TOTAL QUALITY SURVEY OF CANADIAN BUSINESS

G. Dennis Beecroft

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Executive Summary

Product and Service quality is revolutionizing the world. Japan was the first to use this strategic weapon, setting the standard for the rest to follow. The United States is scrambling to prevent any further market erosion. They too have made great strides - witness the automobile industry, but are being continuously challenged by imports.

Canadian business is being faced with global markets. The Canada-U.S. Free Trade Agreement and our overall lower competitiveness makes it imperative that Canada respond quickly to the issues of Product and Service quality.

In Japan, Total Quality Control is promoted by JUSE through the Deming Application Award. In the United States the Malcolm Baldrige Award has been recently introduced to promote and assist U.S. companies in the improvement of quality and productivity. While Canada introduced a Quality Award as one of their Canada Awards for Business Excellence in 1989, the criteria have not yet been made public.

The purpose of this project was to define the elements of Total Quality using the above three awards as references and then to determine to what extent these elements were being practised by Canadian business.

Conclusions:

- Senior business management reported that the elements of Total Quality are being practised. Twenty percent of the companies surveyed scored over 80% with an average score of 68%, on meeting the overall total quality score.

- Large Goods companies consistently scored higher on practising the elements of Total Quality than Small Goods companies.

- The Goods sector performed better in the elements of Human Resource Utilization and Quality Assurance.

- The Service sector scored higher in the elements of Leadership in Product/service and Results.

- Education and Training are not being well practised:

    - 51% of companies had less than 5 days/employee/year
    - Only 5% had greater than 20 days/employee/year

    However,

    - 71% use problem solving training
    - 78% have a quality awareness course
    - 56% have education goals in terms of training per employee

- Companies are weak in the area of communications:

    - Results are not being communicated to employees. Almost 20% of companies make the results available upon request only

    - Only 33% of companies distribute their plans widely

- Companies are not making sufficient use of the input potential of both their customers or suppliers.

    - Less than 50% use customer focus groups
    - Only 45% use customer and/or supplier input in their planning process
    - 53% use customer input for policies and goals
    - Only 36% use supplier input for policies and goals

- Senior management delegates the quality improvement function. While senior management responded that approximately 90% of all their employees - front-line, supervision, and middle management - were involved in problem solving groups, only 70% of them were involved in these groups.

- Almost 20% of the companies surveyed felt that they did not have any requirement for, or was it even applicable for them to have, a documented quality program.

INTRODUCTION

This survey was funded by Bell Canada and conducted by the Institute for Improvement in Quality and Productivity at the University of Waterloo. The Total Quality criteria and survey questionnaire (Appendix A) were jointly developed by Bell Canada and the Institute. The surveyed companies participated in response to a letter of invitation to their President or CEO from the President of Bell Canada, Mr. Jean Monty. The survey was conducted by telephone and the identities of the survey participants were kept anonymous.

Total Quality Criteria:

Total Quality was defined using The Deming Prize Guide for Overseas Companies (1989), the Malcolm Baldrige National Quality Award, the 1990 Application Guidelines and the Canada Quality Award criteria as references.

Total Quality was defined in terms of seven major elements. The seven major elements are:

- Human Resource Utilization
- Leadership in Product/service
- Quality Assurance
- Results
- Plans
- Organization
- Policy and Goals

A brief description of each of these elements follow.

Human Resource Utilization:

Education and training play a very important role in Total Quality. All employees must be aware of the importance of quality and have a common understanding of definitions. In addition to normal job skills training, problem solving and the use of quality improvement tools must be taught.

Motivation and recognition programs must support quality improvement suggestions and improvement activities. Quality improvement can best be implemented through the use of teams. There are two basic types of team involvement required; department teams or teams within the work function and cross function teams. To encourage team involvement, it is necessary to reward group participation. If present programs recognize only individuals, then individual behaviour will be reinforced. It is necessary in a total quality environment to encourage ideas and suggestions for improvement. Old suggestion systems are being reviewed and replaced by better systems that reward all ideas whether implemented or not. Customer satisfaction has become a major factor. In order to reinforce the importance many companies are implementing gains sharing programs that are tied to customer satisfaction.

Leadership in Product/service:

Companies must form intimate ties with their customers in order to provide products/services that meet their customer needs and expectations. There are many effective ways to better understand these needs - customer surveys, customer focus groups, market surveys, and product/service testing with customers.

Suppliers also should be actively involved in the design of the product/service that is being

provided. Many of the sub components or Services are provided from outside companies. These suppliers are experts in their product/service and this expertise must be tapped.

Product/service must be appropriately innovative and be reviewed and verified to ensure that customer requirements are met. Value engineering, value analysis and standardization programs can be used. It is necessary to know how product/service compares with the competition, not only in functions and features but also in cost. Design input should be sought at all levels within an organization, including suppliers and customers. While complaints must be handled in an expeditious manner, feedback must be given to all involved. Corrective action must be put in place to prevent recurrences.

Quality Assurance:

Processes and procedures must be developed and documented to ensure Total Quality of a product/service. This must include all stages of a product/service: concept, development, production and delivery. It is important to ensure that plans and specifications are met at all stages throughout the process by tracking quality performance measures. The integrity of the Quality Assurance system needs to be verified by both internal and external audits of the process. It is necessary to ensure that products/services provided from suppliers meet requirements. This is accomplished in a number of ways such as preferred suppliers, registration/certification of suppliers, or by use of incoming inspection.

Results:

Key product/service quality measures must be monitored and tracked over time to ensure that business and customer requirements are met. It is important to make product/service comparisons not only with the competition, but also other industry and world leaders. Wide distribution of results is required to ensure awareness and to encourage ideas for improvement.

Plans:

Planning plays a key role in Total Quality management. Total Quality must be included as part of both strategic and financial plans. The formal planning process should allow for input from employees, customers and suppliers. Output of the planning process should result in specific plans on a department or function basis, which include setting priorities, assignment of resources, establishing targets and goals and scheduling for implementation. Details of these plans and their progress should be widely distributed to all employees. Management involvement is a key to this step. Their role is not only one of assigning resources, but also of regular follow up on the progress. Even when detailed plans exist, they are often not implemented.

Organization:

Management has the responsibility to lead the organization by establishing an environment that supports and encourages Total Quality and quality improvement. This is accomplished by regular involvement in recognition of employees, meetings with customers and suppliers, communication with employees, development and review of plans and general involvement in day-to-day operations. Participative management is a more appropriate approach to planning and decision

making, where input is solicited from all employees. It is appropriate to drive decisions as low in the organization hierarchy as possible; therefore, levels of management should be minimized. It is important for individuals to have a clear understanding of their role in the organization. One of the more recent approaches in deploying decision making for daily operations is to use self managed work groups. The quality assurance function must be internalized in all work functions with the Quality Assurance department's role becoming one of auditor and coordinator/trainer for the quality improvement activities.

Policy and Goals:

A quality policy or mission statement forms the basis for the Total Quality program. It must be widely distributed and understood by all employees. Policies must support both the long and short range plans. Overall policy and goals must be further developed into specific department goals. Input to policy and goals should be solicited from all employees, customers and suppliers.

SURVEY SAMPLE

Breakdown by Economic Sector:

1989 Gross Domestic Product (GDP) data as published by Statistics Canada were used as a basis for the sectoral breakdown of the Canadian economy. GDP data were broken down by province and general sectors of manufacturing or Goods and Services. The two general sectors, Goods and Services, for the Canadian economy as a whole were broken down further into more specific sectors using the Standard Industrial Classification (SIC) codes. These SIC codes are listed in Table 1.

Table 1.

STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES

Manufacturing and Products

Code	Sector
01	Agriculture-crops
02	Agriculture-livestock
08	Forestry
09	Fishing and hunting
10	Metal Mining
12	Coal mining
13	Oil and gas extraction
14	Mineral quarrying
15	General building contractors
16	Heavy construction contractors
17	Special trade contractors
20	Food products
21	Tobacco products
22	Textile mill products
23	Apparel
24	Lumber and wood products
25	Furniture and fixtures
26	Paper and allied products
27	Printing and publishing
28	Chemicals
29	Petroleum refining
30	Rubber and plastics
31	Leather and leather products
32	Stone/clay/glass/concrete products
33	Primary metal industries
34	Fabricated metal products
35	Machinery/computer equipment
36	Electrical/electronic equipment
37	Transportation equipment
38	Instruments/clocks/optical goods
39	Miscellaneous manufacturing

Services

Code	Sector
07	Agricultural services
40	Railroad transportation
41	Local & interurban transport
42	Trucking and warehousing
44	Water transportation
45	Air transportation
46	Pipelines/except natural gas
47	Transportation services
48	Communications
49	Electric/gas/sanitary services
50	Wholesale trade/durable goods
51	Wholesale trade/nondurable goods
52	Retail building materials
53	General merchandise stores
54	Food stores
55	Auto dealers & service stations
56	Apparel and accessory stores
57	Furniture stores
58	Eating and drinking places
59	Miscellaneous retail
60	Banking
61	Credit agencies
62	Security & commodity brokers
63	Insurance carriers
64	Insurance agents
65	Real estate
67	Holding & other investment offices
70	Hotels and lodging places
72	Personal services
73	Business services
75	Auto repair and services
76	Miscellaneous repair services
78	Motion pictures
79	Amusement and recreation
80	Health services
81	Legal services
82	Educational services
83	Social Services
84	Museum and art galleries
86	Membership organizations
87	Professional services
89	Miscellaneous services

Some sectors were removed for purposes of the survey. These included the agriculture, fishing and hunting, personal services, and all government services. The remaining sectors were converted into a sample base of a total of 427 business units. The sample sizes were adjusted in order to present a more reliable sample in certain sectors. Some Small sample sizes were increased while some Larger sector's or sample sizes were decreased slightly in order to maintain a total sample size of 427. Table 2 shows a breakdown of sectors and number of companies surveyed.

