

REVIEW OF THE USE OF DIAGNOSTIC TOOLS

***To Assess SMEs
Technology Capabilities***

INDUSTRY CANADA

MARCH 1996

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TO ASSESS SME TECHNOLOGY CAPABILITIES

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PURPOSE OF THE REVIEW

- * Share with members of the APEC SME policy level group Canada's experience in using diagnostic tools;
- * Provide information on different kinds of diagnostic tools, the level of information they capture, the experience and results in Canada, the experience in the ASEAN - Singapore, Malaysia and Thailand projects as well as the demonstration project using a performance benchmarking tool to develop management training profiles for participating SMEs.

BACKGROUND

In its search of growth tools for SMEs, Industry Canada met with the Saskatchewan and the Alberta Research Councils who had been using diagnostic tools for a number of years to assist technology adoption by SMEs, to assess company operations and recommend improvements.

The Saskatchewan and Alberta Research Councils are members of the Association of Provincial Research Organizations. Their mandate is to help the businesses of their respective province to develop a viable economy with quality jobs and a secure environment. They achieve this mandate through research, development and transfer of innovative scientific and technological solutions, applications and services.

The Saskatchewan Research Council's Diagnostic Tools

The Saskatchewan Research Council (SRC) developed its "*Total Company Assessment*" diagnostic tool which was used in research projects in three ASEAN countries - Malaysia (1987-1988), Singapore (1991-1992) and Thailand (1993-1994). All of these projects were related to technology adoption by SMEs.

Objective:

The objective of the research projects was to enable SMEs to access, adopt and use technologies to enhance their viability and competitiveness by developing effective linkages between themselves and organizations responsible for technology development, technology dissemination and assistance.

The "*Total Company Assessment*" diagnostic tool provides the following information:

- a description of the company;
- a description of the manufacturing processes used by the SME whether it is a plastics manufacturer, a metal fabricator or a food processor;
- an assessment of the SMEs openness to new processes;
- an evaluation of how the SME manages its manufacturing processes including quality control, production and inventory planning and control, plant maintenance and manufacturing management technology;
- a description of the internal and external sources and infrastructures used by the SME to conduct new product development;
- a description of knowledge and skill of the SME's human resource base as well as an assessment of how well the SME manages its human resources;
- an assessment of the marketing techniques used by the SME including sales training, sales forecasting, market research, break-even analysis, market planning, competitive analysis, market share analysis, strategic planning; an assessment of the marketing problems facing the SME; and an assessment of the barriers to new business opportunities;
- an assessment of how the SME manages its financial resources including an analysis of its balance sheet, its liabilities, and its income statement; and
- an assessment of which technology support institutions used the SME.

The Malaysian Research Project

The Malaysian research project was sponsored by the Canadian International Research and Development and performed by the Universiti Pertanian Malaysia, the Institut Teknologi MARA, the University of Saskatchewan and the Saskatchewan Research Council. The research team collected data from 762 SMEs operating in food processing, wood-based products, construction materials and light engineering) located within Peninsular Malaysia.

Using the "*Total Company Assessment*" diagnostic tool during personal interviews, the study was able to obtain information on the state of technological resources available to SMEs, on sources from which they acquire technologies and on the utilization of various known technologies. In addition, the study obtained data on the SMEs awareness of various technology support institutions as well as on their perception of the usefulness of these institutions. The results of this study can be found in Annex 1 of this report.

The Singapore Research Project

The research project in Singapore was conducted by the Singapore Institute of Standards and Industrial Research (SISIR) and the Saskatchewan Research Council (SRC). Personal interviews were conducted with 84 SMEs (out of 927) in the electrical/electronics, precision engineering, plastics, packaging and the food subsectors. The results of this study can be found in Annex 2.

The Thailand Research Project

The Thailand research project, sponsored by the Earth and Engineering Sciences Division of the International Development Research Centre (IDRC), Ottawa, Canada, was a two phase, five-year project designed to develop and test a process by which SMEs can identify and introduce technologies into their operations. *The term "technology" in this project includes machinery and processes used in design and manufacturing as well as the techniques related to manufacturing management, financial management, human resources management and marketing management.*

The first phase of the project resulted in the identification of the components of a test system for improved access and adoption of technology, while the second phase involved the operation test of the system to evaluate the workability of an SME-oriented technology evaluation and delivery system. The operational test involved 50 Thai SMEs, 25 from the garment manufacturing sector and 25 from the textile dyeing and finishing sector.

The results of this project are discussed in the report entitled "*Technology Adoption by Small and Medium Enterprises in Thailand (Phase II)*". The Executive Summary is attached as Annex 3.

Other Uses of the "Total Company Assessment" Diagnostic Tool

In 1988 through 1991, the SRC's Industrial Technology Advisors (ITAs) had as part of their objectives to assess company operations using the "*Total Company Assessment*" diagnostic tool. In 1991, one complete sector study of the Plastics Industry was conducted involving 15 SMEs of the 45 firms in this sector. The results of these efforts has been an official recognition by the Saskatchewan Government of the benefit of Total Company Assessments as a means of improving the rate of technology adoption of firms undergoing the diagnostic. In 1995, the SRC received additional funding under the Saskatchewan government's technology services program to conduct sectoral diagnostic programs in the processing industry and software technology industries.

The Readiness for Change Diagnostic Tool

In 1994, after applying the "*Total Company Assessment*" to over 1200 SMEs in the ASEAN countries and in Canada, the SRC created its "Readiness for Change" diagnostic tool as a predictor of the likelihood of SMEs implementing the recommendations contained in a "*Total Company Assessment*" report.

The "*Readiness for Change*" tool helps the specialist assess a company's readiness for change which is a predictor of its potential for growth. Specifically this diagnostic product assesses:

- * a SME's strategic leadership;
- * its track record for adaptation of new methods, technology, markets, product lines, services, etc; the external factors such as market/supplier shifts, regulatory, quality assurance, impacting on the SME's operation;
- * the internal factors such as labour relations, cash flow, reject rates, down line, impacting of the SME's operations; the SME's current system capabilities (present systems, methods, equipment, space, human and financial resources) for handling challenges and changes that may be required; and company vision.

For more information on the Saskatchewan Research Council diagnostic tools, please contact: Tony Rawa, Vice President, Technology Transfer, 15 Innovation Blvd., Saskatoon, Sask. Canada S7N 2X8. Telephone 306-933-5499; fax 306-933-7896; internet address rawa@src4330.src.sk.ca

The Alberta Research Council's Diagnostic Tool - Manufacturing Assessment Methodology (MAM)

The Alberta Research Council has been using the Manufacturing Assessment Methodology (MAM) in the province of Alberta since 1990. A manufacturing assessment is one major step towards changing a manufacturing operation into a profitable, world-class business.

The MAM is a standardized efficient, low-cost assessment and recommendation procedure. This comprehensive two- to three-week assessment looks at every aspect of a manufacturing plant. The methodology consists of analyzing productivity and making determinations that cover streamlining operation, exploring new technologies and developing human resources. It helps a SME make decisions on specific manufacturing improvement that will increase its industrial and world-class competitiveness. MAM provides a road map and implementation plan to lead the SME from where it is today (relative to other North American companies of like size, products, industry, sales, human resources and level of activity) to where it wants to be.

For more information regarding the Alberta Research Council's diagnostic tool, please contact: Duke du Plessis, Vice President, R & D Operations, Alberta Research Council, 6815 - 8 Street NE, Calgary, Alberta Canada T2E 7H7. Telephone 403-297-2603; fax 403-297-2607; internet address duplessis@arc.ab.ca.

RATIONALE FOR USING DIAGNOSTIC TOOLS

Canadian firms face a turbulent global environment characterized by fiercely-contested markets, trade liberalization, rapid technological change, rising skill needs and demographic shifts.

These profound changes have dramatically altered the business environment and the basis on which firms compete. This means that global competition is putting firms under unprecedented pressure to make significant productivity improvements; and the new knowledge-based economy challenges firms to compete on their ability to produce higher value-added and differentiated goods and services and to take these to market faster than others.

The old approaches to productivity improvements and economic success are increasingly proving to be inadequate to deal with the new world:

- * the "new" managers must, above all, think globally and benchmark themselves against the global competition;
- * they must often introduce far-reaching qualitative changes in key traditional areas (e.g., production planning and processes, exporting, financing) to become more responsive to international market requirements; and,

- * most importantly, beating the competition requires that they innovate by fully engaging people's intelligence, skills and motivation, to drive down decision-making to where the job is done, providing people with the technical, organizational and social skills required to carry out that work, and reorganizing work practices to unleash the collective knowledge of employees.

In February 1994, Statistics Canada released its report entitled *Strategies for Success: Survey of Growing Small and Medium-Sized Enterprises*. The report clearly confirmed that growing small- and medium-sized enterprises were innovative managers. Growing SME's had:

- * flexibility to respond to customer needs, produced quality products; were customer service oriented;
- * management strategies that stressed total quality management, process and just-in-time inventory control;
- * strong management and marketing skills; and
- * a skilled labour force.

The report further demonstrated that 800 of the 1600 growing small- and medium-sized enterprises surveyed had the following improvements in economic performance:

- * 31% increase in profits
- * 42% increase in equity
- * 49% increase in assets
- * 48% increase in sales.

Management skills and leadership are even more important in the new economy. Its structure and characteristics - complex technologies, rapid and increasing change, fierce competition - and its engines of growth - knowledge and innovation - place a heavy premium on organizational capital.

But Canadian managers are not all prepared to deal with global competition and higher levels of innovation.....

As numerous pieces of evidence suggest, many Canadian managers and entrepreneurs are poorly equipped to deal with globalization and organizational innovation.

.... businesses are often unable to identify their own weaknesses

In 1991, the Association of Provincial Research Organizations (APRO) highlighted the fact that:

- businesses typically do not identify management shortcomings as an area requiring improvement through training;
- managers are better able to diagnose their difficulties through comparisons with other companies in their sector; and
- there is a deficiency of intra-industry comparisons and benchmarking, as facilitated by the analysis of "best practice techniques and technologies".

Industry Canada's experience with the Manufacturing Assessment Program reveals that some 40% of clients misdiagnosed their problem. In many cases, what firms had perceived as technology problems were in fact problems related to the efficient use of technology and needed action in key areas such as quality, work organization or training.

INDUSTRY CANADA AIMS TO IMPROVE SME PERFORMANCE

In 1994, Industry Canada participated in an assessment of the SRC's "*Total Company Assessment*" diagnostic tool and the ARC's "*Manufacturing Assessment Methodology*" (*MAM*) tool. Both projects were designed to measure how the SMEs had changed as a result of having had an assessment.

The SRC used a questionnaire to determine the impact of the assessment. A copy of the questionnaire is attached as Annex 4.

The ARC used a performance benchmarking process to compare the performance of those companies who had undergone a MAM versus the performance of companies who had not undergone a MAM. This process was developed by the Industrial Technology Institute, Ann Arbor, Michigan. A sample of a performance benchmarking report is attached as Annex 5.

RESULTS OF THE IMPACT ASSESSMENT

The assessment of the impact of SRC's diagnostic tool on Saskatchewan SMEs reveals the following:

- * 81% of the companies did implement all or part of the recommendations;
- * 39% completely eliminated/improved their problems and 61% partially eliminated/improved their problems;

- * 70% of the companies found SRC's diagnostic process to be very useful; the benefits from recognizing the problems as identified by the consultant are:
 - * 67% saved the company money;
 - * 27% increased sales; and
 - * 7% increased productivity.

The benefits from implementing recommendations:

- * increased profitability 30%;
- * increased sales 26%;
- * increased productivity 13%;
- * refocused/improved company direction 13%;
- * refocused company objectives/vision/mission 9%; and
- * decreased costs - specifically, savings in labour 9%.

Impact of Recommendations:

On a scale of 1 to 10 (1 being very small impact, 5 being average impact to 10 being greatest impact) , 58% of the companies responding said that the diagnostic process used by the SRC had an impact of between 6-10 on the operations of their company. Specifically,

- 5% ranked it at a level 6;
- 16% ranked it at a level 7;
- 21% ranked the process at a level 8;
- 5% ranked it at a level 9; and
- 11% ranked it at a level 10

The key success factors were ranked as follows:

- * expertise of the consultants in the areas being diagnosed;
- * support of consultants throughout implementation of the process;
- * good advice received from SRC;
- * staff/company commitment; and
- * company persistence.

The key failure factors were as follows:

- * lack of human resources to implement the recommendations; and
- * lack of financial resources to implement the recommendations.

The results of the MAM are as follows:

- * 80% of the companies found the MAM process to be very practical, focused, and the results applicable to their operations;
- * 80% of the companies showed significant increases in sales after having been involved in MAM. These increases range from 20.7% (\$840,000) to 175% (\$3,500,000) for two small companies and over 30% and 40% for two larger companies. Those companies who did not have MAM showed on average less than 20% improvement in sales;
- * 60% of MAM companies had an increase in dollar value added per shop employee. 51% of companies who did not have a MAM showed a decrease in dollar added per employee;
- * all companies involved in MAM had an increase in the use of computers to assist in operations. Only 51% of those who did not have MAM had an increase in computer use;
- * all MAM companies showed a decrease in the percentage of units scrapped in house or rejected by the customer. 63% of companies who did not have MAM showed no change, 10% showed a decrease greater than 2%, and the remainder were less than 2%;

- * companies who had MAM had an on time delivery of 91% while those who did not had an on time delivery rate of 85%.
- * 60% of the MAM companies showed an increase in the number of inventory turns per year, therefore saving money on inventory holding charges;
- * 40% of MAM companies showed an improvement in lead times and 60% stayed the same;
- * 60% of MAM companies showed an increase in the amount of money spent on training, 20% showed no change and 20% showed a decrease;

GENERAL FINDINGS

Despite the positive results obtained by SMEs which went through a benchmarking or diagnostic process, there is a low take up from SMEs in using these tools. Some of the reasons may include: lack of awareness, cost, fear of results, or resistance to change.

We have found that diagnostic and benchmarking tools can be used for many purposes:

- * provide SMEs with a better picture of their own situation vis-a-vis their competitors and help them to determine where they should make changes to improve their competitiveness; and
- * provide government officials with a better understanding of the SME needs for improvement and help to develop government policies and programs to address these needs.

FURTHER DEVELOPMENTS IN CANADA

Given the importance for SMEs to develop appropriate management skills to compete in the new economy, Industry Canada has decided to undertake a pilot project involving 80 environmental industry SMEs using a benchmarking tool to analyze deficiencies in management practices of these SMEs, diagnose, through comparisons with other SMEs, areas that require improvement and development management training profiles. Through this project, the ARC and CCHREI will design their own benchmarking tool which could apply to both the manufacturing and the service sectors. Benchmarking tools used by this group to-date were applicable only to the manufacturing sector. The project is being executed by the Canadian Council for Human Resources in the Environment Industries (CCHREI) and the Alberta Research Council and will be completed by the end of April, 1996.

The Business Development Bank of Canada (BDC), with the assistance of Industry Canada and the Regional Agencies, is developing an integrated business development approach to strengthen business capabilities. The BDC's integrated approach will consist of the use of benchmarking and diagnostic tools, the development of improvement plans for SMEs as well as the development of a national network of experts to provide tailor-made services.

CONCLUSION

Canada's experience in using benchmarking and diagnostic tools is still limited. It would be very helpful if other APEC economies using similar tools could share their experience with the APEC SME policy group members so that we could develop a better understanding of the impact of using these tools to improve business performance.

We could also explore the possibility of using information resulting from these diagnostics to develop business profiles that could be used for business matching purposes.

**TECHNOLOGY ADOPTION BY SMALL AND MEDIUM-SIZED
ENTERPRISES IN MALAYSIA PREPARED BY: INSTITUT
TEKNOLOGI: MARA SASKATCHEWAN RESEARCH COUNCIL
UNIVERSITE PERTANIA MALAYSIA UNIVERSITY OF
SASKATCHEWAN NOVEMBER, 1988**

INTRODUCTION

Small and medium-sized enterprises (SMEs) occupy important roles in both developed and developing economies. In the developed economies, they are seen as reflections of entrepreneurial spirit, generators of employment and potential sources of increasing total savings in the economy. In the developing economies, they are seen both as engines of growth as well as roads to the development of a strong private sector in the economy. Therefore, almost all countries in the non-communist world devote special attention to the factors affecting the establishment and success of small and medium-sized enterprises within their own economies.

As most developing countries reach the stage where suitable infrastructures for the formation of SMEs have already been built, attention shifts to the problem of ensuring their successful continuance. In this process, a key concern is the competitiveness of SMEs in both domestic and export markets.

While there is no single route to competitiveness, it is now widely recognized that market performance of enterprises (a competitive phenomenon) is affected by a set of interrelated technological factors. For example, market performance could be affected by poor designs (product or process technology), poor product quality (manufacturing management technology), inadequate plant capacity (maintenance of available equipment), and/or lack of after-sales service (marketing management). In turn, poor product quality could be related to the lack of precision and adequate equipment (product or process technology) and to the lack of skilled personnel (management of human resources). Thus, remaining competitive ultimately requires accessing appropriate technology and managing this technology in the best interest of the firm.

A situation which complicates the position of the SMEs in their quest for competitiveness in the developing economies is that most SMEs are not generators of technology internally. The need to maintain a healthy cash flow and a satisfactory return on investment does not leave much scope for most SMEs to make regular and substantial research and development expenditures. Therefore,

they are particularly dependent on the technology available elsewhere within the economy and the necessary resources to access such technology to satisfy their own needs. Access to technological advances is only part of the problem which SMEs have in maintaining their competitive position in the marketplace. Even when technology is accessible, many SMEs are incapable of adopting specific technologies due to constraints associated with existing physical facilities, financing the acquisition of the technology itself and managing the enterprises incorporating the new technology. Thus, ways and means to improve the technology management of SMEs continue to draw special attention from all those concerned with the long-term viability of SMEs.

PROJECT BACKGROUND

As elsewhere, the countries belonging to the Association of South East Asian Nations (ASEAN), namely Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand, consider the development and maintenance of SMEs as an important public policy objective. In Malaysia, SMEs are becoming important constituents of the manufacturing sector, constituting almost 98% of all manufacturing enterprises. To solidify their role as providers of effective import substitutes, and to gain a larger share of the export markets, they must become more competitive. As Malaysia moves closer to being classified as a newly-industrialized country (NICE), the pressures on its SMEs to become technologically competitive will increase. The Fourth Malaysia Plan (1981-85) expects SMEs to be important contributors to the process of developing entrepreneurs, creating employment, mobilizing individual savings for investment, broadening the industrial base of the indigenous groups (Bumiputra) and providing inputs and support services for large enterprises (Mohammadiyah 1985).

To meet the objectives of the Fourth Malaysia Plan, the Malaysian government depends on a number of SME support institutions such as Majlis Amanah Rakyat (MARA), the National Productivity Centre (NPC), Bank Pembangunan Malaysia Berhad (BPMB), Bank Pertanian Malaysia (BPM) and the Small Enterprise Division (SED) of the Ministry of Trade and Industry (MTI). However, the government is not satisfied with the impact that such SME support institutions have had in meeting the SME need for more effective technology management. Mohammadiyah (1985) points out at least five areas of concern:

- (1) programs lack a common framework with respect to objectives and strategy setting, detailed planning as well as operational tools;

- (2) most programs are not comprehensive in terms of providing the necessary support ingredients in all stages of the project life cycle with respect to each project/enterprise;
- (3) failure to coordinate or link the crucial technical support assistance and macro policy incentives with financial assistance;
- (4) inadequate government policies and preference to provide a conducive environment for SME development;
- (5) lack of sub-sectoral industry focus, thereby diluting and dispersing administrative and financial resources.

