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Canadian Aerospace Industry

Total Quality Survey Report 1991

Canada 



Aerospace Industries / Association des Industries
Association of Canada / Aérospatiales du Canada

Table of Contents

Executive Summary.....	1
Introduction.....	7
Observations and Conclusions.....	9
Critical Issues.....	27
ISTC as Catalyst.....	29
Appendix A: Findings for Each Question.....	33
Appendix B: Sampling Tolerances.....	65

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Executive Summary

Total Quality Management (TQM) has become widely accepted as one of the keys to improving competitiveness and productivity. To assist Canadian aerospace companies and their suppliers in meeting the competitive challenges of the future, the Aeronautics Branch of the Department of Industry, Science, and Technology Canada (ISTC) sponsored, in cooperation with the Aerospace Industries Association of Canada (AIAC), a Total Quality Survey for the Canadian Aerospace Industry in 1991. The objective was to determine the extent to which TQM is practised, the obstacles to implementation, and the role ISTC and the AIAC should play in fostering the implementation of TQM. The following are the highlights of the survey results.

Awareness, Perceptions, and Obstacles

Awareness is High but Implementation is Limited. Over ninety percent of the people who responded have already heard of TQM and nearly two thirds are familiar with it. However, the number of responding companies with a formal TQM process in place is significantly lower (31%).

Most Agree TQM is Important. Even though TQM implementation is limited, most people perceive TQM as being critical to the long term competitiveness of their companies. There is also a strong perception that quality improvements contribute to both cost reduction and profitability.

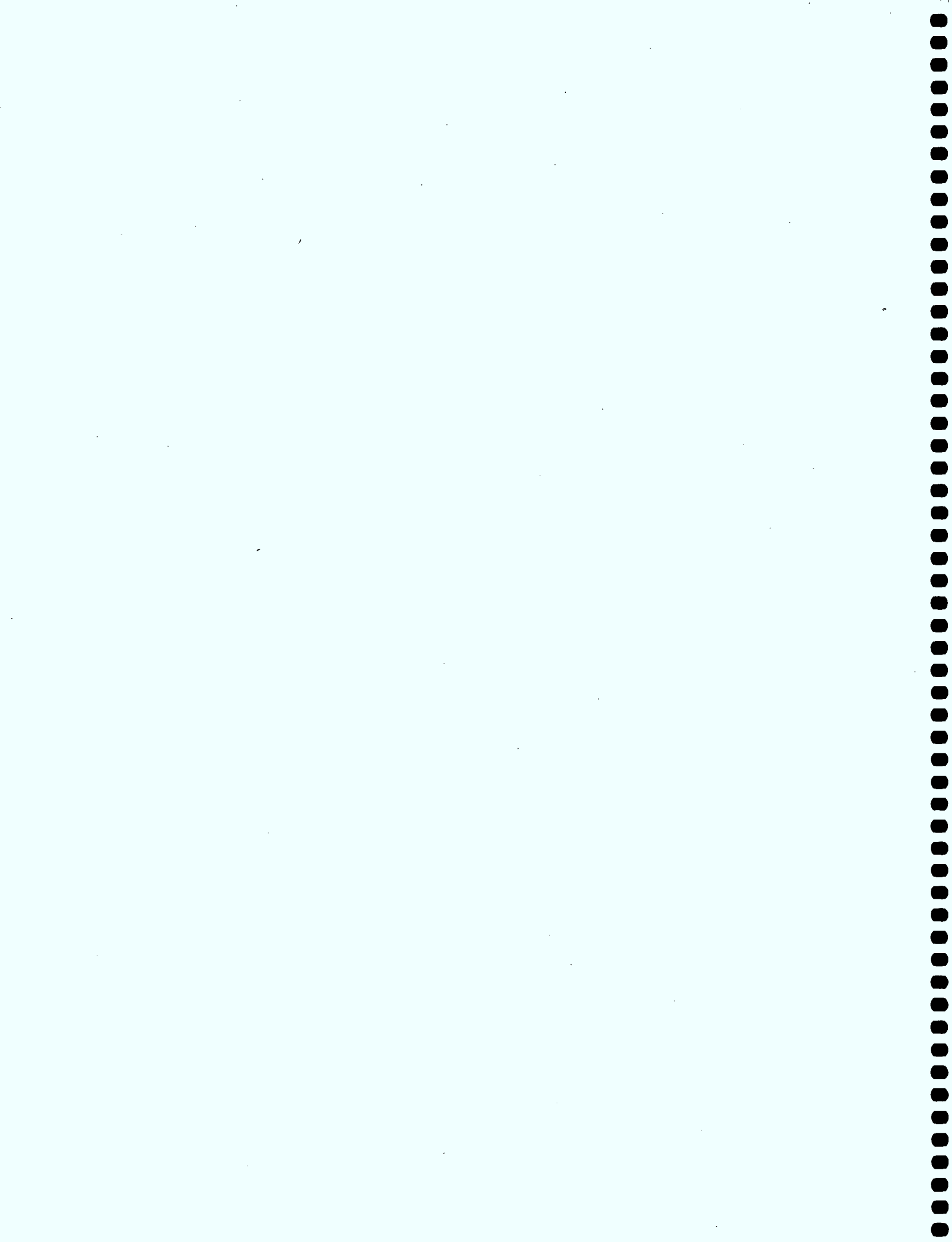
People Related Issues and Cost are Seen as Main Obstacles. People issues rank among the most frequently cited challenges to TQM implementation. This is not surprising since TQM represents a fundamental shift in mindset and culture. Lack of training, resistance to change, and organizational barriers are the main obstacles many organizations face in adopting TQM. Another often mentioned obstacle is the cost of implementation. This is despite the fact that most agree TQM's benefits far outweigh the cost of implementation.

Improvement Opportunities

Top Management Leadership. Less than half of the respondents said senior management leads and actively participates in ongoing improvement efforts.

Business Planning and Customer Focus. Few companies develop improvement goals and action plans at all levels of their organization. There is also a need for more emphasis on using customer and competitor information in planning if companies are to deliver maximum customer value and satisfaction.

Quality Related Training. The percentage of employees who have received quality-related training is quite low for the majority of the companies who responded. This phenomenon is not only true with the smaller companies but also true with the bigger firms. This is



consistent with an earlier observation that lack of employee training is the most frequently mentioned challenge to TQM implementation.

Implementation of Key Techniques. For companies engaged in product design, concurrent engineering has been shown to be extremely effective in increasing product quality and reducing costs. Yet only a fraction of those companies engaged in product development and manufacturing have applied this technique extensively. There is also a need for more focus on Quality Function Deployment and Cellular Manufacturing, techniques proven to yield substantial benefits.

Other Observations

Foreign Oriented Companies Tend to do Better. Companies with a majority of their sales in foreign markets are more likely to practise TQM principles in a number of key areas than companies who serve primarily the domestic market.

Larger Companies Tend to be More Aware of TQM. Respondents from larger companies are more familiar with TQM than those from smaller ones. They also tend to believe more strongly that TQM can generate significant benefits and that these benefits will more than outweigh implementation costs.

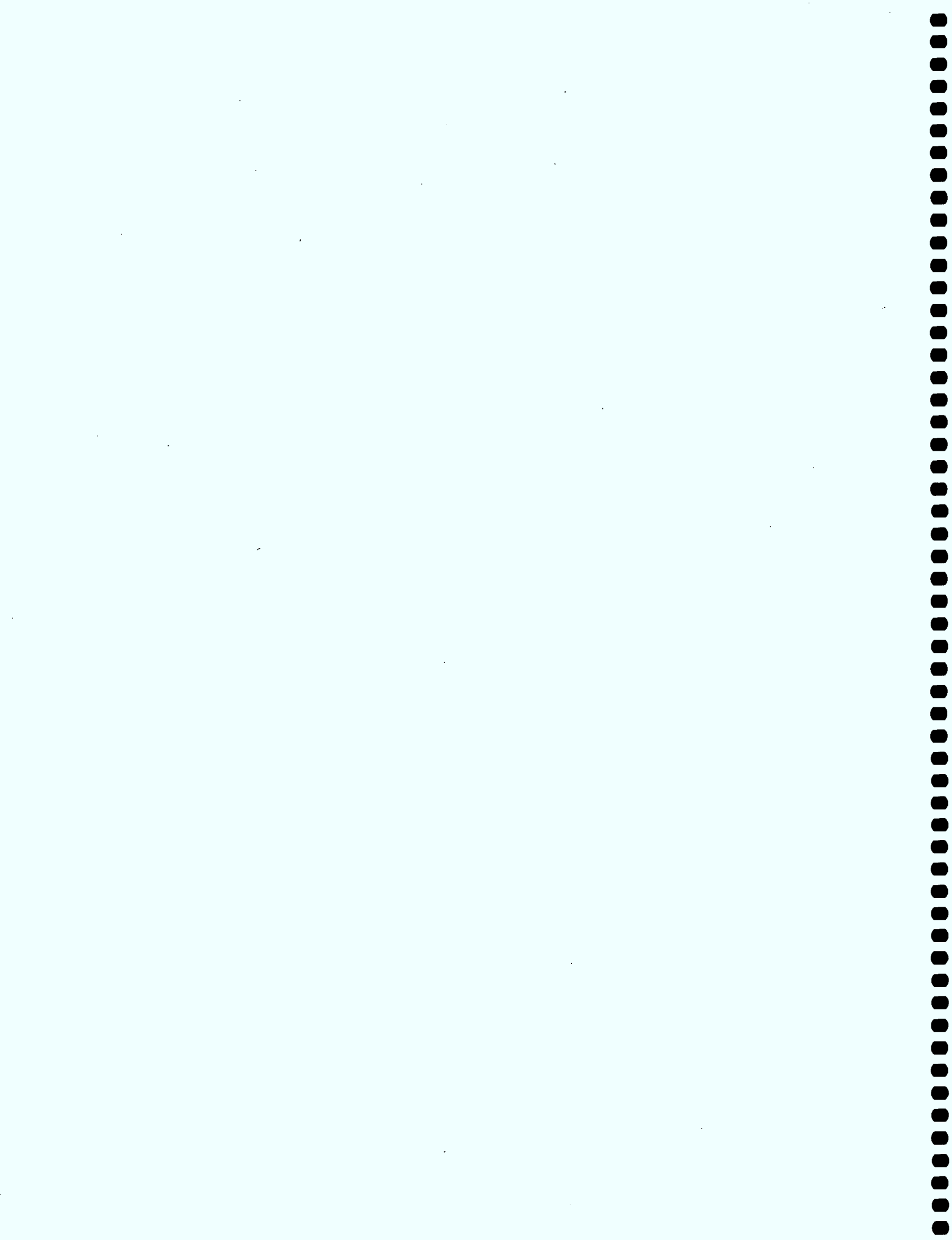
Contrast between Commercial and Defence Oriented Companies. Companies with primarily commercial sales are more likely to measure service quality and the impact of improvement activities. They are also more likely to consider employee

well-being and morale. Defence oriented companies, however, tend to be more positive regarding TQM's benefits and the speed with which they are realized.

Critical Issues

Based on the results of this survey and discussions with TQM practitioners in the industry, we have identified a number of issues companies should focus on in implementing their TQM process. These are as follows:

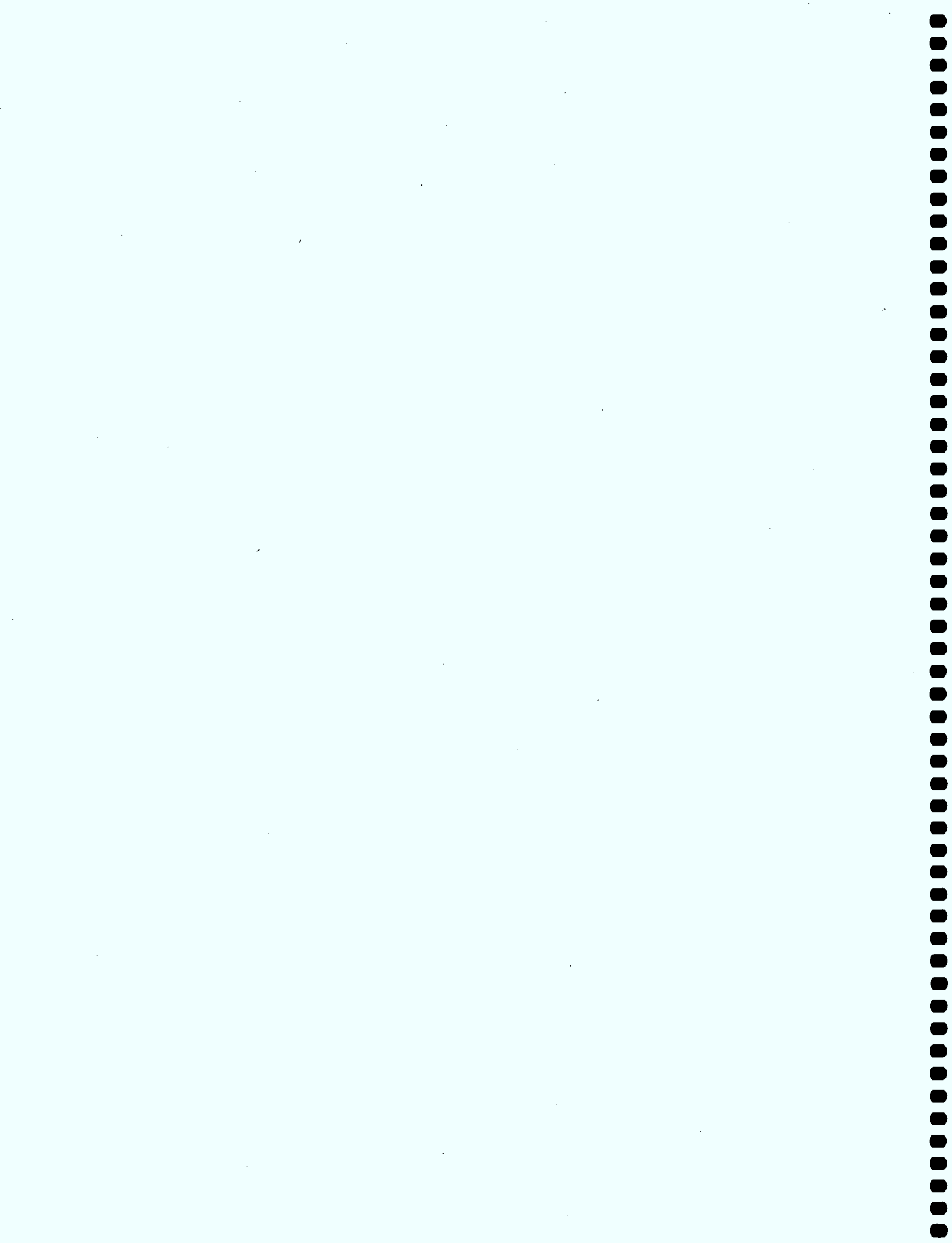
- ☐ Focus improvement efforts on achieving results that have a direct impact on competitiveness.
- ☐ Integrate TQM into the overall business strategy and set measurable improvement targets.
- ☐ Develop a plan that ties all the TQM elements into an integrated framework and strikes a balance among the elements.
- ☐ Manage change by assessing obstacles to change and developing measures to remove or minimize them.
- ☐ Develop an in-depth understanding of a company's business processes as a foundation to improvements.
- ☐ Top management must provide leadership by developing a vision and roadmap for the organization.



Recommendations

We believe the most effective way ISTC can help to encourage the adoption of TQM is to foster and support the dissemination of relevant information to the industry. Specifically, we think ISTC should explore the following options:

- ☐ Conduct case studies on TQM implementation and change management
- ☐ Conduct surveys on international competitive benchmarks
- ☐ Expand the use of bulletins and newsletters as a means to continuously communicate and provide information on quality and productivity matters
- ☐ Sponsor seminars and workshops aimed at educating top management on understanding, assessing, and planning TQM activities
- ☐ Address training needs of industry by using a "train the trainer" approach and by encouraging larger companies and educational institutions to provide training
- ☐ Strengthen coordination with provincial governments, industry associations, as well as quality and productivity societies



Introduction

This report summarizes the findings of a Canadian Aerospace Total Quality Survey conducted in early 1991. This survey was conducted by Andersen Consulting for the Aeronautics Branch of Industry, Science, and Technology Canada (ISTC) in cooperation with the Productivity Committee of the Aerospace Industries Association of Canada (AIAC). The primary objectives of the survey were:

- ☐ To determine the status of Total Quality Management (TQM) adoption in the Canadian Aerospace industry;
- ☐ To provide input to ISTC and the AIAC to help them formulate strategies for promoting further adoption of TQM.

To achieve these objectives, questionnaires were sent to 346 senior executives from the aerospace sector companies and their suppliers. These companies come from a diverse industry spectrum including:

- ☐ Airframe ☐ Propulsion
- ☐ Aviation ☐ Defense electronics
- ☐ Services

The questionnaire covered a wide range of topics including the following:

- ☐ Perception of TQM
- ☐ Leadership and Business Planning
- ☐ People and Organization
- ☐ Voice of the Customer
- ☐ Customer Service
- ☐ Product and Process Design
- ☐ Supplier Management
- ☐ Production

Suggestions for improving the questionnaire were solicited from over 20 companies before the design was finalized. To supplement the results obtained from the questionnaire, a number of companies were visited to provide more in-depth information.

Through follow-up mailings and phone calls, we were able to achieve a response rate of 45%. In total, 157 questionnaires were completed and returned. The respondent breakdown by company size and type of business is shown in Figure 1 and Figure 2.

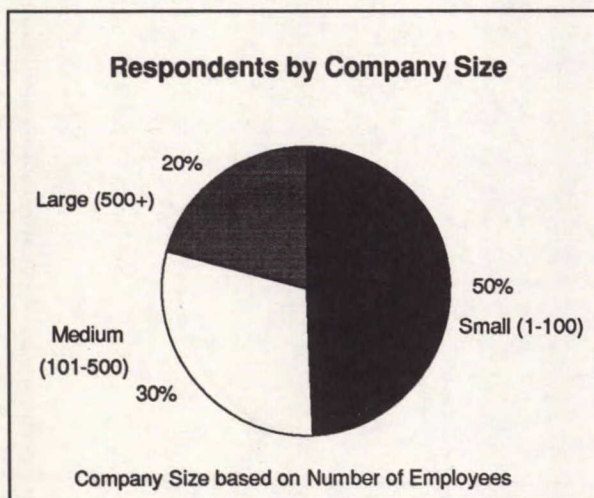


Figure 1

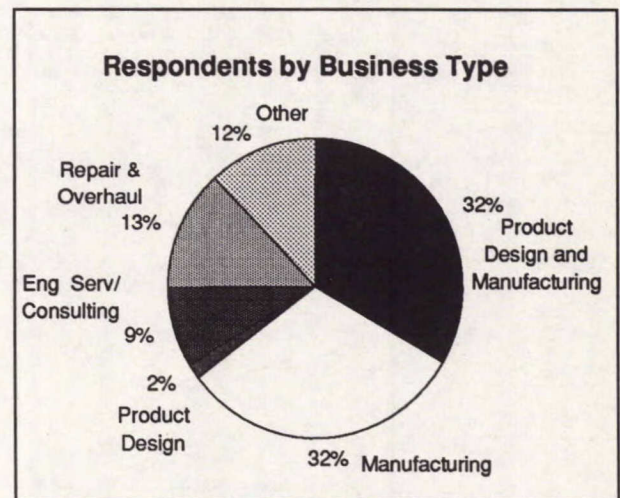


Figure 2

A total of 192 surveys were sent to AIAC members while 154 were sent to non-AIAC members. Of the completed surveys, 101 are from AIAC members. This gives a response rate of 53% for AIAC members and 36% for non-AIAC members.

In the remainder of this report, we will discuss the main observations and conclusions of the survey. This will be followed by a summary of findings for each question.

For More Information. If, after reading this report, you require more information, or wish to discuss any aspect of the project, please contact:

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Observations and Conclusions

TQM Awareness is High

Total Quality Management (TQM) has received considerable attention in both the private and public sectors in Canada over the last two to three years. This is evidenced by the fact that the vast majority (94%) of the respondents had heard of TQM prior to this survey. Only those from companies with 25 employees or less have a significantly lower level of awareness (76%).

As for familiarity, over two thirds of the respondents indicated that they are either very familiar or familiar with TQM. Respondents from smaller companies are less likely to be familiar with TQM than those from larger companies, as are those from engineering/consulting companies when compared to other businesses¹.