Table 2.

CODE	DESCRIPTION	NUMBER SOLICITED	NUMBER SURVEYED
	Goods		
1100	Mining/Quarry/Oil	36	9
1200	Construction (residential,civil)	28	3
1300	Manufacturing		
1301	- Food/Beverage	15	7
1302	- Textile/apparel/leather Goods	8	5
1303	- Computer/electronic	19	11
1304	- Transportation equipment	24	13
1305	- Furniture/fixtures	7	2
1307	- Paper/allied products	10	5
1308	- Printing/publishing	7	3
1309	- Primary metals	12	6
1310	- Metal fabrication	14	3
1311	- Machinery	6	3
1312	- Non-Metallic minerals (cement,glass)	5	0
1313	- Chemicals/rubber/plastic/oil refining	21	6
		212	76
	Services		
2100	Transportation		
2101	- airlines	4	3
2102	- rail, water transport	7	2
2103	- bus, rapid transit	9	2
2104	- trucking	6	1
2200	Communications		
2201	- broadcasting	6	2
2202	- telecom carriers	16	11
2300	Utilities	17	8
2401	Wholesale	42	10
2402	Retail	39	6
2501	Finance	26	5
2502	Insurance	11	5
2503	Real Estate	12	2
2600	Accommodation/food	10	3
2700	Amusement and recreation	4	1
2800	Health Services	6	2
		215	63
	Total	427	139

Company Selection:

Company names were selected from a number of lists. The primary reference was the Canadian Key Business Directory by Dun & Bradstreet International. Companies were stratified into Large (400 employees or larger) and Small (less than 400 employees) companies. In order to obtain the desired number of companies in the specific industry sector several other company listings were used.

Other references (Report on Business Magazine and Canadian Business magazine listings) for Large companies included:

- top 1000 traded Canadian companies by assets (1989)
- top 300 private Canadian companies by profit (1989)
- top 700 Canadian companies by profit (1989)

Another reference for Small companies was a random selection from the Business Opportunities Sourcing System (BOSS). For Large companies with several business units, divisions, plants or locations, the survey was restricted to a particular business unit.

Survey Process:

The survey was initially piloted on six companies to ensure that the questions were understood and that there were no other concerns.

A letter from Jean Monty, President of Bell Canada was sent to the President or CEO of each of the 427 companies. The companies were invited to participate in the survey by identifying a spokesperson. Large companies with more than one plant or location were asked to identify the specific location or business unit that they wished to be surveyed. 148 companies responded positively. The persons interviewed by telephone, for the most part, were senior management staff. Some of the companies could not be contacted during the survey period so that the number of companies surveyed was 139. This represented 76 from the Goods sector and 63 from the

Service sector. Of these 106 were Large and 33 Small. This is further broken down as shown below:

	Small	Large	
Goods	17	59	76
Service	16	47	63
	33	106	139

RESULTS

Questionnaire Score:

Scores were developed for each of the questions on the survey. Combining these scores allowed an overall evaluation of how the elements were being practised. It was also possible to determine how the individual elements are being practised. In general a "yes" would be given one point and a "no" would be given zero points. Some questions, where it was felt to be more appropriate, were excluded from the scoring and analyzed separately. Questions that required a choice between alternate responses, for example 1.0 question the "best" was given the score of one. This scoring equally weights all questions. The difference in "weighting" for the Total Quality score of the elements is reflected in the different number of questions per element. The overall evaluation of how business was practising the elements of Total Quality is the total of the scores for all questions. The individual element score is the total of all questions in a given element. Scoring is shown in Table 3.

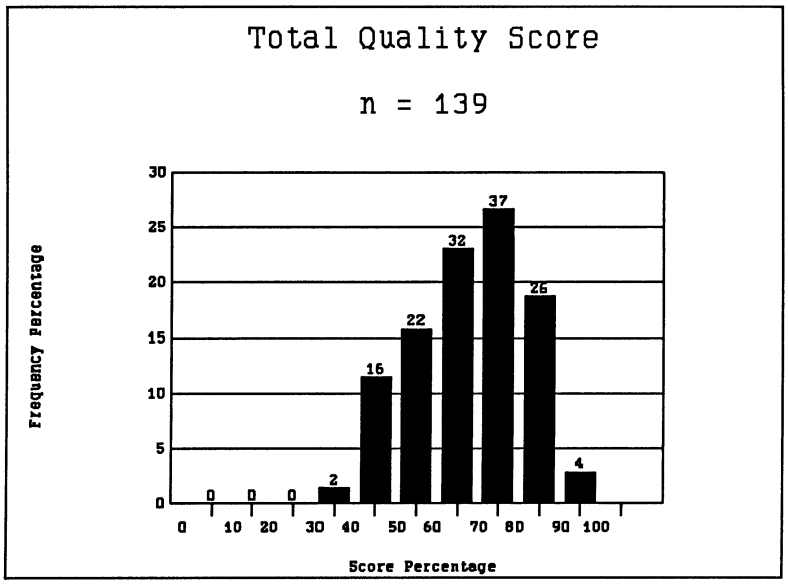
Table 3.

	Question		Score	Question		Score
Human Resource Utilization	1.0	A	0	1.5		1
		B	0.5	1.6		1
13		C	1	1.6.1		1
	1.1		1	1.7		1
	1.2		1	1.7.1		1
	1.3		1	1.7.2		1
	1.4		1	1.7.3		1
				1.7.4		1
Leadership in Products/services	2.0.1		1	2.2		1
	2.0.2		1	2.3		1
7	2.0.3		1	2.4		1
	2.0.4		1			
Quality Assurance	3.0		1			
	3.0.1		1			
3	3.1		1			
Results	4.0		1	4.4	A	1
	4.1		1		B	0.5
4	4.3		1		C	0
Plans	5.1		1	5.2.2		1
	5.1.1		1	5.2.3	A	1
6	5.2		1		B	0.5
	5.2.2		1		C	0
Organization	6.1.1		1	6.5	D	1
	6.1.2		1	7.0.1		0-1
13	6.1.3		1	7.0.2		0-1
	6.3		1	7.0.3		0-1
	6.4		1	7.0.4		0-1
	6.5	A	0	7.0.5		0-1
		B	0.25	7.0.6		0-1
		C	0.5	7.0.7		0-1
Policy and Goals	7.1.1		1	8.1		1
	7.1.2		1	8.2		1
6	7.1.3		1	8.3		1
Total						
52						

Overall Evaluation:

Figure 1 shows how companies scored overall based on the Total Quality score. For example, about 30% of the companies, or 42 of the 139, scored between 60% and 70%. The average score was 68.1% with a minimum of 34.1% and a maximum of 97.6%. These results were produced by converting how each of the 139 companies scored out of 52 into a percentage. There are several factors that contribute to the scores. The companies surveyed voluntarily responded to an invitation; it is therefore reasonable to assume that the companies practising more of the elements of Total Quality would respond. The individuals interviewed were senior management who likely have a good appreciation of Total Quality and therefore would be attempting to practise them. However, because of the type of survey and its constraints, it was impossible to determine the extent to which the elements were being practised or deployed. The evaluation of the individual elements and their comparison, never the less provides some useful information.