While the government has undertaken a number of initiatives to deal with the above concerns, it is still looking at additional ways and means to improve the SME's access to various support institutions for services in the areas of product/process technology and the managerial capabilities for effective use of such technology.

In particular, the potential role of various technology development institutions in the country has come under consideration.

In Canada, the subject of enhancing the technological capability of SMEs has been a public policy issue for many years. An effective system of delivering technical services to SMEs has evolved, linking the country's National Research Council and various provincial research organizations. An adaptation of the Canadian experience has already been used in South and South East Asia through the establishment of Technonet Asia. Although the establishment of Technonet Asia has focused attention on the need to develop a regional resource pool of industrial extension officers, much remains to be done to increase the technological orientation of SMEs in Asia, so as to facilitate the use of technologies available at the research institutes, and to enhance the technology dissemination capacities of the SME support institutions.

This research project was developed by a team of Malaysian and Canadian researchers to address these issues. Its focus is the technological capability and technology adoption-related problems of Malaysian SMEs. In keeping with the national priorities set in the Revised Fourth Malaysia Plan, this project has concentrated on SMEs in four manufacturing sub-sectors: food processing, wood-based products, light engineering, and selected construction materials.

A TECHNOLOGY PROFILE OF SMEs

1.1 A Profile of SMEs' Management Technologies

This section describes in some detail the general management capabilities of SMEs in the study. It is not possible to draw statistically valid generalizations from this sample to the general population. Nevertheless, a consistent picture emerges from the data, adding weight to the conclusions made about the technology transfer process.

1.1.1 Human Resource Management

The management tools investigated in human resources were:

- job analysis/description
- selection/interviewing techniques
- performance appraisal
- job rotation/enrichment
- management by objectives (MBO)
- profit sharing
- flex time

There was very little difference across the sub-sectors in their patterns of awareness and use of these tools. In each sub-sector, the first three techniques were used by about one firm in three or better, and the last three techniques were seldom used or unknown. Job rotation/enrichment was used by about as many firms as the first three techniques in every sub-sector except construction materials where it was used by only one firm in five.

Bumiputra firms were usually less aware of the techniques than their non-Bumiputra counterparts. As a result, firms in the East (largely Bumiputra-owned) generally showed very low levels of awareness and use.

There was a consistent increase in awareness and an impressive increase in the use of techniques in medium firms. For example, only 40% of small food processing companies used job descriptions, but 70% of medium ones used them. This illustrates a relationship that holds for all techniques across all sectors.

Concern may be expressed about the low level of use of techniques in small firms and in Bumiputra firms. Even small firms, with 5 to 49 employees, are large enough to benefit from the use of job descriptions, or better hiring methods, or improved performance appraisal techniques. Similarly, Bumiputra firms, which are expected to be a growing, vital part of the economy, would benefit from improved human resource management as their employee base grows. Conversely, it is of no concern that, for example, 100% of tiny construction materials firms were unaware of MBO, performance appraisals or job enrichment. These techniques are largely inappropriate to their situation. *The technology transfer challenge is to get tools into firms' hands as these tools become relevant.*

1.1.2 Financial Management

The management tools considered in financial management were:

- income statements
- balance sheets
- cash budgets
- projected income statements
- variance analysis
- source and uses of funds statements
- product costing

Similar to human resources, there was little variation by sub-sector in the awareness or use of these tools. In general, 1/3 of the firms were at least aware of all the techniques, and over 85% of the firms were using income statements and balance sheets. The cash budget, sources and uses statement, and product costing techniques were used by over half the firms. In *all* cases, statements or budgets were prepared yearly: not one firm in the sample used them monthly or even quarterly.

In general, Bumiputra firms showed less use of techniques than non-Bumiputra firms in some sectors, but similar use levels in others. Differences were not as pronounced as in the human resources area. Increasing firm size again correlated with increased use but the differences were most apparent in the lesser-used

techniques: e.g. cash budgets, variance analysis, and projected income statements.

The almost universal use of income statements and balance sheets reflects the formal record keeping requirements for business.. The relatively high awareness of other techniques may be attributed to the obvious importance of financial performance. Nevertheless, it was of concern that firms overall were so weak in the "control" aspect. This was shown by the low use of techniques like variance analysis, projected income statements and cash budgets, and by the universal use of financial statements on a yearly basis only. It appears that the value of accounting and financial tools in *managing* the business, as opposed to recording its activities, has not as yet been recognized.

1.1.3 Marketing Management

The management tools asked about in the marketing area were:

- sales training
- sales forecasting
- formal market research
- break-even analysis
- marketing plans

Marketing was similar to human resources and financial management in that the sample showed little variation by sub-sector. Overall, marketing plans were used the most, from about 40% of the firms in light engineering to almost 50% in the other sub-sectors. Sales forecasting and break-even analysis were used by roughly one firm in three. Formal market research was used at best by roughly only one firm in five.

Bumiputra firms were much less aware than non-Bumiputras of marketing technology in construction materials, less aware in food processing, about as aware in light engineering, and more aware in wood processing. The dominant relationship was size. There were big jumps in the use of techniques as the category changed from tiny to small and from small to medium.

The study did not attempt to measure the level of sophistication of the techniques in use. Thus, for example, marketing plans might well have varied from elaborate

and thoroughly written plans to verbal agreements on sales targets. However, overall, the level of marketing technology was as good as, or higher than, technology used in human resources management. It was also significantly lower than the level of technology extant in the financial area, with the exception of the "control" technology already discussed, with which it was on par. It is of concern that market research and sales training, for example, are not done by more firms given the economic climate. Most of these firms are not "production-bound": *rather, their growth is limited by their marketing effectiveness or lack thereof.*

1.1.4 Manufacturing Management

The tools of general manufacturing management investigated were:

- preventive maintenance
- work measurement
- method improvement
- order point system
- value analysis
- statistical quality control
- zero defect program

Once gain, there was little variation by sub-sector in the techniques used. The first three techniques listed above were used by about 40 to 50% of the firms across all sectors. Food processing was an exception, being more active in preventive maintenance. The next three techniques were used by fewer than one firm in three, and a zero defect program was in place in just one firm in twenty. Typically, over half of the firms were not even aware of the final three techniques.

Bumiputra firms usually showed lower awareness than did non-Bumiputra firms, as well as lower use, although sometimes the use relationship was reversed. In general, there was not much difference by ownership in the use of the three most popular techniques. There was also the usual pattern of increasing use with increasing firm size.

These figures are comparable to those for marketing technology use, and raise similar questions or concerns. More than half of the firms do not use preventive

maintenance which means that many, if not most, of the small firms are missing a key manufacturing management tool. Similarly, medium firms - which are large enough in most cases to make use of more sophisticated techniques, like statistical quality control - are not making the move away from tools more suitable for smaller firms.

1.1.4.1 Quality Control:

The factors considered in assessing the quality control technology in use were:

- type of product standards
- quality control measurement "points"
- frequency of inspection
- defective product rates

Although there was some variation by sub-sector, it was not large. Similarly, the differences among the regions or between Bumiputra and non-Bumiputra firms were not significant. The big differences correlated with differences in size. Overall, as size increased, so too did the firms' concern for quality control. For example:

- 1) Tiny and small firms tended to use the customer's standard as the product standard, whereas medium firms more often used their own factory standard, or even an international standard. This probably reflects the greater export orientation of larger firms, and the increased process standardization that comes with increased levels of production.
- 2) Medium firms were more likely than smaller firms to make quality control measures at more than one point in the production process. They were also more likely to measure the proportion of defective production.
- 3) While tiny and small firms most commonly did inspections only when a problem arose, medium firms were more likely to use "first batch inspection" or statistical quality control.

Overall, it was recognized that quality control is important. Over half the firms used quality measures at every major step in the production process, including almost half of *tiny* firms. Approximately 80 to 90% of the firms across all sectors had a standard in place for the final product. Nevertheless, it is also true that if

firms want to broaden their markets, they will have to make greater use of Malaysian and international standards. This is particularly important for small firms (still mostly using customer standards) and for food processing firms, not one of whom was using an international standard, and which may restrict their export opportunities. Finally, the control of production processes would be better served by more firms measuring their proportion of defective production. Currently, almost 47% of all firms do not measure their defect rate. While this may not be necessary for tiny firms, it does become important for small firms.

1.1.4.2 Plant Maintenance:

The aspects of plant or machine maintenance investigated were:

- frequency of machine maintenance
- existence of a program for analyzing breakdowns
- method of analyzing breakdowns

Just over 40% of the firms used a preventive maintenance program. If one considers the dividends derived from such a program in terms of reduced frequency of breakdown, increased productivity, and longer machine life, this low level of prevention should be a concern even for tiny firms. For SMEs in general, capital resources being in short supply, preventive maintenance techniques should receive more attention.

Consistent with the above finding is that two-thirds of the firms have no program for analyzing breakdowns for the purpose of preventing future breakdowns. For those firms that did conduct analyses, the most common method used was that of a formal analysis by company personnel. In general, increasing firm size correlated with increased use of outside experts in these analysis programs.

Overall, this area of the study provides more evidence for the general conclusion that SMEs are lagging in their use of technology to control the performance of their firms. Medium firms score not too badly in this respect although improvement would be desirable, but small firms are generally weak in this regard.

1.1.4.3 Planning and Scheduling Techniques:

The planning and scheduling techniques considered were:

- type of production scheduling

- method of inventory control for raw materials and finished goods.

The success or effectiveness of the techniques used was roughly assessed by looking at:

- delays in deliveries from vendors
- delays in deliveries to customers
- utilization ratios of main production machinery.

As firms size increased, greater use of more sophisticated production scheduling techniques was evident. The modal category for medium firms was the combination of man-hours and utilization ratios. Overall however, over half used rough scheduling only. Similarly, techniques of inventory control became more sophisticated as firms grew: an appropriate response to a task that is more complex, by volume. Almost 60% of all firms used only an informal visual check of inventory, but 40% of medium firms used an MRP (Material Requirements Planning) system.

Are the techniques in use effective? Delays from vendors are roughly comparable to delays to customers. This suggests that, regardless of the level of such delays, the scheduling techniques in use are not adequately responding to the realities of the business environment. It is interesting to note that medium firms, the biggest users of sophisticated inventory techniques, are also the biggest reporters of frequency of vendor delays as being "very often". Several questions arise:

- 1) Is the group reporting problems "very often"? Is the group using or not using the more precise techniques?
- 2) Are techniques being used, but used poorly?
- 3) Are firms with more precise inventory systems simply more aware of delivery delay

Just over 51% of the firms across all sub-sectors reported a utilization ratio of over 75%. Since for 20% of the firms - the ones with labour-dependent processes - this measure is not applicable, the effective percentage increases to 65% from roughly 50%. There is little difference in utilization ratios by size of firm. This is ample evidence to indicate that they were experiencing a recession when the survey was carried out.

1.1.5 *New Product Management*

The aspects of new product management investigated were:

- innovativeness of firms
- sources for development of new products
- guides for development of new products
- coordination of design and marketing
- product success and failure

Overall, the level of innovativeness was low. Only about one firm in five developed new products. With such a small representation from the sample, it is more difficult than usual to make meaningful generalizations, but the following tentative results are suggested:

- 1) There is little or no correlation of ownership with innovation.
- 2) Medium firms are more apt to innovate than small or tiny firms.
- 3) There is no difference in SME innovativeness across sub-sectors.

One-third or more of the firms that developed new products did so at a rate of not more than one per year. Considering that product improvements were treated as new products, this finding reinforces the contention that innovation is at a low level in SMEs.

Company personnel were the most widely used source of new product ideas. Formal market research was used by roughly 35 to 50% of firms, primarily medium ones. Product development seems to have been guided by input from a combination of sources: other companies' products, users and formal market research. Again, medium firms were more likely to use the more formal approaches, while small and tiny firms were guided by informally-gained information.

The most commonly used method of coordinating design with marketing was to have the same person doing both jobs. Although this method was universally used in tiny firms, the realities of larger

firms pushed them more into formal meetings to achieve coordination. These methods seemed appropriate for their associated size category.

The ultimate test of new product management is the success rate of new product introduction, tempered by an analysis of the causes of failure. The analysis that would give an actual success *rate* has not been done. However, judging by the reported numbers of introductions and successes, it appears that the success rate is one-quarter or one-third on average. If product improvements were removed from these estimates, the success rate would be lower. The major cause of new product failure is that demand was less than expected. It seems that firms have the technical capability to develop new products, but lack the marketing skills to protect their investment in new product development.

1.2 A Profile of SMEs' Technical Processes

This section provides a very brief overview of the technical processes in use in SMEs and that which can be termed their technical "resources", that is the age of their equipment and their level of mechanization. This data provides the information on the manufacturing processes used by the companies in the sample. This data can be extremely useful "market" information for vendors of new and more advanced technology.

See Annex 2.1 for a list of the research reports for each sector. These reports provide a detailed picture of the processes in use.

1.2.1 Diversity of Processes in Use Within Each Sub-Sector

The processes for which detailed level or method data were obtained in this study were:

- 1) Food Processing
 - size reduction/grinding
 - mixing/emulsification
 - filtration/clarification/separation/dehydration/drying
 - pasteurization

2) Wood Processing:

- ripping
- cross cutting
- drying
- de-barking
- surfacing/shaping
- gluing
- sanding
- painting/varnishing

3) Light Engineering

- casting
- forging
- sheet metal working/press work
- welding/brazing
- plating
- machine assembly
- machinery

4) Construction Materials:

- mixing
- moulding
- drying
- glazing
- burning/firing

Each of these processes was considered a "major" process, with many methods or aspects subsumed by it. The research reports provide much detail on each one of these processes. However, for the purposes of this report it is sufficient to note that the task of transferring "technology" to any one of these sub-sectors would be exceedingly complex.

1.2.2 Age of Equipment

Almost 65% of the firms have equipment that is less than 10 years old, and one-third have equipment whose average age is less than five years. Bumiputra firms are more heavily represented in this category (<10 years) than non-Bumiputra. This probably reflects the

preponderance of newly-founded firms in the Bumiputra part of the sample. If so, it means these firms were established with new or nearly new machinery.

1.2.3 Level of Mechanization

Overall, just over 70% of all firms were semi-mechanized, ranging from 55% of Bumiputra construction firms to 87% of Bumiputra wood based firms. Within the sub-sectors, the construction firms showed greater differences by ownership, with Bumiputra firms characterized by a lower level of mechanization.

Without more information, it is not possible to assess whether these levels of mechanization are appropriate to the products being made and to the size of the firm. However, it can be said that there is significant potential for upgrading the process technology in use. Whether this makes economic sense in all cases should be decided at the firm level.

THE BEHAVIOUR OF SMEs IN SEARCHING FOR AND ACQUIRING TECHNOLOGY

The behaviour of SMEs in acquiring technology was considered from three angles:

- SMEs' awareness of support institutions
- sources of information on technology
- sources of technology used by SMEs

2.1 Awareness of Support Institutions

Overall, awareness levels were low. Awareness increased with firm size, but even medium-sized firms showed a surprising level of ignorance regarding sources of help, while tiny firms were as good as being alone in the world. This was particularly surprising in the case of institutions set up specifically to assist SMEs, e.g. MESEAM, and MTI-SED. Bumiputra firms were more aware of government agencies than non-Bumiputra firms, probably a reflection of the government's policy

initiatives. Conversely, non-Bumiputra firms were slightly more aware of private sources (e.g. consultants, vendors, other firms) than Bumiputra firms. Overall, awareness levels of private sources and government agencies are roughly comparable, with research institutions and universities lagging.

It is clear that institutions designed to support SMEs are not adequately getting the word out. *SMEs cannot make use of agencies' services if they are not even aware of their existence.*

2.2 Sources of Information About Technology

Where do SMEs go to get information on technology? There was little variation by sub-sector or by ownership. The most popular information sources for all firms were other firms, vendors of machinery and equipment and books/journals/magazines. Trade fairs were a secondary source. The least popular information sources were consultants, universities and trade schools, and licensing agreements.

The effect of size on the use of sources is that medium firms use almost *all* sources to a greater extent than small or tiny firms, but the relative popularity described above still holds.

Given this pattern of search behaviour, support institutions could consider:

- 1) Publishing journals of technical information and management processes.
- 2) Supplying vendors with supporting literature.
- 3) Encouraging the development of regional or industry associations for SMEs.

2.3 Sources of Technology

Once they have the information, where do SMEs get their technology? Again, there was little difference across sub-sectors or by ownership. As firms got bigger, they used more technology sources, just as they used more information sources.

In every sector, in-house personnel were reported as the most often-used source of technology (used by 70 to 80% of the firms). Vendors of machinery and equipment were the second choice, followed by other firms. The least popular sources were, once again, consultants, universities and licensing agreements.

Since firms seem to rely mostly on the knowledge base of company personnel, support institutions could consider the value of sponsoring technology seminars. These could be on a general or "pure" knowledge basis, or on a brand-specific basis with a variety of vendors presenting information. Also, support institutions could provide vendors with literature or training to improve the likelihood of better management processes being "sold" along with their equipment.

SERVICES FOR INDUSTRY: SOURCES USED

	Manufacturing Processes	Manufacturing Management	Business Services*
Govt. Agencies	262	338	344
Inst. Of Higher Learning	34	37	43
Research Institutes	183	182	159
Private Sector Groups	833	902	1023

*** Finance, marketing and Human Resources Management.**

2.4 Summary

The data shows a preference for private, or business-linked, sources for both information and technology. The strength of this preference is shown in the above table.

TECHNOLOGY NEEDS OF SMES

Two paths were considered to determine the technology needs of the SMEs. One way was to start with the problems identified by the companies and the other way was to start with the opportunities identified by them.

In considering the problems and opportunities reported by firms, this section of the report tries to provide some interpretation or context for those reports. It does this by combining them with the less formal remarks made by interviewees during

discussion, the results of other research projects in related areas, and a knowledge of the economic and policy environment.

3.1 Perceptions of Problems

3.1.1 Human Resource Management Problems

Overall, there was a low level of perceived problems in the area of human resource management. The two worst problems, reported by one in four and one in five firms respectively, were being unable to attract the right kind of employees, and having poorly motivated employees.

There was no significant difference in these results by sub-sector or by ownership. Medium firms reported more problems than small firms, and tiny firms reported almost no problems. It is not clear whether medium firms *have* more problems than small firms, or whether medium firms are more *aware* of human resources as a function and therefore report more problems. Although cause and effect cannot be reliably determined, it is interesting to compare the relatively trouble-free perception of human resources with the low level of human resources technology in use (note section 1.1.1). Perhaps there is little need for better human resource management techniques, or perhaps firms are not aware of what their employees could be accomplishing with better management.

3.1.2 Manufacturing Management Problems

The most commonly reported problem in this area was plant under-utilization. Almost 40% of the firms in all sub-sectors reported this as a problem. One explanation was the recession in the economy. This is supported by the fact that the most common problem in the area of marketing is "not enough sales".

Curiously, however, almost one-quarter of all firms report *inadequate* plant capacity as a problem. One can speculate that the firms are not well conversant in the use of various scheduling techniques to effect greater production from the same plant.

In a different vein, 60 to 75% of the firms in the different sectors wanted to upgrade their manufacturing processes. However, when asked what obstacles stood in their way, 70 to 80% identified lack of funds as an obstacle. Roughly half identified lack of information, and about 40% identified lack of in-house expertise. This is very interesting. It appears that approximately half the companies' obstacles to upgrading related to lack of information and in-house expertise which is a lot cheaper to rectify than, for example, paying for the technology. These problems might be better described as financial and human resource problems, yet they are

creating a manufacturing management problem: an inability to upgrade process technology. This interaction of problems makes it harder to assist SMEs.