It is interesting to note that respondents from domestically oriented companies² are less likely to be familiar with TQM than those from export oriented companies. Figures 3, 4 and 5 illustrate these patterns.

TQM's Importance is Well Recognized

There is a broad agreement (89%) among the respondents that TQM is critical to the long term competitiveness of their businesses. Related to this is a prevailing perception that improved quality contributes to cost reduction and profitability. Over 90% of the respondents agreed that quality improvement leads to cost reduction and higher profits.

TQM Familiarity
By Company Size, Business Area and Percent of Domestic Sales

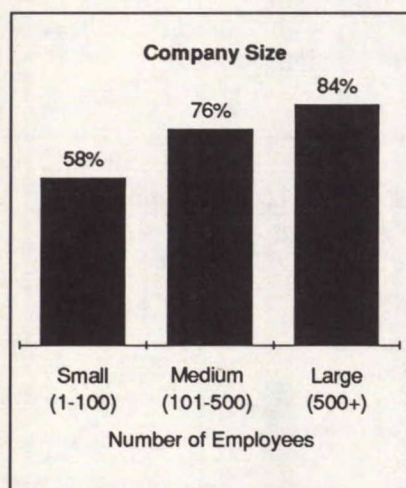


Figure 3

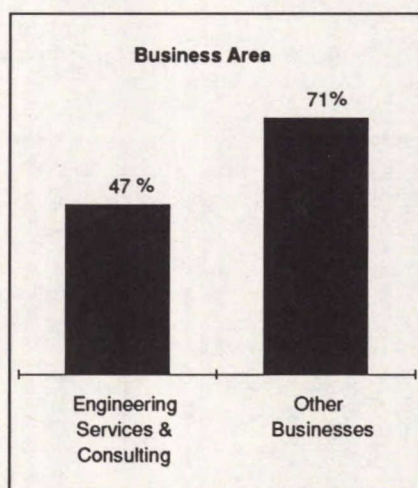


Figure 4

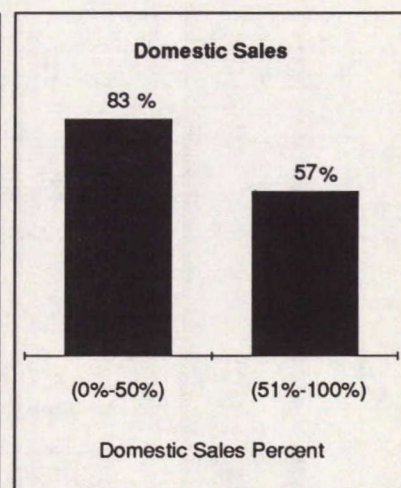


Figure 5

¹ Companies involved mainly in manufacturing, product design, repair and overhaul, and other activities.

² Companies with domestic sales in excess of 59% of total sales.

Only respondents from engineering services and consulting companies were less likely to agree (61%) that quality improvement leads to higher profit.

As Figure 6 illustrates, while most (75%) agreed that TQM's benefits outweigh the cost of implementation, the level of agreement was stronger for issues such as competitiveness and profits.

TQM Implementation is Limited

While there is no doubt that TQM has received a lot of attention within the industry and is favorably perceived, less than a third (31%) of the respondents said that they have a formal TQM process in place. Over half of the export oriented companies (51%) have implemented a TQM process compared to only 28% of domestically oriented ones. As expected, larger companies are far more likely to have a formal TQM process than smaller firms. Figure 7 illustrates this pattern.

When asked what is the extent of improvement activities at their companies, 36% of the respondents said they have ongoing quality or productivity improvement

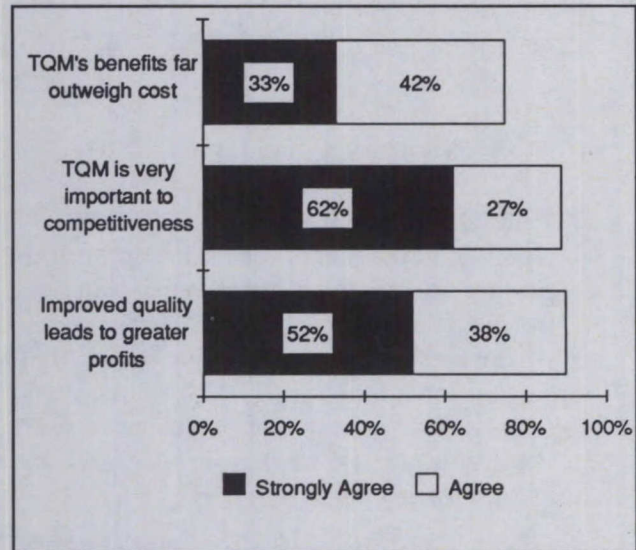


Figure 6

activities in all business areas. Interestingly, for companies where there is a formal TQM process, only 18% indicated that they have improvement activities in all business areas.

When the status of the industry's awareness, familiarity, and implementation of TQM are examined together, the pattern displayed in Figure 8 emerges. This shows an approximately 30% "attrition" going from awareness to familiarity and also from familiarity to implementation.

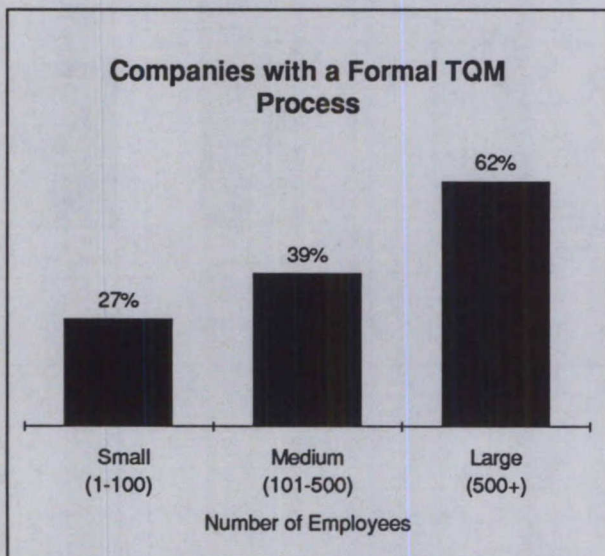


Figure 7

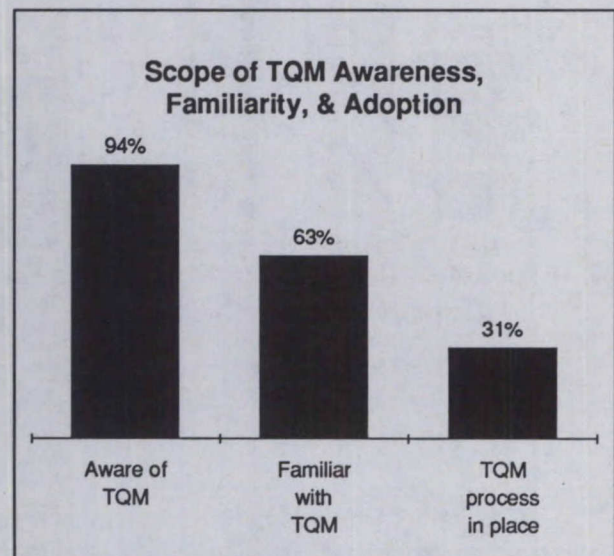


Figure 8

People Issues and Cost are Main Challenges

When asked what are the challenges to improving quality, *lack of employee training*, tops the list of answers. A close second is *resistance to change* followed by *organizational barriers* and *high cost of implementation*. Interestingly, only a small percentage of respondents regard poor technology (7%) and lack of capital (20%) as major challenges.

The most frequently mentioned factors that have the greatest impact in improving quality are *employee training*, *methods and procedures* and *employee motivation and teamwork*. *Change in corporate culture*, while only selected by 25% of the respondents, was ranked number one almost as often as *methods and procedures*. It is worth noting that *business planning and control* was not frequently mentioned as a key factor. Figures 9 and 10 show the distribution of responses to these questions:

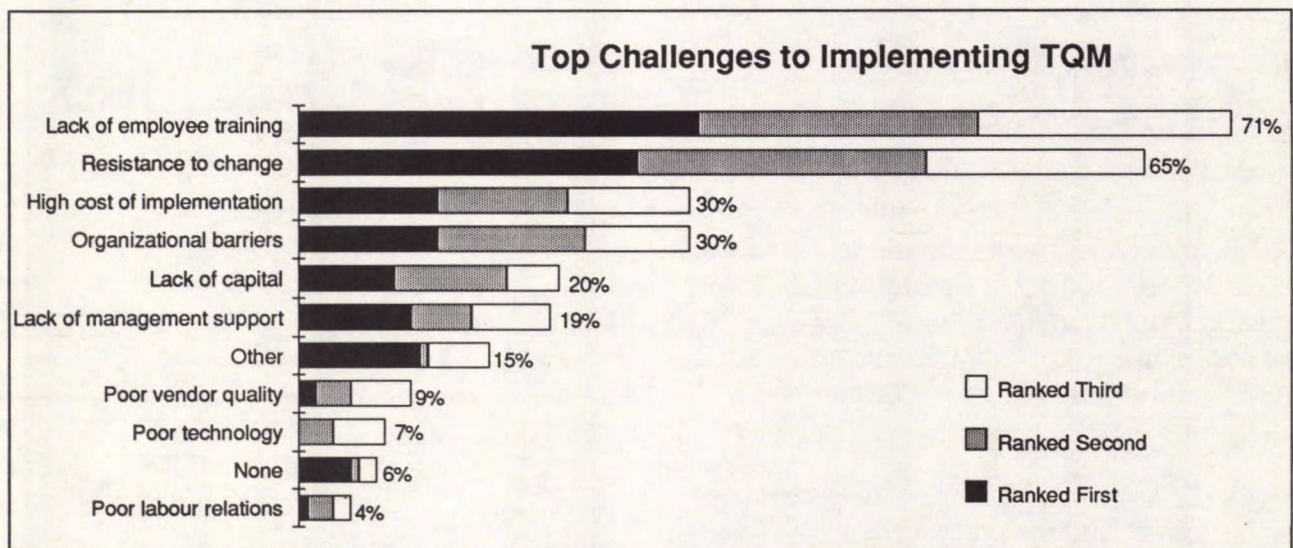


Figure 9

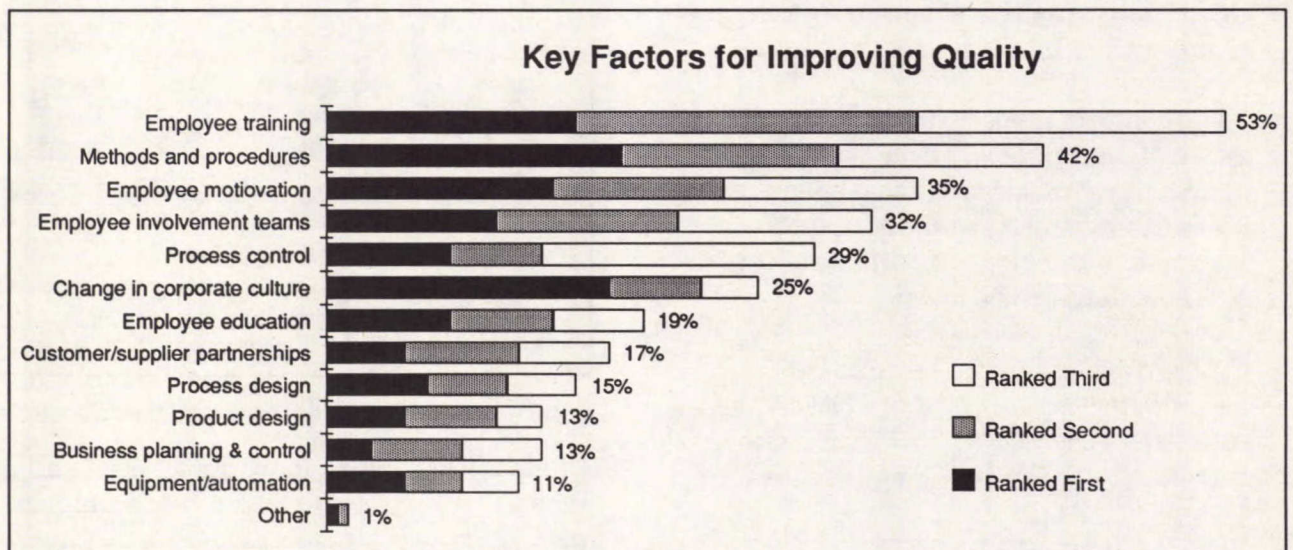


Figure 10

Discerning the Voice of the Customer

A fundamental principle of TQM says that companies must focus their energy on creating value for their customers and exceeding customer expectations. A prerequisite to achieving this is an in-depth understanding of the customers' values and needs. In other words, companies must listen carefully to the voice of the customer. Part of this listening process involves determining the relative importance of various product and service features in the eyes of the customers. Thirty-six per cent of the respondents agreed that their companies are doing this as a normal practice. Interestingly, nearly the same percentage (32%) said their companies are not doing it.³

Besides understanding the relative importance of various product and service attributes, determining customers' perception of product and service performance is equally important. Our survey shows that approximately 58% of the companies ask their customers to rate their performance as a normal practice.

Of the mechanisms used for determining customer requirements and expectations, *customers' specifications*, *customer complaints* and *informal contact* are the most often used. Other more proactive means to "listen" such as *surveys* and *interviews* are used less often.

Like all information, customer satisfaction information is of no use unless it is acted upon. Our results indicate that a majority (79%) of companies regularly feed this information back to the appropriate persons so that actions can be taken.

Customers often play a key role in encouraging the adoption of TQM by their suppliers. When asked how many of their customers were encouraging them to adopt

TQM, 33% said most, 28% said some, and 39% said none or few. Figures 11 and 12 illustrate the responses from companies of different sizes and from companies with different levels of domestic sales.

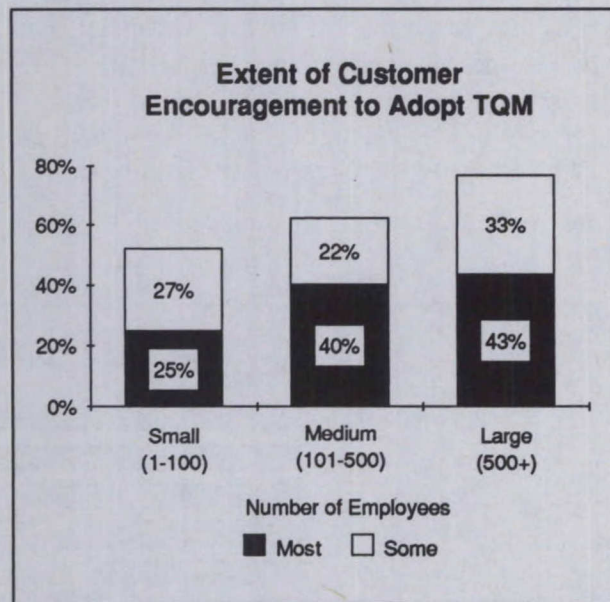


Figure 11

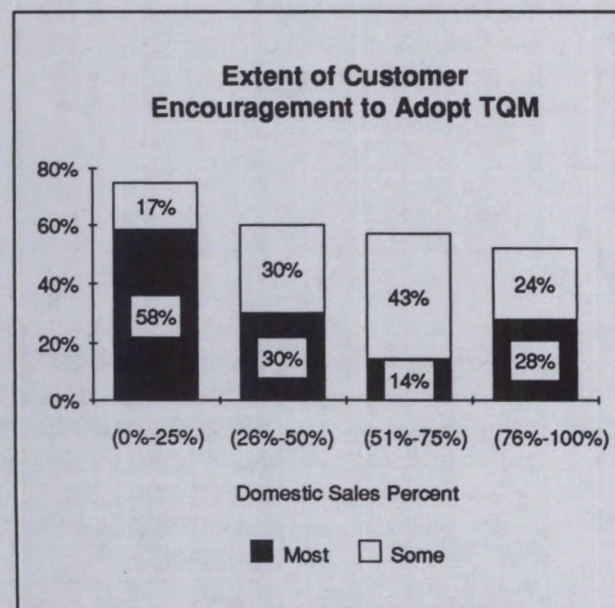


Figure 12

Companies involved in manufacturing and repair & overhaul also tend to have a higher percentage of their customers encouraging them to adopt TQM than service companies.

³ The rest were neutral or did not know.

Although our discussion so far has mainly been concerned with external customers, we recognize the importance of understanding internal customer requirements. When asked whether employees formally identify their internal customers and review their requirements, 33% agreed, 65% said they were neutral or disagreed. This suggests that there is more emphasis on external customers than internal ones at most firms.

Top Management Leadership

Top management leadership has long been recognized as a key success factor for TQM. Of the 155 companies that responded, less than half (41%) indicated that senior management leads and actively participates in the ongoing improvement of products or services. Sixteen percent said their company or division head has primary responsibility for implementing improvement activities while 37% said that responsibility lies with top management.

Less than a third (28%) of the respondents strongly agreed that senior management gives continuous improvement as high a priority as short term profits and schedules. Figure 13 indicates the difference in response between companies of different sizes.

An important part of leadership has to do with senior management's communication of goals and results to employees at all levels. We asked in our survey how often this communication occurs. A large percentage (45%) said this occurs regularly even though nearly a quarter (22%) said this never occurs or occurs infrequently.

Based on these results, we believe there are major opportunities for top management to play a stronger role in spearheading quality improvements within the industry.

Business Planning

Many failed attempts to improve quality are a result of inadequate planning. In fact, planning is the only way to ensure that company-wide improvement efforts are in sync with the business strategy and work towards common business goals.

To achieve the highest possible customer satisfaction, companies must start their planning process by focusing on the customers and determining their performance gap by benchmarking against their competitors.

When asked how customer information is used in the planning process, only 21% responded that this information is used to drive their business planning. However, a majority (56%) did say customer information is used as a key input to their planning process. A very small percentage (5%) are using competitor information to drive business planning. These results suggest that companies need to increase their use of external information in their planning process.

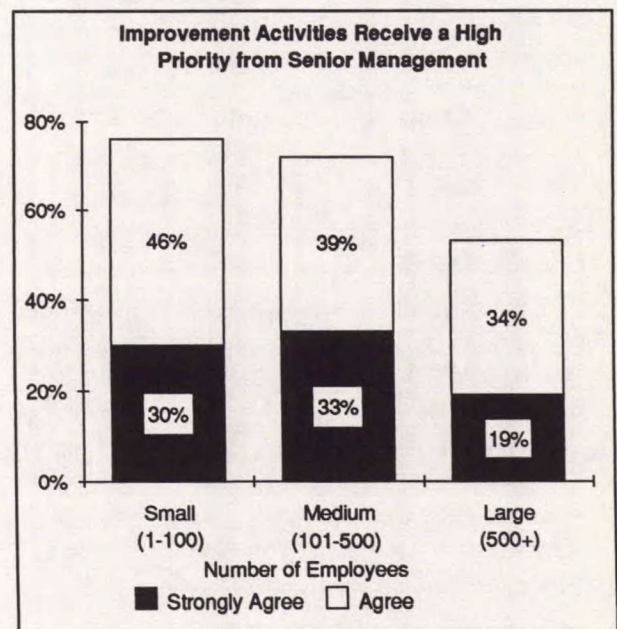


Figure 13

To gauge how well customers are involved in the planning process, we asked respondents how strongly they agreed that their companies:

1. Actively pursue partnerships with customers.
2. Actively involve customers in developing business plans.

Our results show that most companies are pursuing customer partnerships (77%) while only slightly over half are involving customers in business planning (54%).

Thorough planning requires the development of goals and action plans at all levels of the company. Only 20% of respondents claim that goals and actions are developed at all levels of the company. Foreign oriented companies seem to be doing better as 71% indicated that action plans are developed at all or most levels. Only 52% of domestically oriented companies said they are doing this.

Another sign of good planning is the use of cross-functional teams in developing business plans. A cross-functional approach promotes

global optimization of business decisions and helps to break down the barriers between departments. It appears that a majority (76%) of the companies are practising concurrent cross-functional business planning.

Employee Involvement

Among the keys to employee involvement, teamwork stands out as the most prominent. Teamwork improves communication, fosters commitment to achieving common goals, and allows employees to better understand the business processes. Based on our survey results, it appears that teamwork is widespread in less than half of the companies (44%). Engineering services and consulting firms were least likely to indicate widespread teamwork (24%) while repair and overhaul companies were most likely to do so (58%).

Over half of the companies (58%) agreed that team improvement activities regularly involve employees from different departments. Companies with primarily commercial sales were more likely to agree (70%) than companies with primarily defence sales (38%).