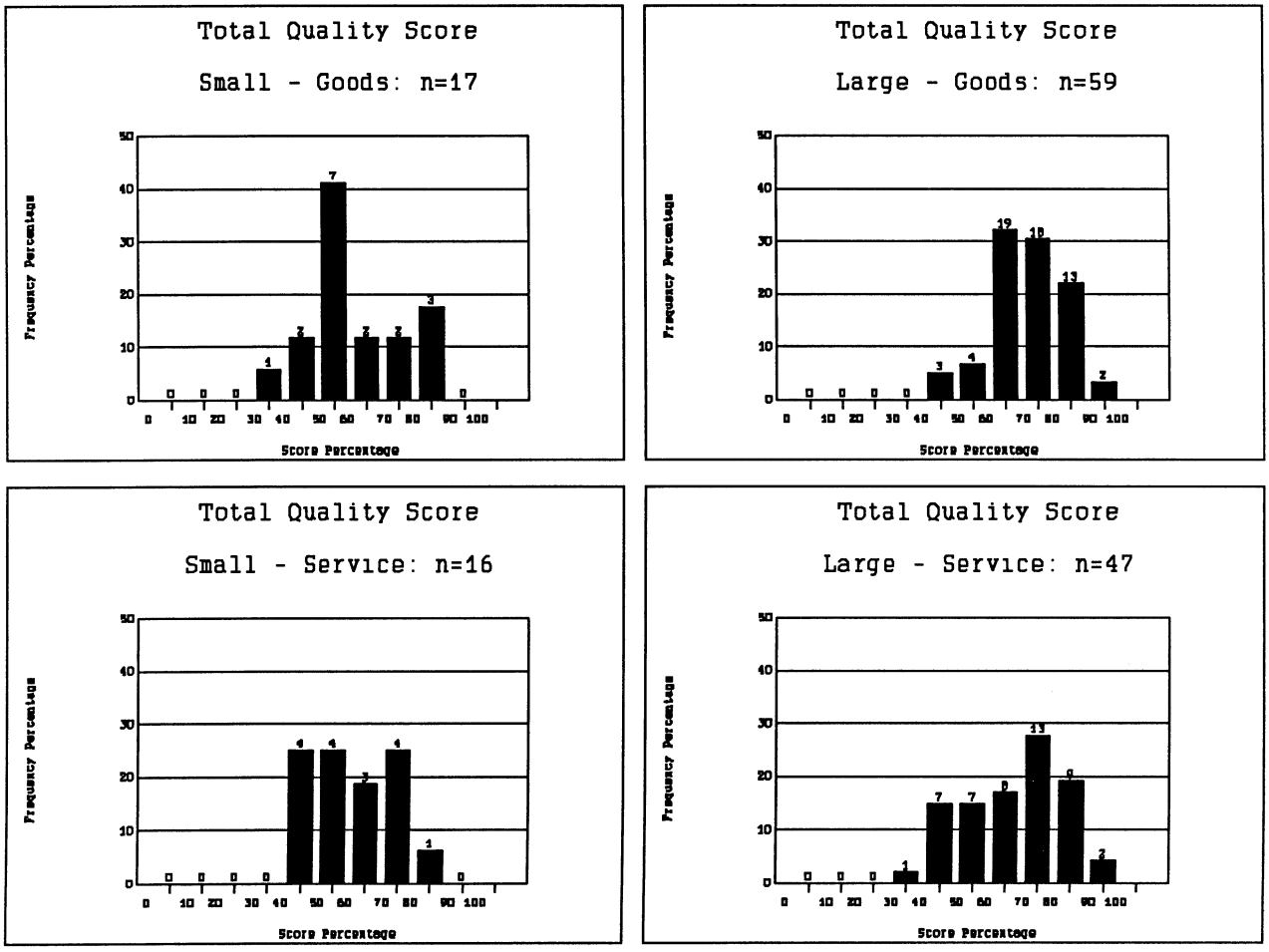
Figure 1.



In order to determine whether there was a difference between the Goods and Service sector and Large and Small companies the data were stratified into four groups: Large and Small Goods

and Large and Small Service. The distribution of Total Quality scores for each of the strata is illustrated in Figure 2. The distributions for the four strata were compared. The cell proportions (e.g., 10% cells for the Total Quality score were compared by a chi-squared test of homogeneity using the SAS procedure FREQ (SAS Version 5 (1985), Cary, NC:SAS Institute Inc.). The hypothesis of the distributions being the same was tested. A significant result suggests that the distributions are different. An insignificant result does not mean there is no difference, however there may be a difference but it may not able to be detected by the sample sizes used in the survey. Analysis indicated that there was only a difference between Small - Goods and Large - Goods with Large - Goods scoring somewhat better.

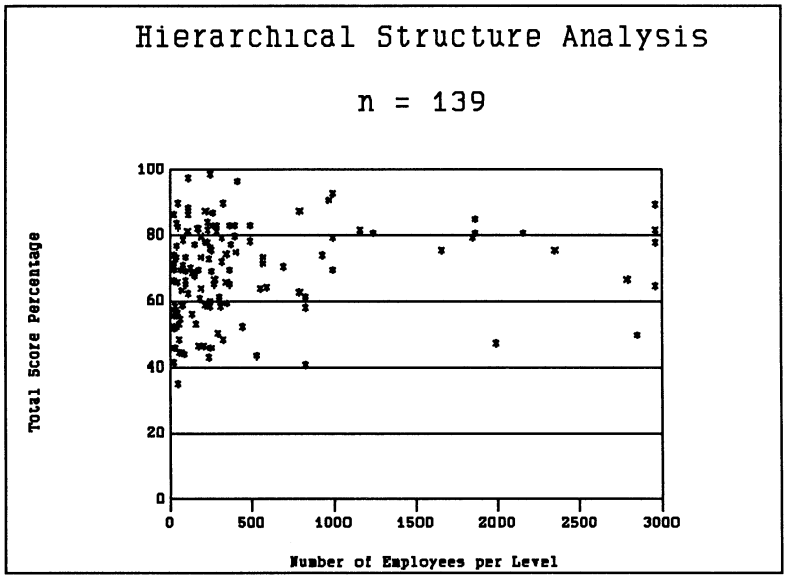
Figure 2.



Management Levels:

It is generally accepted that the number of management levels should be minimized in order to push the decision making process as low as possible within an organization. During our research we investigated whether there was a possible correlation between the number of employees per level of management and the Total Quality score. We plotted the number of employees divided by the number of management levels on the x-axis against how the company scored on the y-axis. As can be seen in Figure 3, there appears to be no correlation. The number of employees per level ranged from a low of about 20 to well over 3000. The number of management levels ranged from 3 to 11.

Figure 3. Management Levels



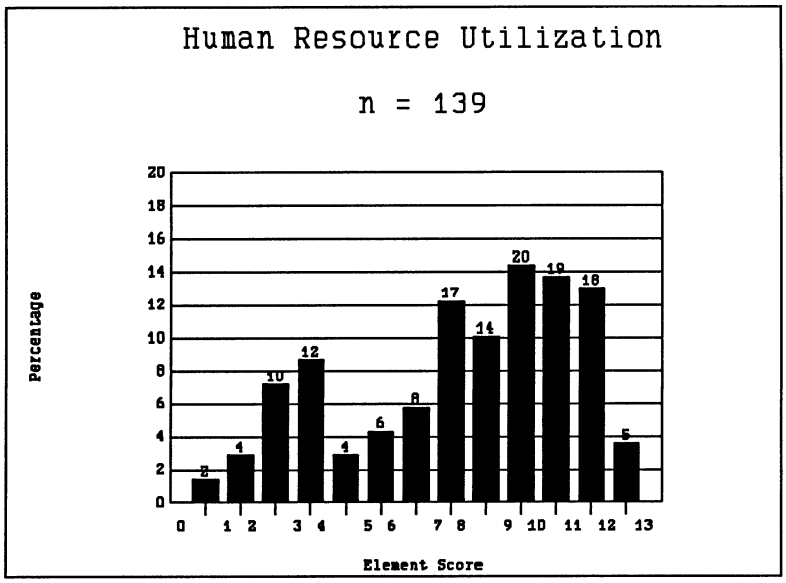
INDIVIDUAL ELEMENT ANALYSIS

Human Resource Utilization:

Figure 4 shows the distribution of how the companies scored overall. Companies could score from 0 to a maximum of 13 on this element. Question 1.0 had three parts with possible scores of 0, 0.5 and 1 respectively. The data groups were {0 <= score <= 1}, {1 < score <= 2}, {2 < score <= 3}, etc.. The number of questions on a scale from 0 - 13 were converted to a

percentage. The average score was 62% (or 8 of 13 questions) with a minimum score of 0% and a maximum score of 100%. The data were again stratified into the four groups: Large - Goods/Service and Small - Goods/Service.

Figure 4.



As illustrated in Figure 5, there are some differences between the groups. It should be noted, however, that while the number of companies between Large - Goods and Large - Service were about equal, 59 versus 47, that of the Small - Goods and Small - Service were less in number - 17 and 16 respectively. Analysis of the data suggests that there is a slight difference between the scores of Small and Large Service companies with Large - Service performing better than Small - Service. There is also a moderate difference between Small Goods and Small Service companies with Small - Goods performing better than Small - Service.

Figure 5.