3.1.3 Financial Management Problems

Financial management problems are either more prevalent or more evident to managers than either human resource or manufacturing problems. Of 14 problems listed, only three were *not* identified as problems by at least one firm in four over all the sub-sectors. Some problems, like customers not paying promptly, were more typically cited by almost three firms in four. Concerns covered all areas, from getting adequate financing (through equity, loans, or trade credits) to controlling overhead and product costs.

These problems are not difficult to understand - however difficult they may be to resolve - in times of economic slowdown and given the cautious lending policy of financial institutions. SMEs, lacking substantial internal resources, are hurt the most by their inability to collect debts or arrange bridge financing. This situation is not new for SMEs. In a survey conducted by Dr. Chee Peng Lim in 1979, out of 399 manufacturing establishments surveyed, only 15% had access to bank credit over the previous three years. In a similar study conducted by Lee Shing Yi, as cited by Dr. Chee, it was found that most commercial banks in Malaysia favoured large customers. According to that study, about 70% of the loans were given to large clients and the rest given to the smaller clients even though the number of smaller clients was significantly larger.

The reluctance of the financial institutions to provide loans to SMEs creates financial problems for SMEs. Banks are reluctant to extend the facilities to SMEs because the SMEs are usually unable to provide the necessary financial records required by the banks as most of them do not get their accounts audited. Based on this study, 48% and 84% of the small and tiny firms respectively did not prepare a report on the sources and uses of funds. Even those who were able to provide the necessary accounts were required to provide collateral before the loans were even considered.

In general, most banks consider small loans unattractive because these small loans require almost the same amount of resources and time to process as the bigger loans. Therefore, given their amount, small loans are usually considered too costly and too time consuming to process. Also, loans to small and tiny enterprises have been found to be more risky but the banks are unable to charge more because interest rate charges are governed by a directive from Bank Negara (Central Bank).

The lack of an orientation among SMEs to use financial management techniques for control purposes, as opposed to record keeping purposes, has already been

discussed (note section 1.1.2). The cash flow problem of SMEs at the time of the survey was certainly partially rooted in the economic conditions and bank policies. However, it was probably exacerbated by the infrequent use of cash budgeting, projected income statements, and variance analysis.

3.1.4 Marketing management Problems

The most common marketing problem as perceived by SMEs is their inability to generate enough sales at a high enough margin. Just over 62% identified "not enough sales" and just over 56% identified "low margins" as a problem. While this may be partly due to economic conditions, it could also be partly caused by the infrequent use of market research and sales force training (note section 1.1.3). This was especially true in the small and tiny enterprises where there was little evidence of use of such skills and techniques. In most cases, formal market research and sales forecasting skills were not present, which affected the ability of SMEs to plan their marketing programs adequately. For the medium-sized firms, only about one-half of those in the sample reported using such techniques.

Not many small and medium-sized firms managed to exploit the foreign markets. Only 13% of the total sample were able to export their goods. Even then, the percentage of their exports in relation to their total sales was not impressive.

Based on observations derived from comments arising from the personal interviews, the researchers believed the inability of the SMEs to penetrate the world market was due to unattractive packaging and labelling, and ineffective promotional and advertising campaigns. This is consistent with the findings of a 1985 study, implying that the situation has not changed since that study was conducted ("Small-Scale Industries - Stimulus of Growth" in *Malaysian Business*, November 16, 1985). Another reason could be that the quality of their products failed to meet the overseas standards. Only 13% of SMEs employed a Malaysian National standard, while an insignificant 3% employed an International Standard for quality control purposes. Both of these standards were, however, more commonly used by medium-sized enterprises, particularly the non-Bumiputra firms.

In addition, lack of knowledge with respect to export procedures and overseas market opportunities also acted as a deterrent to exploiting foreign markets. Hence, a majority of the SMEs depended heavily upon the domestic markets for sales. Even then they had to compete not only with other local manufacturers, but also with foreign manufacturers. To make matters worse, these imported goods were usually perceived by the consumers to be of better quality when compared with the local goods. This competition forced the SMEs in Malaysia to reduce the prices of their goods and this, in turn, tended to lower their profit margins.

3.2 Perceptions of Business Opportunities

The perceptions of business opportunities were remarkably similar across all sub-sectors. Willingness to grow or to change business practices increased with increasing firm size.

Expansion into new markets was the most desired business opportunity. It would be very interesting to find out what obstacles are perceived by the companies to prevent them from seizing this opportunity. Based on the interviews conducted, it appears all the usual causes such as lack of access (distribution), lack of knowledge about the export markets, packaging, quality of products, etc. play a part. It is useful to note that the Malaysian government is trying to encourage "cooperative export boards", trading companies, etc. to assist with the problem. Indeed, the findings of this study show that a lot remains to be done in this area.

Expansion or modernization of plant was identified by almost 70% of the firms. Expansion desires are difficult to explain, given the high level of plant under-utilization. This may reflect firms' hopes to move into new markets. The push for modernization may also explain much of this figure, particularly in food processing, where 75% identified this as an opportunity. Food processing firms have a higher non-Bumiputra representation than average, correlating with larger and older firms. About half the firms expressed a desire to introduce new cost controls and to improve product quality. This may reflect their recognition of overall control management as weak.

3.3 Problems and Opportunities: Creating a Need for Technology Transfer

What can be projected about the needs of firms as they try to deal with their current problems and exploit the opportunities they wish to pursue? Growth will cause old problems to intensify, and new problems to emerge. For example:

- 1) Given the availability of markets, increased production will depend on better methods of inventory and scheduling control.
- 2) Addition of employees will strain existing hiring methods, and eventually require more formal human resources policies and procedures.
- 3) Entry into new markets will require market research and analysis skills, and sales force training.
- 4) Modernization will require an analysis of the trade-offs inherent in competing technologies.

- 5) Growth will aggravate cash flow problems, requiring more sophisticated financial controls and negotiating skills.

Time and management energy will be at a premium. As a result, the key to effecting successful technology transfer will be to find ways to make the technology relevant to the firms's situation and to make it relevant to the problems the firm is aware of or to the opportunities the firm wishes to pursue and to do so quickly and clearly. It is this "key" that explains the demonstrated success of vendors and other firms in transferring technology. They understand the situation of the potential user, and are able to address it.

SOURCES OF TECHNOLOGY: THE SUPPLY SIDE OF THE EQUATION

The "supply side" of the study involved a survey among public and private agencies concerned with supplying management and technical support to SMEs in the four manufacturing sectors studied. Of 36 institutions selected, 27 responded, representing a cross-section of agencies involved in SME development. These included training institutions, banks, institutions of higher learning, government agencies, private sector agencies, and agencies involved in information dissemination. This section of the report describes the activities of these agencies, both those actively involved in training or consulting for SMEs, and those working to develop policies to encourage SME development. The final section presents some observations on the technology transfer process as it now exists in Malaysia. Note Appendix D for a list of the support institutions interviewed.

4.1 Broadening the Definition of "Technological Support"

The term "technology" is defined to include not only the hardware associated with various technical processes, but also the system of softwares associated with the use of those technical processes, including the managerial capability to use such processes. Thus, technology as studied here included the manufacturing management, financial and accounting systems, marketing management and human resources management of the firms. Given this definition of technology, "technological support" must therefore also encompass more than the help provided by engineers and research scientists. Technological support must also include those training or consulting activities that target financial, marketing and human resources management.

Fourteen institutions in the survey were active in training and consultation. Most types of training or consulting were provided by six to eight of these agencies.

However, only three agencies provided consulting in human resource management and 10 agencies provided training in entrepreneurial development. The former may reflect the low level of perceived problems in human resources (note section 3.1.1), while the latter is interesting when considered with the finding that over half the firms in the sample were less than 10 years old.

A breakdown of the target sectors for technical training and consulting showed that food processing received less attention than the other sectors, and that the wood based industries received the most help. Half of the agencies indicated an industry focus, e.g. SIRIM (manufacturing), FRIM (wood), MARDI (food), BKP (engineering and shipbuilding).

Six of the agencies doing training or consulting, which amount to fewer than half, indicated that SMEs were their focus. Again, only six of the 14 had branch locations. Lack of branches increases the difficulty of access for SMEs located in other parts of the country.

4.2 The Policy Environment for SMEs

At the firm level, it is the access to technical and management support on a day-to-day basis that is important. Therefore on the supply side, this study focused on those agencies providing direct training and consulting. Nevertheless, the macro policy environment is also important to SMEs since it may determine, for example, the funding levels for direct assistance agencies.

Interviews were conducted with MIDF, EPU, SED, TECH-CTR, MSTE, ICU, and SEDC, all of which are policy development agencies (note Annex 1.2 for the names associated with these acronyms). These agencies are active in coordinating policies with each other and with research institutions. Their plans reflect an ongoing concern with policy initiatives:

- **MIDF** - to continue with current work.
- **EPU** - to streamline SME activities with overall macro policy objectives.
- **MSTE** - to improve the current technological capabilities and management of new technology via the setting up of the Technology Transfer Council and Technology Transfer Centre.
- **ICU** - to improve coordination among agencies through monitoring by ICU; to house entrepreneurial development activities under one institution; to improve training.

- **SEDC** - to continue providing infrastructure needed by the SMEs.

The environment of SMEs is largely hostile to their development. This is rarely, if ever, intentional: it can occur by policy responses to the well-organized lobbying of larger businesses, or as a side effect of other policies - for example, those aimed at encouraging pioneer industries. Nevertheless, if SMEs are to flourish, they need not only a well-designed and well-functioning technology transfer system, but also a favourable policy environment.

4.3 Supply Side Generalizations

There is a wide array of institutions and agencies which are active in providing technology assistance to SMEs in Malaysia. The following generalizations on their activities are noteworthy:

- 1) Most of the technology training/assistance programs are standardized and not customized to the needs of specific users. There is very little product-specific or enterprise-specific training or consulting.
- 2) There is a high level of dependence on classroom instruction as compared to on-site assistance. There is very little technical consulting provided.
- 3) There is very little evidence of any special focus on the SME sector in terms of the activities and programs of various support institutions.
- 4) Generally, most activities/programs seem to be concentrated in a few of the larger industrial centres of the country. The exceptions are Malaysian Agricultural Research and Development Institute (MARDI) and MARA, the federal government organization whose mandate is to improve economic opportunities for the Malay population.
- 5) Most support institutions indicate that they are unable to keep up with the demand for their programs/services. Most would like to expand their services, but are unable due to financial and human resource constraints.
- 6) There seems to be a general lack of effective information systems to assess the impact of the services/programs on the performance of their trainee enterprises.

- 7) A very positive element evident throughout the study is the interest, on the part of the SME support institutions, in finding ways and means to improve their services to the SMEs.
- 8) While looking at the issue of the capacity of the support system to deliver the technology services to the SME sector, one must also note that the support system as it is operating now has a considerable private sector component, and often, the SMEs have been willing to pay these private sector suppliers for the appropriate services. Therefore, the question of capacity of the system cannot be entirely separated from the issue of appropriate pricing of these services.

4.4 Conclusions

The list of SME support institutions in Malaysia is quite long. Even when one excludes those whose primary concern is policy-making rather than day-to-day technological support, there are still a lot of "players" in the game. However, very few are involved in programs that effectively connect the other "team" - the SMEs. As discussed earlier in Section 2.1, the general level of awareness of support institutions among the SMEs is rather low. Furthermore, SMEs report that an important source of their technology is not public sector support institutions, but rather private sector organizations.

The evidence gathered from the SME support institutions suggests an important gap in their activities: technical consulting. Of the 27 institutions interviewed, only seven reported providing technical consulting to firms. Thus, a vast majority have been committing resources to providing generalized assistance programs such as seminars and workshops while the extent of variations within the SME population and their varying positions in the marketplace suggests the appropriateness for more firm-specific assistance, i.e. consulting. Even those institutions which reported providing technical consulting, seemed to be too narrowly focused. Much of their consulting is too much function-specific rather than enterprise-specific, thus ignoring the interdependencies of functions within a business. A technology transfer agency that doesn't do technical consulting is not doing its job. However, technical consulting that is not cognizant of the needs of the total enterprise may create more problems for the firm than it solves.

Most of the SME support institutions lack any kind of outreach programming. The support institutions need to understand that many SMEs need assistance in problem diagnosis which would lead to determination of the SME's technology need. Such a diagnosis cannot be done by expecting the SME to visit the support institution. It has to be done on the premises where the SME operates. The fact that many SMEs

reported vendors and suppliers as being important sources of technology could be attributed to their process of doing business - they go to their customers and don't expect customers to come to them. Thus, when SMEs report low awareness of support institutions, this cannot be solved by printing and sending more brochures. This can be done only by changing the whole orientation towards technology assistance activities - shifting from supplier-driven programming to customer-oriented programming.

LIST OF RESEARCH REPORTS

1. A Survey of Technology Adoption by Selected Small and Medium Enterprises in Malaysia A Focus on:
 - Light Engineering Subsector
 - Construction Material Sector
 - Wood-Based Sector
 - Food Processing Sectorby: Dr. Mohd. Ghazali Mohayiddin, Universiti Pertanian Malaysia.
2. Adoption of Management Technology by SMEs: Food Processing Subsector (Management) by: Yaakob Ibrahim, Universiti Pertanian Malaysia.
3. Technology Adoption by the Small and Medium Enterprises in Malaysia for the Food Processing Subsector (Technical) by: Wan Mohamad Abdullah, Universiti Pertanian Malaysia.
4. Adoption of Management Technology by SMEs: Light Engineering Subsector (Management) by: Rohiyati Hashim, Institut Teknologi Mara.
5. Technology Adoption by the Small and Medium Enterprise in Malaysia for the Light Engineering Subsector (Technical) by: M. Yusuff Mohd.
6. Technology Adoption by SMEs in Malaysia - Wood Based Subsector - Management Aspect by Loo Sin Chun, Universiti Pertanian Malaysia.
7. Technology Adoption by the Small and Medium Enterprises (SMEs) in Malaysia - Wood Based Subsector (Technical) by: Yusuff Bin Mohd.
8. Adoption of Management and Manufacturing Technology by SMEs in the Construction Materials Subsector in Malaysia (Management and Technical) by Zulkifli Yusof & Ahmad Zabdi Jami, Institut Teknologi Mara.
9. Support Institutions by Siti Khairon Shariff, Universiti Pertanian Malaysia.

LIST OF SUPPORT INSTITUTIONS INTERVIEWED

BBMB	Bank Bumiputra Malaysia Berhad
BKPMB	Bank Kemajuan Perusahaan Malaysia Berhad
EPU	Economic Planning Unit (Prime Minister's Department)
FMM	Federation of Malaysian Manufacturers
FRIM	Forest Research Institute Malaysia
HICOM	Heavy Industries Corporation of Malaysia
ICU	Implementation Coordination Unit (Prime Minister's Industry Department)
ITI	Industrial Training Institute
KPC	Kumpulan Pekebun Campuran (Rubber Research Institute of Malaysia)
KSSB	Kayu Sedia Sdn. Bhd.
MARA	Majlis Amanah Rakyat
MARDI	Malaysian Agricultural Research & Development Institute
MEDEC	Malaysian Entrepreneurial Development Centre
MEXPO	Malaysian Export Trade Centre
MIDF	Malaysian Industrial Development Finance
MIM	Malaysian Institute of Management
MSTE	Ministry of Science, Technology and Environment
NPC	National Productivity Centre
SBDC	Small Business Development Centre (UPM)
SED	Small Enterprise Division (Ministry of National and Rural Development)
SEDC	State Economic Development Corporation (Selangor, Penang, Melaka, Johore)
SIRIM	Standard Industrial Research Institute of Malaysia
TECH-CTR	Technology Centre (Ministry of National and Rural Development)
UKM	Universiti Kebangsaan Malaysia
USM	Universiti Sains Malaysia

ANNEX 2

HIGHLIGHTS FROM THE OPERATIONAL TEST FOR THE TECHNOLOGY ADOPTION BY SMALL- AND MEDIUM-SIZED ENTERPRISES IN SINGAPORE PROJECT

This is the highlights of an operational test of a new system of technology adoption in Singapore. The project entailed the collection of relevant operational data (through visits and interviews) from a group of SMEs in the same subsector; the analysis of the data to develop benchmarks for different technologies and processes used by the companies in the same subsector. This enabled each SME to compare itself with the group; the assembly of a diagnostic panel consisting of experts in the following fields: manufacturing processes used by the subsector; manufacturing management (plant layout; production and inventory planning and control; quality control; plant maintenance and product engineering); general business strategic analysis as it applied to SMEs; financial management; human resources development; and marketing and sales management including new product development. The Singapore Institute of Standards and Industrial Research (SISIR) assisted the Saskatchewan Research Council (SRC) in a project in which the SRC's proprietary diagnostic tool "*Total Company Assessment*" was used in 84 (out of 927) SMEs in the electrical/electronics, precision engineering, plastics, packaging and the food subsectors.

The "*Total Company Assessment*" diagnostic tool showed that

PROFILE OF THE MANUFACTURING TECHNOLOGY OF SMEs:

- 70% of the participating firms were established after 1974 and 33% were established before 1980.
- the companies produced a very wide range of products;
- Companies use a large number of manufacturing processes and need assistance with upgrading of their specific processes. Whereas the companies in the same manufacturing subsector have similar processes, there were few, if any, manufacturing processes common between subsectors. This means that the technology support or assistance programs must be geared to specific processes.
- 55% of the companies reported that their main production machinery is less than 5 years old and 91% said that it was less than 9 years old.
- 49% of the SMEs identified high production costs as a major manufacturing problem.
- 20% of the SMEs said that high reject rate was a major manufacturing problem.
- the variations between subsectors was quite great. Since all firms in all subsectors have an incentive to minimize the wastage of raw materials, subsectoral differences can be at least partly attributed to the manufacturing processes employed.
- 100% of the firms in the precision engineering subsector reported considering upgrading their equipment and processes; 92% of the firms in plastics and food subsectors, and 85% of the firms in the electrical/electronics subsector, considered updating. This translates an image of SMEs who use modern machinery and want to keep it current.

- 64% of the SMEs identified machinery/equipment suppliers as their primary source of information about manufacturing processes; 49% identified book, journals, magazines as their primary source of information; and 48% said that trade fairs were their sources of information. 26% identified the Research Institute as a source of information about manufacturing processes.
- 69% of the SMEs from all subsectors said that the manufacturing technology used by them was developed by the company; 50% of the SMEs from all subsectors named machinery/equipment suppliers as sources of manufacturing technology.

PROFILE OF MANUFACTURING MANAGEMENT PROCESSES USED BY THE SMEs IN THE SAMPLE:

Quality Control:

- 76% of the firms reported the use of standards for outgoing quality control (final product) and 58% performed incoming inspection of raw materials;
- 67% use customers product standards, 33% use their own standards and 33% use national/international standards;
- 63% of the firms reported that they sampled on a regular basis as their method of inspection. The first batch of the product was inspected by 60% of the firms and only 11% of the firms reported using inspection only when there was a problem. 23% used Statistical Quality Control with control limits;
- 62% of the firms measured defect rates. In the food subsector, the percentage of production identified as defective ranged from 0.01% to 60%. The percentages ranged from 0.15% to 10% in the other subsectors. The defect rate after the goods leave the factory was high in all subsectors except packaging. There is ample opportunity to improve quality products manufactured by the firms in the sample.

Plant Maintenance:

- 50% of the firms reported the use of a preventive maintenance plan; 50% repaired the machines when the breakdown occurred;
- 61% of the firms do not have a program for analyzing breakdowns. Only 25% of the firms in the sample do have such a program;
- 70% of the firms report monitor machine availability of main equipment;

- 52% of the firms from all subsectors reported the percentage of non-availability of main machinery to be from 0 to 5%. This is a measure of the effectiveness of the plant maintenance function.

