

The Precision Engineering Industry in Victoria

Audit Report

MAY 2002

strategic audit of
victorian industry 



State Government
Victoria

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Acknowledgments

The preparation of this report has involved the participation and contributions of many individuals and organisations. While the final form and content of this report remain the responsibility of the Audit Team, I would like to acknowledge the individuals and organisations that made substantial contributions throughout the Audit process.

First, I wish to thank the many stakeholders in the Precision Engineering sector. Without the interest and contributions of a wide range of industry stakeholders this Audit Report would not be possible. This includes all those who responded to the Issues Paper, those individuals who were interviewed face-to-face, participants in the Public Forum held December 6th 2000 and of regional workshops in Geelong and Ballarat.

Most important to the quality and relevance of this report I am very grateful for the detailed and consistent research provided by the Audit Team members Mr David Eldridge, Mr John McGregor, Ms Rachel Perkins, Mr Kean Chan and Ms Lisa Rolle. Also much appreciated has been the guidance and assistance from other personnel within the Victorian Department of Industry, Innovation and Regional Development.

The Industry Reference Group in particular provided the audit team with an essential link to the sector in the compilation of this report and in the refining of the recommendations.

I am also grateful to the members of the Industry Working Group, the Tooling Industry Forum of Australia and the Australian Manufacturing Technology Institute Limited for their contributions to the production of this report.

Many within the Victorian Government have also contributed to the conduct of this Audit. Special thanks are due to the Office of Manufacturing that provided the audit team with invaluable advice, guidance, information and contacts.

Finally, we are grateful for the active interest and support that The Honourable Rob Hulls, Minister for Manufacturing Industry and his staff have given to the Audit Team throughout the Audit process.

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1. Executive Summary

The Precision Engineering Industry sector (PEI) produces vital inputs for virtually all types of manufactured product used in the world today. The industry covers four segments: manufacturing tooling, machine tools, cutting tools, and precision components.

The Victorian industry consists of over 350 small enterprises with a total turnover of almost \$800 million, exports over \$150 million and directly employing 7,000 people. Nationally the industry is becoming increasingly concentrated in Victoria. Victoria's share of national output is 45 % and increasing and its share of exports is 60 %.

The four segments of the industry differ in product and in market, but all have a foundation of precision engineering expertise and skill requirements and have common issues of concern.

The significance of the industry in Victoria extends through the rest of manufacturing. The automotive industry, for example, relies strongly on the capability and depth of experience and capacity available within the tooling segment of the industry. This segment is a vital base to manufacturing and a key part of the supply chain leading from raw materials to the consumer sector in the form of the everyday use of vast numbers of products produced from tooling. Also, most manufacturing companies employ people who have developed their skills in the precision engineering industry including many engineering technicians and toolmakers.

The industry has a number of leading firms that are now internationally competitive in each of the main segments and recent results show a doubling in total exports over the past five years and a trebling of tooling segment exports over the last four years.

The industry is small on the global scale representing a similar proportion of global market share as the vehicle-manufacturing sector, something around 1%. Like that sector the precision engineering industry is capable of significant growth by exporting and could grow by several times its current output if the issues currently inhibiting it are overcome. There are several other recent examples of precision engineering industries in other countries expanding very rapidly with strong strategic assistance from their governments and downstream industries. Victoria's industry has a more comprehensive infrastructure than most of the other examples mentioned and would stand to make more gain faster.

Similar to the rest of the world, the industry sector in Victoria is comprised of a large number of small and medium sized firms with a few larger internationally owned enterprises. On average 70 % of the domestic market is supplied by local manufacturers. This ranges from over 95 % for precision machining to 35 % for machine tools with tooling at 86 %. The future prospects for the industry in the domestic market primarily depend on the health of the automotive assembly and components sector. Major issues are the lack of global scale manufacturing and the need for supportive Government strategies to improve the processes of technology diffusion, training and export market access.

With one of the chief characteristics of the global precision engineering market being the large and increasingly wide range of products utilised, there are opportunities to develop specialised product types and exploit market niches in the global marketplace. This is almost entirely due to the combined factors of the continuing search for quality, safety, faster and more productive manufacturing and improvements in design, verification and assembly processes in all fields of industry. Rising prosperity in sections of the developing world provide increased opportunities for sales growth for the industry.

