3	4.02	2	4.03
Finance, Insurance	4	3.85	5	3.78
Manufacturing	5	3.82	4	3.93
Wholesale Trade	6	3.77	9	3.40
Services	7	3.57	7	3.50
Agriculture, Forestry	8	3.52	8	3.48
Construction	9	3.30	6	3.50

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Human Resource Utilization effort level is a measure of how committed organizations are to developing and realizing the full potential of the work force. Individual items in this section addressed issues such as employee training, recognition, performance measures, well-being and morale. Scores ranged from 3.30 to 4.20 for the average of item responses, and between 3.40 and 4.33 for the overall assessment item. Mining was the only industry that indicated an effort that was tending towards "high" (4.33).

Table B7

Quality Assurance of Products and Services Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Manufacturing	1	3.88	1	3.87
Mining	2	3.82	3	3.83
Wholesale Trade	3	3.78	2	3.83
Transportation & Comm.	4	3.75	4	3.72
Agriculture, Forestry	5	3.62	5	3.72
Retail Trade	6	3.55	6	3.70
Construction	7	3.53	7	3.58
Finance, Insurance	8	3.52	9	3.42
Services	9	3.27	8	3.42

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Quality Assurance of Products and Services indicates whether an organization has a systematic approach for total quality control of goods and services. This assurance applies not only to internal processes and products, but also those of suppliers and other services that are external to the organization. This was another category in which most companies scored themselves rather low. Most responses were solidly "medium" effort. There was no statistically significant difference between industry groups.

Table B8

Quality Results Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Manufacturing	1	4.12	1	4.10
Finance, Insurance	2	3.97	2	3.97
Agriculture, Forestry	3	3.93	3	3.97
Construction	4	3.92	9	3.42
Transportation & Comm.	5	3.87	4	3.92
Retail Trade	6	3.80	7	3.58
Mining	7	3.72	5	3.83
Services	8	3.72	6	3.72
Wholesale Trade	9	3.62	8	3.55

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Quality Results refers to the objective measures of meeting customer requirements and comparisons to competing firms. When we average over all industry groups, this category ranked third with an average response of 3.87. There was no statistically significant differences between groups.

Table B9

Customer Satisfaction Effort Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Retail Trade	1	4.43	1	4.53
Transportation & Comm.	2	4.25	2	4.42
Mining	3	4.18	3	4.33
Manufacturing	4	4.17	4	4.23
Construction	5	4.08	9	3.82
Services	6	4.07	5	4.13
Agriculture, Forestry	7	4.00	8	3.88
Finance, Insurance	8	3.90	6	3.97
Wholesale Trade	9	3.87	7	3.92

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Customer Satisfaction is a measure of the knowledge of the customer and the extent to which there are systems of customer service. Averaged over all industry groups, Customer Satisfaction was ranked highest among all of the Baldrige criteria, with an average response of 4.10. The Retail Trade Industry ranked highest among all industry groups, both in the item average and in the overall assessment. It should be noted, however, that all industries rated themselves very close to each other, since there was little statistical significance in the differences between them.

Now that self-reported effort level has been examined, attention will now move to self-reported status level. It is important to remember that status level was measured along a continuum of attainment with one indicating no effort at all, two indicating awareness of the issue, three indicating planning, four indicating action, and five indicating attainment.

Table B10

Leadership Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Manufacturing	1	3.72	2	3.77
Mining	2	3.65	1	3.78
Retail Trade	3	3.27	3	3.53
Finance, Insurance	4	3.26	7	3.05
Services	5	3.23	5	3.27
Agriculture, Forestry	6	3.22	6	3.20
Wholesale Trade	7	3.18	4	3.32
Transportation & Comm.	8	3.10	8	3.04
Construction	9	3.04	9	2.89

Manufacturing and Mining stand out as industries in which action is taken on issues of leadership. Most of the other industry groups came in around 3.0 to 3.5, indicating that some have taken action while others remain primarily in the planning stage. Construction was the only industry group to score under 3.0 for the single item overall assessment.

Table B11

Information and Analysis Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	3.47	1	3.80
Manufacturing	2	3.33	3	3.21
Retail Trade	3	3.24	2	3.40
Transportation & Comm.	4	3.12	4	3.11
Wholesale Trade	5	2.99	5	2.91
Services	6	2.98	7	2.76
Agriculture, Forestry	7	2.97	6	2.90
Finance, Insurance	8	2.70	9	2.64
Construction	9	2.69	8	2.70

Averaged across all industries, Information & Analysis ranked six out of seven in terms of status level. Businesses gave an average response on this section of only 3.02, indicating that most firms are in the planning stage, with some firms exhibiting only awareness. In fact, the industries of Construction and Finance & Insurance scored well under 3.0, indicating that at best some are in the planning stage. In the single item overall assessment, Mining ranks a strong first.