Production and Inventory Planning and Control:

- Only 10% of the firms use materials requirement planning (MPR). Only 13% of the firms use just-in-time inventory. Most firms use rough scheduling, schedule based on forecast of sales and based on actual orders received;
- 19% of the firms use (MPR) for controlling raw material and work-in-process inventories;
- 33% of the firms use computers in production and inventory planning and control;

Performance Measurement criteria for production and inventory planning and control functions include: frequency of delays in deliveries from vendors, frequency of delays in deliveries to customers, estimated utilization ratio for the main machinery, and overall percentage of the set-up time as compared to the total time running.

53% of the firms reported that they frequently had delays in deliveries from vendors
48% of firms reported that they frequently had delays to customers
71% of the firms reported an estimated utilization ratio of over 75%.

Manufacturing Management Techniques and Problems:

- 56% of the firms use preventive maintenance;
- 55% of the firms reported using the reorder point system;
- 45% used work study, 46% used method study and 44% of the firms used statistical quality control;
- Regarding the sources of manufacturing management systems used, firms reported that owner's/manufacturing manager's choice was the predominant source. Therefore, any attempt to introduce new systems must be directed towards the owners/manufacturing managers of SMEs, and once the technique is accepted by a few companies it will have a snowball effect.

Product Development Management:

- 63% of the firms reported development of new products/processes; this is considered quite high considering the role SMEs play as support industries for MNCs and other large companies. This indicates that SMEs in the sample were trying to create product differentiation and improve their profitability by reducing cost-based competition;
- 54% of the firms reported that "lack of ideas for new products/processes" was the main reason for not developing new products; 26% gave "lack of funds" as the reason. source of ideas come from company personnel and product ideas from foreign countries. Information from public R&D institutions and systematic search for new products are the next two most popular sources of ideas;
- 40% of SMEs use the "informal talks with potential users" as the most popular method of assessment of market. Only 11% of the SMEs used "formal market research of potential customers" as a source to assess the market;
- 47% of the firms in the precision engineering subsector said that "product/process quality was unacceptable" as the leading cause of lack of success. The most popular cause for lack of success by firms in the plastics, food and electrical/electronic subsectors was "the product/process did not have the demand we expected". This is a failure of market assessment and related to the fact that formal market research of potential customers is carried out by only 11% of the firms in the sample.

PROFILE OF SMEs' BUSINESS MANAGEMENT PROCESSES AND TECHNIQUES

HUMAN RESOURCES MANAGEMENT:

- 0% of the engineering staff in the food and packaging subsectors have university education; whereas 39% and 22% of the engineering staff in the electrical/electronics and plastic subsectors, respectively have university degrees. 82.6% of the production workers have only primary education. Since the implementation of new technologies are dependent greatly on ability of the staff to understand, adopt and adapt the new technologies, the data here is a very important part of the "internal capacity" of the firm;
- 27% of general managers and 20% of financial managers have university education;
- The SMEs' consideration and use of various human resource management techniques was examined. Job analysis, interviewing techniques, quality of work life (employee participation), and formal employee performance appraisal were the more popular techniques were used by 60% of the firms sampled;

- 94% of the firms used the system of human resource management where owners or human resource managers play a significant role. Only 8% used consultant's advice and 14% followed standard practice in the industry. This suggests that bringing new systems of human resource management would require awareness and education and trust of the management and owners of the companies;
- 20% of the firms claim that they provide over 12 person-days of training per employee per year. 24% provide 7 to 12 per-days of training per employee per year; and
- 31% of the firms claim that the number of working days lost due to absenteeism is less than 4 person-days per employee.

MARKETING MANAGEMENT:

- When added together, the informal and formal use of various marketing techniques and tools was quite respectable. 23% of the firms used formal sales training; 40% used formal sales forecasting; 18% of the firms used formal market research techniques; 35% of the firms did formal break-even analysis; 30% of the firm had a formal market planning system and 32% of the firms conducted formal competitive product analysis;
- 95% of the firms reported that the "owners or marketing managers choice as the predominant source of marketing systems used;
- 56% of the firms reported low profits and 50% of the firms said that they did not have enough export sales; 37% of the firms reported not enough sales in general;
- 89% of all firms responded that expanding into new markets, 89% said that expanding into new products, while 88% said that modernization or expansion of plant facilities were the best business solutions they wishes to explore;
- 83% of the firms in total were interested in improving profitability and 80% of the firms were interested in improving product quality to meet export standards;
- All of this suggests that these are aggressive market-oriented firms who are interested in growth and improvement of profits;
- 75% of the firms said that personal selling was their most popular strategy; 54% of the firms advertise in the press media and 42% of the firms participate in trade shows. Radio advertisements, television and advertisements and direct mailing are the least used promotional strategies;

- 46% of the firms reported use salesmen selling directly to customers as their distribution strategy; 38% use agents; and
- 54% of the firms in the sample reported that 90-100% of the sales are in Singapore; 20% of the firms said that they export between 10-29% of their sales to other Asean countries. Only 11 firms reported any sales to the US. Of these, 5 companies sell less than 10% of their sales to the US.

FINANCIAL MANAGEMENT:

- 86% of firms are private limited companies;
- 83% of the firms reported owners's or financial manager's choice as the source of the financial management accounting system. 19% reported using consultant's advice as a source of financial accounting systems. Consultant's advice plays a more dominant role in financial planning than in marketing management, human resources management, or manufacturing management;
- 44% of all firms said that their production costs were too high; only 4% of the firms reported that it was difficult to get trade credit; and
- Income statements and balance sheet are the most commonly used financial management techniques. All firms that answered the question reported their use either yearly, quarterly or monthly. Report on sources and uses of funds is not as popular but 68 out of 84 firms reported their use yearly, quarterly, or monthly. Some of the less used techniques are projected income statement, variance analysis and comparison of ratios with industry data.

The following table summarize the financial assistance schemes considered and used by the respondents:

Organizations:	TOTAL			
	Not Cons	USED		Dissat.
		Cons	Sat.	
Small Industry Finance Scheme	27	14	36	7
Venture Capital	58	23	3	0
Small Industry Technical Assistance Scheme	33	17	33	1
Product Development Assistance Scheme	64	14	5	1
Software Development Assistance Scheme	71	13	0	0
Market Development Assistance Scheme	52	15	17	0
Initiatives in New Technologies Scheme	72	12	0	0
Skills Development Fund Training Grant	29	12	40	3
Investment Allowance Scheme	42	12	25	5
Double Tax Deduction	47	10	26	1
TOTAL SMEs IN THE SAMPLE		84		

Cons = considered; Not Cons = not considered; Sat = satisfied; dissat = dissatisfied

TYPICAL ASSESSMENT REPORT TO SME

COMPANY: Precision Engineering Company, Singapore.

DATE OF INTERVIEW:

INTERVIEWERS:

1. MANUFACTURING PROCESSES

The reject rate of electroplating (10% by subcontractors is too high. This, coupled with the cost level for electroplating (33% of unit cost) has resulted in unacceptable production costs, thereby lowering profitability considerably.

The solution would be to upgrade the electroplating subcontractors, find better alternative subcontractors or for Stamping Industries to integrate the electroplating processes as part of their production, with external technical assistance.

2. MANUFACTURING MANAGEMENT

The fundamental problem of poor electroplating has to be solved first before the following problems in manufacturing management can be improved:

- * high defect rate of products before leaving the factory;
- * delay in deliveries to customers.

Low utilization ratio of main production machinery (25 to 50%) indicates the need to reduce their excess capacity by gaining more orders.

The company practices machine maintenance when breakdowns occur as it has excess capacity to rely on. This would not be acceptable if the machinery were utilized to full capacity.

3. PRODUCT AND PROCESS DEVELOPMENT

The company is not currently in a position to develop new product/processes. However, failure to do so will seriously impede any further growth and development. There are a number of development assistance programmes available to SMEs which the company is using. The company should immediately apply to the following programs: "Productivity Manager in SMEs (PROMIS) Scheme"; Technology Upgrading; and Production and Quality Control Systems Upgrading programmes.

4. HUMAN RESOURCE MANAGEMENT

The company is considering transfer of its operations to Thailand to reduce labour costs. However, this move will not improve the profitability of the company long-term unless: a) it resolves the electroplating quality problems; b) has a highly skilled labour force including electroplaters; and c) it implements good human resources management practices at all levels of management in the company. The company can benefit from the Management Training and the Specialist Manpower Training programmes available to SMEs under the government's Development Assistance Programme.

5. MARKETING

The company is unaware of various marketing techniques. It suffers from low profit margins, probably due again to the high cost of electroplating and low sales. The company should take advantage of two business development programmes, namely: Local Industry Upgrading Programme and Business Development Scheme to develop the capability to conduct market research, competitive product analysis, sales forecasting and formal training of the sales force.

6. FINANCIAL MANAGEMENT

The company appears to be using various financial techniques on a very regular basis, in some cases monthly. Financial ratios to be supplied by the company

7. AWARENESS OF TECHNOLOGY-SUPPORT INSTITUTIONS

The company is aware of most of the schemes and the institutions offering them, only in their areas of interest.

CONCLUSION

The immediate task at hand is for the company to solve the problem of poor electroplating. A move to Thailand will not improve the profitability of the company. A company policy decision must be made to implement sound management practices in the areas of product and process development, human resources development and marketing. The company should immediately hire an "operations manager" to take advantage of the various business development programmes available to it to upgrade the management skills at all levels of the company.

EXECUTIVE SUMMARY

The Government of Thailand recognizes the essential role played by small and medium-sized enterprises (SMEs) in the development and growth of the economy. Accordingly, the Thai government has established a priority of improving SME competitiveness in certain key sectors, including textile dyeing, textile finishing, and garment manufacturing. A significant first step toward this objective is to improve the process by which SMEs select and adopt new technologies¹.

This report describes a two-phase, five-year project designed to develop and test a process by which SMEs can identify and introduce technologies into their operations. The ultimate goal of this endeavour was and is to put into place a technology delivery system that will react to the unique needs of individual SMEs, to strengthen their economic viability and, ultimately, to enhance the productive capacity of Thailand.

The technology system that has been developed during this project depends, for its success, on providing SMEs with access to the existing resources and expertise from a wide range of institutions, both private and government sectors. This approach may be seen as ambitious in that it calls for certain changes in the behaviours of existing organizations. The test described in this report suggests that such an objective is both doable and effective.

The process logistics for the design and development of the proposed technology delivery system are presented in Figure 1. This figure also serves as the organizational framework for the project.

The Operational Test (1)

This project consisted of two phases: Phase I resulted in the identification of the components of a test system for improved access and adoption of technology; Phase II involved the operational test of the system to evaluate the workability of an SME-oriented technology evaluation and delivery system. The operational test involved 50 Thai SMEs, 25 from the garment manufacturing sector and 25 from the textile dyeing and finishing sector; it was a collaborative effort involving Saskatchewan Research Council, University of Saskatchewan and the Department of Industrial Promotion, specifically the Textile Industry Division. The two target industry groups for this operational test came from the six sectors covered during Phase I. The garment manufacturing and textile dyeing and finishing subsectors were chosen, since their long-run economic performance is a major concern in Thailand. The textile dyeing and finishing subsector provides input to the garment manufacturing subsector, and its technological ability

¹ The term 'technology' has been defined in this project to include machinery and processes used in design and manufacturing as well as the techniques related to manufacturing management, financial management, human resources management and marketing management.

is a critical element to overall marketplace performance. Further, these two subsectors were chosen due to practical organizational factors affecting the ability of the Textile Industry Division, under the Department of Industrial Promotion, to deploy appropriate human resources during the project. Figure 2 provides an overview of the technology delivery process. It is important to note that much of the methodology used in Phase II was based on the work done in Phase I, with appropriate improvements made as identified.

There are two unique processes within the operational test. One is *data review and recommendation formulation by Expert Panel*; and another is *generation of factory improvement plans by TID*. Experts from manufacturing, product development, human resources management, marketing and finance were assembled to form the expert panel for each subsector. They reviewed and analyzed the data compiled by TID staff as collected from the individual SMEs. Based on these data, they then made recommendations to TID for each individual SME. TID, based on recommendations from the expert panel, developed factory improvement plans for each individual SME.

The principal objective was to evaluate the workability of a SME-oriented technology evaluation and delivery system ("the System") through an operational test of a pilot system under the sponsorship of the Department of Industrial Promotion.

Specifically, the research was designed to:

- a) Determine the extent of **resource commitment** and assess the applicability of the proposed system.
- b) Identify the **scope and need for collaboration** among SME-support-institutions, both public and private sectors, in the **implementation** of the system.
- c) Assess the **special problems**, and devise possible solutions, in the application of the system for SMEs located in **regions outside Bangkok Metropolitan and its surroundings**.
- d) Assess the feasibility of developing an "**expert system software**" for the technology diagnosis of the individual SMEs.

Socioeconomic Impact

Phase I research demonstrated the need for improving the technological competitiveness of Thai SMEs. Since employment generation is one of the principal benefits that arise out of SMEs, an improved technology evaluation and delivery system for Thai SMEs will have significant positive impact on the level of manufacturing employment in Thailand. The results of this research will provide a significant opportunity for the science and technology sector to seek, in a proactive way, the means to address the marketplace problems of Thai SMEs. To the extent that it is possible to improve Thai SMEs' marketplace performance through the access to and utilization of a more efficient support structure, the overall climate for devoting additional resources to technology development will improve, and this, in turn, will assist the Thai economy in meeting regional and global competitive pressures.

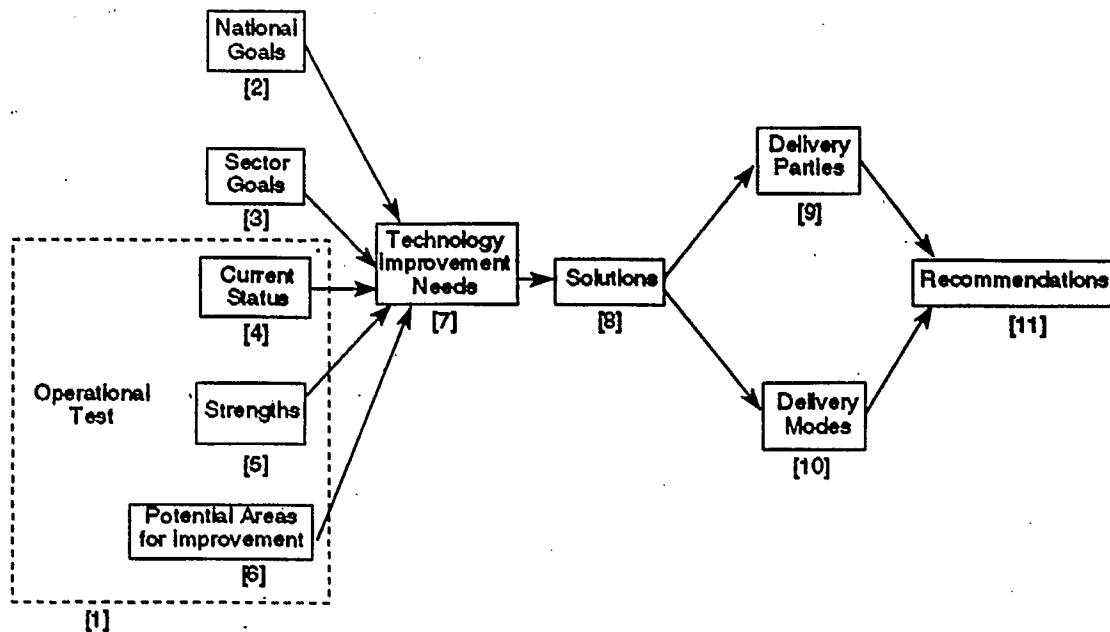


Figure 1: Process Logistics for Development/Design of a Technology Delivery System

- [1]: Executive Summary (Figure 2).
- [2]: Chapter 6 (Section 6.1 and Table 6.1).
- [3]: Chapter 6 (Section 6.2 and Table 6.2).
- [4]: Executive Summary (The Principle Findings of The Study - Current Status and Potential Areas for Improvement), and Chapter 5.
- [5]: Executive Summary (The Principle Findings of The Study - Strengths); and Chapter 5 (Section 5.4).
- [6]: Executive Summary (The Principle Findings of The Study - Current Status and Potential Areas for Improvement).
- [7]: Executive Summary (The Principle Findings of The Study - Current Status and Potential Areas for Improvement); and Chapter 6 (Table 6.1).
- [8]: Executive Summary (Major Recommendations Arising from The Study); and Chapter 6 (Table 6.2).
- [9]: Executive Summary (Key Conclusion Regarding The Technology Delivery System, Figure 3 and Table 1); Chapter 9.
- [10]: Executive Summary (Key Conclusion Regarding The Technology Delivery System, Figure 3 and Table 1); and Chapter 9.
- [11]: Executive Summary (Major Recommendations Arising from The Study); and Chapter 9.

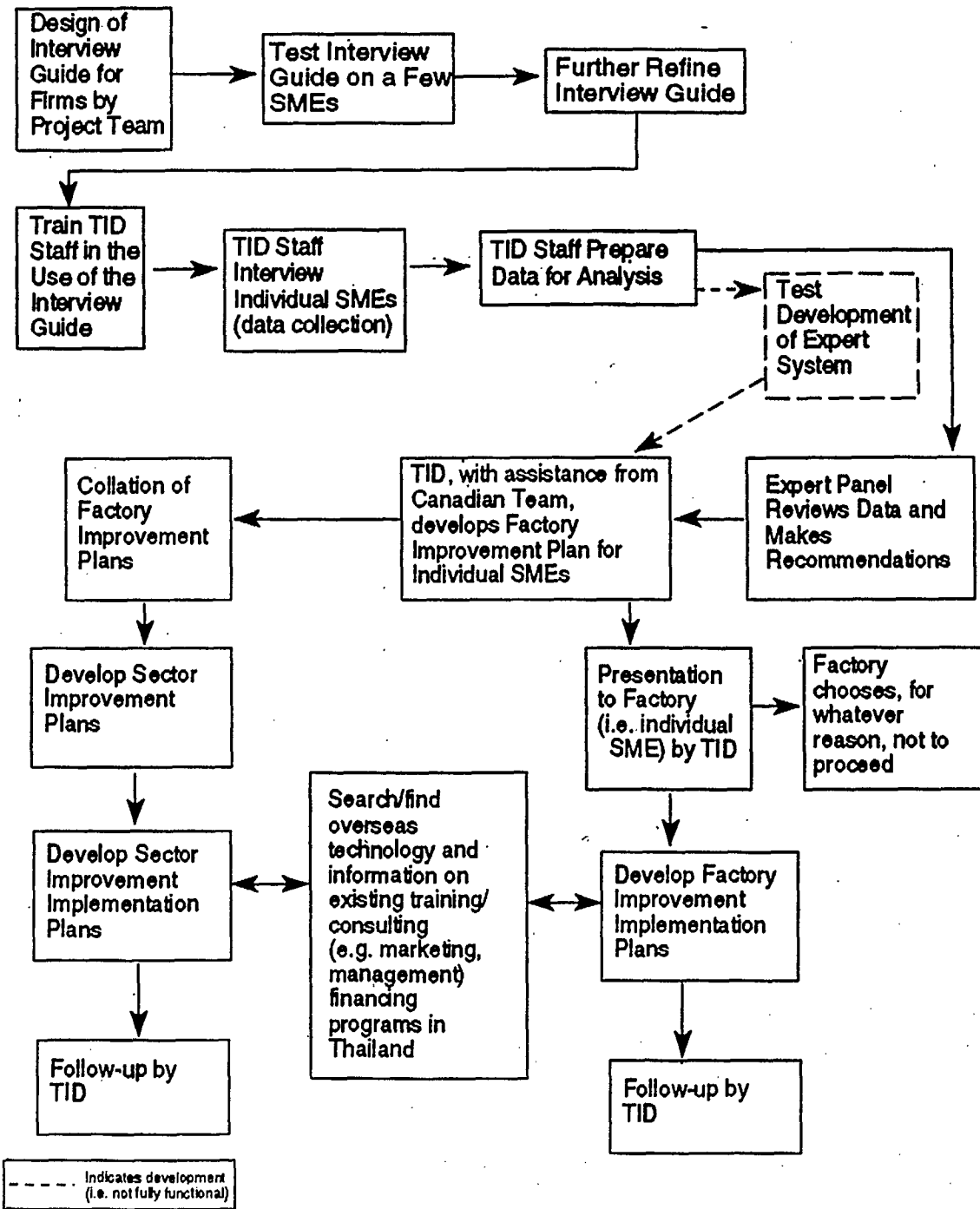


Figure 2: The Technology Evaluation & Delivery System as Used in the Operational Test

THE PRINCIPAL FINDINGS OF THE STUDY

Strengths (5)

Not unexpectedly, a wide range of performance was identified within the SME sample group. Notwithstanding, considerable strengths were noted, especially in particular operations.