Besides teamwork, another important factor for effective employee involvement is the sharing of responsibilities and authority. The majority (70%) of respondents indicated that frontline employees have the authority to take corrective actions regarding their day to day activities.

For companies engaged in production, a similar question was asked as to whether an employee has the authority to stop production in order to correct quality problems. The response is very similar, with 73% responding "yes" to this question. Respondents from smaller companies were more likely to say "yes" than those from medium or large companies. The responses to this question are shown in Figure 14.

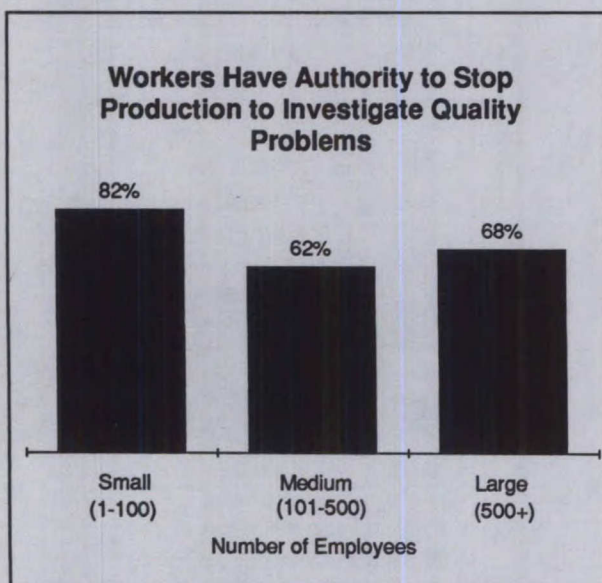


Figure 14

As for accountability, nearly 75% indicated that employees are accountable for the quality of their work and that problem solving is a normal part of their jobs.

To sustain employee involvement and strengthen teamwork, management must:

- ☐ monitor employee well being
- ☐ actively solicit suggestions/feedback
- ☐ recognize their achievements

Only 44% of the respondents responded positively to all three areas. This suggests management should pay more attention to these issues.

Employee Training

Training encourages employee involvement by motivating and enabling employees to continuously improve. Only 32% of the companies surveyed indicated that more than 50% of their employees have received quality-related training. In fact a large percentage (44%) of them have 25% or less of their workforce trained in quality. This suggests that there is a strong need to increase the level

of training in the industry. This also confirms the strong consensus that lack of employee training is a major obstacle to quality improvement.

Most companies (92%) have plans for quality-related training for the next 1-2 years. Over 60% said they plan to use external help. Statistical Process Control is the most popular area for which training is planned.

Measurement, Measurement, Measurement

Performance measurement and information analysis is a key step in the continuous improvement process. Our survey shows that the most often used methods for assessing the quality of products and services are:

- ☐ Customer satisfaction (84%)
- ☐ Quality reports (75%)
- ☐ Inspections (72%)
- ☐ Customer inquiries/complaints (59%)

Figure 15 displays the breakdown of responses.

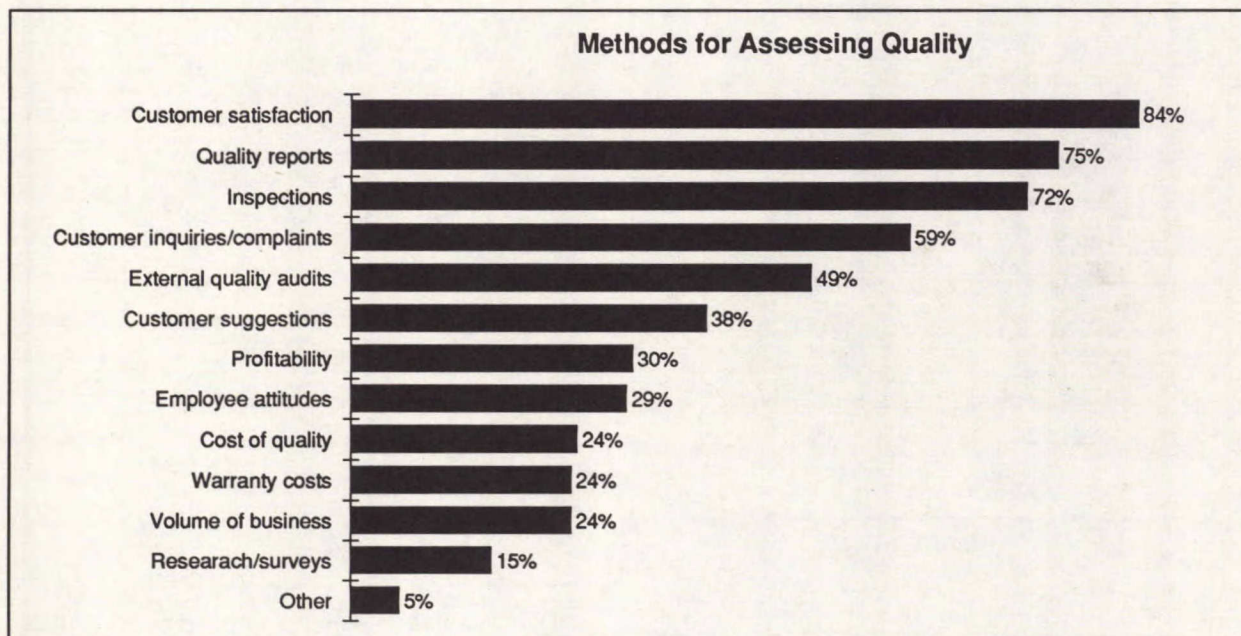


Figure 15

Customer Service Indicators. Since customer service quality is often harder to quantify and measure than product quality, we asked respondents how strongly they agreed that their companies regularly and objectively measure customer service quality. About half of the respondents claimed that their companies measure customer quality regularly and objectively. The most frequently used indicators of service quality are:

- ☐ % on-time delivery (73%)
- ☐ number of complaints (35%)

Cost of Quality Measurement. In addition to measuring quality that is directly visible to the external customers, companies must also manage the quality of their internal processes. Cost of quality is sometimes used by companies to shed light on how well they are doing internally as well as externally. Less than half (39%) indicated the regular measurement and reporting on cost of quality at their companies. This is particularly true

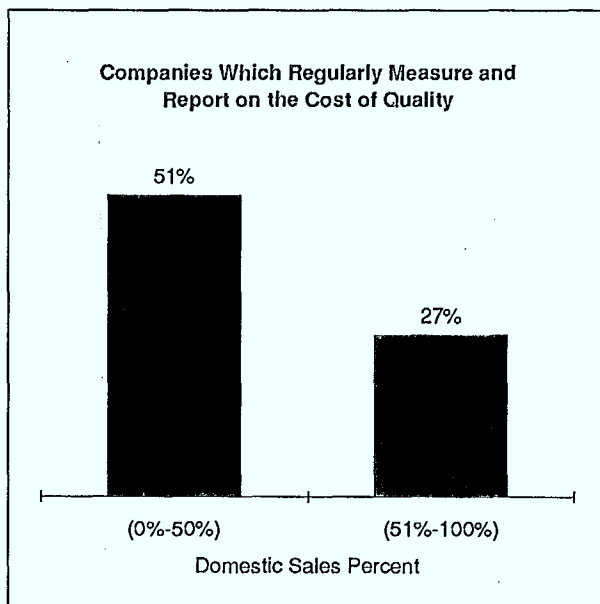


Figure 16

when it comes to service companies⁴ where only 24% indicated the regular measurement of cost of quality. Large companies are more likely to measure cost of quality (55%) than either medium (43%) or small (29%) companies.

As identified in Figure 16, companies with primarily foreign sales are much more likely to measure cost of quality regularly (51%) than those with mainly domestic sales (27%).

Impact of Improvement Activities on Performance Indicators. To ensure that improvement activities are effective and will yield tangible benefits, companies must carefully monitor their impact on operational performance. Over half (59%) of the respondents said they regularly measure the impact of improvement activities on operational performance.

Design and Production Indicators. In the area of product and process design, the most frequently used indicators of productivity and quality are:

- ☐ Manufacturing cost (66%)
- ☐ Product development costs (61%)
- ☐ Development lead time (54%)

In production, the most often used productivity indicators are:

- ☐ Labour Efficiency (65%)
- ☐ Manufacturing lead time (60%)
- ☐ Defect Rate (57%)

Figures 17 and 18 provide a more detailed breakdown of the responses.

⁴ Companies engaged in engineering services, consulting, product design and other activities.

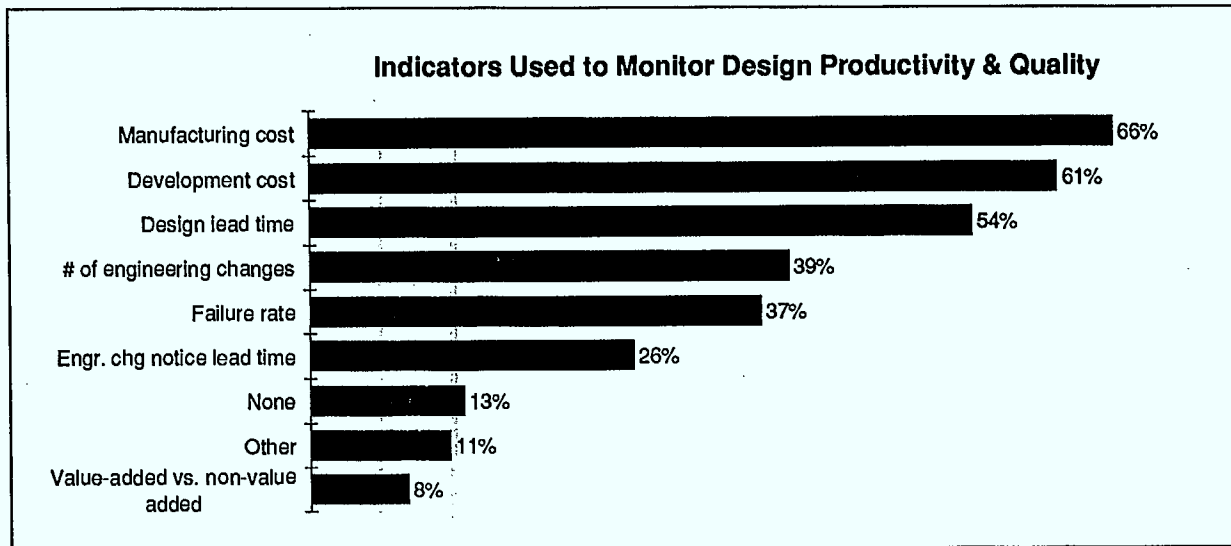


Figure 17

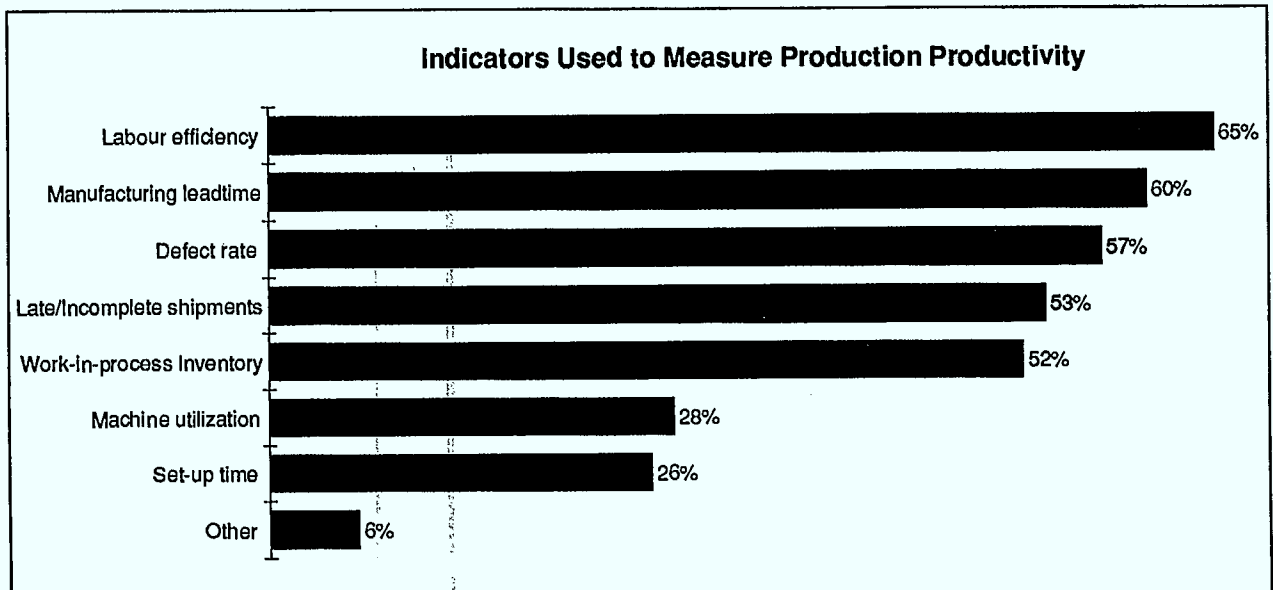


Figure 18

Product and Process Design

The key practices we examined in this area include concurrent engineering and involvement of customers and suppliers in the design process. Less than a quarter (23%) of the companies involved in design and manufacturing use concurrent engineering for the majority of their products. As for involvement of customers in the design process, close to half (49%) claimed that their customers are involved at least 75% of the time. Involvement of suppliers in the design process is less prevalent with only 18% indicating that their suppliers are involved in the majority of their designs.

The survey also explored the degree of familiarity with Quality Function Deployment (QFD) as a key design technique. Only a

minority (36%) of the respondents have heard of the term and of those who have, less than half (39%) are familiar with it. Almost 60% of respondents from large companies have heard of QFD compared to 34% for medium companies and 26% for small companies. As well, respondents from export oriented companies are more likely to have heard of QFD, than those from domestically oriented companies. Only 20% of companies engaged in product design are currently using QFD in their design process.

Despite the lack of familiarity and application, a significant number of companies showed interest in applying and expanding the use of QFD. Figure 19 illustrates this.

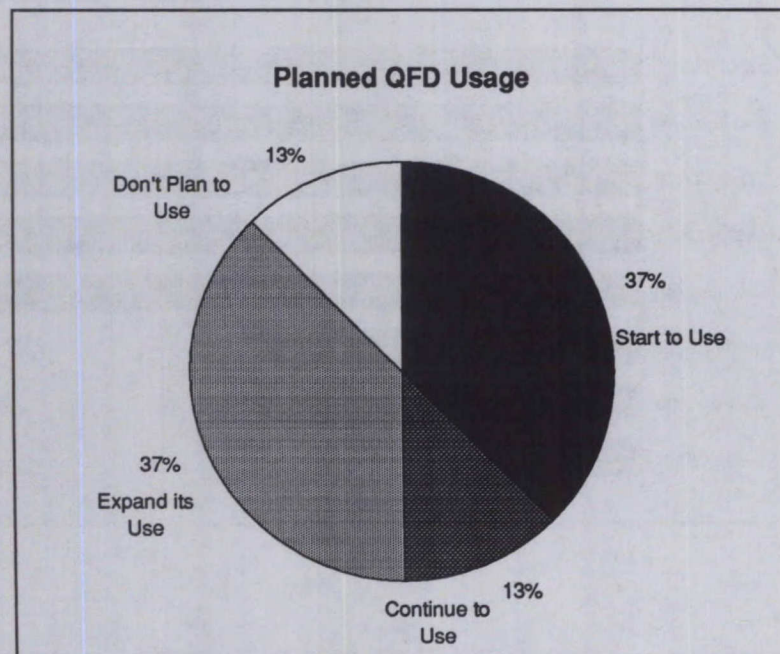


Figure 19

Supplier Management

The three main issues explored in Supplier Management are: long term relationship with suppliers, feedback to suppliers, and assistance and encouragement to use TQM. Most people (88%) surveyed said their companies pursue long-term relationships with their suppliers. A somewhat smaller percentage (78%) said they provide feedback to suppliers regularly. A significantly smaller percentage (42%) said their companies encourage and assist their suppliers to use TQM or other improvement techniques. Figure 20 summarizes the results for these three questions.

Companies with primarily foreign sales are more likely to encourage and assist their suppliers to use TQM than companies with primarily domestic sales. Figure 21 displays this difference. Companies involved in manufacturing only are also more likely to encourage their suppliers to use TQM than

those who also perform product design or are involved in services only.

The most common methods used to ensure the quality of suppliers' products or services are:

- ☐ Supplier certification (64%)
- ☐ Random sampling (58%)
- ☐ Supplier audits/appraisals (54%)

When asked what were the key obstacles to improving suppliers performance, respondents overwhelmingly selected two answers. Sixty-four percent of respondents selected *Few or no alternative sources of suppliers* while 57% selected *Lack of influence over suppliers*. The next most common responses, *Vendor's lack of resources and skills* and *Unpredictable demand of materials* were selected by only 31% of respondents.

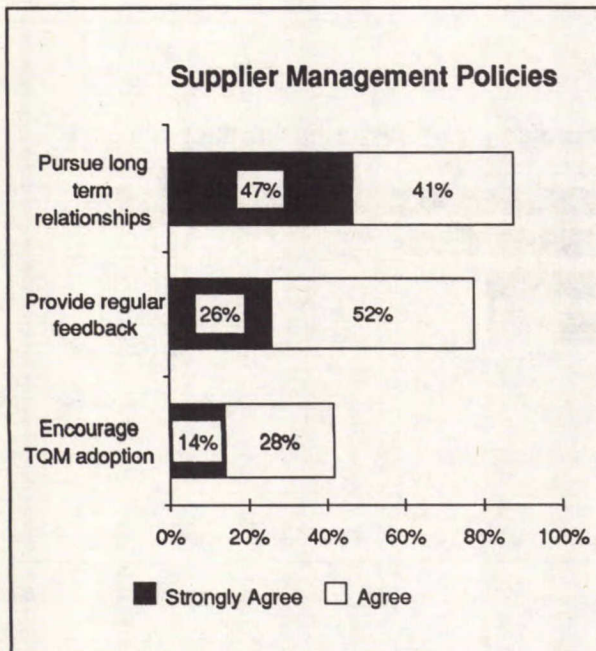


Figure 20

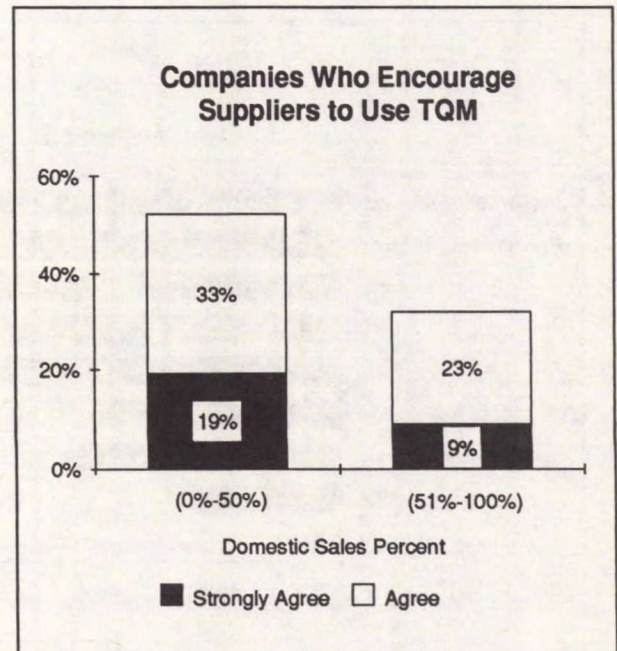


Figure 21

Production

Based on the results of our survey, the most likely production priorities to be cited by manufacturers are:

- ☐ Meeting schedule (85%)
- ☐ Reducing defects and rework (77%)
- ☐ Increasing labour efficiency (51%)

There seems to be broad agreement on the importance of these items as each of the other options were selected by less than 27% of the respondents. It is interesting to note that even though meeting schedule seems to be the most pressing issue, 'late shipments' is not one of the most frequently used productivity indicators.

Employee involvement, process simplification, and material requirements planning (MRP) received the most votes as key approaches for improving manufacturing productivity. Interestingly, cellular manufacturing, which is a key technique for

reducing lead time and improving quality, is near the bottom of the list. Figure 22 shows the frequency with which each approach was cited as being key for improving productivity.

Despite the publicity on SPC in recent years, less than a quarter of the respondents said that over 25% of the production workers had received SPC training. Only one of twenty said that more than 75% of their production workers had received SPC training.