The comprehensive consultation and investigation processes carried out during this audit have identified a number of key issues confronting the industry. The issues are on several fronts but all point to the need to utilise the wealth of knowledge and capability spread throughout the industry by greater cooperation and collaboration between industry participants and stakeholders. The other important issues relate to exports and import replacement, education and training and industry image.

The industry is reasonably fortunate in having active and constructive industry associations, driven by their members, implementing some of the fixes it requires. The needs of the industry however go beyond what the industry can do alone. It needs effective Government policy and industry plans and the provision of assistance and encouragement to enable the industry to achieve its vision.

The recommendations of this report concentrate on the issues of improving stakeholder cooperation and communication and on developing solutions to the problems inhibiting the rate of growth in the industry. Most of these recommendations require combinations of industry and Government actions to develop plans and implement solution processes.

2. Summary of Key Issues and Recommendations

There are six key issues that are of prime importance to the Precision Engineering Industry (PEI):

- Industry scale and local market size
- Coordination, cooperation and collaboration within the industry
- Application of new technologies and management techniques
- The image of the industry as a career
- Technical and professional skill shortages
- Access to funding for large local and global project work.

The following summaries of recommendations to Government are grouped under the sub-headings of the relevant issues. Support for these recommendations in context are contained in **Section 7 - Key Issues and Recommendations**.

Lack of industry scale and local market size (*Refer to pages 33 & 34*)

R1 The PEI, with assistance from government should develop an industry marketing strategy that:

- takes into account the differing needs of each segment
- facilitates marketing planning processes in individual SME's
- facilitates the promotion of PEI exports through publicity, government policies, e-commerce (B2B) and interactive web page capabilities information
- identifies and assists firms that can lead the export development
- provides incentives that defray export establishment costs
- ensures that all state and federal export assistance programs are extended to apply to industry associations such as TIFA and AMTIL
- assists relevant industry associations in gathering industry statistics per segment

Coordination and cooperation by the industry stakeholders (*Refer to pages 35 & 36*)

R2 Through the industry associations and coordinated by government, the PEI needs to develop an overall industry strategy and review the levels of improvement in cooperation and collaboration on a regular basis. These reviews should assess the changes in key parameters such as:

- exports – where, what, why,
- import replacements, enhanced liaison with the ISO,

-
- employment, changes in demand for skills,
 - total revenue performance,
 - numbers of entities,
 - areas of market development effected,
 - effects of assistance and facilitation implemented.

Application of new technologies and management techniques (*Refer to pages 36–39*)

R3. The government should ensure that adequate assistance is available to the PEI in developing stronger industry infrastructure support, particularly:

- technology diffusion in all segments including management technologies and the enhancement of the existing Tooling Technical Support Network program
- the software and hardware servicing needs of the industry
- specific centres to develop greater capabilities for exporting and for major projects –examples are in the areas of design, machine tool training (using virtual reality simulation), product testing, validation and processing R&D
- disseminating knowledge and implementation of relevant R&D assistance programs

The image of the industry as a career (*Refer to pages 39-41*)

R4. As part of the more generic approach to improving Victoria’s manufacturing industry image the PEI together with Government:

- must tackle the overall manufacturing image problems
- need to highlight the particular problems the PEI has with its image
- must develop suitable promotional material aimed at the local community and at both its domestic and global clientele
- need to develop a detailed capabilities register available on the WEB (TIFA has this already for the tooling segment)
- should be represented on the MICC for ongoing development

Technical and professional skill shortages (*Refer to pages 41-44*)

R5. To determine future skilling needs and direction the PEI should:

- conduct a skills audit of the industry in each of its sub-segments,
- develop a database of short and long term skill requirements,
- work cooperatively with the training providers,
- seek information about how they can employ technicians, provide training, pay a training wage, and receive a federal subsidy,

R6. With a whole of industry, whole of government approach, undertake a study to examine the role that primary and secondary education plays in the demand for apprenticeships and consider that:

- the industry educate and equip schoolteachers, employers and career advisers to have an understanding of the PEI and the career options it offers,
- manufacturing related training material be developed to accompany school curricula.

R7. To improve the skills and technology training the PEI needs assistance from Government to:

- work with TAFE institutions to enable development of flexible training programs that provide generic skills required to operate and maintain machine tools, with industry providing practical on site experience
- determine the viability with TAFE of elements of new technologies skills training being carried out in-house utilising the web and virtual reality methods,
- develop more effective mechanisms to help disseminate existing education and also most recent technology training programs more effectively and to determine new training requirements,
- the PEI and Government to create programs to develop management, strategic and entrepreneurial skills specifically for each of the sub-segments.