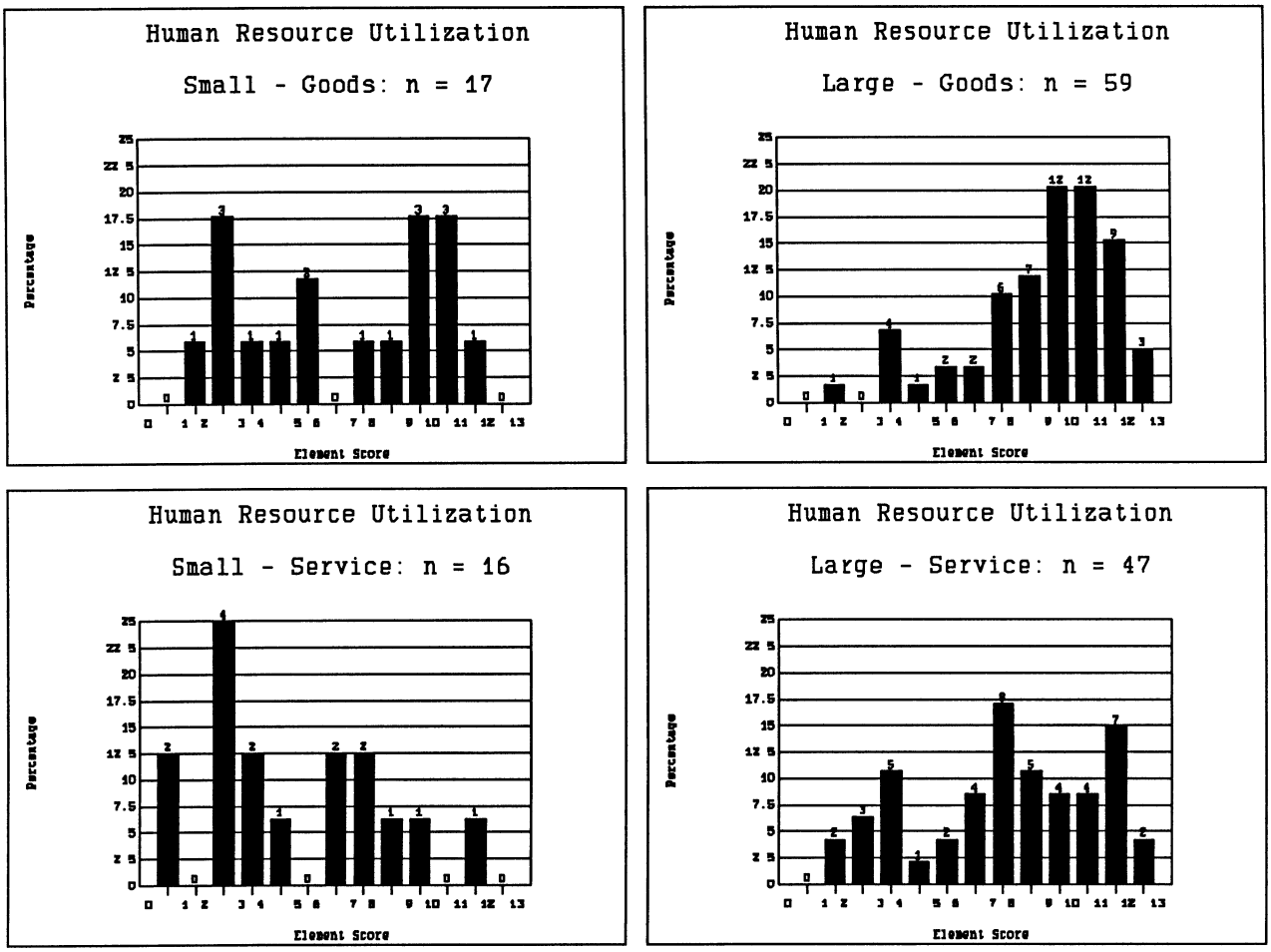
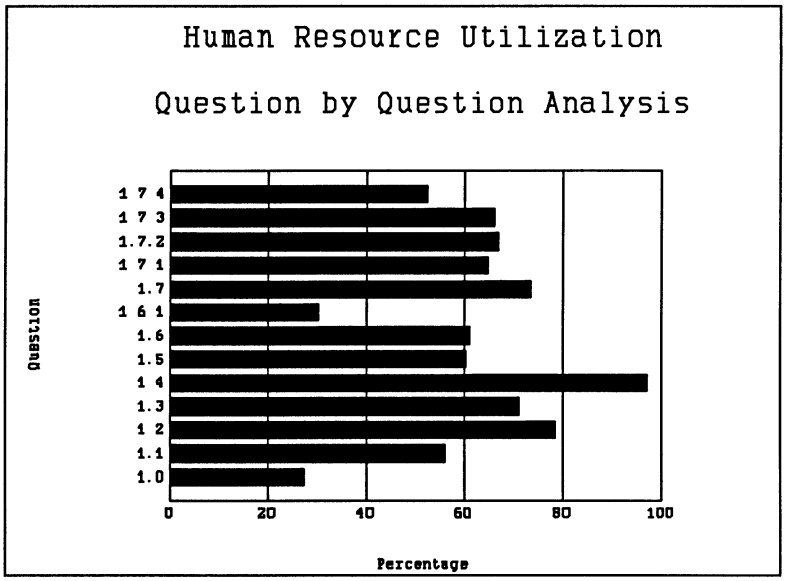


Figure 6 shows how companies responded to the individual questions in this element. For example almost 60% of the companies answered "yes" to question 1.1. For question 1.0, for the purpose of the question by question analysis only those companies that reported over 20 days of training per employee were recorded in Figure 6. This resulted in a low percentage of companies responding positively to this question. 51% of the companies had less than 5 days, 44% had between 5 and 20 days and only 5% had over 20 days of training per employee. Of those companies that conducted employee reviews, 10% were quarterly, 22% were semi-annually and the remaining 68% were annually. Of those companies with formal employee suggestion systems (60%), their recognition was verbal 72%, written 83%, token award 54% and monetary award 66%. As these numbers indicate, most programs included one or more of the above.

Approximately 60% of the companies surveyed had reward systems other than their suggestion programs. However, only about 50% of them tied the reward system to customer satisfaction.

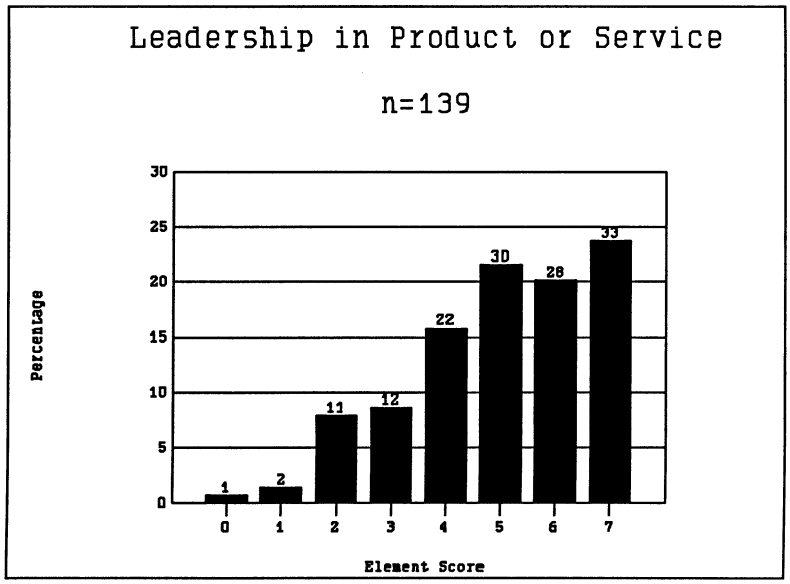
Figure 6.



Leadership in Products/services:

The distribution of overall scores in Leadership in Products/service is shown in Figure 7. There were a total of seven questions in this element resulting in eight groups of data (0 to 7).

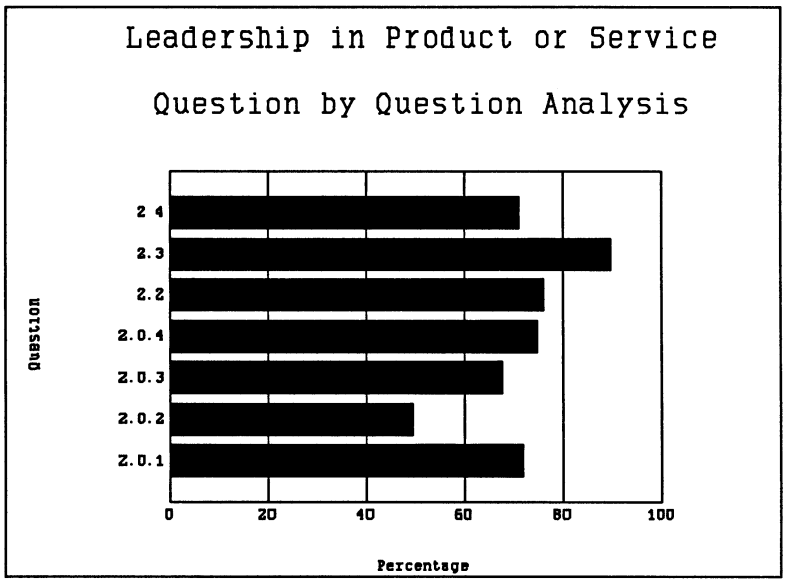
Figure 7.



The average score was 71.6% (5 of the 7 questions) with a minimum score of 0% and a maximum score of 100%. The data was stratified into Large - Goods/Service and Small - Goods/Service. The analysis detected no differences.

Figure 8 shows how companies responded to the individual questions within the Leadership in Products/Services element. For example, approximately 70% of the companies answered "yes" to question 2.0.1. Questions 2.1.1, 2.1.2 and 2.1.3 were removed from the analysis because there appeared to be a Large degree of misunderstanding of these terms. Of those businesses that had a complaint handling process (91%), 88% involved a point of contact, 89% directed complaints to originating departments and 57% published the data.

Figure 8.