A fundamental principle of the Japanese production system is that no defective parts are allowed to pass on to the next operation. The premise is that quality problems should be corrected at the source even if this means stopping the machine or process. When asked how often quality problems are identified immediately after they occur as opposed to later on in the process, less than 25% said this is always done. This clearly represents a significant improvement opportunity.

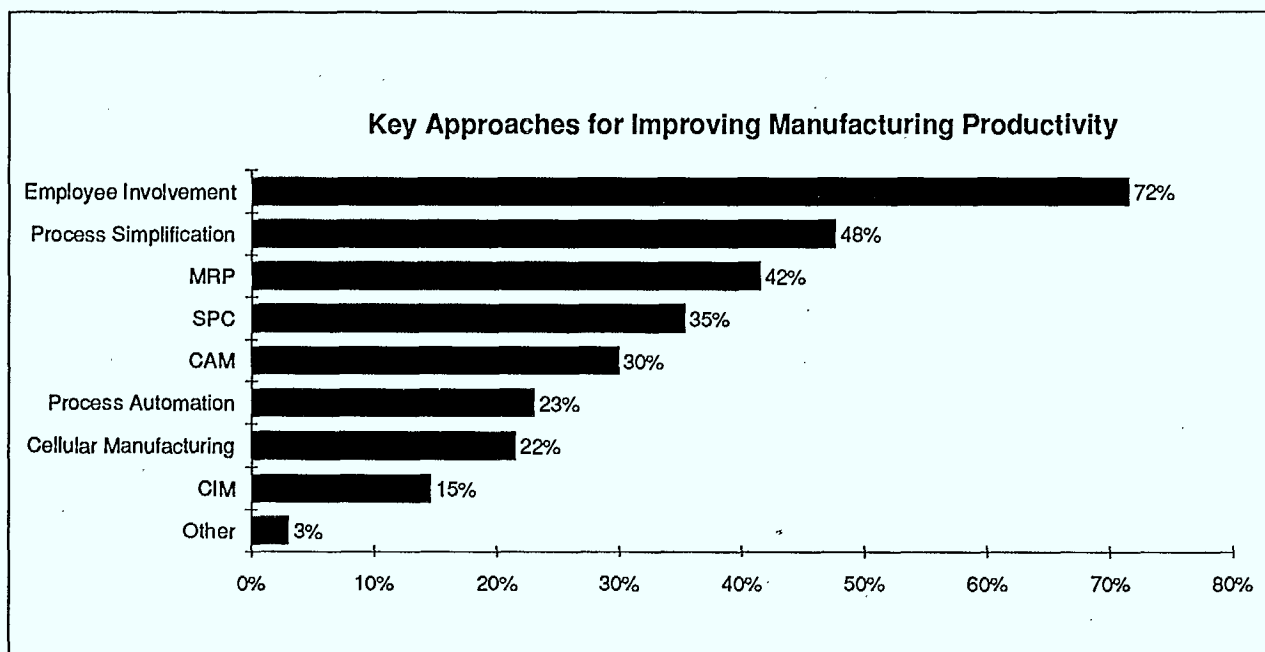


Figure 22

Observations and Conclusions

Customer Service

In this survey, we investigated the presence of a number of key business practices in the customer service area. These include:

- ☐ Prompt response to customer inquiries and requests for assistance
- ☐ Root cause investigation of service problems
- ☐ Customer complaints handling
- ☐ Development of service plans and targets
- ☐ Service quality measurement
- ☐ Specialized training for customer service

We asked respondents to indicate their level of agreement with statements about their practices in each of the above areas. Results indicate that more than 75% of respondents feel their companies are doing well in the first three areas. On the other hand, they are less positive regarding the development of service plans and targets, service quality measurement, and specialized customer service training. Figure 23 displays these results.

There are two notable deviations from the overall averages. Only 55% of respondents from companies with primarily defence sales agreed that their companies have a process for handling customer complaints. Sixty-eight percent of those from manufacturing companies agreed that they regularly and objectively measure customer service quality as opposed to only 38% of companies involved in both product design and manufacturing.

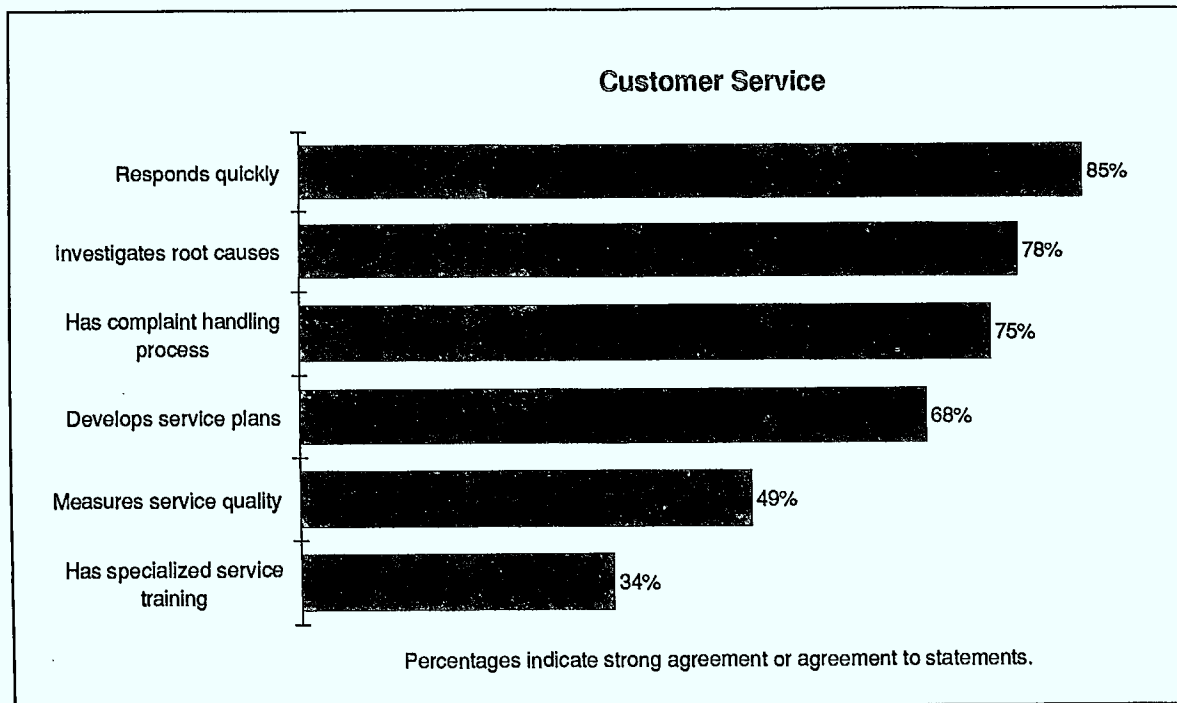


Figure 23

Contrast Between Domestically and Foreign Oriented Companies

In many cases, responses from companies that are domestically oriented are significantly different from those who serve foreign markets. Some of these results have already been discussed but are repeated here to provide a complete comparison.

Foreign oriented companies tend to be more familiar with TQM than domestic ones and a greater percentage seem to be applying TQM concepts in key business areas. They seem to develop action plans and goals more extensively in their business planning process and are more likely to measure the impact of improvement activities and the cost of quality. More of their customers encourage them to use TQM and they pursue customer feedback more actively than domestically oriented companies. On the supplier side, they are more likely to encourage and assist their suppliers to use TQM. They are also more familiar with quality tools such as SPC and QFD. Table 1 summarizes these results.

Contrast Between Domestically and Foreign Oriented Companies

Item	Domestically Oriented	Foreign Oriented
Familiar with TQM	57%	83%
TQM process in place	28%	51%
Develop action plans and goals for all or most levels	52%	71%
Measure impact of improvement activities on operational performance	49%	69%
Measure cost of quality	27%	51%
Encouraged to adopt TQM by most or some customers	54%	68%
Ask customers to rank various product/service features	29%	46%
Ask customers to rate product/service performance	46%	71%
Encourage and assist suppliers to use TQM	32%	52%
Heard of QFD	24%	48%
Use SPC in all or most areas	8%	27%
Plan to continue or expand SPC use	61%	85%

Table 1

Contrast Between Companies of Different Size (Brackets Indicate Disagreement)

Item	Small	Medium	Large
Heard of TQM	88%	100%	100%
Familiar with TQM	58%	76%	84%
Agree TQM's benefits far outweigh implementation costs	66%	80%	87%
Disagree TQM is too general and vague to bring about concrete results	(61%)	(80%)	(90%)
Disagree TQM takes too long to yield substantial benefits	(46%)	(76%)	(81%)
Encouraged to adopt TQM by most or some customers	52%	62%	77%
TQM process in place	27%	39%	62%
Measure cost of quality	29%	43%	55%
Plan to use external sources for training	56%	70%	75%
Heard of QFD	26%	34%	59%
Production workers have authority to stop production	82%	62%	68%
Continuous improvement receives a high priority from senior management	76%	72%	53%

Table 2

Observations and Conclusions

Differences Between Small, Medium and Large Companies

Following is a summary of key differences between responses from companies of different sizes. Table 2 provides a complete listing of these comparisons.

Larger companies tend to be more familiar with TQM and seem to be more positive about TQM and its ability to yield benefits. When asked if TQM's benefits far outweigh the costs of implementation, over 80% of medium and large companies agreed compared to only two-thirds of small companies. As well, small companies were more likely to agree that TQM is too general and vague to be effective and that it takes too long to yield substantial benefits.

A greater percentage of large companies are encouraged to use TQM by their customers. As well, large companies are more likely to have a TQM process implemented and to measure the cost of quality.

Production workers in smaller companies seem to have the most authority to stop production in order to investigate and correct quality problems compared to medium and large companies. Respondents from small and medium companies are more likely to agree that senior management gives a high priority to continuous improvement than large companies.

Contrast Between Defence and Commercial Oriented Companies

There are a number of significant differences between defence oriented and commercial oriented companies. Companies with primarily defence sales seem to have a more positive attitude regarding TQM and its value. In particular, they are far more likely than commercial oriented companies to disagree that:

- ☐ TQM is too general and vague to be effective in bringing about concrete actions and results.
- ☐ TQM takes too long to yield substantial benefits.

On the other hand, companies with primarily commercial sales seem to be doing a better job in applying TQM concepts in a number of areas. A greater number of commercial oriented companies measure customer service quality and the impact of improvement activities on operational performance. Team improvement activities in commercial oriented companies are more likely to include employees from different departments. They are also more likely to regularly review employee well-being and morale issues as input to improvement activities. Table 3 summarizes these findings.

Contrast Between Defence and Commercial Oriented Companies

(Brackets Indicate Disagreement)

Item	Defence Oriented	Commercial Oriented
Disagree TQM is too general and vague to bring about concrete results	(96%)	(71%)
Disagree TQM takes too long to yield substantial benefits	(81%)	(60%)
Objectively and regularly measure customer service quality	38%	61%
Measure impact of improvement activities on operational performance	41%	70%
Team Improvement activities involve employees from different departments	38%	70%
Review employee well-being & morale as input to improvement activities	31%	65%

Table 3

Suggestions for ISTC and the AIAC

One of the objectives of this survey was to determine how ISTC and the AIAC could contribute to the implementation of TQM. While a significant proportion (48%) of the respondents said that ISTC or the AIAC could make a valuable contribution, an almost equal number (44%) indicated that they did not know. Figure 24 illustrates the overall results while Figure 25 illustrates the responses from companies of different sizes.

These results seem to suggest that there is a lack of familiarity with the functions or services offered by these organizations. Small companies in particular are the most uncertain, 50% said they did not know, compared to 30% of respondents from large companies. We believe there is an opportunity to increase awareness regarding the roles of ISTC and the AIAC.

Of those respondents who thought the ISTC or the AIAC could make a valuable contribution, a significant proportion (71%) offered suggestions or comments.

The most common suggestions can be grouped into the following categories:

- ☐ Financial Assistance
- ☐ Information Services
- ☐ Seminars
- ☐ TQM Training Assistance

Figure 26 and 27 show the breakdown of suggestions made to ISTC and the AIAC.

Need for Government Action

It is clear from the survey results that there is a need for the Canadian aerospace industry to be more aggressive in pursuing quality and productivity improvements. This is the only way Canada can maintain its market share in the face of increasing global competition. We believe the department of ISTC can play a useful role in encouraging and stimulating industry to become more competitive. We will discuss how ISTC may accomplish this later in this report.

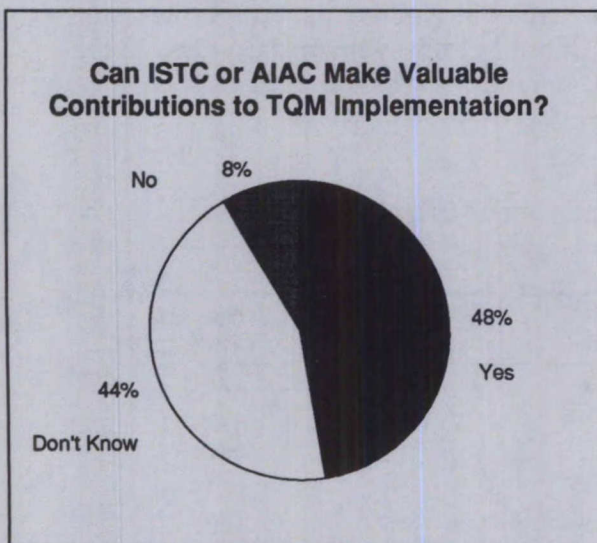


Figure 24

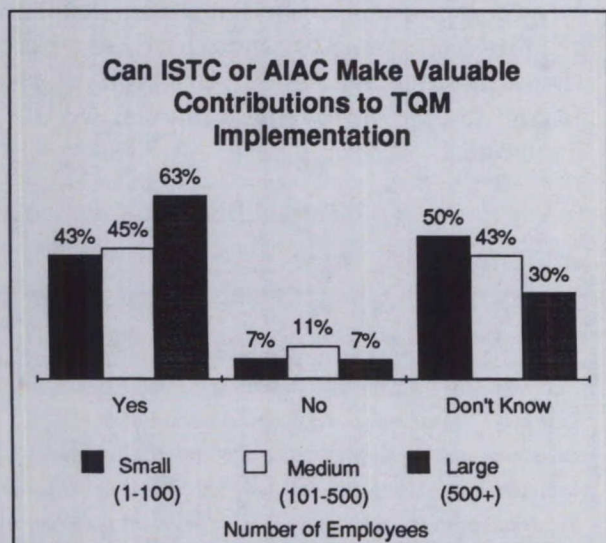


Figure 25

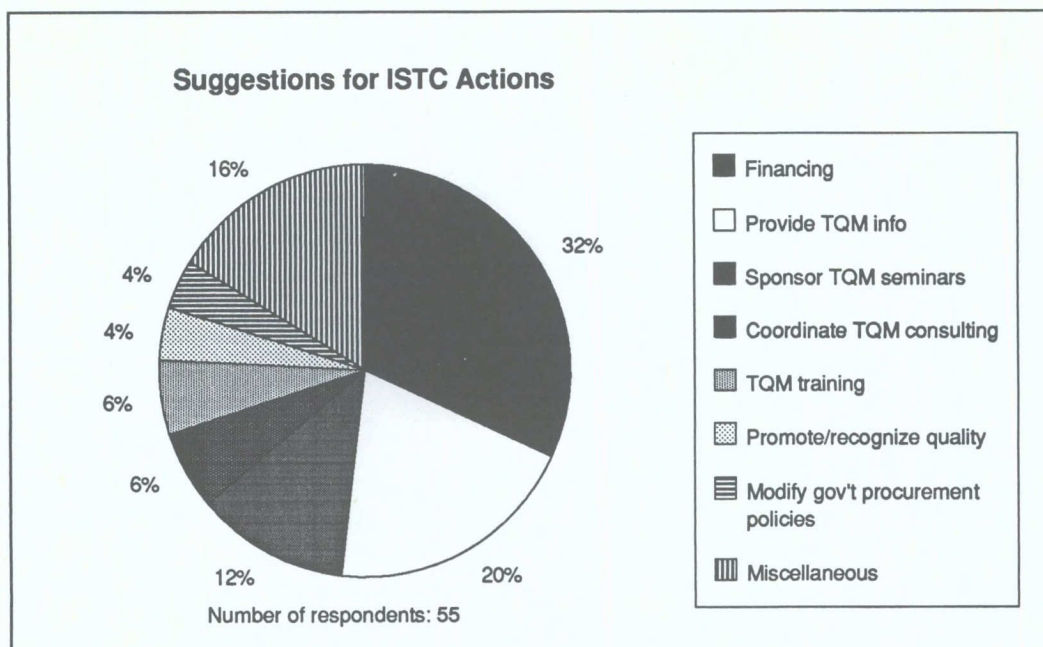


Figure 26

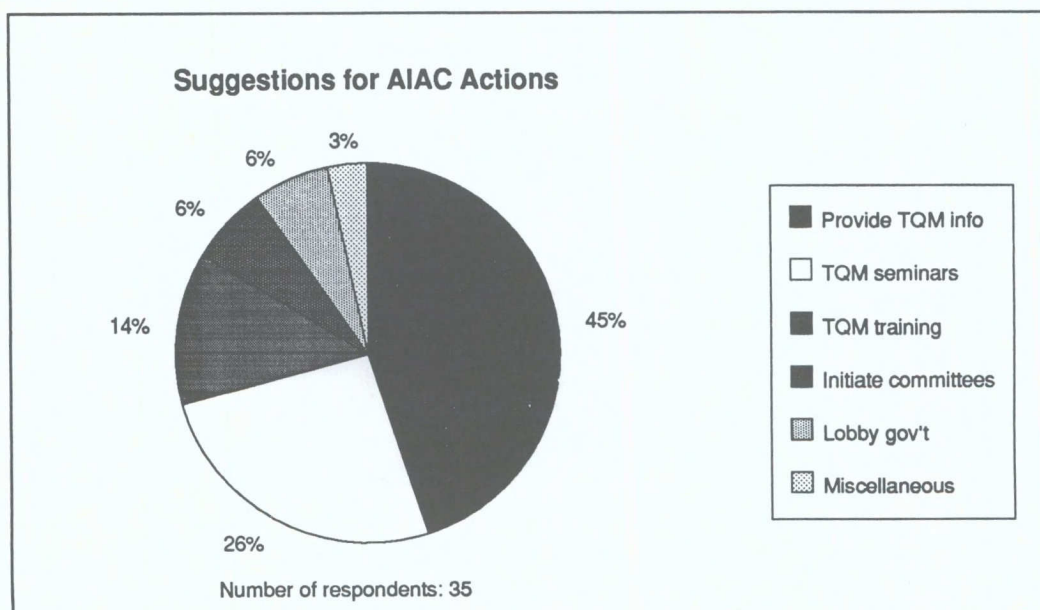


Figure 27



Critical Issues

Based on the results of this survey and the interviews conducted, we have identified a number of issues that companies should pay attention to in order to increase the effectiveness of their TQM efforts.

Focus on Competitiveness. TQM's ultimate objective is to improve competitiveness. Often, TQM efforts are misdirected because people are not focused on achieving tangible improvements that have a direct impact on their company's competitive position. We believe improvement activities must address the core issues of competitiveness such as cost, flexibility and lead time and not just the peripheral.

Integrated Strategy. TQM must be an integral part of the business strategy if it is to be effective. Companies must understand where they stand competitively and set overall improvement targets that are measurable. These targets, when translated into lower level goals, provide focus and priorities for all company improvement activities under TQM. This helps employees understand how they can contribute to the company's competitive goals and survival.

Holistic Planning. Many TQM efforts fail because they are launched without adequate planning. TQM planning requires an integrated framework for improvement that ties all the elements of TQM together. Companies must understand what these elements are and how they interact and depend on one another. For example, team work is important, but teams must be focused on the right things and must direct their energies to improving the fundamental processes of the business and achieving tangible results.

The key is to strike a balance between the people-oriented elements such as rewards and recognition, with those that are more process-oriented and are concerned with specific approaches, methods, or techniques.

Change Management. TQM is about change. It requires changes in management style, culture, policies, processes, and techniques. Companies must assess how people will react to these changes and determine what are the obstacles to change. Strategies and measures to remove or minimize these obstacles must be formulated and implemented as part of the overall plan.

Understand Your Processes. The ability to improve and develop concrete solutions depends critically on how well the processes of a business are understood. A thorough understanding of a company's business processes is a foundation for improvement. A cross-functional approach that emphasizes an end-to-end view of the business is particularly important. Companies should rethink the fundamental architecture of their processes to uncover opportunities to achieve breakthrough results.