R8. The PEI in conjunction with Government to consider education and training methods that can be useful to the industry such as:

- promoting the “Mentoring program” modified to reflect the particular circumstances of the PEI
- companies training their own staff assisted with incentives such as Payroll Tax exemptions similar to the provisions available for apprenticeships.

Access to funding for large local and global project work (*Refer to pages 44-45*)

R9. To assist the tooling and machine tool segments of the PEI in funding major capital equipment and for supply of major project works:

- PEI should explore collaborative arrangements and approaches to major equipment acquisition
- the Government should more effectively market its services especially in regard to assistance available and the alternative sources of funds that could be available to the manufacturing sector both from the Government and private sector. There is a need to fully understand what existing schemes exist and to have this information more effectively disseminated.

3. Objective of the Strategic Audit - and the Process

The Victorian Government is in the course of developing a long-term strategic approach to industry development in the State. This began with the stated recognition of the importance of the manufacturing industry to Victoria's economic wellbeing.

The Government is committed to a strategic audit of Victorian industry to identify current business needs and to determine long term strategies needed to realise the growth potential, job creation and future focus of Victorian industry.

The Department of Industry, Innovation and Regional Development is implementing the commitment in respect of a number of key industries in the State. The precision engineering industry is one such key industry and was selected because of its vital and fundamental role in manufacturing and its significant growth potential. The industry is entrepreneurial and globally competitive and has critical links to the automotive industry as well as to industries as diverse as aerospace, building and construction, medicine, electronics, biotechnology and whitegoods.

The focus of this audit has been on determining the status of the industry sector and assessing what strategies may be enhanced, adopted or renewed to create stronger growth.

A prime objective of the precision engineering industry strategic audit has been to elaborate a clear vision, together with the industry, of what actions are required to support further growth within the industry sector.

Each stage of the audit process was conducted in close consultation with industry stakeholders. This included designers, manufacturers, consultants, technical service providers, industry associations, education and training providers and government industry specialists.

The major stages of the audit process included:

- an initial assessment of the key issues currently facing the precision engineering industry
- PEI stakeholder feedback on these issues and stakeholder assessment of the challenges and opportunities
- workshops to identify and substantiate industry data
- in-depth interviews with industry stakeholders
- a joint forum involving several key segments of the precision engineering industry and the metal fabrication industry
- regional workshops in Ballarat and Geelong (regional consultation also took place in Bendigo, Wodonga, Sale and Hamilton)
- identification of future opportunities for industry growth
- preparation of the final audit report, overseen by an industry reference group and an industry working group, which provides the basis for the development of an industry development plan. Members of the two industry groups are listed in Appendix 1.

The audit team has distilled the key issues from the considerable input provided from the industry stakeholders.

4. Industry Sector Overview

The Precision Engineering Industry (PEI) has as its fundamentals the necessity to achieve precision in any application related to research, design, manufacture, performance validation, and application of high precision machinery, devices and components, including pure and applied research and development in manufacturing processes, fabrication technology, and advanced measurement science.

Today, economists are pointing to information technology and manufacturing technology as keys to a new economic era in which long-term economic growth is possible. Analysts expect that for long term growth industrial economies will require continuous gains in productivity rather than increases in output as population trends point to a declining consumer growth rate. Over the last ten years high rates of growth in productivity were achieved through investments in knowledge, information technology and the latest manufacturing technologies.

The PEI involves research, design, development, manufacture, and verification of high accuracy components, high precision machines and systems. PEI enterprise is practiced in a variety of technical areas - from engineering - mechanical, electrical, optical, and industrial - to materials science, physics, chemistry, mathematics, and computer science.

The PEI is only partially defined under the Australian and New Zealand Specialised Industry Codes (ANZSIC). The Code ANZSIC 2864 – Machine Tool and Part Manufacturing covers “*production of woodworking and metalworking machinery or equipment or metalworking hand tools or pneumatic or power operated hand tools n.e.c. The class includes units mainly engaged in manufacturing dies, die sets, machine tool accessories or attachments*”.¹ The scope of the PEI has therefore been developed and detailed in this report to reflect the spread of product areas outlined below. All statistical data has been derived from the limited ABS reports available supplemented by information direct from industry stakeholders. PEI forecast scenarios use information derived from industry members and from various studies on client industries.