Table B12

Strategic Quality Planning Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	3.80	1	3.80
Manufacturing	2	3.29	2	3.21
Retail Trade	3	3.03	3	3.19
Finance, Insurance	4	2.95	5	2.91
Transportation & Comm.	5	2.91	7	2.74
Agriculture, Forestry	6	2.90	6	2.81
Services	7	2.84	4	2.91
Wholesale Trade	8	2.83	8	2.74
Construction	9	2.65	9	2.60

Strategic Quality Planning ranked last in status among all organizations responding to this survey. The average item response on this section was 2.97, indicating that most companies are in the planning stage only. Mining, however, is an industry that conspicuously stands out among the others as being closer to action in their Strategic Quality Planning efforts.

Table B13

Human Resource Utilization Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	3.82	1	3.90
Retail Trade	2	3.61	2	3.63
Manufacturing	3	3.54	3	3.50
Finance, Insurance	4	3.45	5	3.32
Services	5	3.25	4	3.32
Transportation & Comm.	6	3.16	7	3.12
Agriculture, Forestry	7	3.05	8	3.05
Wholesale Trade	8	3.03	6	3.19
Construction	9	2.85	9	2.56

Responses for the status level of Human Resource Utilization varied significantly amongst industry groups. Responses ranged from a high of 3.90 to a low of 2.56 for the overall assessment question. Once again, Mining was convincingly ranked first while Construction scored at the bottom.

Table B14

Quality Assurance of Products and Services Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	3.61	1	3.56
Agriculture, Forestry	2	3.34	6	3.05
Manufacturing	3	3.32	2	3.40
Wholesale Trade	4	3.15	4	3.10
Finance, Insurance	5	3.10	8	3.05
Construction	6	3.06	9	2.95
Retail Trade	7	3.03	3	3.38
Services	8	2.80	7	3.05
Transportation & Comm.	9	2.72	5	3.08

Mining ranked number one in the category of Quality Assurance of Products and Services, with the average response falling somewhere between action and planning. In the single item overall assessment, Construction ranked last, even though there was no statistically significant difference between industries.

Table B15

Quality Results Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	3.73	1	3.70
Manufacturing	2	3.60	2	3.59
Retail Trade	3	3.52	4	3.33
Finance, Insurance	4	3.47	3	3.35
Construction	5	3.25	8	3.05
Agriculture, Forestry	6	3.16	9	2.90
Transportation & Comm.	7	3.17	5	3.15
Services	8	3.14	6	3.14
Wholesale Trade	9	3.11	7	3.09

Over all industry groups, Quality Results ranked second with an average response of 3.32. This indicates that most firms are in the planning stage or are taking action to come up with objective measures to help meet customer requirements and make comparisons to competing firms. Even though Mining ranked first again, there was no statistically significant difference between groups.

Table B16

Customer Satisfaction Status Level

Rankings for industry groups based on Item Responses and Overall Assessment Responses

Industry Group	Average of Item Responses		Single Item Overall Assessment	
	Rank	Mean (1=low 5=high)	Rank	Mean (1=low 5=high)
Mining	1	3.84	3	3.80
Manufacturing	2	3.81	1	3.91
Retail Trade	3	3.80	2	3.82
Transportation & Comm.	4	3.58	4	3.62
Finance, Insurance	5	3.46	5	3.60
Services	6	3.35	6	2.40
Construction	7	3.35	7	3.32
Wholesale Trade	8	3.30	8	3.23
Agriculture, Forestry	9	3.27	9	3.10

In terms of both effort expended and status achieved, Customer Satisfaction ranked number one among all firms responding to this survey. These firms ranked uniformly high amongst each other, as there was little significant difference between them. Mining, Manufacturing and Retail Trade ranked highest, indicating that the majority of firms in these industries are taking action when it comes to customer satisfaction.

The last series of tables to be presented for Part B compares effort level to status level for the seven Baldrige criteria broken down by industry. All tables will be presented together, with a discussion of the more salient findings to follow.