1. The most significant strength of the sectors is the SMEs' entrepreneurship. It is evidenced through their knowledge/experience about the industry, their ability to overcome operational deficiencies, their ability to respond to market change, their receptivity of new knowledge/technology, and their tenacity and die-hard spirit in facing economic crises.
2. Another key strength is the extent to which SMEs have captured market share for their products and have devoted resources to product design/development.
3. In order to control the supply and quality of incoming materials and/or to generate additional markets for their products, many SMEs have built up-stream and/or down-stream vertical integration into their manufacturing operations.
4. In an effort to increase productivity and upgrade quality to meet specific market demand, some of the SMEs have installed high-tech machinery/equipment.
5. Some SMEs in the textile dyeing and finishing and garment manufacturing sectors have demonstrated considerable strength in process design and machinery maintenance as a means to ensure consistent product quality and higher productivity.
6. Although SMEs in general are relatively weak in management technology, some have shown strengths in inventory/WIP control, motivation techniques, management methods, production management, quality control, methods engineering, and productivity supported purchasing.
7. Some SMEs had good plant layout, clean, comfortable working conditions, and ample space for layout improvement and future business expansion, if necessary.
8. Good financial position, established credibility, unique product for market domination, and design ability are fundamental for industry growth and are strengths fundamental to the success of the industry; this was evident in some of the firms (see Appendix F).
9. Some SMEs have located their production facilities (in whole or in part) in lower wage regions where a relatively ample work force is available.

Current Status (4) and Potential Areas for Improvement (6)

1. Across the sectors, some firms have adopted specific purpose high technology equipment. Computer Colour Matching technology was seen in three textile dyeing and finishing factories, CAD design and film making was seen in two textile dyeing and finishing factories, CAD for pattern grading and marker drawing was seen in a garment manufacturing factory, CAD/CAM embroidering machinery was seen in a garment manufacturing factory, COREL DRAW CAD was seen in another factory located in the Northeast region, and some programmable sewing machines were also in use.

General purpose technologies, such as auto trimming sewing machines, were rarely seen on the production floor. Productivity oriented jigs/fixtures, such as tandem systems, auto stackers and waterfall techniques were not evident in the factories. These types of aides could significantly increase productivity if they were utilized.

One common problem facing most SMEs in adopting advanced hard technology is that they do not have the production volume to fully capture the benefits of high technology, thus making the return of investment unjustified in financial terms. The technical capability of company personnel to operate and maintain many high technology applications also contributes to the difficulties experienced in the adoption of higher levels of technology.

2. The supply of skilled workers is a major problem for SMEs both in Bangkok Metropolitan and surrounding area, and in other provinces in Thailand.

One critical issue overlooked by most SMEs is how to upgrade the skill level of the **available** work force and maximize its productivity. History indicates that as a nation develops, fewer and fewer people want to join the manufacturing sectors. This pattern is particularly evident in the textile dyeing/finishing and garment manufacturing sectors where working conditions compare unfavourably to the electronics and service sectors. In the garment sector, operators are frequently discouraged by the hardship required to master sewing skills, especially when they are left to learn by themselves with little or no proper training or instructions. Consequently, the source of skilled labor is not going to increase, and the market size of the labour force will continue to diminish as is evident in other Southeast Asian countries (Hong Kong, Taiwan and Singapore).

3. SMEs in Bangkok Metropolitan are facing the problem of high wage and high labour turn over rates. Many have begun to move the labour intensive components of production or indeed, their entire production, to regions where wage rates are relatively lower. This presents two problems:

Firstly, many SMEs have simply transferred their unsound management practice to lower wage regions. Unsound management practices generate higher production costs, lower product quality, a less productive work force and higher labour turn over rates, which, at the present, are hidden within the plausible complaint, "wage rates are too high". How long can low-wage regions sustain unsound management practice? Where else can SMEs move when they find out that a low-wage region can no longer sustain them?

Secondly, SMEs move the labour intensive components of the production from Bangkok Metropolitan to low-wage region with the goal of producing high-end and value-added products. However, most of them lack the necessary experience, both in design and production quality. Filling this manufacturing vacuum effectively is a pressing issue for both SMEs and Government. If other Southeast Asian countries can be used as a model, we can foresee that the whole Nation will develop into a high end and value added production base while other low-wage countries will serve as a supportive production base for Thailand's low end products.

Failure to address these two important issues now will substantially affect Thailand's competitiveness in textile and garment markets.

4. Most SMEs are good entrepreneurs, but lack time and focus for soft technology (i.e. management technology). They face considerable difficulty in effectively applying the soft technologies required to tackle current operational problems and to cope with change.

Across the sectors as well as the regions, the problems are similar. The level of sophistication in the use of soft technology is not high. People are paid to do non-value added work (i.e. non-productive activities) and people are paid to produce defective products. The potential of the work force and the operation in general have not been optimized.

5. On the market development side, some of the SMEs (garment sector) have a global vision and have considered investing in Indo-China countries. Most SMEs (garment sector) in the Northeastern region still see Laos and Vietnam as their "global" market.

Low quality products still have a market in the local village markets. As consumers' income levels rise, there will soon be no market for these products.

6. *Trial and error* is still a common manufacturing practice for some SMEs. This is not an effective practice for any manufacturing business, particularly when the industry is striving towards value added, high end markets.
7. There are two elements essential to the development of a value added and high end manufacturing base: (i) quality, and (ii) design ability. For most SMEs, these are still potential areas for improvement in targeting the value added and high end markets. Of the two, design ability requires the most improvement.
8. Most SMEs overlook the importance of financial and management information systems. For example, many hired accounting firms to take care of financial reporting requirements, but made little use of these statements as management tools. They need to be made aware of the important role of the financial system which affects their cost structure, profit and indirectly their product quality improvement.
9. Most of the SMEs lacked appropriate information flow or a documentation system.

KEY ACHIEVEMENTS FROM THE OPERATIONAL TEST (7)

The operational test included training sessions on improved practices in plant design and manufacturing which were identified as priorities by the participating SMEs.

Most SMEs realized they had operational deficiencies. When specific training workshops were designed to address their most urgent needs (as identified by the operational test), SMEs received these workshops with enthusiasm and a positive attitude.

Workshops on (i) *Plant Layout* and (ii) *Motivating Employees to Perform on The Job* were conducted by members from Saskatchewan Research Council in Bangkok. Workshop (i) was presented in January, 1994 and again in August, 1994. Workshop (ii) was presented twice in January, 1994.

The Thai project team members, as well as the rest of the TID staff, are specialists in their fields; this expertise is applied whenever clients require technical service in a specific area.

In the past, when assisting clients, the focus was strictly on functional limiting problem solving in small and specific areas. Since the inception of this project, the Thai project team, as well as the other TIP members, has shifted to an industry focus.

As a result of this shift of focus; positive happenings have been taking place at TID. At the management level, policies and programs are focused on *internal development to meet industry needs*; at the staff level, TID members have begun to enhance their capabilities with respect to the needs of the industry rather than focusing on their own specific functional areas; at the service level, TID started this year (1994) to provide technical services in several advanced CAD/CAM technology areas (pattern grading and marker drawing for the garment sector, and computer colour matching for dyeing sector) as well as material supply exhibitions and other training workshops, including (i) *Entrepreneurship Development Program for Textile Industry*, and (ii) *Time Study Techniques*. In 1995, TID will provide CAD for technical services in the area of the textile dyeing and finishing sector.

An expert system using knowledge based intelligence to computerize the operational test is under development at Saskatchewan Research Council. The pilot test of the system was successful and will be developed as an active part of the SRC's assessment procedure.

KEY CONCLUSIONS REGARDING THE TECHNOLOGY DELIVERY SYSTEM (8)

The operational test has indicated the value of employing a system that identifies the technology improvement needs of the industry. In designing the framework for a technology delivery system, insights from the earlier research on the subject carried out in Malaysia were utilized².

² Two articles, (i) *A Comparative Analysis of Managerial Practice Among SMEs from Malaysia, Singapore and Thailand* and (ii) *Facilitating the Transfer of Technology to SMEs in Underdeveloped Countries* were published by members from the University of Saskatchewan.

It has further demonstrated that in order to provide an effective response to such needs, the technology delivery agency has to have a wider vision, and be prepared to meet the industry needs not only with its own resources, but also by developing new collaborative arrangements with others. Such a framework is presented in Figure 3.

Another important lesson from the operational test is that types of technology improvement activities would have both firm and industry orientations as well as hybrids of the two. The dimensions of such technology activities are: technoeconomic needs assessment, support industry development, new product development, market development, personnel development, finance and business planning, production information system, accessing specialized technology and using accounting systems as a management tool. The multiplicity of vehicles to provide such assistance would include: studies, conferences, workshops, training, consultancy and specialized services. The schematics of this process are provided in the chart "Matrix of Activities by TID and Partners for the 'New Vision'." (Table 1).

The needs of the industry vary in response to the social-economic-technological structure which, in turn, is influenced by variances in geographic locations. Consequently, the delivery system adapts itself to cope with these variance changes in resources commitment; such adaptations enable it to optimize resources utilization and maximize its effectiveness. In Bangkok Metropolitan, commitment of resources to assist SMEs to do value added manufacturing will enable the industry to capture the high-end and value added markets. In the northeast provinces, commitment of resources to assist and train SMEs to enhance their productivity and upgrade their product quality will help industry to strengthen its existing manufacturing foundation and build for future development and growth. In the Chiang Mai area, commitment of resources is needed to assist SMEs in both value added manufacturing and productivity/quality enhancement if the specific needs of this region are to be met.

The application of the *expert system* is particularly effective in remote areas where TID assistance is not readily accessible. Furthermore, the *expert system* computerizes the *operational test* process, thus enabling a less experienced field officer to undertake the company assessment.

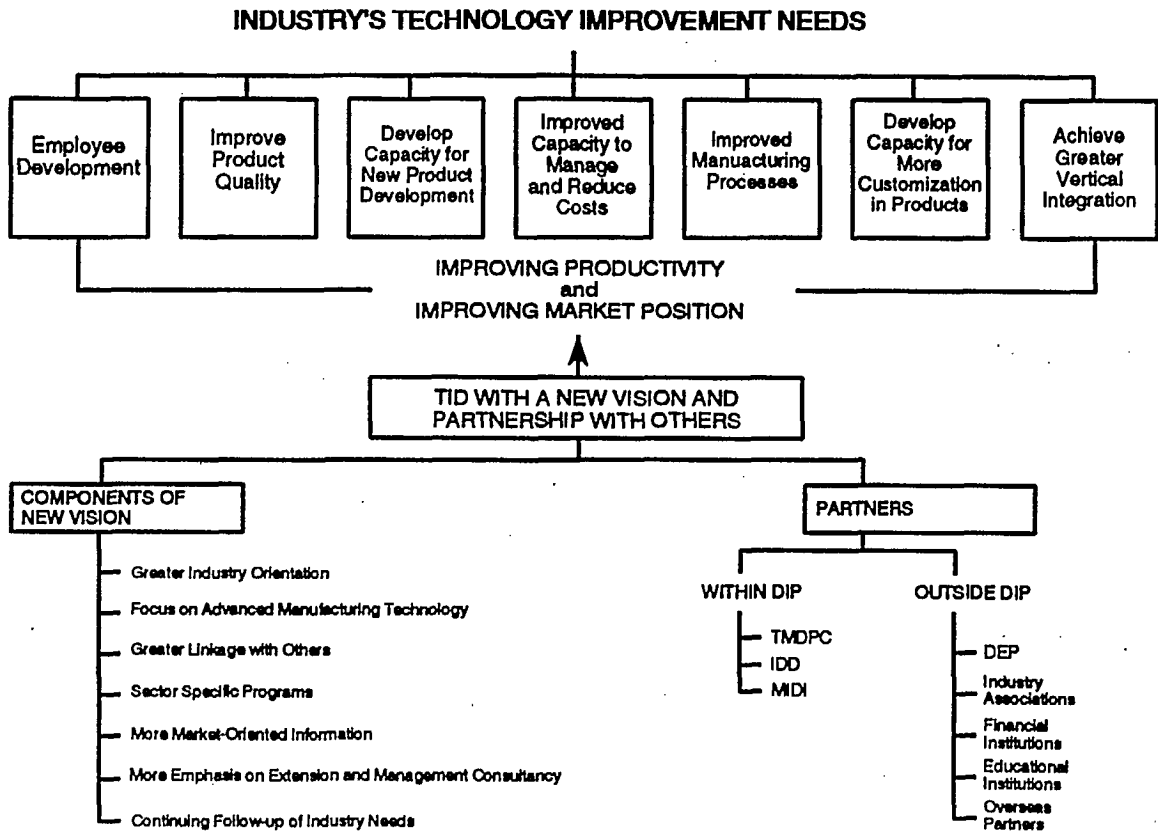


Figure 3: TID's New Vision for Technology Delivery

MAJOR RECOMMENDATIONS ARISING FROM THE STUDY (11)

For SMEs

Case-specific recommendations were summarized for the SMEs and depicted a total plan to help SMEs enhance their competitive strength. These are contained in a separate confidential report. Each individual SME received recommendations for their own company. The guiding principles for these recommendations are: (i) SMEs must enhance their strengths, (ii) SMEs should seek assistance to identify potential areas for improvement, and (iii) SMEs must work diligently to implement improvements. (Figure 3 and Table 1)

For Textile Industry Division, Department of Industrial Promotion

The suggested framework of the technology delivery system will require a significant change in the vision of the Textile Industry Division, supplemented by a set of related decisions on the part of the Thai government. The new vision of TID has to incorporate a shift of focus from function-specific services which emphasized utilizing existing capacity to user-specific activities with emphasis on delivery, consultation and coordination. In this new role, TID can serve as a Model Demonstration Agency for Technology Delivery for other divisions within the Department of Industrial Promotion. The hands-on experience gained by the TID staff during the operational test can be applied to assist other divisions within the Department as well as other government departments.

The framework of the technology delivery system proposed in this study would need to be complemented by a series of decisions by the Royal Thai government involving institution building, reorientation of mandates within existing industry service agencies, promoting innovations in education and training programs for the industry. These are:

1. Establishment of a Technology Service Centre.

Such a centre would be an expansion of TID's role in providing technical services to the industry with an aim to enhance its strength from the present CAD and Computer Colour Matching services.

2. Establishment of a Textile/Apparel Information Centre.

This is the expansion of TID's information services. It is proposed that this Information Centre provide information in four areas:

Hard Technology: information on current developments in advanced technology and its applicability in Thailand environment.

Marketing and Fashion/Product Development: information dealing with market and fashion trends, consumer preferences, and material availability as well as material sources.

Management Technology: information on general management, production management methods and industrial engineering applications.

Manufacturing Technology: information concerning developments in manufacturing technology, environmentally friendly manufacturing, waste treatment and overall regulations.

3. Establishment of A Clothing/Dyeing and Finishing Technology Demonstration Centre.

Investigate the feasibility of establishing a production workshop doing real production to demonstrate management technology and industrial engineering applications in a real manufacturing environment (not in a laboratory).

Set up a machinery/equipment video library to demonstrate equipment and machinery in operation.

Make arrangements with machine suppliers to have their newest machines/equipment demonstrated during production workshops.

4. Add Fashion/Textile Design Curriculum into the Existing Degree Program of Textile Education.

The purpose of this recommendation is to help establish an industry base of domestic designers. The initial step is to incorporate a fashion/textile design curriculum into the existing Textile Degree program at one or two selected universities.

5. Industry and Sector Specific Focus on Manpower Training, Operations Consultancy and Business Development.

Upgrade the existing training program to meet specific needs of the industry.

Provide personal development for TID staff to enhance their capability to provide specific services to the industry.

Identify one agency, say TID, to coordinate all existing *training, consulting and promotion* activities undertaken by various private and public institutions in order to achieve a better utilization of resources and/or more effective delivery to industry.

Table 1: MATRIX OF ACTIVITIES BY TID & PARTNERSHIPS FOR THE "NEW VISION"

	Studies	Conferences	Workshops	Training	Consultancy	
Techno/Economic Needs and Market Studies	TID, DBE, DEP, University, Research Institute	- possibly present paper at conference - distribute to public			TID, DEP, DBE, University	
Support Industry Development	TID, University, Research Institute, Inside DIP (MIDI)	TID, Ind. Assoc., Inside DIP (MIDI)				
Industry Linkages	TID, University, Research Institute, MIDI	TID, Ind. Assoc., MIDI	TID, Ind. Assoc.			
New Product Development			TID, Ind. Assoc., University, Supplier	TID, University, Private textile firms, Supplier, Ind. Assoc.	TID, University	
Market Development	- TID's technoeconomic study - Market study		TID, Ind. Assoc., DEP		TID, DEP, Consulting firms	
Personnel Development	University, Research Institute		TID, TMDPC, Ind. Assoc., University	TMDPC, University, Consulting firms, Ind. Assoc.	TMDPC, University	
Finance & Business Planning				TMDPC, TID, IDD, Financial Institutions	TMDPC, TID, IDD	
Production Information System			TMDPC, TID, Ind. Assoc.	TMDPC, TID, Ind. Assoc.	TMDPC, TID	
Specialized Technology			TID, Ind. Assoc., Foreign Suppliers	TID, Ind. Assoc., Foreign Suppliers	TID	

- Note: 1) Some TID activities as indicated in the matrix will be done in cooperation with international agencies (IDRC, CIDA, JETRO, JICA, JGDC, USAID, HU, etc.)
 2) DEP = Department of Export Promotion
 3) DBE = Department of Business Economics
 4) MIDI = Metal Industry Development Institute
 5) TMDPC = Thailand Management Development and Productivity Centre
 6) IDD = Industrial Development Division

**COMPANY INTERVIEW GUIDE
FOR ASSESSING IMPACT OF SRC's
DIAGNOSTIC TOOL ON SASKATCHEWAN SMEs
(Small and Medium-Sized Enterprises)**

Company Name: _____
Contact Person: _____
Phone Number: _____ Date: _____

Hello, this is _____ calling from the Saskatchewan Research Council. Industry Canada has contracted us to do an economic impact assessment of a diagnostic assessment process that was done for your company. We are trying to assess the effectiveness of this process in helping Saskatchewan companies realize the interrelatedness of their various company operations on the overall health of the company.

_____ (fill in ITA or other name) conducted an assessment of your company's operations in _____ (year) using what is known as **Company Diagnostic Tool** and some recommendations were made to your company. The specific recommendations made were:

1. Do you recall this? Yes No [If NO, prompt with further details on tool and recommendations made.]

2. Did you implement any of the recommendations?

Recommendation 1: _____
(write recommendation here)

Yes (IF YES, go to 2a) No (IF NO, go to 2b)

2a. IF YES, were problems:

- a) completely eliminated/improved¹
- b) partially improved/eliminated²
- c) not at all improved/eliminated³

If b) or c), please explain: _____ (and check appropriate response).