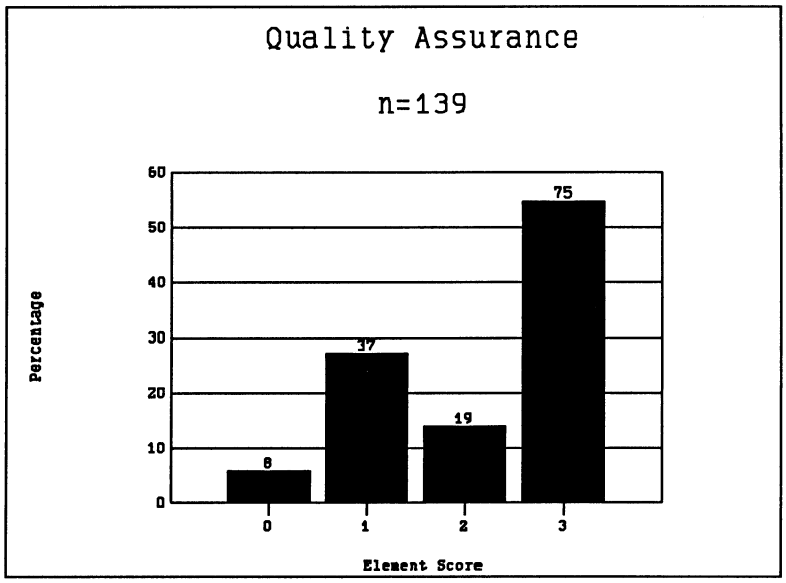


Quality Assurance:

Figure 9 shows the distribution of overall scores in Quality Assurance. There were three questions in this criteria resulting in four groups of data, 0 to 3. On average, companies answered between 2 and 3 questions "yes", this was converted to a percentage resulting in an average score of 71.9% with a minimum score of 0% and a maximum score of 100%. Since there were only

three questions that were included in the scoring, the data fell in two basic groups. One group had quality assurance programs and the other did not. It is interesting to note that approximately 20% of the companies surveyed felt that auditing of their quality assurance program did not apply to them.

Figure 9.



The stratified results are shown in Figure 10. As might be predicted, analysis of the stratified data suggested that Large - Goods scored higher than Large - Service companies. This can be explained by Goods companies emphasis on certification of their quality assurance programs. Large - Goods also scored slightly higher than Small - Goods companies.

Companies were also asked to best describe their supplier relationship in terms of being able to meet their requirements. 35% used Certification or Registration programs, 69% had lists of Preferred Suppliers, and 41% used incoming inspection. These data indicate that several companies used a combination of the three approaches.

Figure 10.

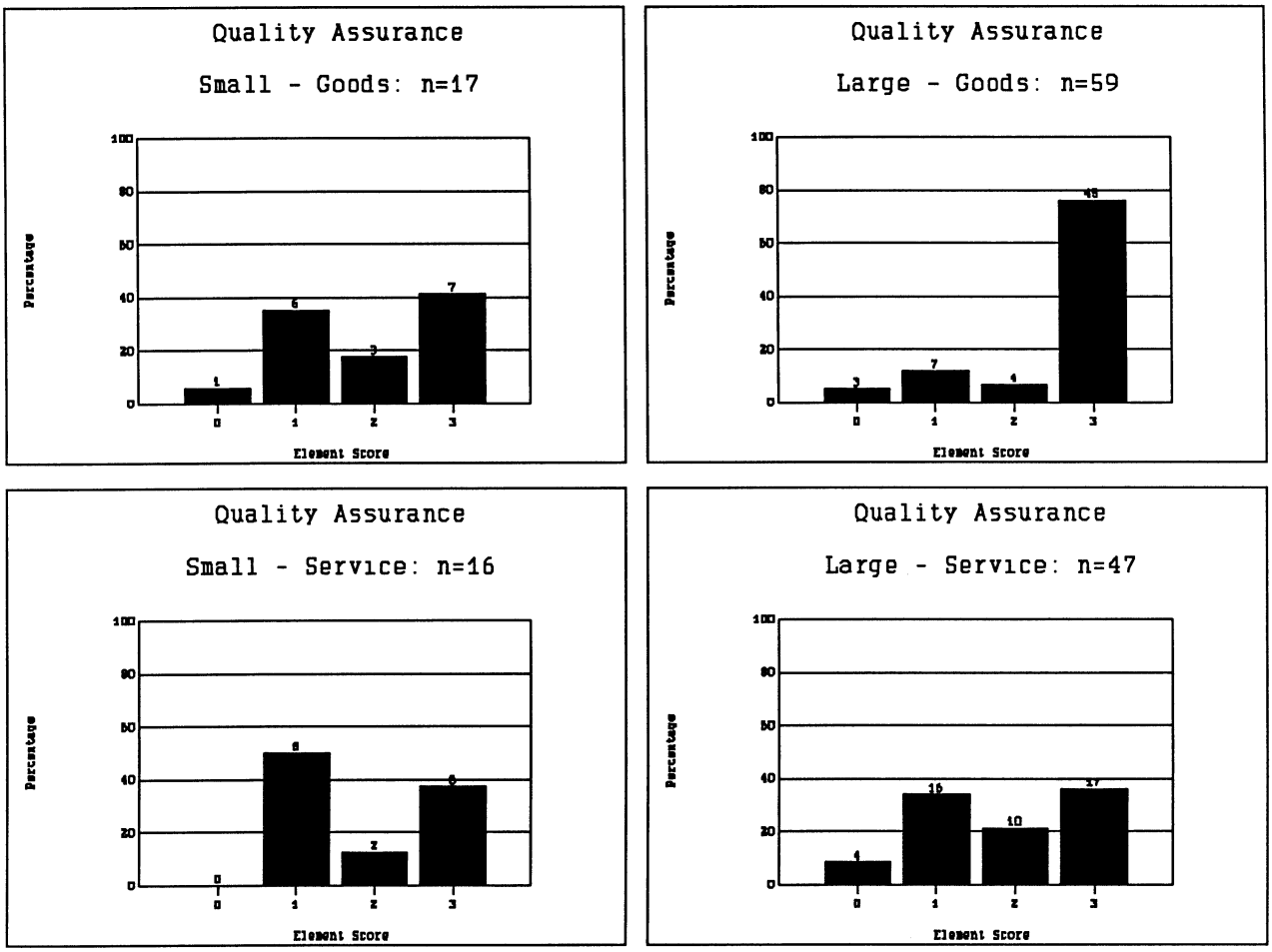
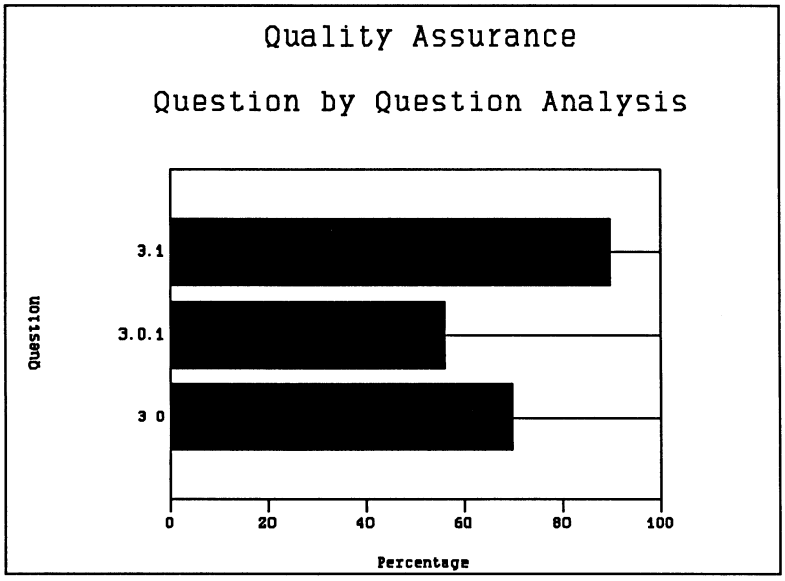


Figure 11 shows how companies scored on the three questions. It is interesting to note that 42 companies or almost 20% felt that having a documented quality program was not applicable to their business.

Figure 11.



Results:

The distribution of overall scores in Results is shown in Figure 12. The maximum score in this element was 4. Question 4.4 gave a choice of three answers resulting in a possible score of 0, 0.5, or 1 therefore the data groups are {0 <= score <= 1}, {1 < score <= 2}, {2 < score <= 3} and {3 < score <= 4}. The average score was 70.9% (2.8 out of 4) with a minimum of 0% and a maximum of 100%.

Figure 12.

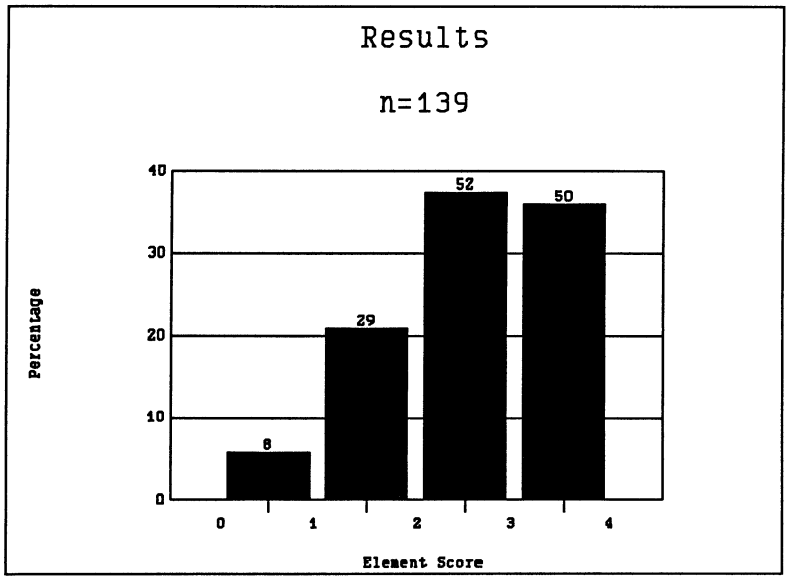


Figure 13 shows the distribution of the results stratified. Analysis of these results indicates a slight difference between Large - Goods and Large - Service companies with Large - Service companies performing slightly better.