Table B17

Mining Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Leadership	4.25	Customer Satisfaction	3.84
Human Resource Utilization	4.20	Human Resource Utilization	3.82
Customer Satisfaction	4.18	Strategic Quality Planning	3.80
Strategic Quality Planning	4.17	Quality Results	3.73
Information and Analysis	3.88	Leadership	3.65
Quality Assurance of P & S	3.82	Quality Assurance of P & S	3.61
Quality Results	3.72	Information and Analysis	3.47

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Construction Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Customer Satisfaction	4.08	Customer Satisfaction	3.35
Quality Results	3.92	Quality Results	3.25
Leadership	3.75	Quality Assurance of P & S	3.06
Quality Assurance of P & S	3.53	Leadership	3.04
Information and Analysis	3.32	Human Resource Utilization	2.85
Human Resource Utilization	3.30	Information and Analysis	2.69
Strategic Quality Planning	3.22	Strategic Quality Planning	2.65

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Table B17 - cont.

Manufacturing Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Leadership	4.23	Customer Satisfaction	3.81
Customer Satisfaction	4.17	Leadership	3.72
Quality Results	4.12	Quality Results	3.60
Information and Analysis	4.03	Human Resource Utilization	3.54
Quality Assurance of P & S	3.88	Information and Analysis	3.33
Human Resource Utilization	3.82	Quality Assurance of P & S	3.32
Strategic Quality Planning	3.65	Strategic Quality Planning	3.29

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Transportation and Communication Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Customer Satisfaction	4.25	Customer Satisfaction	3.58
Leadership	4.15	Human Resource Utilization	3.16
Human Resource Utilization	4.08	Quality Results	3.16
Information and Analysis	3.88	Information and Analysis	3.12
Quality Results	3.87	Leadership	3.10
Strategic Quality Planning	3.83	Strategic Quality Planning	2.91
Quality Assurance of P & S	3.75	Quality Assurance of P & S	2.72

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Table B17 - cont.

Wholesale Trade Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Customer Satisfaction	3.87	Customer Satisfaction	3.30
Quality Assurance of P & S	3.78	Leadership	3.18
Human Resource Utilization	3.77	Quality Assurance of P & S	3.15
Leadership	3.72	Quality Results	3.11
Quality Results	3.62	Human Resource Utilization	3.03
Strategic Quality Planning	3.48	Information and Analysis	2.99
Information and Analysis	3.28	Strategic Quality Planning	2.83

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Retail Trade Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Customer Satisfaction	4.43	Customer Satisfaction	3.80
Human Resource Utilization	4.02	Human Resource Utilization	3.61
Quality Results	3.80	Quality Results	3.52
Leadership	3.80	Leadership	3.27
Information and Analysis	3.55	Information and Analysis	3.24
Quality Assurance of P & S	3.53	Strategic Quality Planning	3.03
Strategic Quality Planning	3.55	Quality Assurance of P & S	3.03

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Table B17 - cont.

Finance and Insurance Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Leadership	4.05	Quality Results	3.47
Quality Results	3.97	Customer Satisfaction	3.46
Customer Satisfaction	3.90	Human Resource Utilization	3.45
Human Resource Utilization	3.85	Leadership	3.26
Quality Assurance of P & S	3.50	Quality Assurance of P & S	3.10
Information and Analysis	3.38	Strategic Quality Planning	2.95
Strategic Quality Planning	3.37	Information and Analysis	2.70

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Service Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Customer Satisfaction	4.07	Customer Satisfaction	3.35
Leadership	3.77	Human Resource Utilization	3.25
Quality Results	3.72	Leadership	3.23
Human Resource Utilization	3.57	Quality Results	3.14
Information and Analysis	3.42	Information and Analysis	2.98
Strategic Quality Planning	3.30	Strategic Quality Planning	2.84
Quality Assurance of P & S	3.27	Quality Assurance of P & S	2.80

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

Table B17 - cont.

Agriculture and Forestry Industry

Rankings of Effort level and Status level for the seven Baldrige criteria.

Effort Level	Mean Value (1=low - 5=high)	Status Level	Mean Value (1=low - 5=high)
Customer Satisfaction	4.00	Quality Assurance of P & S	3.34
Quality Results	3.93	Customer Satisfaction	3.27
Leadership	3.92	Leadership	3.22
Quality Assurance of P & S	3.62	Quality Results	3.17
Human Resource Utilization	3.50	Human Resource Utilization	3.05
Information and Analysis	3.40	Information and Analysis	2.97
Strategic Quality Planning	3.30	Strategic Quality Planning	2.90

*Effort level has been converted to a 5 pt. scale with 5 being the highest and 1 the lowest.

As was brought out by the summary rankings at the beginning of Part B, Customer Satisfaction appears at the top or very close to the top of effort and status results in all industries. Similarly, Strategic Quality Planning appears close to bottom of all industry responses. One noteworthy exception to this finding is Mining, which ranked Strategic Quality Planning fourth in terms of effort and third in terms of status. Is it a coincidence that Mining also ranked number one when an average is taken across all criteria (see Table B1)? One might suspect that the key to a quality improvement effort that is successful on many dimensions includes integration with the strategic plans of the company. Strategic Quality Planning was at the bottom of Construction's efforts, and Construction also ranked last overall. These results need to be researched further, however, because Strategic Quality Planning ranked last for Manufacturing also, which came in second overall.