The PEI has developed to service all engineering fields that require highly advanced technology including research and development of production systems, system control, CAD/CAM, as well as the more visible precise mechanical elements.

The product and service areas covered by the PEI therefore include as follows:

Design and manufacturing: Life cycle engineering, product modelling, CAD, CAM, CAE, CAF, automation, intelligent system, design theory, CIM, prototyping.

Mechatronics: machine tools, intelligent robot, information technology equipment, precision positioning, intelligent controlling, mechanisms and machine elements.

Manufacturing tooling: injection moulds, press tools, die casting dies, extrusion dies, moulding dies, jigs, checking and assembly fixtures, mandrels, forming tools and patterns.

¹ ABS Catalogue No. 1292.0

Precision machining: milling, drilling, boring, planing, cutting and abrasive machining, micro machining, electro discharge machining, energy beam machining, laser deposition processing.

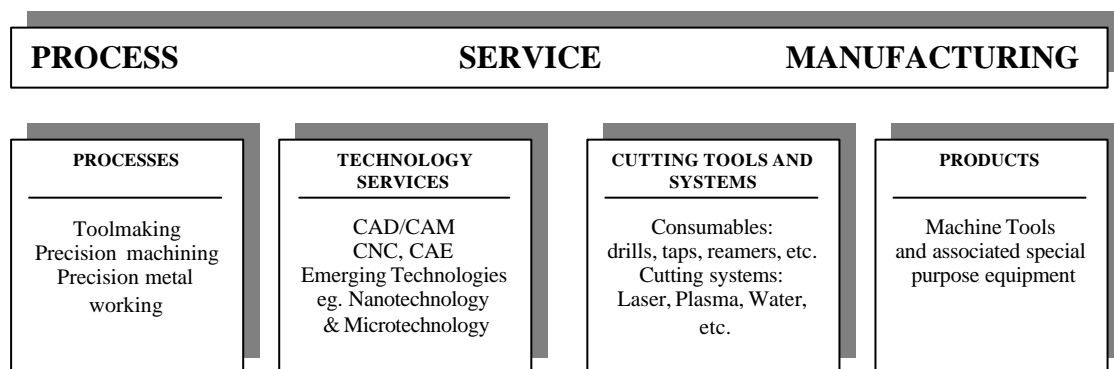
Precision metrology: Image processing, optronics, 3D measurement, roughness measurement, intelligent processing, in-process measurement.

Human/Environment: ergonomics, human support technology, medical device engineering, environmental engineering, amusement equipment, etc.

To further define the industry The American Society for Precision Engineering (ASPE) describe their activities as follows²: “The American Society for Precision Engineering is a multi-disciplinary technical society whose goal is to emphasise research, design, development, manufacture, and measurement of high accuracy components and systems”³.

An important facet of the precision engineering industry is that it is usually high value low volume manufacturing. A representation of the spectrum of activities in the precision engineering sector is presented in Figure 1.

Figure 1. Precision Engineering Spectrum



It is very important to note that the PEI also contributes to the education of technicians, engineers and scientists by acting as a provider for various research and development organisations which are directed toward new technology including medical equipment, new instrumentation concepts, new machining processes and unmanned manufacturing systems.

For the purposes of the audit the PEI has been segmented into the following industry functions:

- Tooling
- Machine tools
- Precision machining
- Cutting tools

The audit team found there was often a deficiency of appreciation and understanding generally in the community about each of these segments, particularly as to what

² <http://www.aspe.net> (accessed June 25, 2000).

³ Audit Team emphasis

purpose each serve, what the segments actually do and what skills are imperative. The following definitions are therefore provided:

4.1. Industry Segment Definitions

4.1.1. Tooling

Enterprises in the tooling segment of the PEI perform the functions of designing, building, testing and validating equipment in the form of special tools that enable the direct repetitious manufacture, assembly or checking by others of products and components in plastics, cast metals, sheet metals and various other materials.