- Problems were not fully addressed¹
- Recommendations were not appropriate²
- Implementation was ineffective³
- Company was not ready to implement change⁴

2b. IF NO, why not? Please explain: _____
(and check appropriate response).

- Lack of human resources¹
- Lack of financial resources²
- Lack of management commitment³
- Did not believe in recommendations⁴
- Not a priority⁵
- Other. Please explain _____

3. Recommendation 2: _____
(write recommendation here)

- Yes No

3a. IF YES, were problems:

- a) completely eliminated/improved¹
- b) partially improved/eliminated²
- c) not at all improved/eliminated³

If b) or c), please explain: _____
(and check appropriate response).

- Problems were not fully addressed¹
- Recommendations were not appropriate²
- Implementation was ineffective³
- Company was not ready to implement change⁴

3b. IF NO, why not? Please explain: _____
(and check appropriate response).

- Lack of human resources¹
- Lack of financial resources²
- Lack of management commitment³
- Did not believe in recommendations⁴
- Not a priority⁵
- Other. Please explain _____

4. Recommendation 3: _____
(write recommendation here)

- Yes No

4a. IF YES, were problems:

- a) completely eliminated/improved¹
- b) partially improved/eliminated²
- c) not at all improved/eliminated³

If b) or c), please explain. _____ (and check appropriate response)

- Problems were not fully addressed¹
- Recommendations were not appropriate²
- Implementation was ineffective³
- Company was not ready to implement change⁴

4b. IF NO, why not? Please explain: _____
_____ (and check appropriate response).

- Lack of human resources¹
- Lack of financial resources²
- Lack of management commitment³
- Did not believe in recommendations⁴
- Not a priority⁵
- Other. Please explain _____

5. IF NO, and you decided not to take any corrective action, do you feel that you made the right decision?

- Yes No Not Sure

Please explain answer: _____

5a. Did you take any action [other than our recommendations] to improve the identified problems?

- Yes (IF YES, go to 5b) No (IF NO, go to 6)

5b. IF YES, what was the result?

- Completely eliminated/improved problem¹
- Partially eliminated/improved problem²
- No improvement³

If improved, what were the key factors for success? _____

If no improvement, what were the key factors for failure? _____

6. When _____ identified the potential areas for improvement,
(ITA or other name)
how did you react to the findings?

- Very positively¹
- Somewhat positively²
- Neutral³

With some scepticism or resistance⁴

Negatively⁵

7. When the _____ identified potential areas for improvement, did it trigger/lead you or other employees to other hidden problems?
(ITA or other name)

Yes (IF YES, go to 7a) No

7a. IF YES, what action did you take? Describe: _____

What was the result?

Success¹

Partial success²

Failure³

What were the key success factors? _____

What were the key failure factors? _____

8. Overall, how useful did you find SRC's diagnostic process?

Very useful¹

Somewhat useful²

Not at all useful³

Please explain _____

9. What were the benefits to your company of going through this diagnostic process? Please explain: _____ (and check appropriate response).

Heightened awareness of inter-relatedness of company's operations¹

Expertise of diagnostic team in identified areas²

Outside perspective of company's operations³

Other. Please explain _____

No perceived benefit

10. What were the benefits from recognizing the problems as identified by _____?
(ITA or other name)

Please explain: _____ (and check appropriate response).

Saved the company money¹

Other. Please explain. _____

11. What were the benefits from implementing the recommendations?

Please explain: _____ (and check appropriate response).

- Increased sales¹ \$ _____ and __%
- Improved profitability² \$ _____ and __%
- Savings in labour³ \$ _____ and __%
- Improved productivity⁴ \$ _____ and __%
- Reduced staff turnover⁵ _____%
- More targeted direction in company's operations⁶
- Refocus on company objectives/vision/mission/focus⁷

11a. If no direct dollar linkages, what impact on a scale from 1 to 10, would you say that the recommendations have had on your company?

12. Were there any setbacks from not implementing the recommendations or not taking any corrective actions?

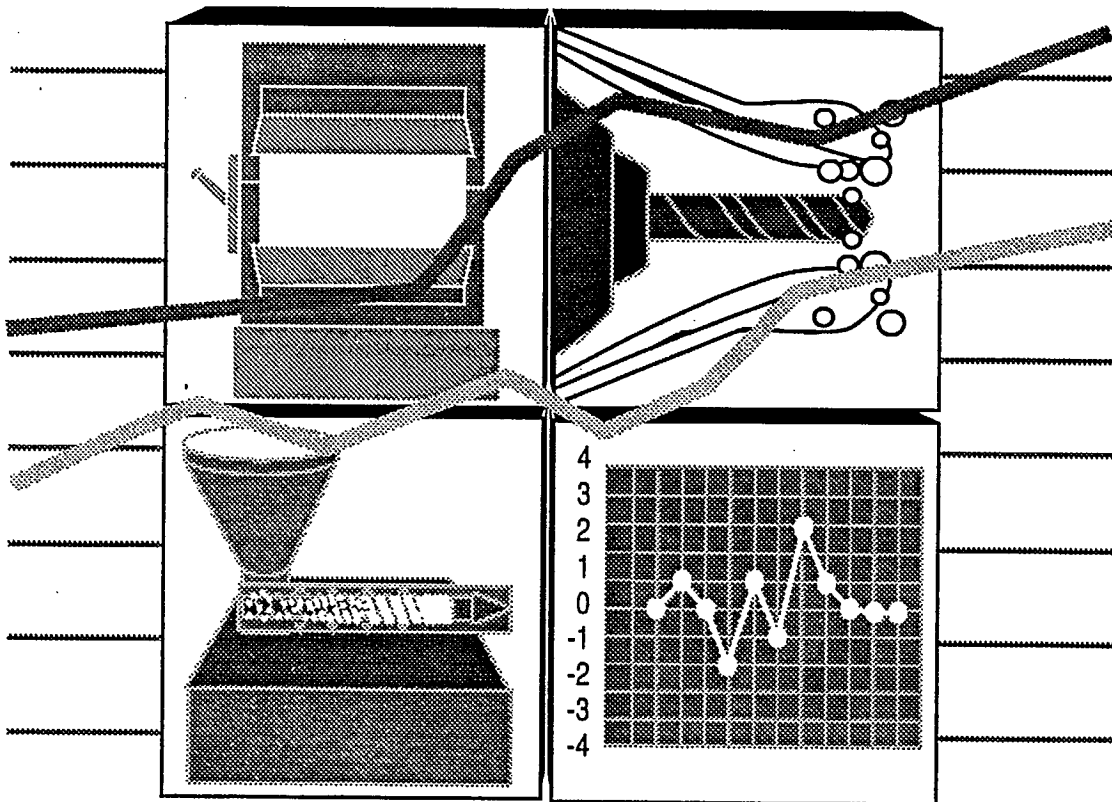
Please explain: _____ (and check appropriate response).

- Loss of sales¹ \$ _____ and __%
- Loss of productivity² \$ _____ and __%
- Loss of profitability³ \$ _____ and __%

13. Other comments: _____

Thank you for your time and input.

P E R F O R M A N C E
B E N C H M A R K I N G S E R V I C E



Customized Benchmarking Report

for:

Alberta #4

October 6, 1994

**Notes on Selecting Custom Comparison Group
for Alberta #4**

DATE: 6 October, 1994
For Alberta: Robert Faulder
For PBS: Dan Luria/Mickie Speers

Alberta #4 - SVKEY 1344

Shop Characterization:

Shop makes liquid storage tanks averaging \$370 (U.S.), mainly to-stock. Branch plant: limited design work in-house. *All dollar figures were converted to, and are expressed in, U.S. dollars at \$1.35 CDN = \$1.00 U.S.*

Comparison Group Size

Result: Group size = 25

Piece Price (q4) = \$500.00 (\$370.00 U.S.)

Result: Used price = between \$10.00 and 2,500.00

Shop's average units/order volume (q3) = 1,000 - 9,999

Result: Used volume = 10 +

Made-to-Stock (MTS) (q8) = 90%

Result: MTS = greater than or equal to 30%

Industry (q1) = Metal Liquid Storage Tanks

Result: Used Industries = Heat Treating, Coating, & Plating; Stamping & Metal Fabrication (incl Screw Mach Prdts); Other Nonelectrical Parts, Mach & Eqpt; Tooling & Machining; Automotive & Heavy Truck; Aircraft/Aerospace; Instruments; All Others

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1. Critical Measures

This page presents how your plant ranks on ten measures that managers in business like yours say are the most important. No company ranks high on every measure; and there is no single "recipe" for being a "good" company. You should consider the implications of how your plant ranks. For example, if some of your major customers use late delivery as the basis for dropping suppliers, then scoring well on on-time delivery matters. Delivery, scheduling, and quality performance are often enhanced by close tracking of your own and your suppliers' on-time record, of your success in sticking to the shop schedule, and of your past record on material scrap and customer rejects. On the other hand, if you're in a mature business, failure to score well on sales growth may be less of a concern. In terms of profitability, the most important measure is value-added per employee, often called labor productivity. It is usually higher in plants that train employees and organize work in ways that result in most workers regularly using computers on the job.

One note: in the table below, we define "Best Practice" as the value achieved by the best 10 percent of firms in your comparison group. (If fewer than 20 comparison group members provided the data needed to compute their value for a particular measure, then the "Best Practice" column is left blank.)

10 Critical Measures			
Measure	Your Rank	Your Value	Best Practice
Value-Added (Sales Less Purchased Inputs) per Employee	1 out of 23	109,800	108,667
Percent On-Time Deliveries to Your Customers	2 out of 24	98.0	98.0
**Percent of Lots or Jobs Expedited by Bumping Other Lots or Jobs from Schedule	2 out of 20	3.3	3.3
**Percent of Units Scrapped or Material-Yield Lost	6 out of 25	1.00	0.25
Percent Change in Sales, Past 2 Years	10 out of 23	25.0	122.2
**Percent of Lots or Jobs Initially Rejected by Customers for Quality Reasons	12 out of 23	1.000	0.000
Total Inventory Turns	13 out of 23	6.3	15.1
Training Tuition and Fees per Employee	17 out of 20	0	1,000
Number of Keyboards and Keypads Used by Shop Floor and Design/Engineering, per Employee	20 out of 24	0.00	0.52
Percent of Employees Using a Computer or Programmable Machine Controller at Least Once a Week	21 out of 25	5.0	70.0

** This measure is ranked from lowest to highest; i.e., the firm with the lowest value has rank 1.

2. Profiting from Improvement

Top performers save money by avoiding waste and making sure that their operations are systematic. They use reliable, carefully scheduled equipment to avoid premium freight costs and achieve low labor and material costs. As a result, they can submit lower quotes and/or make more money. This page presents some of the benefits companies like yours might expect as they improve on some of the critical measures.

Expected Benefits from Selected Improvements		
A Firm Like Yours That:	And Makes An Improvement Of:	Can Expect Annual Benefits Of:
Consumes \$ 76,792 in energy costs per year	10% reduction in energy use	\$ 7,679 savings in energy costs
Achieves 6.3 inventory turns on \$ 3,703,000 in sales	10% reduction in inventory	\$ 5,920 savings in inventory holding charges ¹
Buys \$ 1,507,000 in purchased material, parts and services per year	1.0 percentage point reduction in scrap rate	\$ 15,070 savings in material and services costs
Produces \$ 109,800 in value-added (sales less purchased inputs) per employee	\$ 10,000 increase in value-added per employee	\$ 55,545 increase in pre-tax profit ²

Note 1: Assumes inventory holding charge (or interest rate) of 10 percent. Thus total savings = inventory reduction * 0.1.

Note 2: Benchmarking Service analysis shows that every \$10,000 of additional value-added per employee is associated with an average increase in pre-tax profits of 1.5 percent of sales. This result is highly statistically significant.

Of course, sometimes the benefit from improvement is the entire value of your business. If high rejects or poor on-time performance causes you to lose large orders, improving on these measures is a life or death matter.

3. Interpreting the Information

Throughout this report, we distinguish between two types of data. For *Performance Measures*, the preferred direction (higher or lower) is clear and unambiguous. Customer Reject Rate should be driven toward zero; On-Time Percent should approach 100. Our approach to reporting on performance measures is to describe what it means to be "good." For any given performance measure, Comparison Groups are first sorted from best value to worst. We then report the cutoffs that what it takes to be in the top 5 percent, top 10 percent, top quarter, top half, and bottom quarter of the group.

Here is an example of the performance measure reporting format.

1. Percent On-Time Deliveries to Your Customers (Q69)

Your Rank: 2 out of 24 Responses	
Plants in the Top 5% Have Values of at Least	No data
Plants in the Top 10% Have Values of at Least	98.0
Plants in the Top 25% Have Values of at Least	95.0
Plants in the Top Half Have Values of at Least	89.0
Plants in the Bottom 25% Have Values at or Below	80.0
Your Performance 98.0	

Practices, however, have no obvious preferred direction. Rather than being clear-cut indicators of performance, they instead reflect a firm's strategy or production choices. For example, successful firms might use new or old equipment, and might employ different quoting strategies. For all practices, we present several values describing the distribution: the middle or median, the quartiles, and the outer (highest and lowest) 10 percent.

Here is an example of the reporting format for practices:

2. Percent of Shop Floor Workers Participating in Work Teams (Q78 / Q76 * 100)

Your Location In the Group: 17 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
100.0	65.2	16.7	0.0	0.0
Your Value 0.0				

One note: If the number of responses for any measure falls below 40, we do not report the "Top 5 Percent" cutoff. (With under 40 responses, the top 5 percent would reflect just a single Comparison Group.) Similarly, if the number of responses falls below 20, we do not report the 10 percent cutoffs for either measures or practices.

4. Profile of the Comparison Group

This chapter provides a brief description of the 25 shops against which this report compares your performance. They were selected based on how close their values were to yours on the items in this section. It allows you to get a feel for how similar you are to the group, in terms of size, customer base, average unit price, and other traits.

3. Industry

Industry Breakdown of Plants Included in Your Comparison Group (Total Group Size of 25 Plants)	
Textile & Apparel	0.0 %
Furniture and Other Wood Products	0.0
Printing & Publishing	0.0
Plastic and Rubber Products	0.0
Heat Treating, Coating & Plating	0.0
Stamping & Metal Fabrication (including Screw Machine Products)	40.0
Large, Powered Machine-Building	0.0
Other Non-Electrical Parts, Machinery & Equipment	4.0
Tooling & Machining	16.0
Computer, Communications & Electronic Equipment & Components	0.0
Other Electrical Equipment (including Appliances)	0.0
Automotive & Heavy Truck	16.0
Aircraft/Aerospace	0.0
Instruments (including Medical Devices & Equipment)	16.0
Other Industries	8.0

4. Geographic Distribution

Percent of Comparison Group Located In:	
New England/Mid-Atlantic (CT,DE,MA,MD,ME, NH,NJ,RI,VA,VT,WV)	8.0 %
Michigan	12.0
Other Great Lakes (IN,IL,MN,NY,OH,PA,WI,Ont)	56.0
South (AL,AR,FL,GA,KY,LA,MS,OK,NC,SC,TN,TX)	4.0
Plains (IA,KS,MO,MT,ND,NE,SD)	4.0
West (AK,AZ,CA,CO,HA,ID,NM,NV,OR,UT,WA,WY)	12.0

5. Annual Sales (Q18)

Your Location In the Group: 19 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
\$ 50,000,000	\$ 25,000,000	\$ 8,835,000	\$ 3,703,000	\$ 1,522,000
Your Value \$ 3,703,000				

6. Average Unit or Piece Price (Q4)

Your Location In the Group: 6 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
\$ 1,000.00	\$ 370.00	\$ 35.00	\$ 15.00	\$ 12.00
Your Value \$ 370.00				

7. Annual Production Volume (Number of Units) for a Typical Order or Part Number (Q3)

Percent of Comparison Group With Typical Annual Volumes in the Range:				
1-9	10-99	100-999	1000-9999	10,000 +
0.0 %	24.0 %	40.0 %	20.0 %	16.0 %
Your Typical Annual Volume 1000-9999				

8. Percent of Sales from Engineered-to-Order Work (One-Off Items, Such as Dies, Molds, Prototypes, Etc.) (Q5)

Your Location In the Group: 6 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
20.0	10.0	1.0	0.0	0.0
Your Value 10.0				

9. Percent of Sales from Job Shop Parts and Services (Q6)

Your Location In the Group: 11 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
30.0	10.0	0.0	0.0	0.0
Your Value 0.0				

10. Percent of Sales from Repetitive Work on Jobs Done Regularly (e.g., Ship-to-Release Work) (Q7)

Your Location In the Group: 19 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
50.0	30.0	15.0	0.0	0.0
Your Value 0.0				

11. Percent of Sales from Make-to-Stock Work(Q8)

Your Location In the Group: 7 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
100.0	95.0	70.0	40.0	30.0
Your Value 90.0				

12. Percent of Sales to the Auto Industry (Q14)

Your Location In the Group: 4 out of 23 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
100.0	20.0	1.0	0.0	0.0
Your Value 20.0				

13. Percent of Sales to Aircraft/Aerospace Industry (Q15)

Your Location In the Group: 11 out of 22 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
30.0	5.0	0.5	0.0	0.0
Your Value 0.0				

14. Percent of Sales to the Communications/Electronics Industry (Q16)

Your Location In the Group: 9 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
65.0	3.0	0.0	0.0	0.0
Your Value 0.0				

15. Percent of Sales that are Military/Defense-Related (Q13)

Your Location In the Group: 15 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
16.0	5.0	2.0	0.0	0.0
Your Value 0.0				

16. Percent of Sales to the Public or Final Consumers (Directly or Through Distributors and Retailers) (Q11)

Your Location In the Group: 1 out of 23 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
100.0	100.0	80.0	0.0	0.0
Your Value 100.0				

5. General Business

Sales growth is often a requirement for improved margins, and being busy enough to operate on a two- or three- basis boosts profits by spreading fixed costs over more output. Being paid on a timely basis and having an efficient quoting process both improve cash flow and free up resources with which to grow the business.

5.1 Performance Measures

17. Percent Change in Sales, Past 2 Years
 ((Q18 - Q19)/Q19 * 100)

Your Rank: 10 out of 23 Responses	
Plants in the Top 5% Have Values of at Least	No data
Plants in the Top 10% Have Values of at Least	122.2
Plants in the Top 25% Have Values of at Least	36.4
Plants in the Top Half Have Values of at Least	23.8
Plants in the Bottom 25% Have Values at or Below	-2.2
Your Performance 25.0	

5.2 Practices

18. Percent of Sales Exported Beyond U.S. (beyond Canada for Canadian firms) (Q20)

Your Location In the Group: 16 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
50.0	10.0	2.5	0.0	0.0
Your Value 1.0				

**19. Change in Share of Sales Exported, Past 2 Years
(Q20 - Q21)**

Panel Changes: Based on 24 Responses	
Median Change	0.0 %
Percent of Panel Showing an Increase	29.2 %
Percent of Panel Showing a Decrease	20.8 %
Your Change 0.0	

20. Percent of Sales from Products not Made 3 Years Ago (Q10)

Your Location In the Group: 24 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
85.0	30.0	20.0	10.0	0.0
Your Value 0.0				

21. Percent of Sales to Customers not Served 3 Years Ago (Q22)

Your Location In the Group: 10 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
70.0	25.0	10.0	5.0	1.0
Your Value 10.0				

22. Percent of Sales for Which You Acted as Systems Supplier (Q12)

Your Location In the Group: No data out of 13 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
No data	40	20	0	No data
Your Value No data				

23. Percent of Shop Labor Time Spent Doing Assembly (Q9)

Your Location In the Group: 4 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
98.0	75.0	30.0	20.0	5.0
Your Value 80.0				

5.3 Yes/No Questions

Doing business electronically can improve timeliness and shorten collection periods. Basing quotes and prices on accurately measured costs can improve your bottom line. Some companies:

Quoting & Doing Business Electronically			
	% Yes	Number Answering	Your Answer
Q28. Do business electronically (send or receive invoices, releases or electronic mail, or get paid via electronic funds transfer)	68.0	25	Yes
Q30. In preparing quotes, use different rates depending on which machines will be used to run the job	56.5	23	Yes
Q34. In preparing quotes, calculate a separate changeover or downtime charge for each job	50.0	24	Yes
Q32. In preparing quotes, calculate separately for each job the floorspace needed to store raw material or work-in-process for the job	4.3	23	No

6. Timeliness

Time has become an important factor in reducing costs and satisfying customers. Indicators of how well you are able to use timeliness as a competitive asset reducing manufacturing lead time, achieving high inventory turns, avoiding having to violate schedules by expediting lots, and delivering on time. In some markets, being fast also allows you to charge premium prices. In others, being on time is a condition of being retained as a supplier.