Top Management Leadership. Leadership by top management holds the key to the success of TQM implementation. TQM will fail if top management does not wholeheartedly support the new vision and lead the change.

Good leadership requires insight and understanding. Top management must develop a long term vision and roadmap for the company by gaining a deep understanding of the business, its competitive environment, and the improvement process. No one can develop this and roadmap except top management .

STAGE	KEY QUESTIONS
Understand	What is TQM all about? Why is it important? What are others doing, including my competitors? Where can I get more information and help?
Assess	Where do we stand competitively? How would TQM improve our competitiveness? What are the tangible and intangible benefits? What are the costs and efforts involved? How long would it take? What are the risks, obstacles, and success factors?
Plan	What is our long term vision and business strategy? How does TQM fit into this strategy? What should be the overall implementation framework? What are the improvement targets and how will they be achieved? What policies, practices, tools, techniques to use to achieve targets? How should the TQM effort be organized? How will we manage obstacles to change? Where to start, how much, how fast?
Implement	How to monitor and control progress? How to keep momentum going and handle failures/mistakes?
Improve	How to encourage innovation? How to sustain and improve on past achievements? How to foster a learning organization?

Table 4

STAGES	PRIMARY AUDIENCE	TOPICS
Understand/Assess	<ul style="list-style-type: none"> * Medium/Small companies * Service companies * Top management 	<ul style="list-style-type: none"> * TQM and competitiveness * Success factors/Pitfalls * Cost versus Benefit
Plan	<ul style="list-style-type: none"> * Medium to large * Top/Middle management 	<ul style="list-style-type: none"> * Planning for change * Implementation framework * Best practices and benchmarking
Implement	<ul style="list-style-type: none"> * Medium to large * Top/Middle management 	<ul style="list-style-type: none"> * Process/Project management * Organizing for change
Improve	<ul style="list-style-type: none"> * Large/Medium company * Top/Middle management 	<ul style="list-style-type: none"> * Knowledge capture and diffusion * Continued learning and training

Table 5

ISTC as Catalyst

Competitive advantages are ultimately created through the efforts of individual companies. This does not mean, however, that the government is powerless in improving the competitive position of companies. We believe the government can play an important role in alerting industries to emerging competitive issues and urging them into action.

One of the best ways ISTC can stimulate the adoption of TQM and other productivity improvement methods is by providing relevant information to industry. The results of this survey suggest that many companies in the industry need practical information on both the planning and implementation aspects of TQM. Although there is much literature in the public domain on TQM, the emphasis is on concepts instead of practical implementation issues. For instance, there are few specifics on how to deal with resistance to change and organizational barriers. Also, discussions tend to focus on TQM's elements without providing a holistic framework that ties the elements together. We believe companies would benefit from practical guidelines on how to assess where they stand, the industry-specific issues they should consider, and the alternatives they face in starting TQM. Information such as this will help companies avoid pitfalls and achieve significant results more readily. In the next section we will examine in more detail the information requirements of the industry.

TQM Adoption Model

To give a glimpse of the type of information the government might provide, we have developed a model of TQM adoption. This model, shown in Table 4, depicts five stages

of TQM adoption from understanding to improvement. For each stage, we have listed some of the questions a company might ask in determining how to proceed.

Since the overall level of TQM implementation within the industry is still limited, we believe that ISTC should focus on the first two stages. This would be of particular relevance for some of the smaller companies as well as service oriented firms. ISTC should target top management at these companies since they are in the best position to initiate fundamental changes required by TQM.

For companies that have already started or are on the verge of implementing TQM, their interest would most likely be in planning, implementing, and improving. The target audience should include both top and middle management. We believe the emphasis here should be on planning since both survey results and company interviews indicate that this is an area that needs major improvement.

One of the most pressing planning issues of TQM is change management. A majority of the people we interviewed cited resistance to change and organizational issues as major impediments to achieving better operational results. We also think there should be more emphasis on the linkage between performance goals and TQM activities. To do this, companies need a more balanced implementation framework that emphasizes both human resource issues and systemic improvements of the business process architecture.

Table 5 identifies the primary audience and key topics in relation to the TQM adoption stages.

Information Development and Dissemination

So far we have only discussed what information ISTC may provide but not how it is to be provided. In this section we discuss mechanisms ISTC may use to develop and disseminate this information.

Information Development. The main mechanisms for developing TQM information are surveys and special studies. Surveys can be very cost effective in providing answers to specific questions concerning a large number of companies or industries. They are also useful when conducted longitudinally to reveal trends and development within the industry. The main disadvantage with surveys lies in the difficulty to get in-depth information. It is often difficult to get an in-depth understanding of a situation without asking open-ended and probing questions that are ill-suited for questionnaires.

Special studies can provide much more depth than surveys. As well, there are simply issues, such as how to manage change, that cannot be answered satisfactorily through surveys alone. Studies, however, are not without their disadvantages. They generally cost more and may need inputs from surveys anyway in order to support their conclusions. It is not feasible to discuss all the potential topics for surveys and studies within this report. But as a starting point, we have listed a number of topics that we think would be of value to the industry based on our discussion of the TQM adoption model in an earlier section:

- ☐ Longitudinal surveys on the status of TQM implementation over time
- ☐ Surveys on international benchmarks of key performance indicators

- ☐ Case studies on how companies manage change
- ☐ Case studies on how small companies and service companies implement TQM and other productivity improvements
- ☐ Special study on industry-specific best practices and improvement techniques

Information Dissemination. Seminars, workshops, focus groups, and training courses are the most direct means of dissemination. With these methods, information can be adapted dynamically and interactively depending on the needs of a specific audience. This form of delivery, however, has its limits in terms of number of people it can reach. To maximize effectiveness, ISTC should leverage this form of delivery as much as possible. For example, a train-the-trainer approach would circumvent the problem of reach to some extent. Also, by judiciously focusing on a certain level of management or a certain tier within the industry, the impact per dollar spent can be maximized.

Based on our survey results, there is substantial interest in seminars in the TQM area. We think the following topics should be considered:

- ☐ TQM and Aerospace Competitiveness: Success Factors and Pitfalls
- ☐ How to Implement TQM in a Small Company
- ☐ Managing Change in a TQM environment
- ☐ How to achieve World Class Results through TQM

- ❑ Best Practices and Techniques in Aerospace Design and Manufacturing
- ❑ TQM Case Studies of U.S., Canadian, and Overseas companies

Part of the information needed for these seminars may come from studies or surveys sponsored by ISTC or the AIAC.

Publications are another means of information dissemination. They tend to be more reusable and less restricted in terms of time and place of delivery. Of course, distribution and ease of use are critical to their effectiveness.

As in the case of seminars and workshops, publications should be aimed at providing a comprehensive, objective treatment of relevant topics that are not readily available from other sources. Since there are so many schools of thought within the TQM community, we think a Planning and Implementation Guide would be helpful in sorting out the options facing companies today.

Publications would also be useful in documenting results and highlights of studies, surveys, as well as conclusions and key points of focus group and workshop sessions.

Newsletters and bulletins are effective means to inform people of current industry issues, publications, upcoming events and government sponsored activities. They tend to be relatively inexpensive and can be produced and distributed within a very short time. We recommend the continued use of TQM bulletins to act as a channel of communication. It would be worthwhile to expand the bulletin into a newsletter so that relevant articles and real life cases can be incorporated.

Other Information Services

One way to make information more accessible to the industry is to have an information help desk to which inquiries on TQM related materials, activities, federal or provincial initiatives, etc. can be directed. The establishment of a TQM reference library would be a positive step in this direction.

Another service ISTC may want to consider is to have representatives provide advice and information to small companies who are interested in implementing TQM. Since this would require a substantial commitment in people and training, a careful analysis of industry demand and costs must be conducted before launching.

Quality of Information

To ensure the information provided is relevant and useful, ISTC should actively solicit input from industry. In cases where ISTC lacks expertise to develop the information required, external assistance would be necessary. MITI of Japan, for example, routinely recruits the brightest minds in the country to conduct studies and research into industry matters. This raises the profile of these efforts and encourages industries to pay attention to their results and conclusions.

Beyond Information

There are a number of initiatives ISTC can pursue beyond providing information. These include increased networking with industry associations, quality/productivity societies, colleges and universities. There is also a need to coordinate TQM initiatives with provincial governments in order to minimize overlap and increase synergies.

Since there is such a strong need for training within the industry, universities or colleges should be encouraged to provide training on specific quality skills to help alleviate the burden. Also, large companies who have started TQM should be encouraged to either offer training to their suppliers directly or sponsor it through public education channels.

Next Steps

The discussions provided in this report are necessarily brief given the scope of this project. We feel, however, there is enough information contained within this report to serve as a starting point for planning the next wave of initiatives.

The following are steps we think ISTC should consider in developing its future TQM initiatives:

- ☐ Confirm industry needs by soliciting input.
- ☐ Determine what are the most effective mechanisms to meet those needs.
- ☐ Prioritize actions based on budgetary constraints, costs versus benefits.
- ☐ Harmonize TQM activities in the aerospace sector with ISTC's overall TQM strategy.
- ☐ Select projects, set scope and objectives.

Appendix A: Findings for Each Question

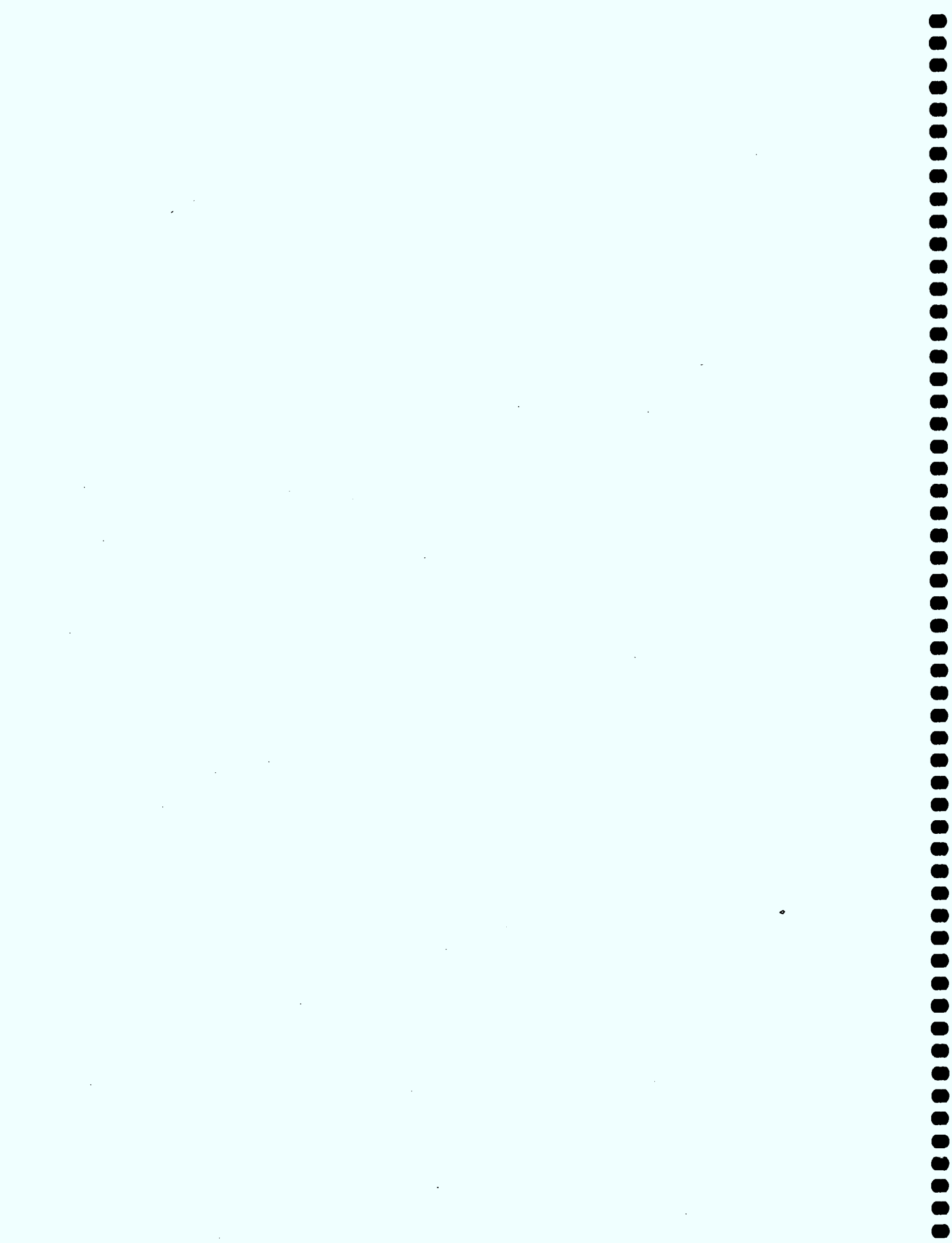
The following section contains the results for each of the questions from the questionnaire. They are presented in the same order as in the questionnaire and are divided into the following sections:

- ☐ Perception of TQM
- ☐ Leadership and Business Planning
- ☐ People and Organization
- ☐ Voice of the Customer
- ☐ Customer Service
- ☐ Product and Process Design
- ☐ Supplier Management
- ☐ Production
- ☐ Your Suggestions for Improvement

Interpreting the Findings

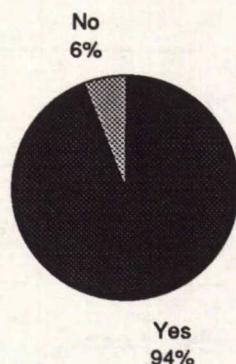
For each question the number of people who responded to the question is identified. For questions where respondents could select more than one response, the total number of responses to the question is also identified.

Most percentages identified in this appendix indicate the percentage of respondents who selected a given response. Exceptions are noted, where they occur. When different categories of companies are compared, percentages indicate the percentage of respondents within each category who selected a given response.



Perception of TQM

1. Before receiving this survey, had you ever heard of the term Total Quality Management (TQM)?

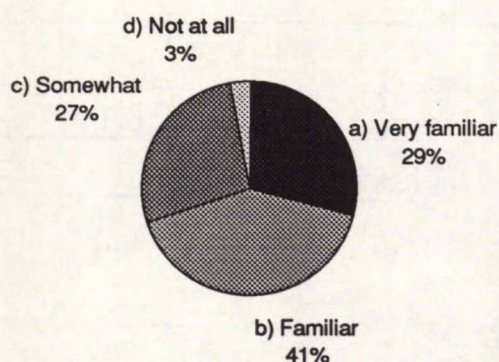


Breakdown by Number of Employees

	0-100	101-500	>500
Yes	87%	100%	100%
No	13%	0%	0%
Respondents	(77)	(46)	(32)

Total Respondents: 156

2. Which of the following most accurately reflects your familiarity with TQM?

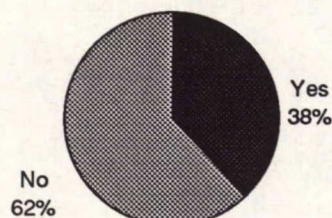


Breakdown by Number of Employees

	0-100	101-500	>500
Very familiar	15%	38%	44%
Familiar	43%	38%	41%
Somewhat	37%	24%	12%
Not at all	5%	0%	3%
Respondents	(65)	(45)	(32)

Total Respondents: 143

3. Does your company have a formal TQM process in place?



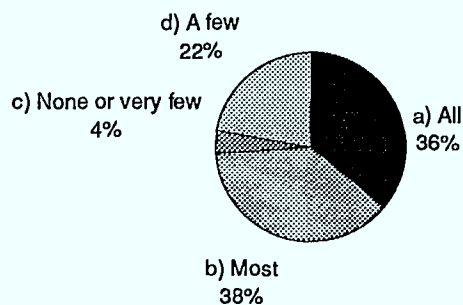
Breakdown by Number of Employees

	0-100	101-500	>500
Yes	27%	39%	62%
No	73%	61%	38%
Respondents	(59)	(44)	(26)

Total Respondents: 130

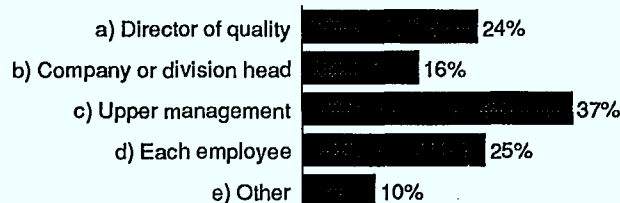
	Respondents	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	x Don't Know
4. TQM is very important to the long term competitiveness of my company.	141	62%	27%	7%	1%	1%	2%
5. TQM's benefits far outweigh the costs of implementation.	140	33%	42%	16%	3%	-	6%
6. TQM is too general and vague to be effective in bringing about concrete actions and results.	140	1%	5%	14%	46%	29%	6%
7. TQM takes too long to yield substantial benefits.	139	1%	3%	23%	47%	17%	9%
8. Well-managed companies will continue to be successful with or without the implementation of TQM.	139	4%	17%	30%	31%	15%	3%
9. Improved quality leads to cost reduction.	156	54%	40%	2%	3%	1%	-
10. Improved quality leads to greater profits.	154	52%	38%	5%	3%	1%	1%

11. My company has ongoing quality or productivity improvement activities in _____ business areas.



Respondents: 152

12. In your company, who is primarily responsible for the implementation of improvement activities.

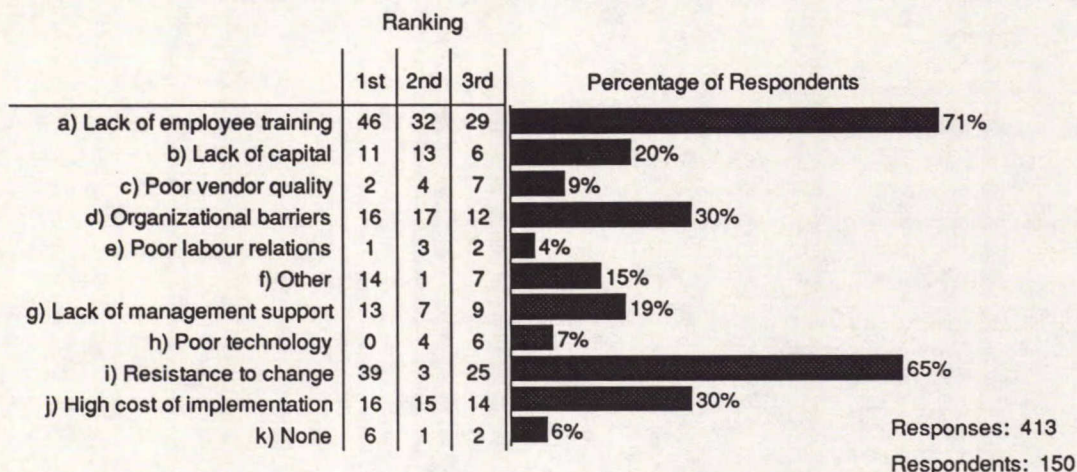


Percentage of Respondents

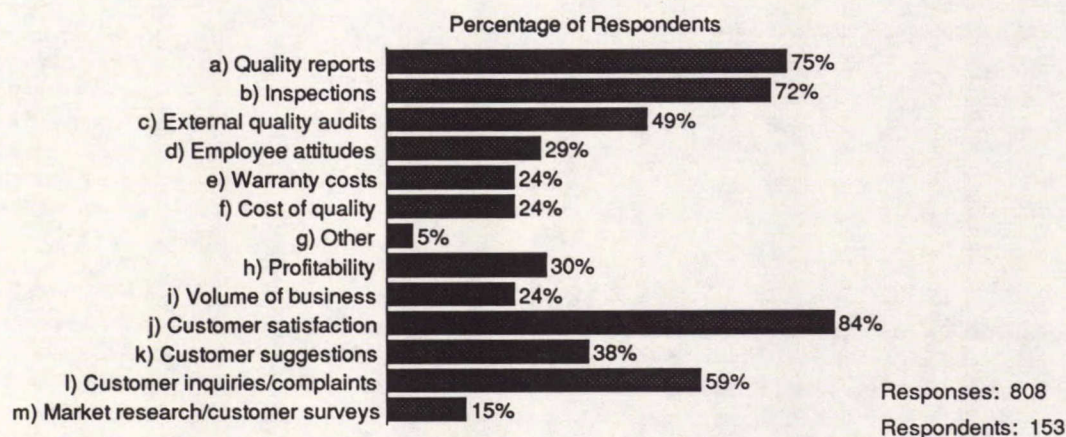
Responses: 170
Respondents: 153

Perception of TQM

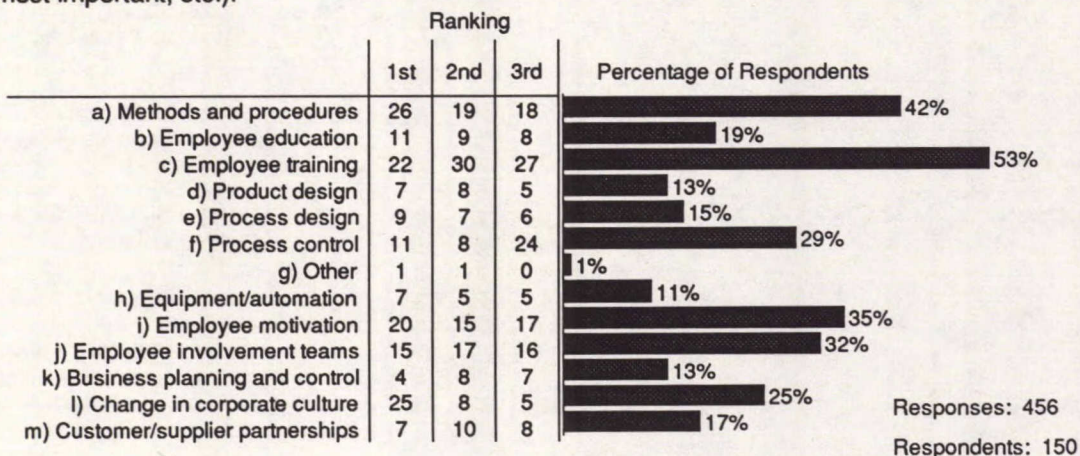
13. Select and rank the top 3 challenges to improving quality at your company,
(Where 1 is the most important, 2 is the next most important, etc.)