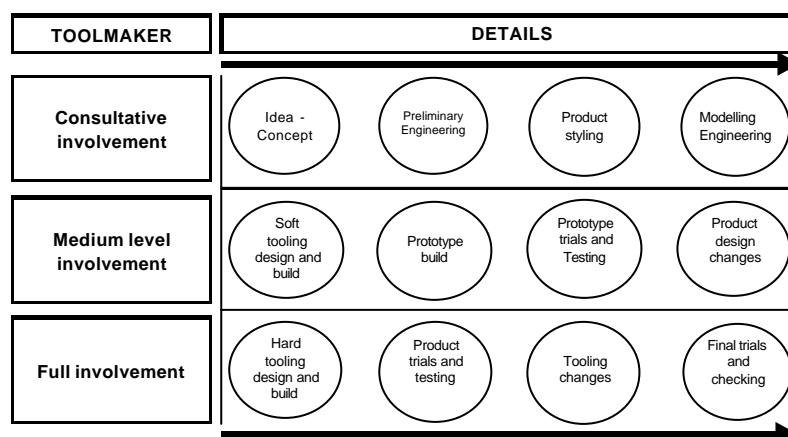
This equipment mainly consists of dies, moulds and fixtures used by a range of industries to manufacture their end products.

Tooling including the following:

- Sheet metal press dies for piercing, forming, trimming, hemming, etc.
- Injection moulds for plastic and rubber product manufacture
- Compression moulds for composite material products
- Blow moulds for plastics and rubber products
- Moulds for glass forming and shaping
- Mandrels for lay-up material products such as fibreglass or carpet
- Vacuum forming dies for sheet plastic shaping
- Extrusion dies for long, uniform section product
- Casting dies and trim tooling for cast metal products
- Forging dies and hot stamping dies for ferrous and non-ferrous products
- Cutting jigs and holding fixtures for machine tool processes
- Checking fixtures for component verification
- Assembly and welding fixtures for product joining and assembly
- Prototype tooling for virtually any product

Tooling enterprises are often involved in virtually the whole product manufacturing process, which is shown in diagram 1.

Figure 2 – Product Development Process



The major users of tooling are the auto assemblers and their first and second tier suppliers. There is a strong inter-dependence between the tooling segment and the

automotive industry with the latter strongly dependent on the capability and depth of experience and capacity available within the tooling segment of the PEI industry.

Other users of tooling are manufacturers of electronic and electrical goods, telecommunications equipment, white goods, household equipment, furniture, aerospace items, defence products, building products, machinery, medical and scientific equipment, toys, safety items, office equipment, footwear and sports equipment, civil construction, waste collection, etc.

The tooling segment is therefore an extremely vital base to almost all manufacturing. However the consumer is usually totally unaware the products they buy are produced with the essential use of some form of tooling.

Tooling enterprises require a highly skilled workforce. Tools are usually single pieces of equipment custom designed for the high volume manufacture of one or more items of plastic, elastomer, metal or composite material. Tooling in its many forms can be very complex with many precise fixed and moving components with power, water and hydraulic control circuits incorporated. Tool shops use complex-geometry software for developing their client's product requirement of shape, for creating the tool surfaces, and for tool design and machine programming and machining controls. The hardware used in the industry consists of high capacity computer workstations and computer numerical controlled machine tools and equipment for manufacture, testing, measurement and verification. Some conventional machine tools and equipment retain usefulness to the industry and are often upgraded to greater capability by modification and using add-on higher technology equipment.

4.1.2. Machine Tools

The machine tool industry segment of the PEI designs and builds standard and special purpose machines that remove or shape material by the processes of cutting, eroding, grinding, forming or otherwise working material to achieve the desired net shape. Finishing by the use of various other processes may also use machine tools.

This equipment typically consists of machines for:

<u>Function</u>	<u>Machine type</u>
• Turning	Lathes
• Drilling	Pedestal, Radial, Machining centres
• Boring	Boring mills, Jig mills, Machining centres
• Milling	Mills, Machining centres
• Planing	Planing mills
• Physio-Chemical	EDM, Laser, Ultrasonic, Water jet
• Grinding	Surface, cylindrical, internal, centre, jig
• Broaching	Broaching machines
• Tool Cutting/Grinding	Multi axis special machines
• Polishing	Portable and multi axis machines
• Honing	Honing machines
• Gear Cutting	Various gear specific type machines
• Forging	Hydraulic & Crank presses, Air Hammers
• Stamping & Pressing	Hydraulic & crank presses

<u>Function</u>	<u>Machine type</u>
• Forming	Hydraulic form presses
• Punching	Punch presses, Piercing & notching presses
• Shearing	Shearing machines
• Bending	Brake presses and other bending machines
• Broaching	Broaching machines
• Sawing	Various types of straight cut, orbital & band saws
• Tapping	Tapping machine, Drilling machine
• Thread rolling	Various thread rolling specific machines
• Wire Working	Straightening, bending, coiling, forming machines

The segment is composed of:

- ❑ manufacturers who design and build various types of machine tools
- ❑ specialist operators who repair, modify and upgrade machine tools
- ❑ vendors who provide sales and servicing of imported machine tools.