6.1 Performance Measures

24. Percent Change in Manufacturing Lead Time, Past 2 Years ($[Q64 - Q65] / Q65 * 100$)

Your Rank: 12 out of 23 Responses	
Plants in the Top 5% Have Values at or Below	No data
Plants in the Top 10% Have Values at or Below	-68.0
Plants in the Top 25% Have Values at or Below	-50.0
Plants in the Top Half Have Values at or Below	0.0
Plants in the Bottom 25% Have Values of at Least	0.0
Your Performance 0.0	

25. Total Inventory Turns ($Q18 / Q67$)

Your Rank: 13 out of 23 Responses	
Plants in the Top 5% Have Values of at Least	No data
Plants in the Top 10% Have Values of at Least	15.1
Plants in the Top 25% Have Values of at Least	9.9
Plants in the Top Half Have Values of at Least	6.9
Plants in the Bottom 25% Have Values at or Below	3.9
Your Performance 6.3	

26. Percent Change in Total Inventory Turns, Past 2 Years
 ([Q18/Q67 - Q19/Q68] / [Q19/Q68] * 100)

Panel Changes: Based on 22 Responses	
Median Change	9.0 %
Percent of Panel Showing an Increase	63.6 %
Percent of Panel Showing a Decrease	36.4 %
Your Change -6.2	

27. Percent of Lots Expedited by Bumping Other Lots or Jobs from Schedule
 (Q73 / Q72 * 100)

Your Rank: 2 out of 20 Responses	
Plants in the Top 5% Have Values at or Below	No data
Plants in the Top 10% Have Values at or Below	3.3
Plants in the Top 25% Have Values at or Below	4.4
Plants in the Top Half Have Values at or Below	18.5
Plants in the Bottom 25% Have Values of at Least	33.3
Your Performance 3.3	

28. Percent On-Time Deliveries to Your Customers (Q69)

Your Rank: 2 out of 24 Responses	
Plants in the Top 5% Have Values of at Least	No data
Plants in the Top 10% Have Values of at Least	98.0
Plants in the Top 25% Have Values of at Least	95.0
Plants in the Top Half Have Values of at Least	89.0
Plants in the Bottom 25% Have Values at or Below	80.0
Your Performance 98.0	

**29. Change in Delivery On-Time Percent, Past 2 Years
(Q69 - Q70)**

Panel Changes: Based on 23 Responses	
Median Change	5 %
Percent of Panel Showing an Increase	60.9 %
Percent of Panel Showing a Decrease	4.3 %
Your Change 28	

6.2 Practices

30. Days Manufacturing Lead Time, Typical Order (Q64)

Your Location In the Group: 16 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
56	26	10	4	2
Your Value 5				

6.3 Yes/No Questions

Computer technologies are important inventory tools in the manufacturing environment. Some companies:

Activity			
	% Yes	Number Answering	Your Answer
71. Bought software to use in scheduling, inventory control, or purchasing, in the past two years	56.0	25	No

7. Design & Manufacturing

Design can add significant value to products and income to the business. CAD, used well and deeply, can make design much more efficient, especially if the parts or tooling being designed have fairly consistent geometry, i.e., many new designs are really variations on current or past designs kept in a CAD library. As for manufacturing, shops running several jobs on the same machine can benefit from quick set-ups.

7.1 Performance Measures

31. Change in Average Hours Per Setup, Typical Machine, Past 2 Years (Q46-Q47)

Your Rank: 12 out of 21 Responses	
Plants in the Top 5% Have Values at or Below	No data hours
Plants in the Top 10% Have Values at or Below	-1.5
Plants in the Top 25% Have Values at or Below	-1.0
Plants in the Top Half Have Values at or Below	-0.1
Plants in the Bottom 25% Have Values of at Least	0.0
Your Performance 0.0	

7.2 Practices

32. Percent of Sales from Jobs for Which You Designed the Part or Assembly (Q37)

Your Location In the Group: No data out of 19 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
No data	95	75	20	No data
Your Value No data				

33. For CAD Users, Percent of Design Hours Logged by Employees at CAD Terminals (Q39)

Your Location In the Group: No data out of 17 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
No data	100.0	80.0	10.0	No data
Your Value No data				

34. Change in Percent of Design Hours Logged on CAD, Past 2 Years (Q39 - Q40)

Panel Changes: Based on 17 Responses	
Median Change	0.0 %
Percent of Panel Showing an Increase	47.1 %
Percent of Panel Showing a Decrease	5.9 %
Your Change No data	

7.3 Yes/No Questions

CAD has become a powerful force in the design and manufacturing environments. Optimizing plant layout can eliminate bottlenecks. Some companies:

Activities			
	% Yes	Number Answering	Your Answer
41. Routinely use CAD data to develop instructions for their own or their tooling suppliers' machines (i.e., CAD/CAM)	48.0	25	No
43. Send CAD "math" (or product) data to suppliers or receive it from customers	40.0	25	Yes
38. Bought CAD or CAE software, in the past two years.	57.9	19	N/A
51. Have significantly changed the layout of machines or activities on the shop floor to improve process flow and/or throughput, in the past 2 years	48.0	25	No

8. Workforce Productivity & Methods

High and rising productivity can be aided not only by good equipment and well-applied technology, but by well-trained, computer-literate workers that have a voice in the business. Suggestion programs and work teams can be significant ways to make that voice heard.

8.1 Performance Measures

35. Value-Added (Sales Less Purchased Inputs) per Employee (([Q18 - Q24] / Q74) * 1000)

Your Rank: 1 out of 23 Responses	
Plants in the Top 5% Have Values of at Least	\$ No data
Plants in the Top 10% Have Values of at Least	\$ 108,667
Plants in the Top 25% Have Values of at Least	\$ 95,000
Plants in the Top Half Have Values of at Least	\$ 72,667
Plants in the Bottom 25% Have Values at or Below	\$ 50,636
Your Performance \$ 109,800	

36. Percent Change in Value-Added per Employee, Past 2 Years ((([Q18-Q24] / Q74) - [(Q19-Q25) / Q75]) / ((Q19-Q25) / Q75) * 100)

Panel Changes: Based on 22 Responses	
Median Change	12.2 %
Percent of Panel Showing an Increase	63.6 %
Percent of Panel Showing a Decrease	36.4 %
Your Change 19.9	

37. Value-Added per Shop Employee
 (([Q18 - Q24] / Q76) * 1000)

Your Rank: 9 out of 23 Responses	
Plants in the Top 5% Have Values of at Least	\$ No data
Plants in the Top 10% Have Values of at Least	\$ 314,889
Plants in the Top 25% Have Values of at Least	\$ 166,504
Plants in the Top Half Have Values of at Least	\$ 126,667
Plants in the Bottom 25% Have Values at or Below	\$ 66,563
Your Performance 137,250	

38. Percent Change in Value-Added per Shop Employee, Past 2 Years
 ((([Q18 - Q24] / Q76) - [(Q19 - Q25) / Q77]) / ((Q19 - Q25) / Q77) * 100)

Panel Changes: Based on 22 Responses	
Median Change	8.6 %
Percent of Panel Showing an Increase	68.2 %
Percent of Panel Showing a Decrease	31.8 %
Your Change 19.9	

8.2 Practices

39. Training Tuition and Fees per Employee
 (Q84 / Q74)

Your Location In the Group: 17 out of 20 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
\$ 1,000	\$ 417	\$ 215	\$ 4	\$ 0
Your Value 0				

40. Change in Dollars Spent on Training Tuition and Fees per Employee, Past 2 Years
(Q84/Q74 - Q85/Q75)

Panel Changes: Based on 19 Responses	
Median Change	\$ 37
Percent of Panel Showing an Increase	73.7 %
Percent of Panel Showing a Decrease	5.3 %
Your Change 0	

41. Training Tuition and Fees per Shop Employee
(Q84*Q86 / (Q76*100))

Your Location In the Group: 16 out of 19 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
\$ No data	\$ 500	\$ 109	\$ 0	\$ No data
Your Value 0				

42. Change in Dollars Spent on Training Tuition and Fees per Shop Employee, Past 2 Years
((Q86*Q84/Q76 - Q87 * Q85/Q77)/100)

Panel Changes: Based on 18 Responses	
Median Change	\$ 34
Percent of Panel Showing an Increase	66.7 %
Percent of Panel Showing a Decrease	5.6 %
Your Change 0	

43. Percent of Shop Floor Workers Participating in Work Teams
(Q78 / Q76 * 100)

Your Location In the Group: 17 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
100.0	65.2	16.7	0.0	0.0
Your Value 0.0				

44. Change in Percent of Shop Employees Participating in Work Teams, Past 2 Years
 ((Q78/Q74 - Q79/Q77) * 100)

Panel Changes: Based on 25 Responses	
Median Change	0.0 %
Percent of Panel Showing an Increase	36.0 %
Percent of Panel Showing a Decrease	28.0 %
Your Change 0.0	

45. Percent of Employees Using a Computer or Programmable Machine Controller at Least Once a Week
 (Q88)

Your Location In the Group: 21 out of 25 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
70.0	57.1	40.0	8.0	2.0
Your Value 5.0				

46. Increase in Percent of Employees Using a Computer or Programmable Machine Controller at Least Once a Week, Past 2 Years
 (Q88 - Q89)

Panel Changes: Based on 24 Responses	
Median Change	3.5 %
Percent of Panel Showing an Increase	66.7 %
Percent of Panel Showing a Decrease	4.2 %
Your Change 0.0	

9. Technology

Computer-based technologies can be invaluable aids to productivity and quality. Computerized machine controls, PCs, and other keyboard-instructed devices are some of the key technology tools in your type of business. Specifically, we asked about the number of keyboards and keypads -- PCs, on-machine controllers, DataMytes, etc. -- used on the shop floor and in the design/engineering function.

9.1 Practices

47. Number of Keyboards and Keypads per Employee (Q48/Q74)

Your Location In the Group: 20 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
0.52	0.30	0.20	0.02	0.00
Your Value 0.00				

48. Change in Average Number of Keyboards and Keypads per Employee, Past 2 Years (Q48/Q74 - Q49/Q75)

Panel Changes: Based on 24 Responses	
Median Change	0.03
Percent of Panel Showing an Increase	66.7 %
Percent of Panel Showing a Decrease	12.5 %
Your Change 0.00	

49. Number of Keyboards and Keypads Used by Shop Floor and Design/Engineering, per Shop Floor Employee (Q48/Q76)

Your Location In the Group: 20 out of 24 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
0.81	0.62	0.34	0.02	0.00
Your Value 0.00				

50. Change in Average Number of Keyboards and Keypads per Shop Employee, Past 2 Years
(Q48/Q76 - Q49/Q77)

Panel Changes: Based on 24 Responses	
Median Change	0.05
Percent of Panel Showing an Increase	66.7 %
Percent of Panel Showing a Decrease	8.3 %
Your Change 0.00	

10. Quality

Customer rejects are always to be avoided. The trick is to avoid them without incurring huge inspection or other QA costs. While good product design is essential, so too is good process control; sophisticated gauging; and appropriate statistical sampling, analysis, and quality training.

10.1 Performance Measures

51. Percent of Lots Rejected by Customers for Quality Reasons (Q92)

Your Rank: 12 out of 23 Responses	
Plants in the Top 5% Have Values at or Below	No data
Plants in the Top 10% Have Values at or Below	0.000
Plants in the Top 25% Have Values at or Below	0.250
Plants in the Top Half Have Values at or Below	1.000
Plants in the Bottom 25% Have Values of at Least	1.000
Your Performance 1.000	

52. Change in Percent Customer Rejects, Past 2 Years (Q92 - Q93)

Panel Changes: Based on 23 Responses	
Median Change	0.000 %
Percent of Panel Showing an Increase	8.7 %
Percent of Panel Showing a Decrease	39.1 %
Your Change 0.000	

53. Percent of Units Scrapped
(Q90)

Your Rank: 6 out of 25 Responses	
Plants in the Top 5% Have Values at or Below	No data
Plants in the Top 10% Have Values at or Below	0.25
Plants in the Top 25% Have Values at or Below	1.00
Plants in the Top Half Have Values at or Below	2.00
Plants in the Bottom 25% Have Values of at Least	3.70
Your Performance 1.00	

54. Two-Year Change in Percent of Units Scrapped
(Q90 - Q91)

Panel Changes: Based on 25 Responses	
Median Change	-1.00 %
Percent of Panel Showing an Increase	8.0 %
Percent of Panel Showing a Decrease	64.0 %
Your Change 0.00	

10.2 Practices

55. Percent of Shop Employees Receiving SPC/SQA Training in Past 3 Years
(Q100)

Your Location In the Group: 11 out of 23 Responses				
10% Said At Least	25% Said At Least	Median	25% Said At or Below	10% Said At or Below
90	70	0	0	0
Your Value 0				

10.3 Yes/No Questions

The following was true of quality assurance efforts at many companies:

Activity			
	% Yes	Number Answering	Your Answer
94. Have a formal quality assurance program that includes statistical quality analysis (SQA) of data on parts and/or machines	36.0	25	No
96. Routinely analyze quality data using computers or DataMytes	36.0	25	Yes
98. Plant is ISO 9000-certified	0.0	25	No

A Comparative Analysis of Managerial Practices among SMEs from Malaysia, Singapore, and Thailand

Jack Dart
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The primary purpose of this article is to compare and contrast the managerial practices and problems faced by the SMEs operating in Malaysia, Singapore, and Thailand. While such a comparative analysis has been done in the past, this study differs from previous studies in two ways. First, the same questionnaire is used across the three countries thus allowing for more consistent comparison. Second, this study is the first to examine human resource management problems and practices.

Introduction

This article* examines the managerial practices and problems of the SMEs in selected ASEAN countries. Since the early seventies, policy-makers in developing countries have become increasingly aware of the inappropriateness of large-scale plants and industries as engines of growth. These plants often use technologies that are unavailable in the developing countries. Further, because of their relative capital intensity, the large-scale plants have not made

any significant impact in reducing the unemployment problem faced by many of the developing nations. It is therefore not surprising that the focus of development policies has since shifted to small-and medium-size enterprises (SMEs).¹ The shift in emphasis is particularly true in countries of the ASEAN region, where policies are now geared towards the development and support of the SMEs (James and Akrasanee 1986).

Accompanying the change in public policy is an increase in research activities on the SMEs.

While the activities cover a broad range of issues, they all point to the importance of the SMEs to the national economy. For example, Hiemenz and Bruch (1983) found that the SMEs in Indonesia account for 54 per cent of the employment in the manufacturing sector. Similarly, Chee (1985) provided evidence suggesting that the SMEs in Malaysia are responsible for 51 per cent of the total employment and 55 per cent of the gross output in the non-agricultural sector.

In terms of the specific issues analysed, some studies were concerned with the relative efficiencies between the SMEs and the large-scale plants. The evidence from earlier studies indicates that the SMEs are just as, if not more, efficient than the large-scale plants (Sarkar 1974; Hiemenz 1983). The recent studies by Little (1987 and 1988), however, suggest that the relationship between size and productivity is not that clear-cut. For Colombia, Korea, and Thailand, medium-size firms² are more productive than the smaller units, and in the case of India, plants with 200-499 employees had the highest productivity levels compared to other plants.

Another area that has received considerable attention in the literature is the nature of government support towards promoting the SMEs (Krongkaew 1988; Sandesara 1988; Yun 1988). The type of support provided varies from country to country but, in general, there appears to be a need for governments to advertise the services offered by the assistance agencies. Furthermore, because of limited resources, it has been suggested that the assistance programmes be more discriminatory, favouring those industries identified as viable for development purposes.

In recent years, the research direction is aimed at the SMEs' problems, brought about by increasing competition and rising labour rates. While there is not a single solution to these problems, it is generally agreed that adopting new technologies may help. More importantly, there is also a consensus that the

term, technology, should be more broadly defined to encompass not only equipment and production processes, but also manufacturing management technology and managerial techniques. In other words, if the SMEs are to remain a driving force in the development process, the acquisition of equipment and blueprints is not enough. In addition, there is a need for the SMEs to have better trained business managers, knowledgeable in financial management, human resource management, and marketing management techniques.

With this broader definition of technology becoming increasingly acceptable, there are now several studies that have focused exclusively on the managerial practices and problems of the SMEs (James 1986; James and Akrasanee 1986 and 1988). To the best of our knowledge, the latter are the most comprehensive studies on the financial and marketing practices of the SMEs in Indonesia, Malaysia, the Philippines, Singapore, and Thailand. These studies have also increased our awareness of the managerial problems faced by the SMEs, and of the need for further analysis in this area.

Thus, the purpose of this article is to provide additional evidence on the managerial practices and problems of the SMEs in Malaysia, Singapore, and Thailand.³ However, instead of analysing each country separately, as is the case in the James and Akrasanee studies, the present study focuses on the comparison of selected practices and problems across countries. This study adds to the SMEs research literature in two ways. First, the study examines not only the financial and marketing practices but also the human resource management practices. To date, little is known about the strategies of the SMEs in their dealings with employees. Second, the same questionnaire is used to gather the information across the three countries. This consistency in data collection should facilitate the comparison of managerial problems and practices across national boundaries.

Methodology

To ascertain the managerial aspects of the SMEs, a questionnaire was designed to gather information on the financial, human resource, and marketing practices of the SMEs. In addition, the respondents were asked to identify the problems they were experiencing in the three areas of management. During the design of the questionnaire, it was decided that the appropriate medium for data collection would be through personal interviews instead of mail surveys. The questionnaire was then pre-tested with a sample of 70 firms in Malaysia. Following the pilot study, the interview guide was modified to remove potentially ambiguous questions.

The modified questionnaire was first used in Malaysia and a total of 780 firms were interviewed. Singapore was next and data from 43 firms were collected. In the case of Thailand, the questionnaire was translated from English into Thai, and the translated questionnaire was then used to gather information on 277 firms.⁵ The number of firms interviewed is largely a reflection of the types of sectors surveyed, and the choice of sectors is itself based on the importance of the sectors to the national economy.⁶ In Malaysia, the sectors surveyed included the Food, Wood, Light Engineering, and Construction Materials industries. In Singapore, the firms were from the Food, Plastic, and Precision Engineering sectors. In Thailand, there were six sub-sectors including Finishing, Garment, Knitting, Plastic, Weaving, and Wood.

It should be pointed out that the firms selected for interviews are not drawn from a random sample. Instead, the sample used is one of convenience. For example, in Thailand, transportation constraints have made it necessary to deal with firms in the Bangkok region only. As such, the reader should be careful in generalizing the findings of this study. The results of the survey must be interpreted with this caveat in mind.