Figure 13.

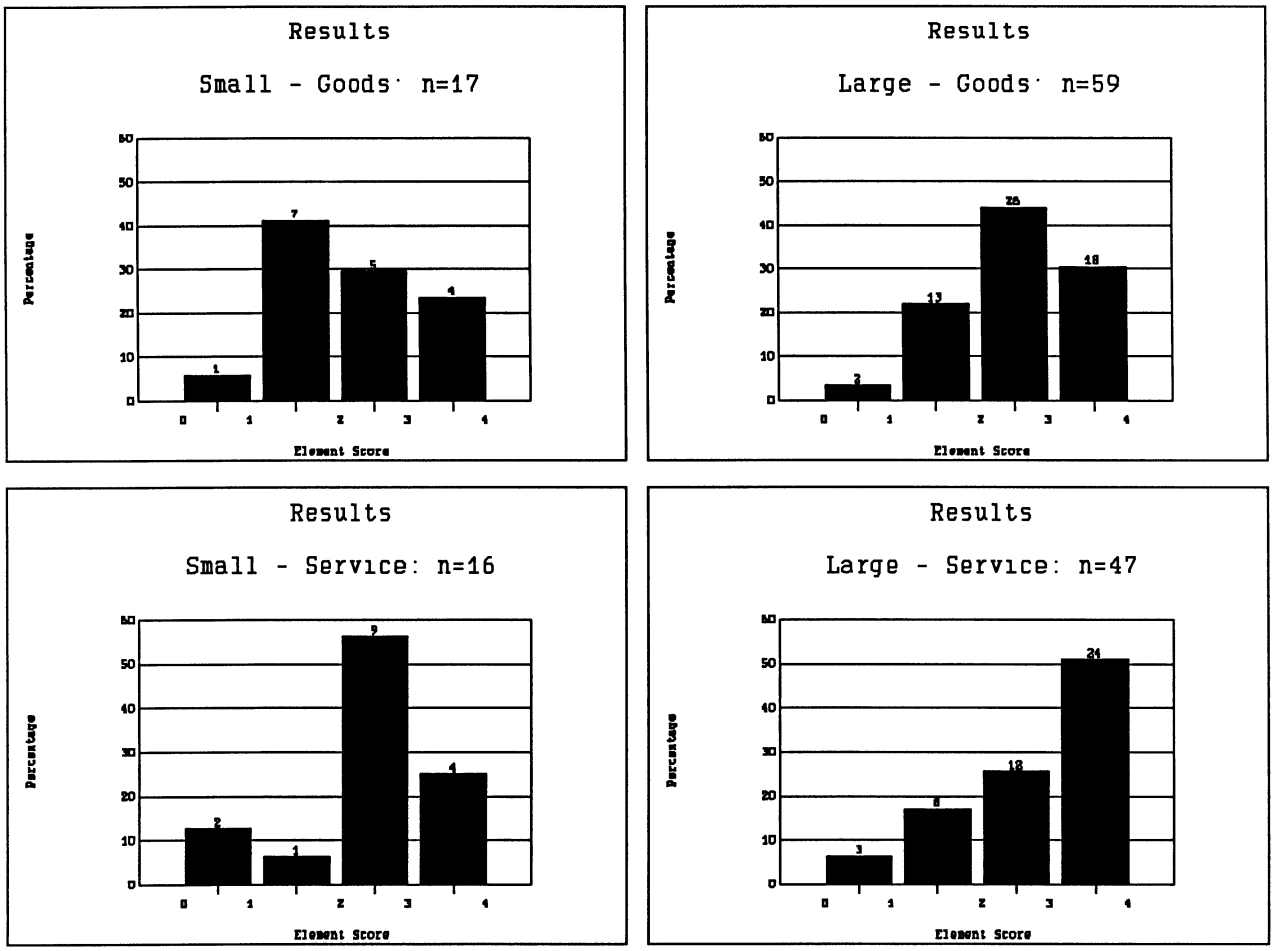
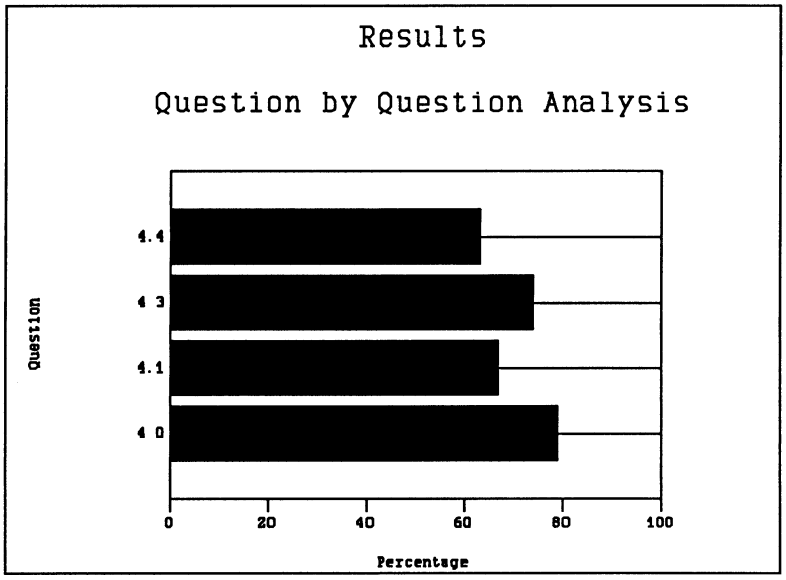


Figure 14 shows how companies responded to the individual questions within the Results element. Only those companies who widely distributed the measurement results are shown for question 4.4 (44% distributed results widely, 39% made results available on a need to know basis and 18% said results were available upon request).

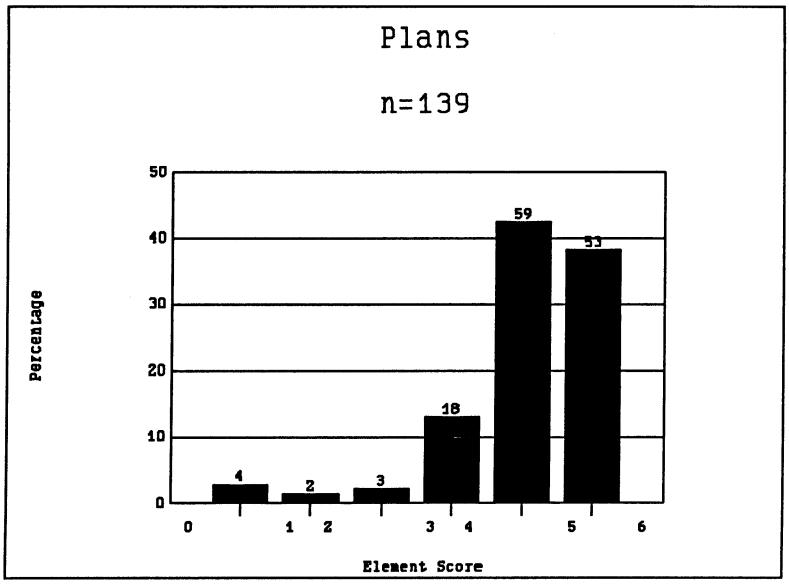
Figure 14.



Plans:

Distribution of the overall scores in Plans is shown in Figure 15. The maximum score in this element was 6. Question 5.2.3 gave a choice of three answers resulting in possible scores of 0, 0.5, or 1, the data groups are {0 <= score <= 1}, {1 < score <= 2}, {2 < score <= 3}, etc.. The average score was 79.8% (4.8 out of 6) with a minimum score of 0% and a maximum score of 100%.

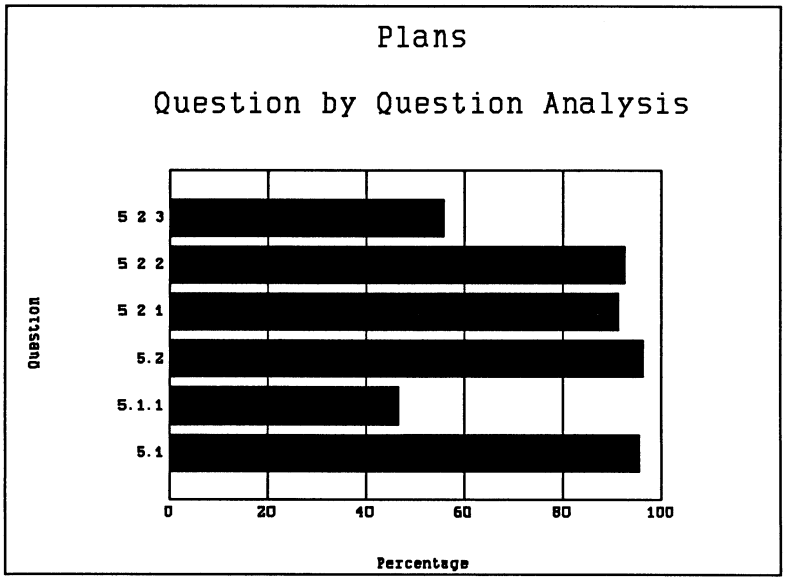
Figure 15.