Part C Survey Results - Special Topic Question

New Product and Service Development Process

Part C was designed to address a special topic germane to quality management. The advisory board decided to make new product and service development the topic for the first round of the Quality Practices Survey, and the questions themselves were developed by Dr. Kevin Dooley of the University of Minnesota. Part C was divided into three sections. The first section asked general questions about market position and product development, the second section addressed drivers that lead to new product development, and the last section concerned the use of various methods and tools that are used in new product and service development.

When companies were asked what percent of sales were generated from products or services developed over the last three years, the average response was 26%, indicating that either most firms are not fully committed to new product development, or that they have not been very successful at it. Only 27.2% of firms said that they have written policies and procedures used for new product and service development, while 72.8% said that they did not. When asked to compare their level of effort in developing new products and services when compared to three years ago, 4.5% of the companies surveyed responded "Less Active", 43.8% responded "About the Same", and 51.7% responded "More Active". When asked to compare their level of effort in developing new products and services when compared to their leading competitor, 6.4% responded "Less Active", 44.6% responded "About the Same", and 49.0% responded "More Active".

As can be seen in Table C1, the firms sampled most strongly agree with the statement indicating that they primarily develop new products in existing markets. Firms are least likely to be developing new products for new markets.

Table C1
General Product Development Practices
Percent Responding to Each Category and Average Response

	1	2	3	4	5	Mean
We primarily develop new products in existing markets	16.8	8.6	21.8	19.3	33.5	3.44
We generally compete as a low cost producer	34.9	17.9	20.0	11.3	15.9	2.55
We primarily develop new products in new markets	42.9	19.4	28.1	7.1	2.6	2.07

Table C2 indicates that executive leadership is the most important driver of new product and service development among companies surveyed with an average response of 3.99. Threats to market share and competition's development activity were second and third, and opportunity from proprietary technology was last with an average response of 2.99.

Table C2
New Product and Service Drivers
Percent Responding to Each Category and Average Response

	1	2	3	4	5	Mean
Influence of executive leadership	5.1	4.5	16.2	34.3	39.9	3.99
Threats to market share	10.0	9.5	18.0	27.5	35.0	3.68
Competition's development activity	6.6	13.1	25.8	31.8	22.7	3.51
Retained earnings	14.9	10.3	27.2	28.2	19.5	3.27
Opportunity from proprietary technology	19.6	16.0	26.3	21.6	16.5	2.99

Table C3 lists methods and tools of new product and service development by response rate. Sales and service feedback was ranked first, with an average response of 3.88, and was well ahead of the next item listed, which was in person customer interviews. Competitive benchmarking and traditional forms of market research also placed rather high in this survey, but. many of the more

exotic methods of product and service development ranked rather low. Seventy-three percent of companies surveyed said they did not even use Taguchi methods.

Table C3
Use of Tools and Methods for New Product and Service Development
Percent Responding to Each Category and Average Response

	1	2	3	4	5	Mean
Sales/Service feedback	4.4	4.9	23.6	38.9	28.1	3.88
In person customer interviews	10.8	13.3	28.1	30.0	17.7	3.30
Competitive benchmarking	15.4	18.4	29.9	24.9	11.4	2.99
Customer surveys and market research	21.3	16.3	24.3	22.8	15.3	2.95
Prototype/field testing	29.4	18.8	25.4	18.8	7.6	2.56
Controlled experimentation	41.9	13.6	21.7	16.7	6.1	2.32
Computer aided design	46.2	15.1	11.6	16.6	10.6	2.31
Formal design reviews	41.4	17.2	19.2	15.7	6.6	2.29
Checklists/ templates	38.1	24.2	21.1	13.4	3.1	2.19
Quality function deployment	48.9	16.3	21.6	8.9	4.2	2.03
Expert systems	47.7	20.8	19.3	8.1	4.1	2.00
Design for manufacturing/ assembly	55.1	11.7	17.9	10.2	5.1	1.99
Basic (laboratory) research and development	45.7	25.6	16.6	8.5	3.5	1.98
Computer simulations	55.8	17.6	14.1	9.5	3.0	1.86
Taguchi methods	73.0	13.5	11.2	1.7	.6	1.43

Conclusion

The first round of this survey has shed significant light on the quality improvement practices of Minnesota business and industry. Results have revealed information concerning what industries have quality improvement efforts and what the characteristics of those efforts are. To summarize some of the more salient findings, a brief synopsis of each section of the survey follows.