14. Which of the following do you use to assess the quality of your products or services?



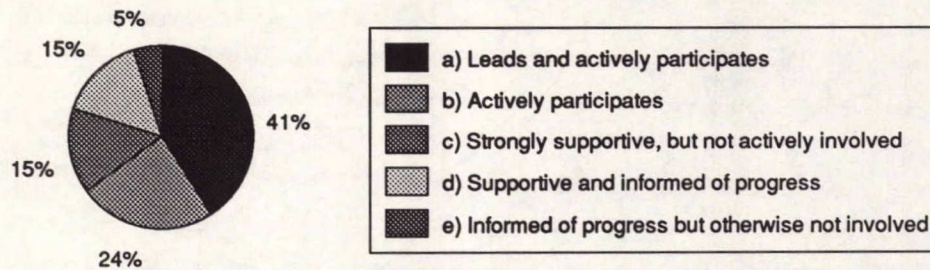
15. Select and rank the 3 factors you believe would have the greatest impact in improving the quality of your company's products and services (where 1 is the most important, 2 the next most important, etc.).





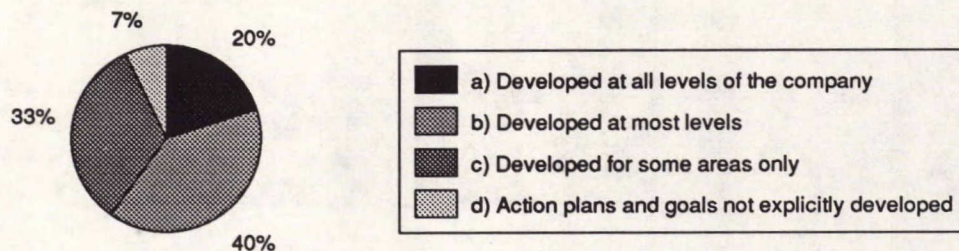
Leadership and Business Planning

1. Which of the following most accurately reflects senior management's involvement in the ongoing improvement of products and/or services at your company or division?



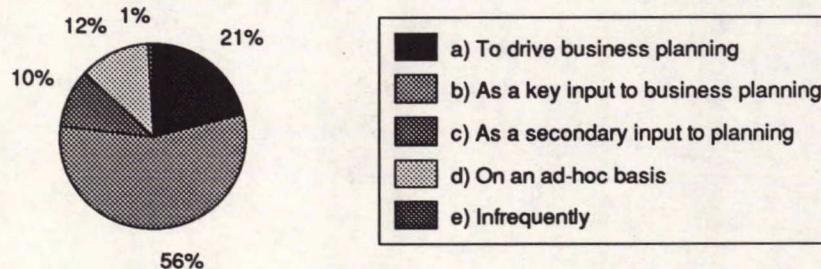
Respondents: 155

2. Which of the following most accurately describes the development of action plans and goals in your business planning process?



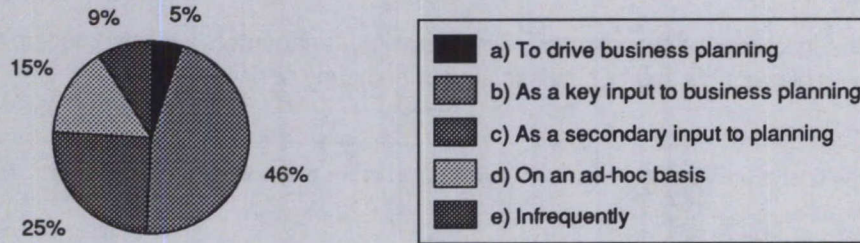
Total Respondents: 154

3. How is customer information used by your company?



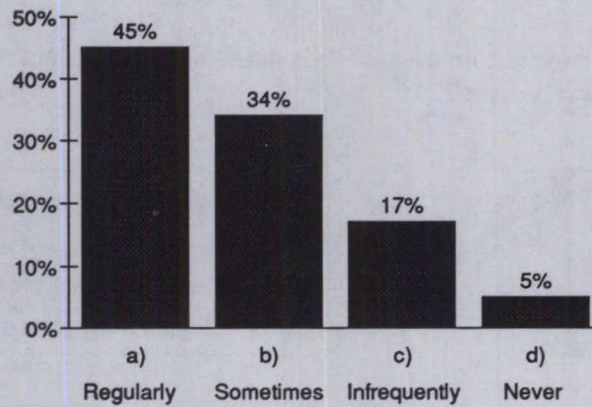
Respondents: 154

4. How is competitor information used by your company?



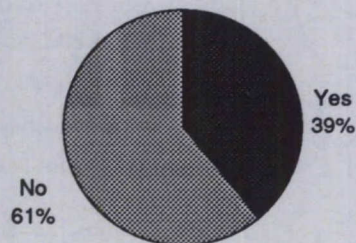
Respondents: 154

5. How often does senior management communicate improvement goals and results to all company employees?



Respondents: 155

6. Does your company regularly measure and report on the cost of quality?



Total Respondents: 153

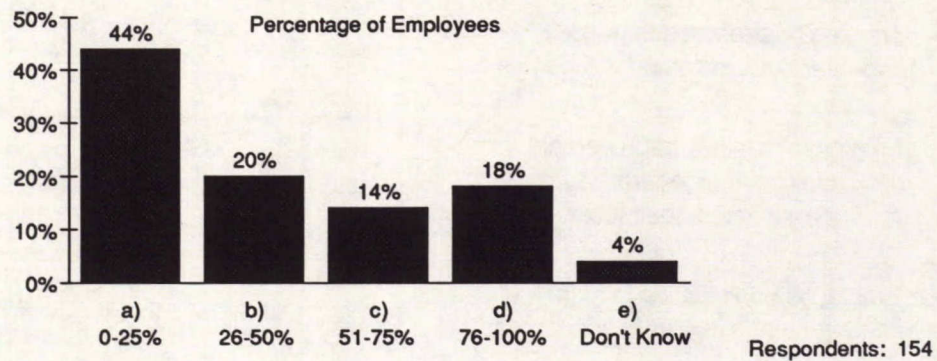
Leadership and Business Planning

	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	x Don't Know
7. Continuous improvement of business activities receives as high a priority from senior management as short term profits and schedules.	155 28%	42%	14%	13%	3%	1%
8. Business plans are developed using a cross-functional approach that involves different departments concurrently.	154 24%	52%	14%	7%	1%	1%
9. Actively pursues partnerships with customers.	155 40%	37%	17%	3%	1%	1%
10. Actively involves customers in developing business plans.	154 16%	38%	28%	15%	1%	2%
11. Regularly obtains input and feedback from suppliers for business planning.	155 12%	38%	30%	15%	3%	2%
12. Regularly measures the impact of improvement activities on operational performance.	155 18%	41%	22%	17%	1%	1%

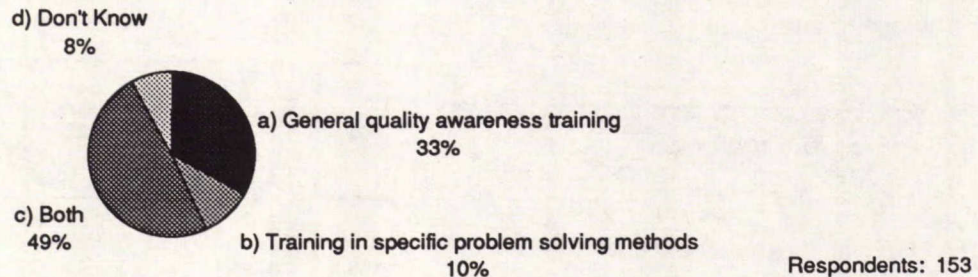


People and Organization

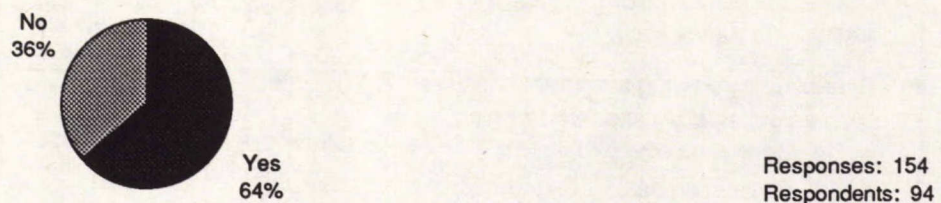
1. What percentage of your company's employees have received quality-related training?



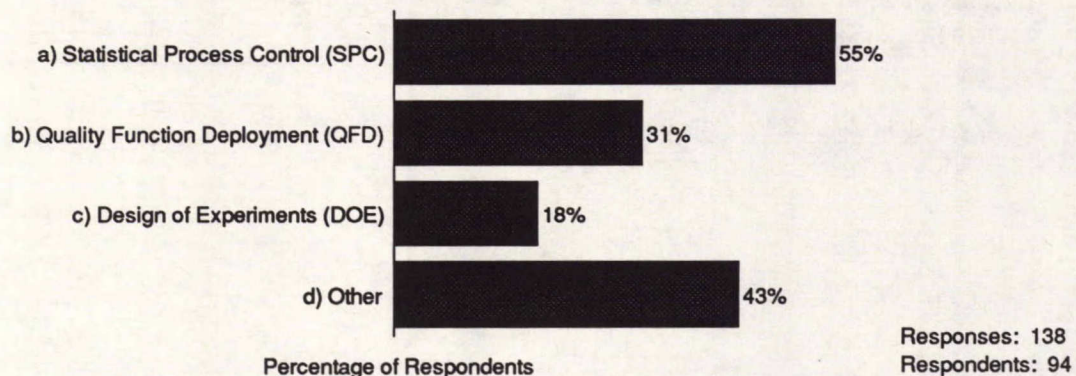
2. What type of quality-related training is your company planning for the next 1-2 years?



3. Does your company plan to use external sources for training in the next 1-2 years?



If yes, for which types of training do you plan to use these sources

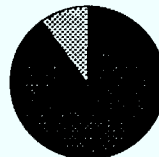


Total Quality Management Survey

	Respon- dents	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	x Don't Know
4. Training has resulted in major improvements in business activities.	155	19	50	23	5	-	4
5. Employees identify improvement opportunities and generate solutions as a normal part of their jobs.	155	19	54	15	12	1	-
6. Employee participation in team improvement activities is widespread.	155	9	35	31	22	3	-
7. Team improvement activities regularly involve employees from different departments.	155	15	43	23	15	4	-
8. Employee contributions to improvements are regularly recognized.	155	15	44	28	8	5	-
9. Each employee is held accountable for the quality of his/her own work.	155	32	41	15	8	3	-
10. Frontline employees have the authority to take corrective actions regarding their day to day activities.	153	22	48	14	12	3	1
11. Employee well-being and morale issues such as satisfaction and ergonomics are regularly reviewed as input to improvement activities.	155	16	41	26	13	3	1
12. Employees formally identify their internal customers and review their requirements jointly.	152	8	25	36	26	3	1

13a. Do you actively solicit suggestions and feedback from employees?

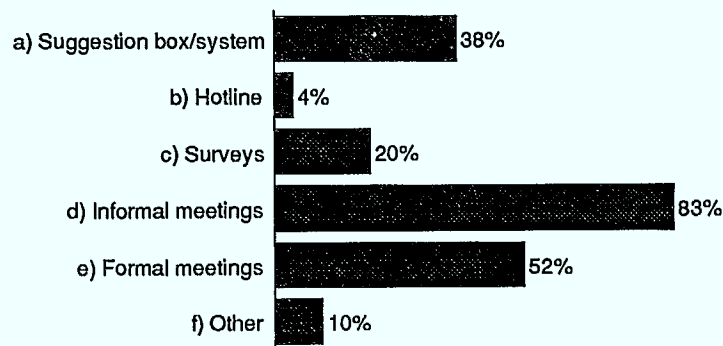
No 10%



Yes 90%

Respondents: 155

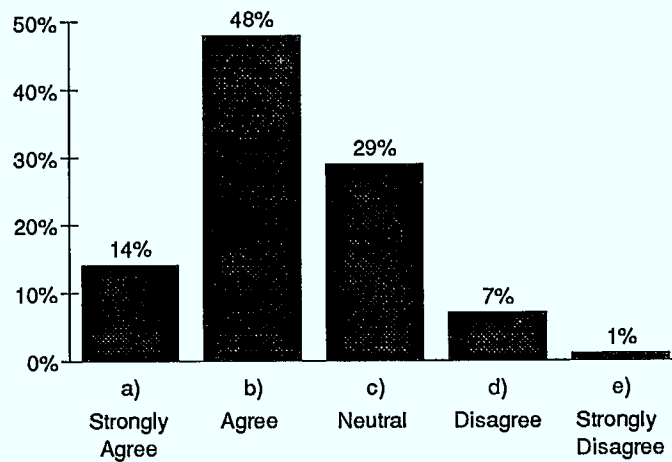
13b. If yes, what mechanisms do you use to solicit this information?



Responses: 287
Respondents: 139

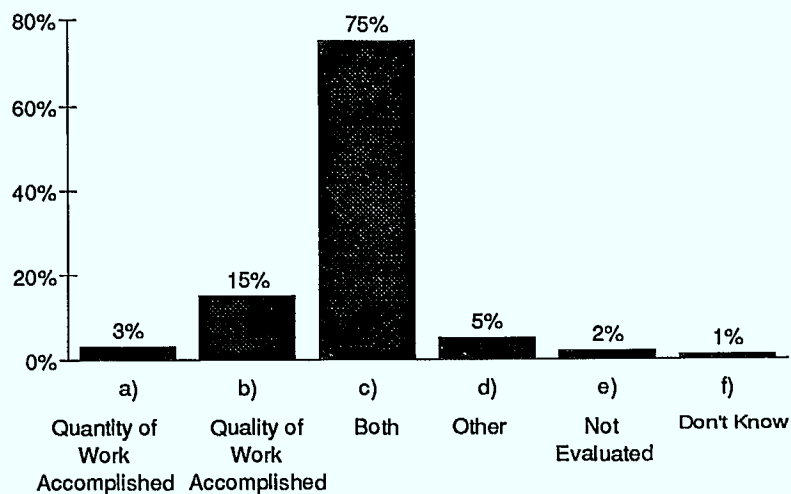
Percentage of Respondents

14. Indicate your level of agreement with the following statement:



Respondents: 152

15. Employees are evaluated primarily on:



Respondents: 153



Voice of the Customer

1. To what extent does your company use the following to determine customer requirements and expectations?

	Respon- dents	a) Always	b) Often	c) Sometimes	d) Never	e) Don't Know
Customer's Specifications	152	131	19	1	1	-
Interviews	144	18	59	51	12	4
Focus Groups	142	5	18	43	64	12
Surveys	142	12	17	56	53	4
Complaint Analysis/Follow-up	148	57	43	35	12	1
Informal Contact	151	45	69	32	3	2
Field Audits	142	20	34	50	31	7
Other	7	3	4	-	-	-

2. As a normal practice, customers are asked to rank the importance of the various features of our company's products and/or services.

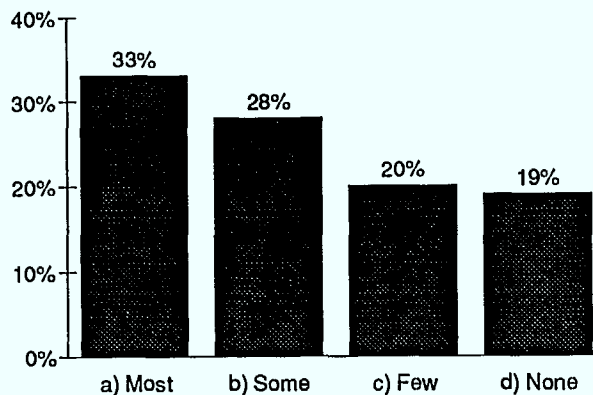
3. As a normal practice, customers are asked to rate the performance of our products and/or services.

4. Customer satisfaction information is regularly fed back to the appropriate person(s) to be acted upon.

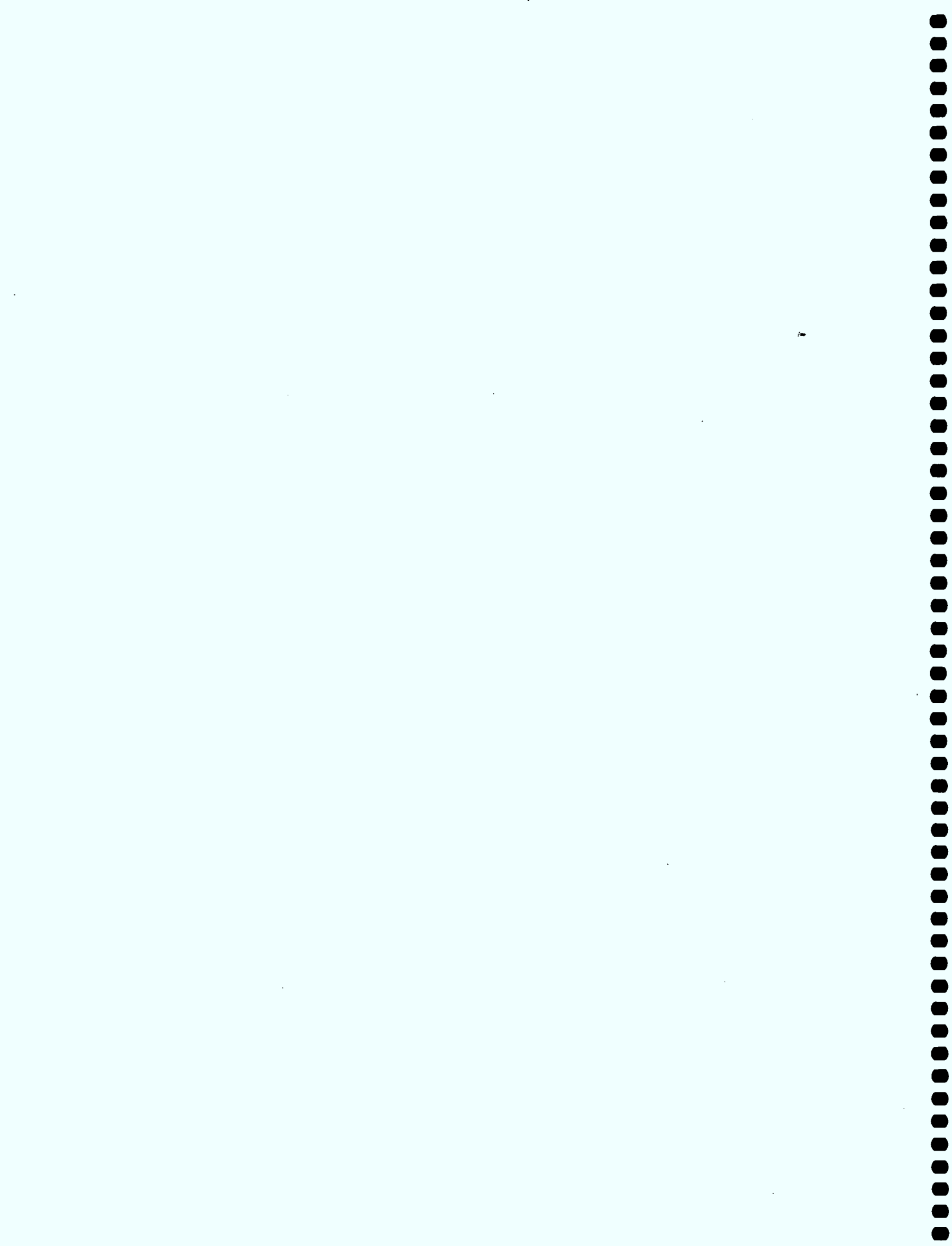
5. Senior executives take time to meet with key customers regularly.