The results were stratified and analyzed to test for differences. No differences were suggested by the tests.

Figure 16 shows how companies responded to the individual questions within the Plans element. Only those companies who widely distributed their plans are shown for question 5.2.3. While 33% distributed their plans widely, 49% made plans available on a need to know basis and 18% made plans available upon request.

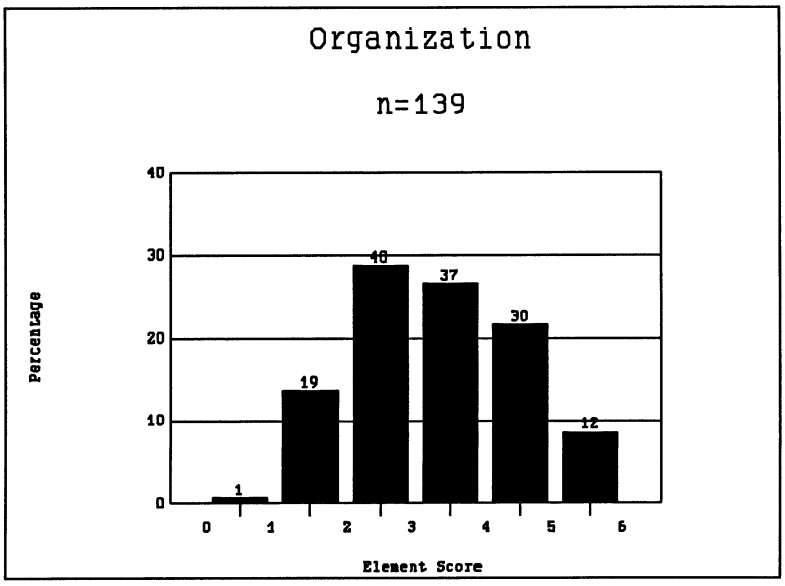
Figure 16.



Organization:

The overall score distributions for Organization are shown in Figure 17. While the maximum score of 13 for Organization was used for evaluating overall Total Quality scores, the Organization element was separated into two parts for analysis under this section. Questions 7.0.1 to 7.0.7 were removed and analyzed separately. The maximum score on this element was 6. Question 6.5 had a choice of four answers with possible scores of 0, 0.25, 0.5, and 1. The groups of data were {0 <= score <= 1}, {1 < score <= 2}, {2 < score <= 3}, etc.. The average score was 57.2% (3.4 out of 6) with a minimum score of 16.7% (1 out of 6) and a maximum score of 100%.

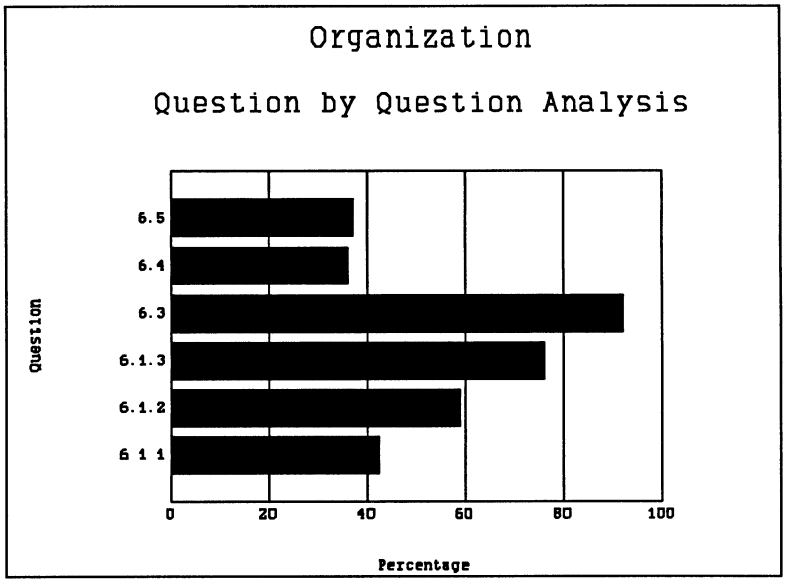
Figure 17.



The data was stratified and then tested for differences. Results indicated that there was no significant differences between the stratified groups.

Figure 18 shows how companies responded to the individual questions. Only those companies where everyone in the organization was responsible for quality are shown for question 6.5. 25% of the companies said quality was the responsibility of an individual, 36% a department, 20% an inter-department committee and only 18% stated that everyone in the organization was responsible. Questions 6.1.1, 6.1.2 and 6.1.3 all related to the planning and decision making process. While the attempt here was to determine who was primarily responsible for these tasks, companies selected more than one response. 42% reported that individuals were responsible, 59% said it was a department responsibility and 76% reported that planning and decision making was the responsibility of more than one department.

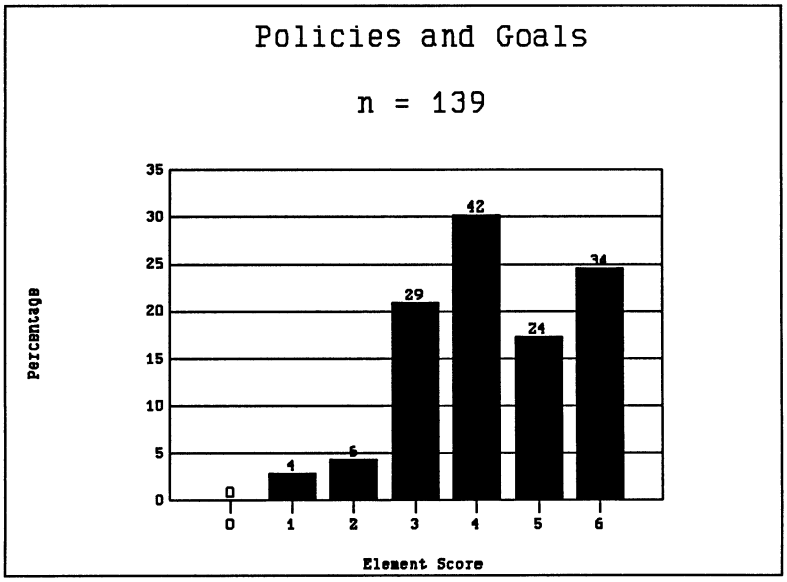
Figure 18.



Policy and Goals:

Figure 19 shows the distribution of the overall scores in Policy and Goals. There were a total of six question in this element resulting in seven groups of data, 0 to 6. The average score was 71.3% (4.3 out of 6) with a minimum score of 16.7% (1 out of 6) and a maximum score of 100%.

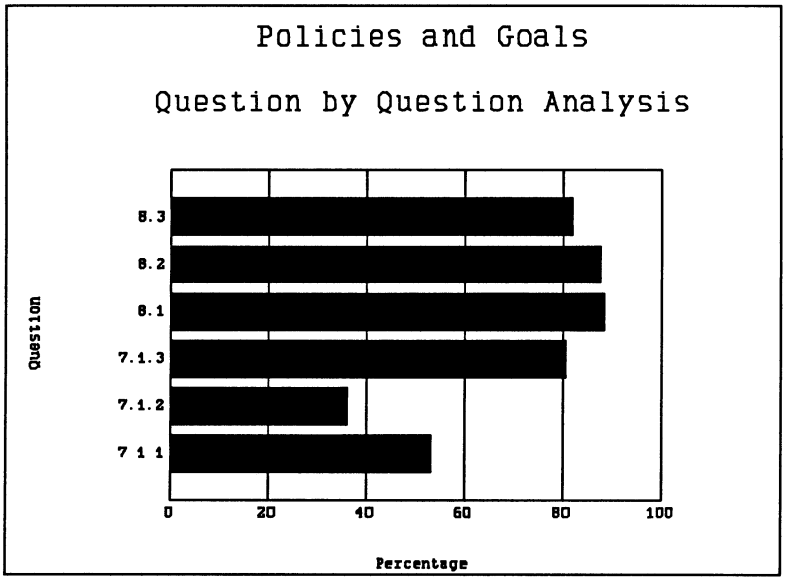
Figure 19.



The data was stratified and then tested for differences. The results indicated that there were no significant differences between the stratified groups.

Figure 20 shows how companies responded to the individual questions within the Policy and Goals element. These results suggest that companies are not utilizing suppliers and customers for input to their policy and goals to the fullest advantage. While 53% of companies reported that they use customer input only 36% used supplier input to their policy and goals.

Figure 20.