Part A was designed to gather background data on what industries have quality improvement efforts and what those quality improvement efforts are like in general terms. Formal quality improvement in Minnesota business and industry was shown to be a relatively new phenomenon, with the majority of firms only establishing such programs within the last five to six years. Unsurprisingly, those firms with formal efforts have broad based support for those efforts, like designated leadership, financial commitment and training. Quality improvement efforts have been implemented in manufacturing settings much more frequently than in knowledge oriented industries such as retail trade, finance and insurance.

Part B was designed to investigate the effort exerted by companies in areas of quality improvement that correspond to the Baldrige Award criteria. Companies appear to expend the most energy in the areas of customer satisfaction, leadership and quality results. Businesses indicated that they exert the least amount of effort in strategic quality planning, and information and analysis. More research should done to better account for these findings. Mining and manufacturing ranked number one and two respectively when it comes to amount of effort expended and status achieved in their quality improvement activities. It should be remembered that these same industries ranked highest in terms of the percent of firms having formal quality improvement efforts.

Part C of this survey investigated new product development practices of business and industry in Minnesota. Most companies surveyed indicated that they developed new products (as opposed to being a low cost competitor), but that those new products were developed for existing markets, not new markets. Influence of executive leadership and threats to market share were the primary drivers for new product development. Opportunities from proprietary technology played a

relatively minor role. The tools most used for new product and service development were simple and familiar. They included sales and service feedback, in person customer interviews and benchmarking.

Even though this survey provided significant results, more research needs to be done to further explore the findings. The second round of this survey will certainly provide a good check for the results contained herein, as well as permit a longitudinal analysis to be undertaken.

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APPENDIX A

COVER LETTERS

STATE OF MINNESOTA
OFFICE OF THE GOVERNOR
SAINT PAUL 55155
612-296-3391

ARNE H. CARLSON
GOVERNOR

May 1, 1991

Dear Business Executive:

I am committed to encouraging Minnesota businesses to adopt "quality management" as a primary strategy and believe that our collective progress in this area is a strong predictive indicator of our state's economic future.

In recognition of the need to improve quality management practices in Minnesota, I urge your support of a study to be undertaken jointly by the University of Minnesota and the Minnesota Council for Quality. It is intended to convert to hard data our state's real progress in quality improvement and to move beyond the "quality of life" platitudes which are often referenced.

The study questionnaire is patterned after the rigorous guidelines of the Malcolm Baldrige National Quality Award and its companion piece - the Minnesota Quality Award.

Your company's participation is vital, because you and 449 others have been scientifically chosen as a sample which will provide us with a picture of the state's entire business community.

Thank you for your assistance in this first-in-the-nation study of our critical success factor - Quality!

Warmest regards,

ARNE H. CARLSON
Governor

AHC:mjb

UNIVERSITY OF MINNESOTA
TWIN CITIES

Training and Development
Department of Vocational and Technical Education
College of Education
420 Vocational and Technical Education Building
1954 Buford Avenue
St. Paul, Minnesota 55108
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May 10, 1991

TO:

FROM: Richard A. Swanson, Professor
University of Minnesota

Jim Buckman, Executive Director
Minnesota Council for Quality

RE: SURVEY OF QUALITY IMPROVEMENT PRACTICES IN MINNESOTA

We need your help. We are conducting a scientific survey of the quality improvement practices of Minnesota business and industry having 50 or more employees. We expect that firms will vary in their quality improvement practices and want to describe those differences. The profile we obtain in 1991 will be valuable in itself and will also be used as a base of comparison for future surveys. You are the key to obtaining the needed 1991 data.

The survey responses from individual firms will always remain anonymous. The coding will only be used to classify your response into the appropriate business-industry group. We will remove any remaining company identification once your response is received at the University.

This survey takes 15-20 minutes to complete. There are 3 parts to the survey instrument:

A. Background Data
B. Quality Improvement Practices (based on the Malcolm Baldrige Award criteria)
C. Special Topic Questions (new product and service development process practices).

While you should complete the questions in Part A, you may have a champion for quality improvement in your firm who could best answer the questions in Parts B and C.

Also included in this mailing you will find a letter from Governor Arne H. Carlson encouraging you to complete this important survey, a reference page on the Baldrige Award criteria, and a return mailing envelope.

We would appreciate having your completed survey in the next 14 days. If we do not receive it, we will call you to check on its status. Our goal is to obtain a 100% response. We will be sending a summary report of the findings to all those who respond, and to Minnesota policy makers in the private and public sectors.