	Respon- dents	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	x Don't Know
2. As a normal practice, customers are asked to rank the importance of the various features of our company's products and/or services.	154	14%	22%	29%	26%	6%	3%
3. As a normal practice, customers are asked to rate the performance of our products and/or services.	155	22%	36%	19%	17%	4%	2%
4. Customer satisfaction information is regularly fed back to the appropriate person(s) to be acted upon.	154	31%	48%	16%	5%	1%	1%
5. Senior executives take time to meet with key customers regularly.	154	51%	38%	8%	3%	-	1%

6. How many of your customers encourage your organization to adopt TQM?



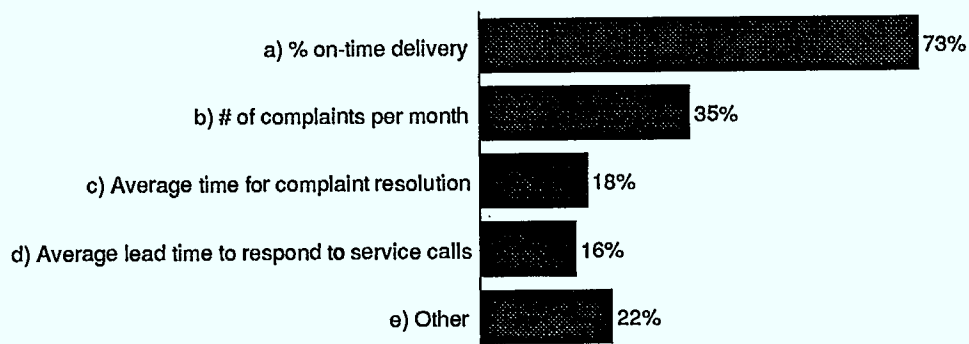
Respondents: 149



Customer Service

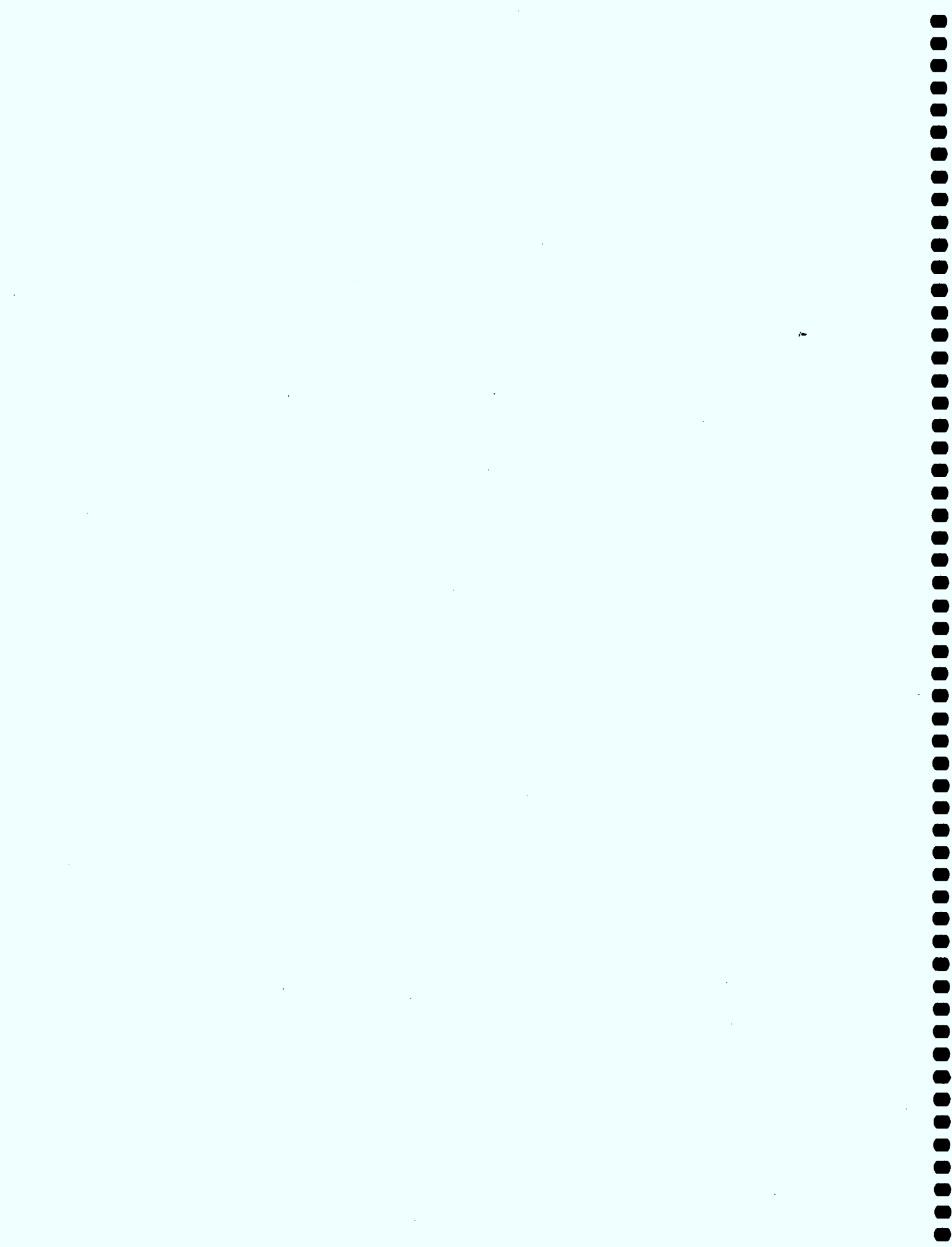
	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	x Don't Know
1. Our company has a process in place to handle all customer complaints.	153 34%	41%	17%	7%	-	1%
2. Our company responds quickly and effectively to all customer inquiries and requests for assistance.	154 38%	47%	13%	30%	-	-
3. Our company objectively and regularly measures customer service quality.	154 16%	33%	30%	14%	6%	1%
4. Our company promptly investigates root causes of service problems and implements solutions.	154 32%	46%	17%	3%	1%	1%
5. We develop specific service plans and targets to meet the unique needs of our customer.	153 29%	39%	20%	7%	3%	3%
6. Our company provides specialized training for all employees who come into direct contact with customers	152 13%	21%	29%	24%	12%	1%

7. Which of the following do you measure to determine the quality of your customer service?



Percentage of Respondents

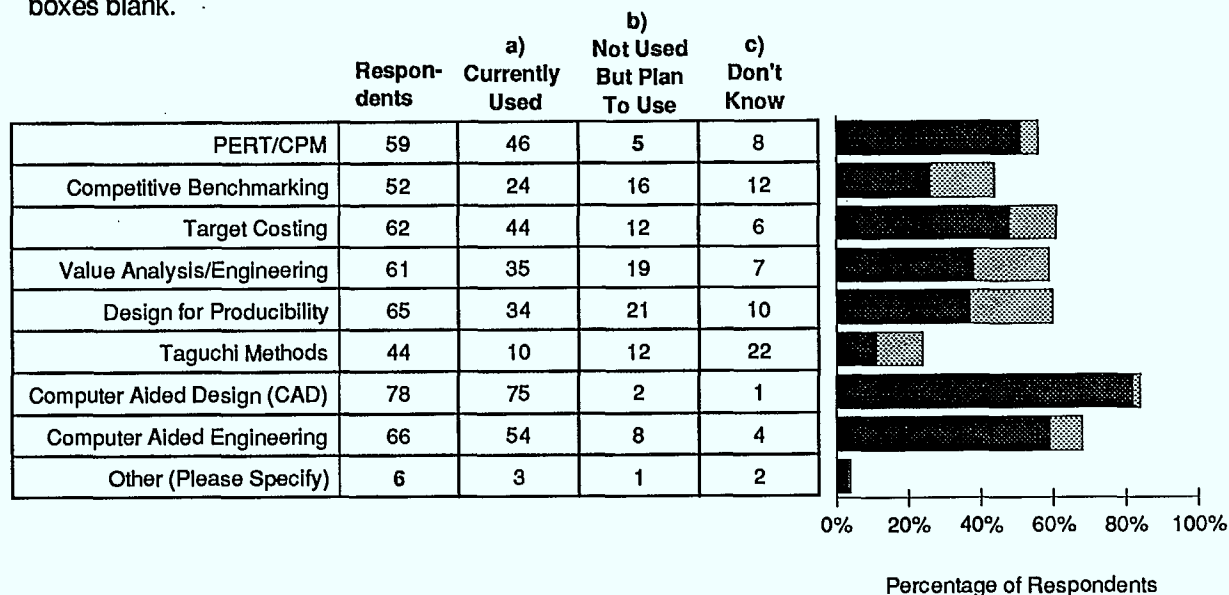
Responses: 242
Respondents: 147



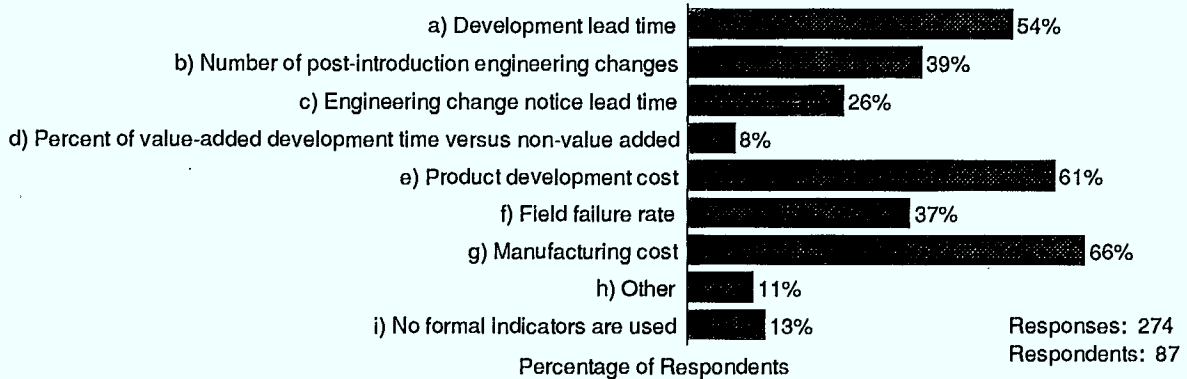
Product and Process Design

	Respon- dents	a) 0-25%	b) 25-50%	c) 51-75%	d) 76-100%	e) Don't Know
1. Products and associated production processes are designed simultaneously as opposed to being done sequentially.	90	29%	22%	20%	23%	6%
2. Suppliers are involved in the product design process.	90	40%	21%	20%	18%	1%
3. Customers are involved in the product design process.	91	9%	14%	24%	49%	3%
4. Engineering, manufacturing, sales/marketing, and other personnel work together in cross-functional design teams.	90	19%	12%	24%	43%	1%

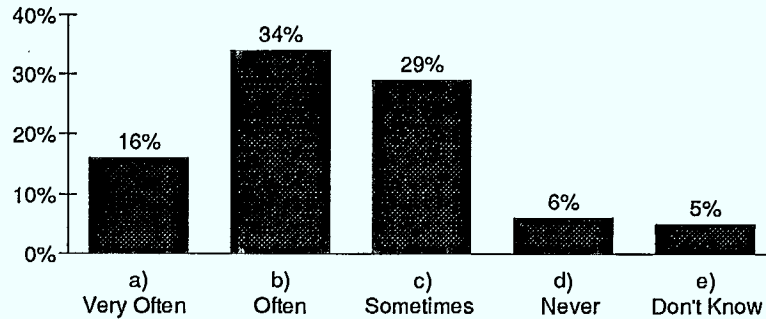
5. Check the design tools your company currently uses and indicate those you are planning to use in the future. If you do not use a particular tool, nor plan to use it in the future, leave all boxes blank.



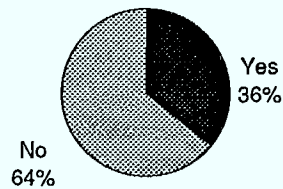
6. Which of the following indicators do you regularly use to monitor design productivity and quality?



7. How frequently are the indicators of design productivity and quality reviewed and used to improve the design process?

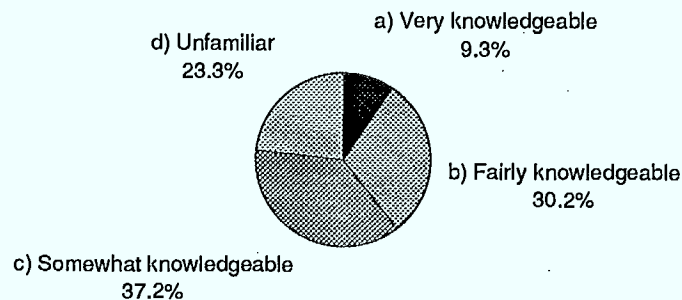


8. Before receiving this questionnaire, had you ever heard of Quality Function Deployment (QFD)?



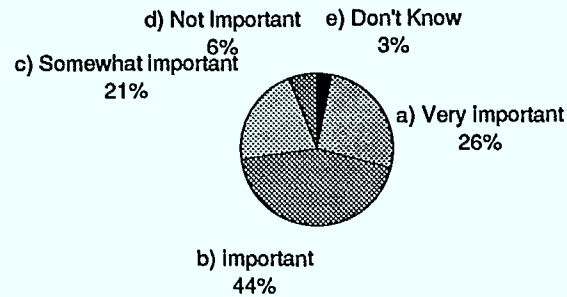
Respondents: 94

9. How familiar are you with QFD?



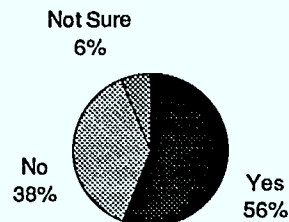
Respondents: 43

10. How important do you think QFD is in improving product and process design?



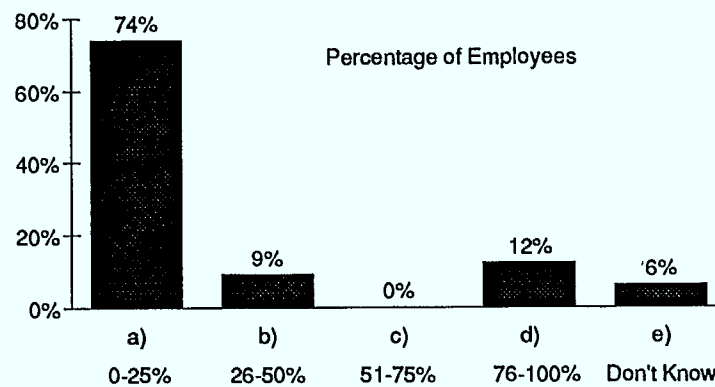
Respondents: 34

11. Is QFD or similar principles currently used in your design process?



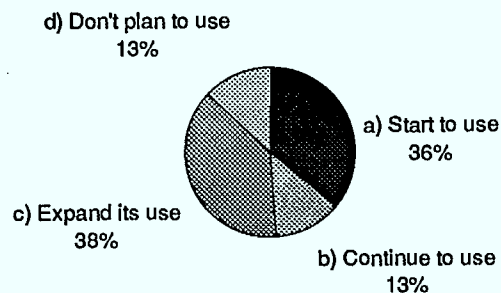
Respondents: 34

12. What percentage of employees involved with design have received QFD training?



Respondents: 34

13. What are your plans regarding the future use of QFD or similar principles?









Respondents: 32



Supplier Management

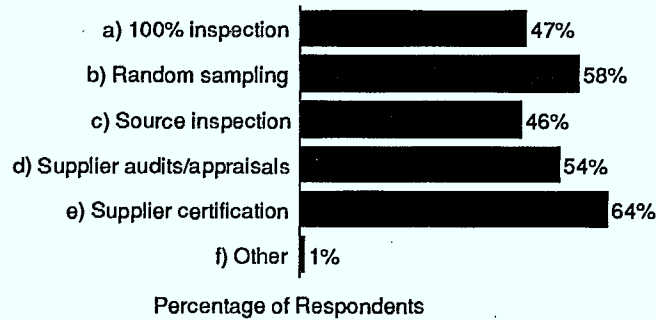
	Respon- dents	1 Strongly Agree	2 Agree	3 Neutral	4 Disagree	5 Strongly Disagree	x Don't Know
1. Our organization pursues long-term relationships with suppliers.	137	47%	41%	9%	2%	1%	-
2. Our company provides regular feedback to suppliers.	137	26%	52%	15%	7%	-	-
3. Our company encourages and assists our suppliers to use Total Quality Management (TQM) or other process improvement techniques.	137	14%	28%	27%	26%	5%	-

4. Select and rank the top 3 criteria your company uses for selecting suppliers.

	Ranking			Percentage of Respondents	
	1st	2nd	3rd		
a) Cost	66	32	37		99%
b) Quality	73	43	15		96%
c) Delivery performance	13	50	64		93%
d) Proximity to plant	0	1	4		4%
e) After sales service	1	2	6		7%
f) Other	3	0	0		2%

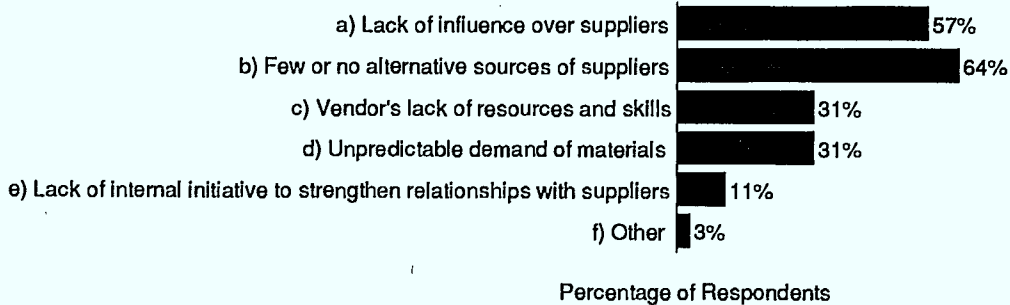
Responses: 410
Respondents: 137

5. Which of the following does your company use to ensure the quality of your suppliers' product or services?



Responses: 363
Respondents: 134

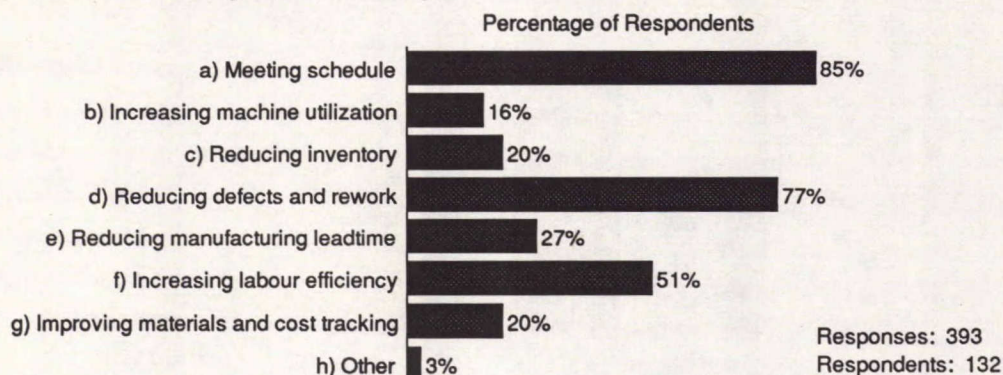
6. Which of the following do you see to be the key obstacles to improving the performance of your company's suppliers?