Comparison of Elements:

To determine possible correlations between the Total Quality elements, the following method was used. Correlations between the element scores were computed using the SAS procedure CORR. The hypothesis of the correlation being zero was tested. A significant result suggests that the correlation is not zero. An insignificant result does not mean that the correlation is zero, the correlation may not be zero but cannot be detected by the sample sizes used in the survey. The correlation results are shown in Table 4. The "X" on the comparison matrix indicates positive correlation between Total Quality elements. For example for small service companies the data suggests correlation between elements 5,6 and 1, 4, 6 and 2, 6, 7, and 4.

Table 4.

Correlation of Total Quality Elements

Small - Goods

Element	1	2	3	4	5	6	7
1							X
2							
3						X	
4							
5						X	X
6							
7						X	

Large - Goods

Element	1	2	3	4	5	6	7
1							X
2			X		X		X
3					X		X
4						X	
5						X	X
6							
7						X	

Small - Service

Element	1	2	3	4	5	6	7
1					X	X	
2				X		X	
3							
4						X	X
5							
6							
7							

Large - Service

Element	1	2	3	4	5	6	7
1		X	X	X	X	X	X
2				X			
3						X	X
4							
5						X	X
6							
7						X	

For purposes of comparing how companies responded to the individual questions, we grouped them into High score (using Total Quality score) score (greater than 80%), Medium score (between 60 and 80%) and Low score (less than 60%). The number of companies in each group were - High 28, Medium 81 and Low 30. To answer the question of whether there was consistency in the questions that were most frequently answered "no", we compared each of the three groups. For example for question 6.5 - 73.3% of High, 75.4% of Medium, and 100% of Low scoring companies answered "no". The results can be seen in Table 5.

Table 5.

Five Most Frequent "No" Questions:

Question Number	High Scoring Companies	Medium Scoring Companies	Low Scoring Companies
1.0	93.3%	92.8%	100%
6.5	73.3%	75.4%	100%
1.6.1	46.7%	73.9%	
5.2.3	40.0%	71.0%	
7.1.2		68.1%	85.0%
6.1.1	36.7%		
5.1.1			90.0%
6.4			87.5%

Of the medium scoring companies, only question 7.1.2 was different than that of the high scorers. This question was supplier input to policy and goals. For the low and high scoring groups question 5.1.1 made the "top five" list. This question dealt with customer and supplier input into the planning process.

The questions that were most frequently answered "yes" in each of the three groups are summarized in Table 6. For example, for question 1.4 - 100% of High, 100% of Medium, and 90% of Low scoring companies answered "yes".

Table 6.

Five Most Frequent "Yes" Questions.

Question Number	High Scoring Companies	Medium Scoring Companies	Low Scoring Companies
1.4	100%	100%	90%
5.2	100%	100%	87.5%
5.1	100%	98.6%	87.5%
5.2.2	100%	98.6%	
6.3		97.1%	82.5%
5.2.1	100%		
2.3			87.5%

All the High scoring companies also answered "yes' to questions 1.2, 1.7, 3.1 and 8.1. It is interesting to note that one of the most frequently correct answered question for the Low scoring companies was not included in either of the High or Medium company lists. This question, 2.3, asked if your business had a complaint handling process. This result suggests that a Large number of companies still view quality in terms of responding to customer complaints.

Acknowledgements:

I wish to acknowledge the contributions of the following people in making this survey a success: Gail Jordan, a consultant with our Institute, for coordinating the company selection and coordination of the telephone survey, David Jamieson and Allen Clark, co-op students with the Institute, for conducting the telephone survey, Dr. Michael Hamada, Department of Statistics and Actuarial Science, University of Waterloo, for input in analyzing the data and Douglas Horne of Bell Canada for assistance in developing the Total Quality Criteria and the questionnaire. I would like to also acknowledge Bell Canada for funding this research.

APPENDIX A

Institute for Improvement in Quality and Productivity

Bell Canada

Total Quality Survey

Sector/Democode _____

Number of Employees _____

1.0 How many days of education / training does an average employee at your business unit receive per year? This includes all inhouse and external business related education (choose one).

Under 5...A ☐

5 to 20...B ☐

Over 20...C ☐

1.1 Does your business unit have an education goal in terms of training per employee? ☐ ☐

1.2 Do employees receive courses on quality awareness? ☐ ☐

1.3 Do employees receive courses on problem solving? ☐ ☐

1.4 Does your business unit have a formal methodology for conducting employee reviews? ☐ ☐

1.4.1 How often do these reviews take place?

Quarterly...A ☐

Semi-Annually...B ☐

Annually...C ☐

1.5	Is there a formal system for soliciting employee suggestions?	☐	☐
	What recognition is offered for these suggestions? (Answer Yes or No to the following)		
1.5.1	Verbal	☐	☐
1.5.2	Written	☐	☐
1.5.3	Token Award	☐	☐
1.5.4	Monetary Award	☐	☐
1.6	Other than a suggestion plan is there a reward system beyond base pay? An example would be profit sharing	☐	☐
1.6.1	Is the reward system tied to customer satisfaction?	☐	☐
1.7	Within your business unit do people work in formal problem solving groups?	☐	☐
	Who of the following are involved in these groups?		
1.7.1	Front-line employees	☐	☐
1.7.2	Front-line supervision	☐	☐
1.7.3	Middle management	☐	☐
1.7.4	Senior management	☐	☐

		Y	N
	Feedback about your product/service is regularly solicited by which of the following means? (answer yes or no to the following)		
2.0.1	Customer Surveys	☐	☐
2.0.2	Customer Focus Groups	☐	☐
2.0.3	Product/Service testing with the customer	☐	☐
2.0.4	Market Surveys	☐	☐
	Which of the following are practised by your business unit?		
2.1.1	Value Engineering	☐	☐
2.1.2	Value Analysis	☐	☐
2.1.3	Standard costing	☐	☐
2.2	Does your business unit conduct inter company comparisons of products/services? (eg. benchmarking)	☐	☐
2.2.1	Are senior management involved in these comparisons?	☐	☐
2.3	Does your business unit have a complaint handling process?	☐	☐
2.3.1	Does it involve a point of contact?	☐	☐
2.3.2	Are complaints directed (sent) to the originating department?	☐	☐
2.3.3	Is complaint information published?	☐	☐
2.4	Are suppliers involved in product/service design or revision?	☐	☐

		Y	N
3.0	Does your business unit have a documented quality program?	☐	☐
3.0.1	Is the program audited?	☐	☐
3.1	Do you track quality performance measures regularly?	☐	☐
	Which of the following best describes the basis of your supplier relationship? (How does your company ensure that suppliers are able to meet its quality requirements)		
3.2.1	Registration or Certification	☐	☐
3.2.2	Preferred suppliers	☐	☐
3.2.3	Incoming Inspection	☐	☐

		Y	N
4.0	Does your business unit perform trend analyses on product/service data?	☐	☐
4.1	Are time standards used by your business unit?	☐	☐
4.2	Are other standards used for your products/services?	☐	☐
4.3	Does your business unit conduct inter company comparisons of operations?	☐	☐
4.4	Which of the following best describes the distribution of measurement results? (trends, standards, comparisons)		
	Results are: Widely Distributed...A	☐	
	Available on a need to know basis...B	☐	
	Available on Request...C	☐	

		Y	N
5.1	Does your business unit have a formal planning process?	☐	☐
5.1.1	Do customers or suppliers have input into the planning process?	☐	☐
5.2	Is there a specific plan for your business unit?	☐	☐
5.2.1	Does the plan involve a prioritization process?	☐	☐
5.2.2	Do your plans have measurable targets and goals?	☐	☐
5.2.3	Which of the following best describes the distribution of plans:		
	Plans are widely distributed...A	☐	
	Plans are available on a need to know basis...B	☐	
	Plans are available upon request...C	☐	

		Y	N
	Who performs planning and decision making tasks:		
6.1.1	Individuals	☐	☐
6.1.2	Within department groups	☐	☐
6.1.3	Between department groups	☐	☐
6.2	How many levels exist between the most senior and the most junior employees in your business unit?	_____	
6.3	Is there a formal process for defining individual roles? eg. job evaluation	☐	☐
6.4	Does your business unit have self-managed work groups?	☐	☐
6.5	Which of the following is primarily responsible for quality assurance:		
	A person/Specific Individual...A	☐	
	A department...B	☐	
	An inter-departmental committee...C	☐	
	(not to be asked, use only if described) Everyone in the organization...D	☐	

The following question refers to management involvement. Please rank on a scale of 1 to 5 where 1 is uninvolved and 5 is very involved. To what extent are senior management involved in the following:

7.0.1	Recognition of employees	_____
7.0.2	Meeting with customers and suppliers	_____
7.0.3	Quality related goal setting	_____
7.0.4	Reviews of quality plans and progress	_____
7.0.5	Communications with employees	_____
7.0.6	Involvement with day to day operations - MBWA	_____
7.0.7	Planning process	_____

	Of the following, who provides input to policies and goals?	Y	N
7.1.1	Customers	☐	☐
7.1.2	Suppliers	☐	☐
7.1.3	Employees	☐	☐

		Y	N
8.1	Does your company have a policy or mission statement?	☐	☐
8.2	Does your company have a strategic planning process?	☐	☐
8.3	In your company, are policies and goals developed below the corporate level?	☐	☐