Thank you for helping with this survey.

APPENDIX B

MINNESOTA QUALITY SURVEY

Survey Code Number _____

MINNESOTA QUALITY IMPROVEMENT PRACTICES SURVEY

1991 CENSUS BY THE UNIVERSITY OF MINNESOTA AND THE MINNESOTA COUNCIL FOR QUALITY

PURPOSE OF THE SURVEY:

This survey is to establish a scientifically accurate profile of the quality improvement practices of Minnesota businesses and industries having 50 or more employees. The core questions are based on the Malcolm Baldrige National Quality Award criteria.

ANONYMITY:

All responses to this survey will remain anonymous. Your survey code number is all we need to see that your data are put in the appropriate business/industry group (individual and company labels will be removed from surveys when they are received by the University). We will be personally contacting non-respondents to ensure a 100% return and, thus, the need for the code number.

DEFINITIONS TO GUIDE YOUR RESPONSES:

- ***Quality*** - a reliable product or service that meets or exceeds customer requirements at a price that they are willing to pay.
- ***Quality Improvement*** - a systematic approach used to reduce variation in the processes which produce a product or service.
- ***Informal Quality Improvement Effort*** - an encouraged and expected outcome without direct involvement and leadership from senior management and financial commitment.
- ***Formal Quality Improvement Effort*** - a defined plan of cultural change and process study -- including senior management leadership, training of employees in problem solving and statistics, and financial commitment.

PART A - BACKGROUND DATA *(Please circle the correct responses and/or fill in responses)*

Yes - No 1. Are you the person whose name appears on the cover letter?
(If no, please identify yourself by name and job title: _____.)

Yes - No 2. Does your organization have a formal quality improvement effort? (If yes, is there
__ Designated leadership? __ Financial commitment? __ Training? __ Regular reporting?)

19____ 3. If yes on #2, what year did you establish a formal quality improvement effort?

Yes - No 4. Is there a person who is credited with being the first champion of the quality improvement effort in your firm? (If yes, what was his/her job title? _____.
Was he/she considered __ Top management __ Middle management __ Worker?)

Yes - No 5. Is there a person who is now credited with being the champion of the quality effort in your firm? (If yes, what is his/her job title? _____.
Was he/she considered __ Top management __ Middle management __ Worker?)

Yes - No 6. Does your firm develop and retain systematic documentation of your quality improvement effort? (If Yes, are you willing to share this with case study researchers? Yes - No)

Yes - No 7. Was there a critical event associated with the origin of your quality improvement effort?
(If yes, describe: _____
_____.)

PART B - QUALITY IMPROVEMENT PRACTICES *(based on the Malcolm Baldrige Award criteria)*

Rate the "effort level" and present "status level" for each item.

1.0 Leadership (senior executives create and sustain clear and visible quality value and quality management systems)

Effort level *low-med-high*	Items within Leadership category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	1.1 Senior Executive Leadership	___	___	___	___	___
L M H	1.2 Quality Values	___	___	___	___	___
L M H	1.3 Management for Quality	___	___	___	___	___
L M H	1.4 Public Responsibility	___	___	___	___	___
L M H	Overall assessment of these 1.0 Leadership practices	___	___	___	___	___

Comments:

2.0 Information and Analysis (purposeful data collection and data utilization underlying the quality improvement effort)

Effort level *low-med-high*	Items within Info. & Analysis category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	2.1 Scope & Management of Quality Data and Information	___	___	___	___	___
L M H	2.2 Competitive Comparisons and Benchmarks	___	___	___	___	___
L M H	2.3 Analysis of Quality Data and Information	___	___	___	___	___
L M H	Overall assessment of these 2.0 Information and Analysis practices	___	___	___	___	___

Comments:

3.0 Strategic Quality Planning (integrates quality improvement into overall business planning)

Effort level *low-med-high*	Items within Strat.Quality Plan. category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	3.1 Strategic Quality Planning Process	___	___	___	___	___
L M H	3.2 Quality Leadership Indicators in Planning	___	___	___	___	___
L M H	Overall assessment of these 3.0 Strategic Quality Planning practices	___	___	___	___	___

Comments:

4.0 Human Resource Utilization (develop and realize the full potential of the work force)

Effort level *low-med-high*	Items within Human Resource Util. category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	4.1 Human Resource Management	___	___	___	___	___
L M H	4.2 Employee Involvement	___	___	___	___	___
L M H	4.3 Quality Education & Training	___	___	___	___	___
L M H	4.4 Employee Recognition & Perf. Measurement	___	___	___	___	___
L M H	4.5 Employee Well-Being & Morale	___	___	___	___	___
L M H	Overall assessment of these 4.0 Human Resource Utilization practices	___	___	___	___	___

Comments:

PART B - QUALITY IMPROVEMENT PRACTICES *(continued)*

Rate the "effort level" and present "status level" for each item.