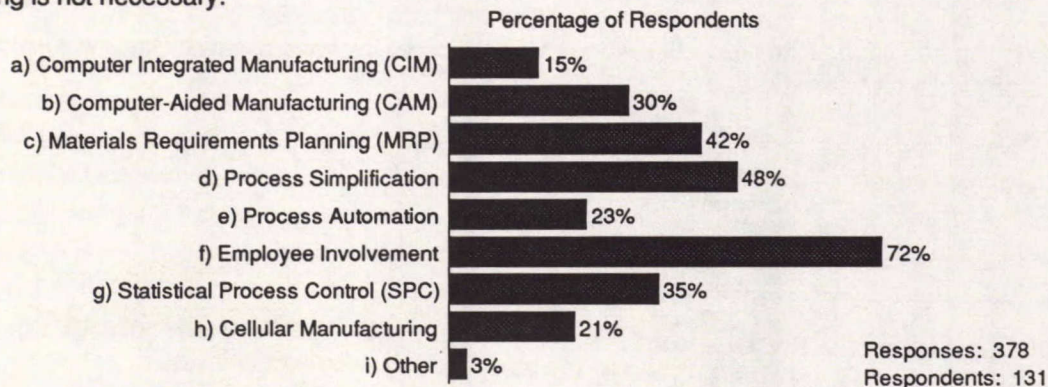
Responses: 249
Respondents: 126

Production

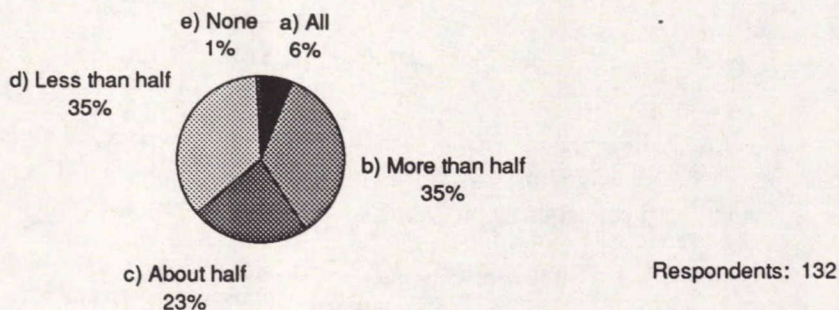
1. Which of the following would you consider to be the top 3 production priorities at your company or division? Ranking is not necessary.



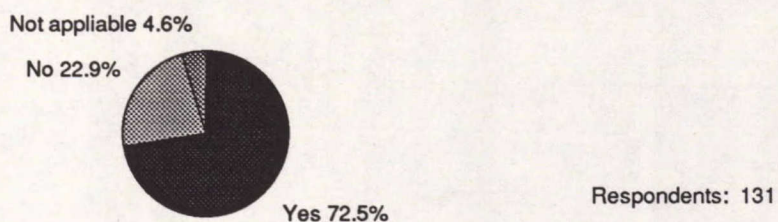
2. Indicate the 3 key approaches for improving manufacturing productivity at your company. Ranking is not necessary.



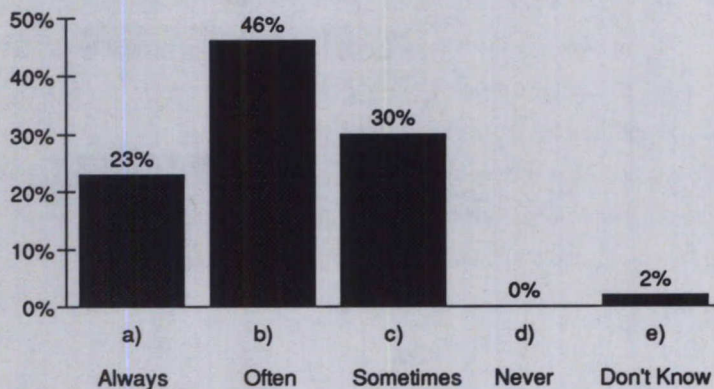
3. To what extent are employees in your manufacturing facilities multi-skilled? (eg. trained to operate different types of machines)



4. Do production workers at your company have the authority to stop production in order to investigate or correct quality problems?

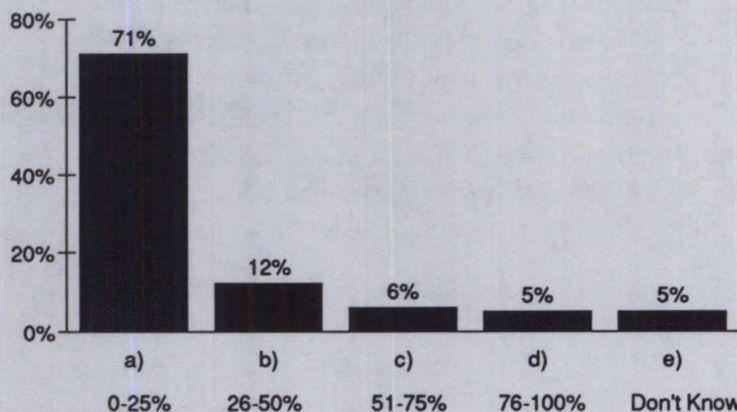


5. To what extent are quality problems identified immediately after they occur as opposed to later on in the process?



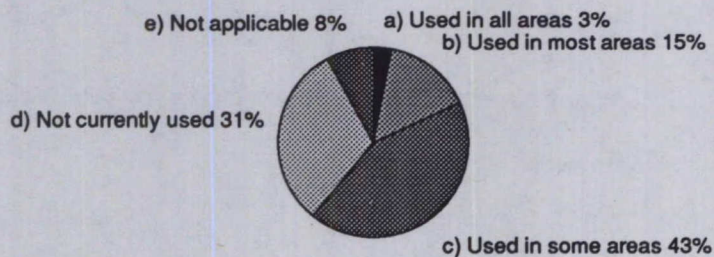
Respondents: 132

6. What percentage of the production workers in your company have received Statistical Process Control (SPC) training?



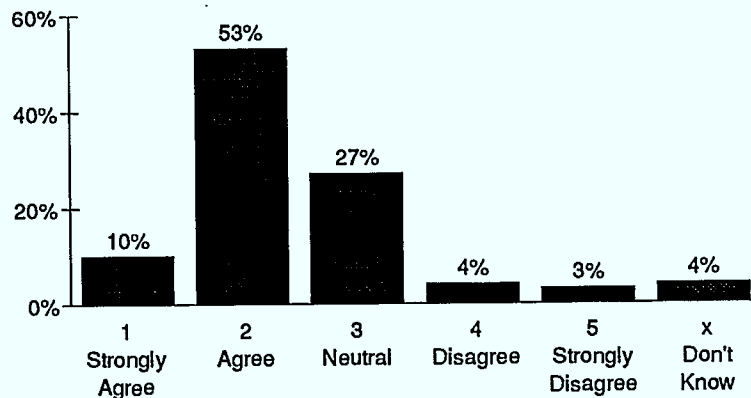
Respondents: 131

7. Which of the following best describes your company's current use of SPC methods to investigate and solve quality problems?



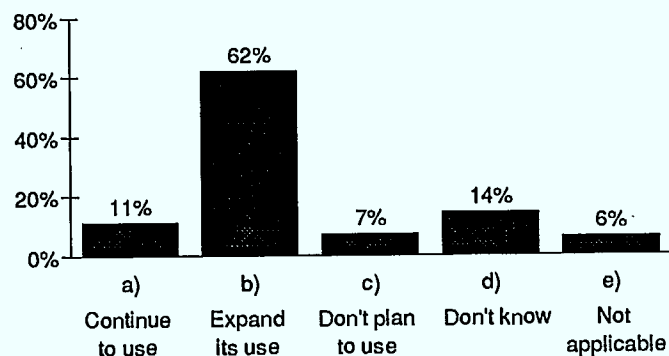
Respondents: 131

8. Indicate your agreement with the following statement, "SPC has resulted in significant benefits for my company."



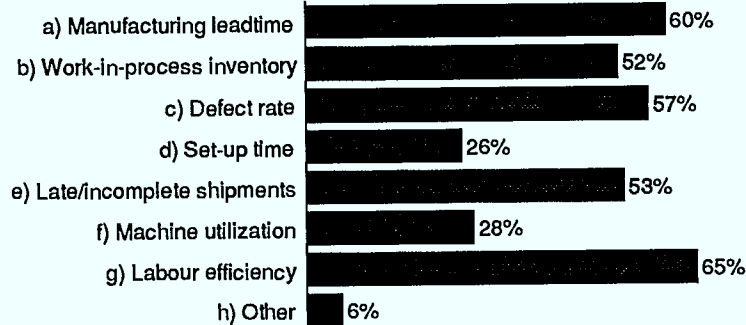
Respondents: 79

9. What are your plans regarding the future use of SPC?



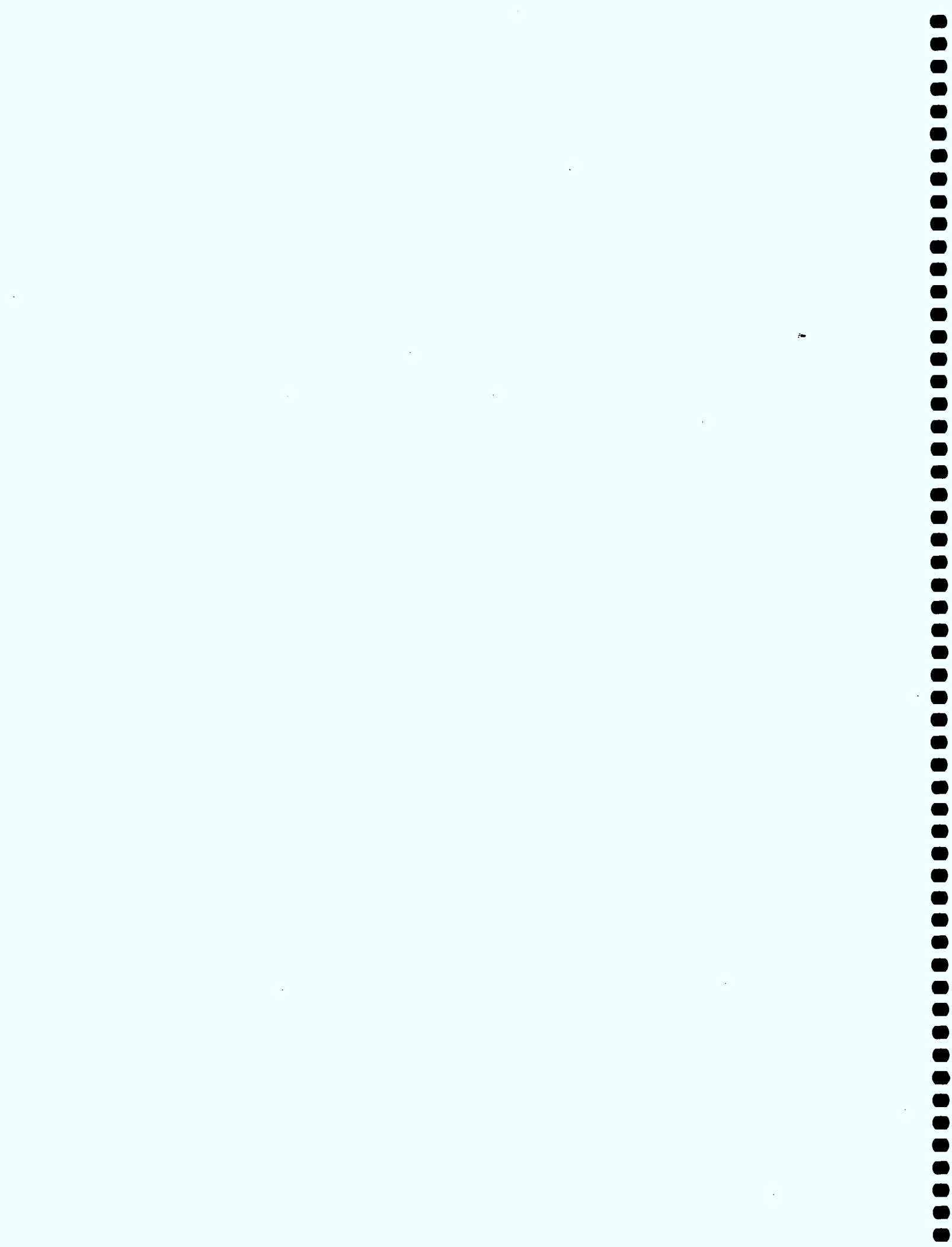
Respondents: 127

10. Check the productivity indicators your company currently uses.



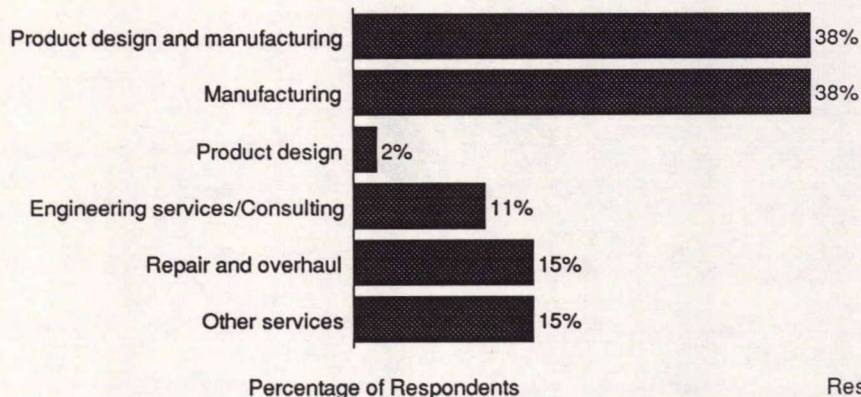
Percentage of Respondents

Responses: 450
Respondents: 129



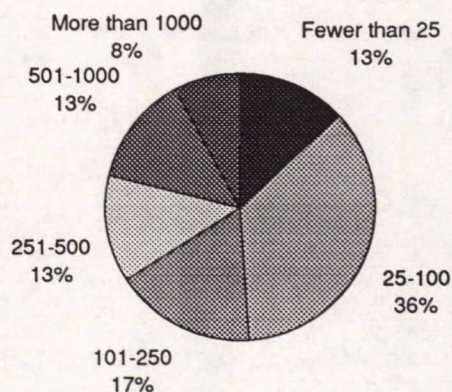
Company Statistics

1. Check the category that best reflects your company's/division's primary area of business.



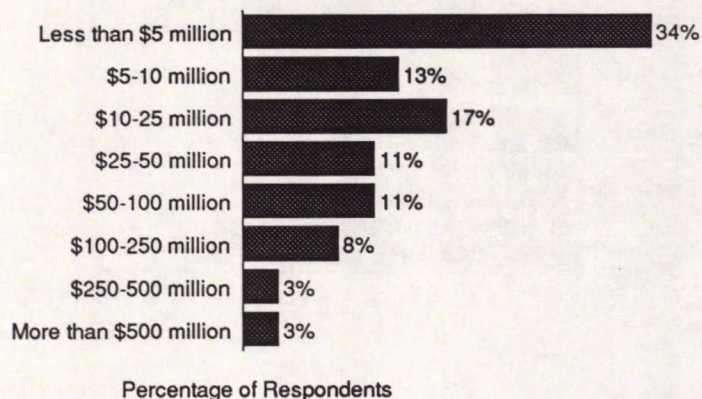
Responses: 187
Respondents: 157

2. Indicate the total number of employees at your company/division.



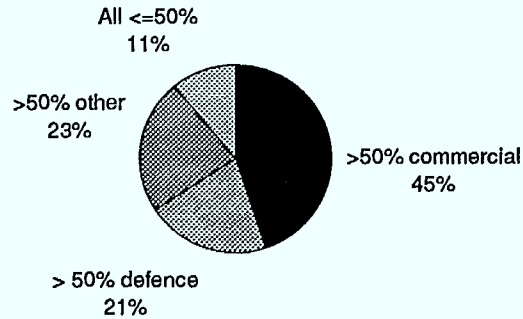
Respondents: 155

3. Indicate total annual revenue for your company/division.



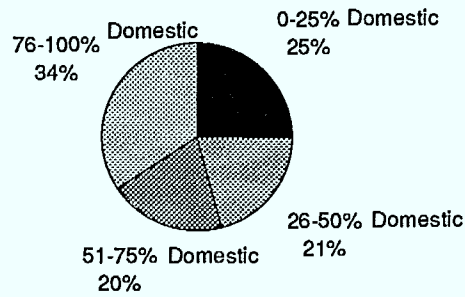
Respondents: 152

4. Estimate the percent of your company's/division's sales in each of the following categories



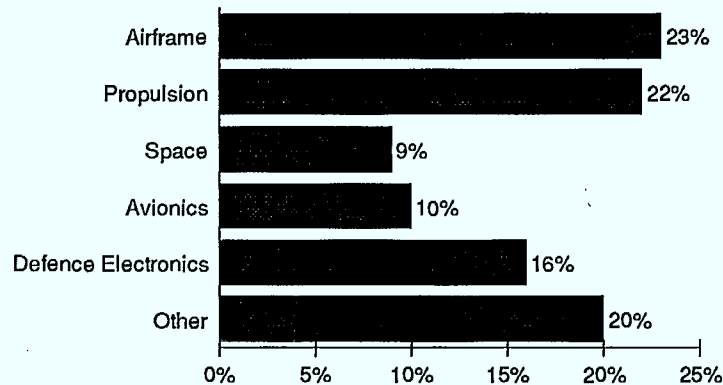
Respondents: 141

5. What percentage of your company's/division's sales are domestic



Respondents: 151

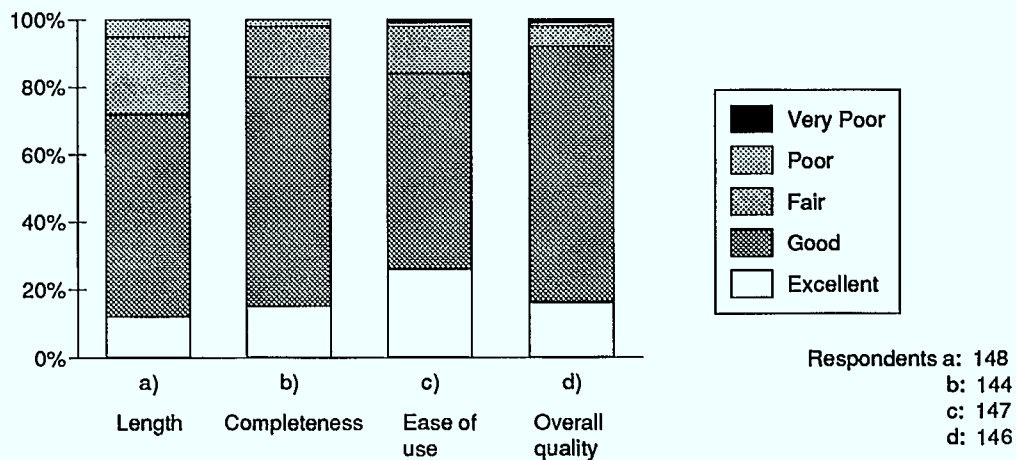
6. In which of the following sub-sectors does your company/division do the majority of its business?



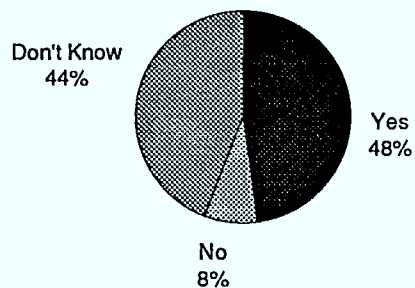
Responses: 221
Respondents: 153

Your Suggestions for Improvement

1. How would you rate this questionnaire on each of the following?



3. Do you believe that ISTC or AIAC can make valuable contribution to your company's efforts to implement TQM?



Respondents: 147



Appendix B: Sampling Tolerances

Since there are companies within the aerospace sector who did not respond to this survey, the results in this report are subject to sampling error. To assist the reader in estimating the sampling error of the percentages in this report, Table A is provided below.

**Recommended Allowance for Sampling Error
of a Percentage in Percentage Points at 95% Confidence
Level**

Sample Size

% Near	150	100	75	50	30
10%	5	6	7	8	11
20%	6	8	9	11	14
30%	7	9	10	13	16
40%	8	10	11	14	18
50%	8	10	11	14	18
60%	8	10	11	14	18
70%	7	9	10	13	16
80%	6	8	9	11	14
90%	5	6	7	8	11

Table A

The following example illustrates how Table A can be used. Suppose a reported percentage is 42 for a group consisting of 100 respondents. We would go to the row labelled "near 40%", and then go across to the column labelled "100". We find the number 10. This means that the result of 42% is subject to a sampling error of plus or minus 10%.

HD62.15/.A5
Andersen Consulting.
Canadian aerospace
industry : total quality
BGYT c. 2 aa ISTC

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