Empirical Results

In this section, the results of the three-country survey are presented. Since the focus of this article is on inter-country comparison of managerial practices and problems, it was decided that presenting the results on a country-by-country basis is inappropriate. Instead, this section is divided into the three areas of management under investigation and within each area, the practices of the SMEs in each country are presented, followed by the managerial problems as perceived by the SMEs. This approach in presenting the results should facilitate the comparability of managerial issues across Malaysia, Singapore, and Thailand.

Financial Management

The SMEs were asked to indicate their awareness and usage of various financial management techniques, ranging from income statements to variance analysis. The responses of the SMEs from the three countries are tabulated in Table 1. Although the types of industries surveyed vary across countries, there exists some similarities in the financial practices of the SMEs.

First, small firms are generally less aware and less likely to utilize financial management techniques than the medium-size firms. Second, projected income statements and variance analysis are among the least understood financial techniques. Third, income statements and balance sheets are the most known and widely used financial techniques. These findings suggest that the SMEs do not realize that many financial tools such as variance analysis can be used to identify problems in certain areas of operation and to help plan for the future. Instead, our suspicion is that because of their almost exclusive focus on income statements and balance sheets, many of the SMEs tend to equate financial management to record-keeping.

It is also worth noting that there is no major

TABLE I
Financial Management Techniques

	<i>Malaysia</i>				<i>Singapore</i>				<i>Thailand</i>			
	<i>Not Aware</i>		<i>Used</i>		<i>Not Aware</i>		<i>Used</i>		<i>Not Aware</i>		<i>Used</i>	
	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>
Income statements	7.5	0	88.6	96.7	0	0	100.0	100.0	12.9	11.6	82.0	79.0
Balance sheets	11.1	0	84.3	95.9	0	0	100.0	100.0	12.9	11.6	75.5	74.6
Report on sources and uses of funds	38.4	6.6	45.6	77.0	42.9	0	57.1	100.0	50.4	28.2	16.5	34.0
Product costing	37.8	5.8	46.4	81.0	40.0	4.8	60.0	61.9	18.0	13.8	61.9	64.5
Cash budgets	33.2	4.9	51.1	86.1	46.7	4.3	46.7	82.5	24.5	17.4	52.5	61.0
Projected income statements	50.5	11.7	24.6	61.7	46.7	8.7	40.0	78.3	45.3	24.0	23.7	39.9
Variance analysis	66.6	23.8	19.0	57.4	46.7	17.4	26.7	65.2	71.9	50.7	8.6	18.1

discernible difference between Malaysia and Singapore in terms of awareness and usage of financial techniques. This may in effect be an indication of the transferability of financial techniques across national boundaries. In general, the Thai SMEs lag behind the Malaysian and Singaporean SMEs in using the financial techniques. This is particularly true with the more sophisticated techniques such as variance analysis, projected income statement, and reports on sources and uses of funds. The difference in usage is particularly large with respect to the last technique. For example, in Singapore, all medium-size firms reported that they were using "report on sources and uses of funds". In Malaysia, the number of users is at 77 per cent whereas in Thailand, the figure stands at 34 per cent. Given that the liquidity question is most crucial to the SMEs, it would certainly be beneficial for the Thai SMEs to become more aware and subsequently make use of techniques that help them manage their funds.

The respondents were also asked to identify various financial problems as experienced by their firms.⁷ The aggregated responses are presented in Table 2. In general, it appears that small firms face more financial problems than the medium-size firms. In Malaysia, the financial problem with the largest perceived differential between small- and medium-size firms

is cash flows, followed closely by loans and capital. In Singapore, the largest differential is related to the lack of capital and in Thailand, obtaining loans and credits are relatively the two most serious problems for the smaller firms. The pattern that seems to emerge from these findings is that the smaller firms face more difficulties in raising money than the medium-size firms. This may be due to the inability of the small firms to put up collateral for the loans or to the possibility that banks view loans to smaller firms as high risk and therefore impose more stringent conditions for these loans.

An examination of Table 2 also reveals that the perceived seriousness of the financial problems tends to vary across countries. In Malaysia, both small and medium-size firms report that the customers' failure to pay on time is their most common financial problem. In Singapore, the SMEs indicate that overhead costs, in particular the labour rates, constitute their most serious financial problem. In Thailand, taxes are perceived to be the most serious problem.⁸ This is not to say that the Thai SMEs pay more taxes than their Malaysian and Singaporean counterparts. Rather, this finding suggests that the Thai SMEs are perhaps less able to pay their taxes, and hence find taxes more problematic than the other SMEs.

TABLE 2
Financial Problems

	<i>Malaysia</i>		<i>Singapore</i>		<i>Thailand</i>	
	<i>Small</i>	<i>Medium</i>	<i>Small</i>	<i>Medium</i>	<i>Small</i>	<i>Medium</i>
Lack of capital	44.2	27.3	41.2	8.0	55.4	40.6
Poor financial records	25.1	12.4	5.9	8.0	18.0	16.7
High product costs	32.6	36.4	58.8	28.0	18.7	12.3
High overhead costs	29.9	47.1	58.8	32.0	16.5	10.1
Overdue account receivables	66.9	59.5	41.2	32.0	51.8	37.7
Difficulties in obtaining loans	52.2	34.7	29.4	12.0	43.2	23.9
Difficulties in credit	36.1	25.6	0	4.0	32.4	11.6
Cash flows	63.9	44.6	41.2	20.0	26.6	16.7
High tax rates	26.0	35.5	5.9	2.0	72.7	58.7
High interest rates	40.6	49.6	29.4	20.0	57.6	47.1

It appears that the Singapore and Thai SMEs cannot do much about their more serious financial problems because these problems are largely "external" to the organizations. In contrast, the late payment problem in Malaysia is an internal issue, within the control of the SMEs. For example, they may try to increase the proportion of cash sales to total sales, offer shorter terms of credit, and improve their collections of account receivables. While these changes are by no means comprehensive, they should help reduce the seriousness of the problem. It must, however, be pointed out that "external" financial problems are by no means trivial in Malaysia. For example, the second most serious problem among the medium-size SMEs is the high interest rates charged by commercial banks.

The above discussion suggests that the more serious financial problems tend to be country-specific, reflecting the individual country's overall economic performance and institutional arrangements. This, however, does not indicate that the financial problems of the SMEs are all beyond their control. The SMEs can still attempt to minimize the adverse impact of these financial problems, and this would require an increase in the awareness and usage of the various financial techniques designed to help the SMEs anticipate future problems.

Human Resource Management

The respondents in the survey were asked to indicate (1) their awareness and usage of managerial tools, and (2) their perceived problems associated with the human resource management area. The responses to the two issues are presented in Tables 3 and 4 respectively. As expected, the smaller firms in all three countries studied are generally less aware and less likely to use the human resource techniques than the medium-size firms. In addition, a comparison of the figures in Tables 1 and 3 suggests that the level of awareness and usage of human resource manage-

ment (HRM) techniques is less than that of the financial management techniques. There are several reasons for this. First, the area of financial management is much more established than the human resource management area. It is therefore not surprising that the level of awareness in the latter is lower. Second, government regulations often require firms to use some of the financial management techniques (for example, balance sheet). No such requirement is found for the HRM techniques. Third, financial issues are usually perceived to be more important than issues dealing with the workers.

In terms of inter-country comparisons, it appears that among the small firms, the Singaporean firms use the HRM techniques more frequently than the Malaysian firms. The latter are in turn more frequent users of the HRM techniques than the Thai firms. Among the medium-size firms, the Malaysian firms have a greater usage level, followed by the Singapore and Thai firms respectively. With regard to the individual HRM techniques, profit-sharing is one of the least used among the SMEs, irrespective of size and country of origin. On the other hand, interviews are the most frequently used technique among the SMEs.

Employee performance appraisals are quite common among the SMEs of Malaysia and Singapore, but not in Thailand. On the other hand, the use of flexitime is most common in Thailand⁹ but not in Malaysia and Singapore. In a sense, this suggests that the Thai SMEs are less bound by rigid production schedules. Furthermore, the lack of employee appraisals indicates the Thai SMEs have a relatively casual attitude towards their employees, in that they are not concerned to *objectively* identify the better employees.

Table 4 presents the human resource management problems as perceived by the SMEs. In all three countries in the sample, the medium-size firms report more human resource problems than the small firms. This result is not unexpected since by definition, medium-size firms have more employees and

TABLE 3
HRM Techniques

	<i>Malaysia</i>				<i>Singapore</i>				<i>Thailand</i>			
	<i>Not Aware</i>		<i>Used</i>		<i>Not Aware</i>		<i>Used</i>		<i>Not Aware</i>		<i>Used</i>	
	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>
Job analysis	45.5	11.5	31.8	66.4	50.0	12.0	44.4	64.0	31.7	21.7	43.2	61.6
Interviewing techniques	32.6	8.2	40.1	77.0	33.3	20.0	50.0	64.0	21.6	8.7	59.0	79.7
Employee performance appraisal	40.9	13.1	38.9	72.1	52.9	16.0	29.4	72.0	52.5	29.7	17.9	35.5
Job rotation/enrichment	41.1	10.7	31.0	50.8	55.6	28.0	38.9	44.0	43.2	21.0	23.0	38.4
Management by objectives	65.4	23.8	12.7	37.7	33.3	20.0	50.0	64.0	49.6	19.6	36.0	62.3
Profit sharing	50.0	21.3	16.6	18.9	77.8	28.0	11.1	32.0	53.2	23.9	9.4	13.8
Flexitime	55.6	27.9	12.7	18.9	82.4	44.0	5.9	20.0	36.7	21.0	41.0	41.3

TABLE 4
HRM Problems

	<i>Malaysia</i>		<i>Singapore</i>		<i>Thailand</i>	
	<i>Small</i>	<i>Medium</i>	<i>Small</i>	<i>Medium</i>	<i>Small</i>	<i>Medium</i>
Poor employee motivation	19.4	24.6	21.4	53.0	25.2	25.4
High absenteeism	16.1	24.6	14.3	35.3	44.6	42.0
Problems with relatives	14.1	14.8	0	0	5.8	9.4
Dissatisfaction with pay	14.6	30.3	42.9	41.1	12.9	15.9
Too much dispute time	3.1	7.4	14.3	17.6	4.3	5.1
Lack of concern for quality	12.7	24.6	14.3	58.8	32.4	26.0

therefore more human resource problems. When comparing the HRM problems to the financial management problems, the former are generally perceived to be less of a concern among the SMEs. The one exception is the medium-size firms in Singapore. In this case, the responses seem to indicate the HRM problems are more widespread than the financial management problems. A possible explanation for this particular result is that the medium-size firms in Singapore are doing very well. They can therefore afford to pay for the best financial advice but at the same time, they cannot find enough qualified employees. Under this scenario, it is conceivable that these firms find HRM problems more pressing than the financial problems.

Among the small firms, the Thai companies appear to experience the HRM problems most frequently whereas among the medium-size firms, the Singaporean companies have the most problems. One interesting piece of evidence is that in both categories of firms, the Malaysian firms reported having the least problems with their workers. Thus, it is possible to argue that when comparing Malaysia to the other two countries, the former has the best employer-employee relationship, at least in the eyes of the employer. This may be because the Malaysian workers are indeed very good or that the Malaysian employers are easily pleased. Another possible explanation is that the Malaysian sample consists of a large num-

ber of rural SMEs whereas in the other samples, all the SMEs surveyed are from the urban areas.

In terms of the individual HRM problems, two problems — dealing with relatives and time spent in resolving disputes with workers — are among the least serious. This finding holds in all three countries and in all the firms, regardless of size. There is, however, no such common pattern with regard to the more serious problems. In Malaysia, employee motivation is the most serious problem among the small firms, whereas the medium-size firms view employee dissatisfaction with wages as their most important HRM problem. The latter is also the most frequent problem among the small Singaporean firms. The medium-size firms, however, find that the lack of concern for quality among the workers to be their most pressing problem. In Thailand, both types of firms report absenteeism as their most serious problem. Interestingly, these same firms do not perceive that their employees are underpaid. It would be worthwhile in future research to identify the reasons for the high absenteeism levels among the Thai SMEs.

Marketing Management

Table 5 presents the awareness and usage levels of various marketing techniques among the SMEs. The results reveal a pattern similar to the ones associated with the other two types of managerial techniques. The medium-size

TABLE 5
Marketing Techniques

	<i>Malaysia</i>				<i>Singapore</i>				<i>Thailand</i>			
	<i>Not Aware</i>		<i>Used</i>		<i>Not Aware</i>		<i>Used</i>		<i>Not Aware</i>		<i>Used</i>	
	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>	<i>Small</i>	<i>Med.</i>
Sales training	44.9	12.3	17.2	37.7	44.4	26.1	38.9	43.5	54.0	38.4	3.6	10.7
Sales forecasting	40.0	8.2	29.0	67.2	11.1	17.4	83.3	60.8	48.9	34.1	19.4	34.1
Market research	56.4	10.7	11.0	49.2	44.4	25.0	55.6	50.0	59.0	35.5	11.5	25.4
Break even analysis	49.4	11.5	29.6	63.9	33.3	25.0	61.1	54.2	50.4	26.1	31.7	43.5
Market planning	40.3	8.2	38.0	71.3	38.9	25.0	55.5	66.7	48.9	28.3	18.7	36.2

firms are more aware of, and more likely to utilize, marketing techniques than the smaller firms. This differential is most noticeable in Malaysia, where approximately 45 per cent of the small firms are unaware of various marketing practices compared to only 10 per cent among the medium-size firms. The data collected unfortunately does not allow us to explain why such a large differential exists in Malaysia.

Another familiar pattern emerging from Table 5 is that the Malaysian and Singapore SMEs are generally more knowledgeable of, and more inclined to use, the marketing techniques than the Thai SMEs. Among the small firms, the Singapore firms reported the most frequent usage. On the other hand, the Malaysian medium-size firms seem to be the most frequent users of marketing techniques among the firms in this class.

It does not appear that there is any common pattern in terms of which marketing technique is most favoured among the SMEs. In Malaysia, market planning is the preferred tool whereas in Singapore, sales forecasting is among the most frequently used techniques. While the preferred marketing tool tends to vary by country, there is, however, a pattern regarding the least used technique. In general, the SMEs use sales training less than all other techniques. There may be several possible explanations for this finding. First, sales training is among the lesser known marketing techniques. This evidently should translate into a lower utilization level. Second, the SMEs may be quite satisfied with their existing sales. In addition, they may be quite confident that they can maintain their present market share without much effort. As such, these firms do not see any need in pursuing sales training. Last, it is also possible that from the SMEs' viewpoint, the skills of a salesperson are acquired on-the-job, in a learning-by-doing fashion. Accordingly, there will be a general reluctance among the SMEs to actually adopt a formal programme whereby employees are trained in various selling techniques.

With regard to the marketing problems reported by the SMEs (Table 6), there are several patterns that are common across the countries surveyed. As with other managerial problems, the size of the firms seems to play an important role. In general, the medium-size firms encounter fewer marketing problems than their smaller counterparts. Low margins appear to be the most common problem faced by the SMEs, whether small or medium. To some extent, this is an indication of the competitiveness in the Southeast Asian market. One may also argue that this finding is to be expected because few firms will ever admit that they achieve high profit margins, especially in personal interviews. The survey also suggests that the SMEs do not have much of a problem with the quality of their products. That is, the SMEs believe that their customers are satisfied with their products. This perception may have been formed because there are perhaps few returns and complaints from the customers. Otherwise, it is unlikely for the SMEs to state that they have no problem with product quality. The Thai firms appear to have the most problem in this area but even then, only 15 per cent of the smaller firms reported as having "product quality" problems. It is interesting to note that all the medium-size Singapore firms in the survey are satisfied with the quality of their products.

Even though there are some common marketing problems across the three countries, major differences are apparent. Irrespective of the size of the firms, the problem associated with low sales varies significantly between the countries. In Singapore, low sales is not a problem. In Thailand, about one-third of the SMEs reported sales problem, and this figure rises to over 50 per cent with the Malaysia SMEs. These inter-country differences probably reflect the difference in the level of economic performance between these countries.

The inability to increase exports is most serious to the Singapore SMEs and it is of least concern to the Thai SMEs. The Malaysian SMEs are somewhere in between. This finding

TABLE 6
Marketing Problems

	<i>Malaysia</i>		<i>Singapore</i>		<i>Thailand</i>	
	<i>Small</i>	<i>Medium</i>	<i>Small</i>	<i>Medium</i>	<i>Small</i>	<i>Medium</i>
Low Sales	64.4	52.9	0	0	37.4	34.1
Low margins	57.2	52.9	72.2	48.0	77.0	59.4
Unable to export	20.5	24.0	61.1	48.0	18.7	24.0
Poor product quality	5.0	5.8	11.1	0	15.1	9.4

should, however, not be interpreted as suggesting that the SMEs of Malaysia and Thailand have been more successful in exporting their products. Rather, our position is that the latter are mainly concerned with the local markets whereas the Singapore SMEs are more export-oriented, reflecting the relative size of the domestic market in these countries. Under these circumstances, it is not surprising to find the "export" problem more frequently reported by the firms in Singapore.

Conclusion

The purpose of this paper has been to provide some evidence regarding the SMEs' managerial practices and problems in Malaysia, Singapore, and Thailand. With respect to the practices, our findings suggest that medium-size firms are generally more aware and more likely to utilize the various managerial tools than the smaller firms. Inter-country comparisons also reveal that the Malaysian and Singapore SMEs have higher levels of awareness and usage of the managerial tools than their Thai counterparts.

Perhaps the most important finding of the survey on managerial practices is that the SMEs appear to have a very limited knowledge of the overall spectrum of managerial practices. For example, even among the financial

techniques, the SMEs' view of these techniques is limited to income statements and balance sheets. This narrow perception gets progressively worse in the other two managerial areas. While we are by no means implying that the SMEs should be using all available managerial tools, we would, however, argue that the benefits of some of these tools are not yet fully appreciated by the SMEs. The latter should be made aware of the potential benefits of the lesser known techniques, and be encouraged to use them as they become relevant. In other words, there is a need for management training aimed at the managers of Southeast Asian firms.

Among the managerial problems, it seems that the problems tend to be country-specific. In Singapore, the problems revolve around high overhead costs, poor employee attitudes, and the inability to compete in international markets. In Thailand, the more serious problems appear to be financial in nature. In addition, these problems which include high taxes and interest rates are beyond the control of the Thai SMEs. On the other hand, the Malaysian SMEs are faced with overdue accounts and low sales. While the first problem is within the SMEs' control, the second problem may be a reflection of the economic performance of the country.

NOTES

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1. For the purpose of this study, SMEs are defined as those organizations that employ between 10 and 199 workers.
2. Medium-size firms are those that employ between 50 and 199 workers.
3. The SMEs in these countries have been the subject of three comprehensive studies in which the authors have participated.
4. The questionnaire also included other information such as the size and age of the firms, the type of production process used, and so on.
5. In all three countries, local research assistants were hired and trained to carry out the interviews.
6. The researchers' knowledge of certain sectors could also have influenced the selection process.
7. After the Malaysian survey, we decided to use a five-point rating scale (1 = no problem to 5 = very serious problem) to measure the seriousness of the problems. To enable a comparison between the Singapore and Thai data with the Malaysian data, we have assumed that responses of 1 and 2 indicate no problem and responses 3, 4, and 5 indicate that there is a problem.
8. By coincidence, the Singapore SMEs view taxes as one of the least financially troublesome problems whereas in Thailand, the SMEs view overhead costs as their least serious problem.
9. Firms operating on flexitime allows their employees to choose their working hours but all employees have to be present for certain core hours.

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