5.0 Quality Assurance of Products and Services (systematic approach for total quality control of goods and services).

Effort level *low-med-high*	Items within Quality Assurance of P&S category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	5.1 Design & Introduction of Quality Products & Services	___	___	___	___	___
L M H	5.2 Process & Quality Control	___	___	___	___	___
L M H	5.3 Continuous Improvement of Processes, Products, & Services	___	___	___	___	___
L M H	5.4 Quality Assessment	___	___	___	___	___
L M H	5.5 Documentation	___	___	___	___	___
L M H	5.6 Quality Assurance/Assessment & Quality Improvement of Support Service & Business Processes	___	___	___	___	___
L M H	5.7 Quality Assurance/Assessment & Quality Improvement of Suppliers	___	___	___	___	___
L M H	Overall assessment of these 5.0 Quality Assurance of Products and Services practices	___	___	___	___	___

Comments:

6.0 Quality Results (objective measures of meeting customer requirements and comparisons to competing firms).

Effort level *low-med-high*	Items within Quality Results category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	6.1 Quality of Products and Services	___	___	___	___	___
L M H	6.2 Comparison of Quality Results	___	___	___	___	___
L M H	6.3 Business Process, Operational Support Service Quality Improvement	___	___	___	___	___
L M H	Overall assessment of these 6.0 Quality Results practices	___	___	___	___	___

Comments:

7.0 Customer Satisfaction (knowledge of the customer and systems for customer service).

Effort level *low-med-high*	Items within Customer Satisfaction category	Status level *None*	*Awareness*	*Planning*	*Action*	*Attainment*
L M H	7.1 Knowledge of Customer Requirements & Expectations	___	___	___	___	___
L M H	7.2 Customer Relationship Management	___	___	___	___	___
L M H	7.3 Customer Service Standards	___	___	___	___	___
L M H	7.4 Commitment to Customers	___	___	___	___	___
L M H	7.5 Complaint Resolution for Quality Improvement	___	___	___	___	___
L M H	7.6 Determining Customer Satisfaction	___	___	___	___	___
L M H	7.7 Customer Satisfaction Results	___	___	___	___	___
L M H	7.8 Customer Satisfaction Comparison	___	___	___	___	___
L M H	Overall assessment of these 7.0 Customer Satisfaction practices	___	___	___	___	___

Comments:

PART C - SPECIAL TOPIC QUESTIONS

NEW PRODUCT AND SERVICE DEVELOPMENT PROCESS. We are interested in gaining information regarding the new product and service development process practices within Minnesota businesses and industries. Please respond to th following questions given your firm's experience.
(Please circle the correct responses and/or fill in responses.)

1. What percent of your sales do you think are generated from products and/or services developed over the past three years? _____ %

2. Please indicate the current level of your company's efforts in developing new products and services compared to three years ago. A. Less Active B. About the Same C. More active

3. Please indicate the current level of your company's efforts in developing new products and services compared to that of your leading competitor. A. Less Active B. About the Same C. More active

4. Do you have written policies and procedures for new product and service development? Yes - No
(If yes, are you willing to share these with case study researchers? Yes - No)

5. On a scale from 1 - 5 *(1= strongly disagree & 5 = strongly agree)*, please respond to the following statements: *(circle your response for each item)*

1 2 3 4 5	A. We primarily develop new products in new markets
1 2 3 4 5	B. We primarily develop new products in existing markets
1 2 3 4 5	C. We generally compete as low cost producer

6. On a scale of importance from 1 - 5 *(1=not important & 5=very important)*, please indicate what you think drives new product and service development within your company:

1 2 3 4 5	A. Influence of executive leadership
1 2 3 4 5	B. Retained earnings
1 2 3 4 5	C. Threats to market share
1 2 3 4 5	D. Competition's development activity
1 2 3 4 5	E. Opportunity from proprietary technology

7. On a scale from 1 - 5 *(1=not used & 5=used extensively)*, please indicate the extent of use of the following methods and tools in new product and service development:

1 2 3 4 5	A. Customer surveys and market research
1 2 3 4 5	B. In-person customer interviews
1 2 3 4 5	C. Sales/service feedback
1 2 3 4 5	D. Competitive benchmarking
1 2 3 4 5	E. Basic (laboratory) research and development
1 2 3 4 5	F. Prototype/field testing
1 2 3 4 5	G. Formal design reviews
1 2 3 4 5	H. Computer simulations
1 2 3 4 5	I. Checklists/templates
1 2 3 4 5	J. Computer aided design
1 2 3 4 5	K. Expert systems
1 2 3 4 5	L. Controlled experimentation
1 2 3 4 5	M. Design for manufacturing/assembly
1 2 3 4 5	N. Taguchi methods
1 2 3 4 5	O. Quality function deployment
1 2 3 4 5	P. Other: _____

THANK YOU!

We will send a summary of the survey results to those who respond.

MINNESOTA QUALITY IMPROVEMENT SURVEY
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APPENDIX C

BALDRIDGE AWARD INFORMATION SHEET

1991 MALCOLM BALDRIGE AWARD INFORMATION SHEET

1.0 Leadership

1.1 Refers to the senior executives' leadership, personal involvement, and visibility in developing and maintaining an environment for quality excellence.

1.2 Refers to the company's quality values, how they are projected in a consistent manner, and how adoption of the values throughout the company is determined.

1.3 Refers to the how the quality values are integrated into day-to-day leadership, management, and supervision of all company units.

1.4 Refer to how the company extends its quality leadership to the external community and includes its responsibilities to the public for health, safety, environmental protection, and ethical business practice in its quality policies and improvement activities.

2.0 Information and Analysis

2.1 Refers to how the company's base of data and information is used for planning, day-to-day management, and evaluation of quality, and how data and information reliability, timeliness, and access are assured.

2.2 Refers to the company's approach to selecting quality-related competitive comparisons and world-class benchmarks to support quality planning, evaluation, and improvement.

2.3 Refers to how data and information are analyzed to support the company's overall quality objectives.

3.0 Strategic Quality Planning

3.1 Refers to the company's strategic quality planning process for short-term (1-2 years) and longer term(3 years or more) quality leadership and customer satisfaction.

3.2 Refers to the company's goals and strategies involving principal quality plans for the short term (1-2 years) and longer term (3 years or more).

4.0 Human Resource Utilization

4.1 Refers to how the company's overall human resource management effort supports its quality objectives.

4.2 Refers to the means available for all employees to contribute effectively to meeting the company's quality objectives; summarize trends and current levels of involvement.

4.3 Refers to how the company decides what quality education and training is needed by employees and how it utilizes the knowledge and skills acquired.

4.4 Refers to how the company's recognition and performance measurement processes support quality objectives.

4.5 Refers to how the company maintains a work environment conducive to the well-being and growth of all employees.

(continued on other side)

5.0 Quality Assurance of Products and Services

5.1 Refers to how new and/or improved products and services are designed and introduced and how processes are designed to meet key product and service quality requirements.
5.2 Refers to how the processes used to produce the company's products and services are controlled.
5.3 Refers to how processes used to produce products and services are continuously improved.
5.4 Refers to how the company assesses, the quality of its systems, processes, practices, products, and services.
5.5 Refers to company documentation and other modes of knowledge preservation and knowledge transfer to support quality assurance, quality assessment, and quality improvement.
5.6 Refers to the company's summary of its process quality, quality assessment, and quality improvement activities for business processes and support services.
5.7 Refers to how the quality of materials, components, and services furnished by other businesses is assured, assessed, and improved.

6.0 Quality Results

6.1 Refers to the company's trends in quality improvement and current quality levels for key product and service features; comparison of the company's current quality levels with those of competitors and world leaders.
6.2 Refers to the company's summarized trends in quality improvement and current quality levels for business processes, operations, and support services.
6.3 Refers to the company's summarized trends and levels in quality of suppliers and services furnished by other companies; comparison of the company's supplier quality with that of competitors and with key benchmarks.

7.0 Customer Satisfaction

7.1 Refers to how the company determines current and future customer requirements and expectations.
7.2 Refers to how the company provides effective management of its relationships with its customers and uses information gained from customers to improve products and services as well as its customer relationship management practices.
7.3 Refers to the company's standards governing the direct contact between its employees and customers and how these standards are set and modified.
7.4 Refers to the company's commitments to customers on explicit and implicit promises underlying its products and services.
7.5 Refers to how the company handles complaints, resolves them, and uses complaint information for quality improvement and for prevention of recurrence of problems.
7.6 Refers to the company's methods for determining customer satisfaction, how satisfaction information is used in quality improvement, and how methods for determining customer satisfaction are improved.
7.7 Refers to the trends in the company's customer satisfaction and in indicators of adverse customer response.
7.8 Refers to how the company's customer satisfaction results and recognition compare with those of competitors that provide similar products and services.