All of the above provide after sales service and operator and maintenance training. The continued viability of the existing support infrastructure of specialists, vendors and manufacturers is essential to the rest of the manufacturing industry within the State.

The major users of machine tools are the automotive OEMs and their tier 1 and tier 2 suppliers, including their precision engineering suppliers.

However, machine tools are essential to almost all industries. Other significant users of machine tools are manufacturers of aircraft components, rolling stock, engines, electric motors, white goods, domestic appliances, pumps, valves, compressors, mining equipment, agricultural and food machinery and equipment. The defence, marine, construction, office supplies, environment control, furniture, medical and scientific equipment industries also use machine tools.

4.1.3. Precision Machining

Firms in the precision machining segment perform sub-contract functions for other manufacturers. These functions include many different types and sizes of machining operations and finishing, testing and validating components and parts that are usually designed by others. However some firms also take on the task of designing the components for the prime manufacturer.

Such products may be from cast, forged, sintered or wrought metals of a large variety of different alloyed materials.

Major users of the precision machining segment are the aerospace, automotive, marine, electronics, food machinery and defence industries.

Similar to the rest of the PEI, the precision machining segment employs high levels of skill and uses complex software in the developing of client designed product surfaces and for machine programming, finishing, checking and validation processes.

The hardware used in this segment consists of high capacity computer workstations and a large range of conventional and computer numerical controlled machine tools and equipment for machining, assembly, testing, measurement and verification.

4.1.4. Cutting Tools

Enterprises in this segment design and manufacture cutting tools for machining virtually any materials including: wood, plastics, ceramic, cast, forged, wrought and sintered materials of various metals and their alloys. Cutting tools are made using a variety of machining processes and surface finishes including hard chrome, titanium nitride, chromium nitride and boron nitride.

Cutting tools include:

- Twist drills – centre, deep hole, masonry, jobbers, etc.
- Files and punches – flat, square, round, bastard, rasps, etc.
- Blades – power hacksaw, band saw, jigsaw, slitting knives
- Reamers – hand, machine, taper pin, bridge
- Broaches – internal, surface, push & pull type
- Woodturning tools
- Threading tools - taps and dies
- Straight, rotary and band saw blades
- Turning & milling - high-speed steel, carbides, diamonds/CBN/PCD, ceramics, cermets.

The clients of cutting tools are the industries that need to cut, drill or otherwise machine to shape any materials used in producing their products. This includes industries such as the transportation, electronics, food, machinery, defence, tooling, scientific and medical equipment industries.

The hardware used by the manufacturers in this segment consists of computer workstations and both conventional and computer numerical controlled machine tools and a range of equipment for manufacture, heat treatment, surface coating, testing, measurement, packaging and verification.

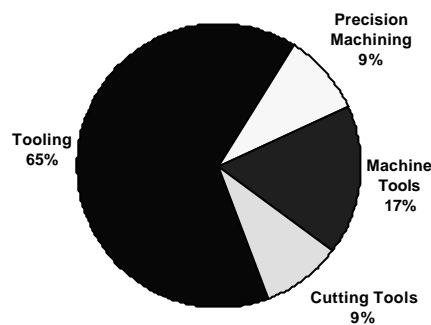
The technology of cutting tools is required to develop at a pace required to keep abreast of the very rapid developments in machine tool capability and in the materials being machined.

5. Current Industry Status and Opportunities

5.1. Importance to Victoria

The PEI produces essential inputs for all manufacturing industries. The industry consists of some 350 small enterprises, most are quite small operations, the average level of employment is about 20 people and the largest has about 200. Industry turnover in Victoria was \$775 million in 2001, which represents over 45% of the total Australian turnover of \$1.7 billion. The proportion per segment is shown in Chart 1:

Chart 1 – PEI Turnover per Segment



The four segments of the PEI are interrelated in several ways and have many features and issues in common.

For example, all segments require cutting tools, precision machining is a supplier to the tooling and machine tool segments, the machine tool segment is a supplier to the other three PEI segments and the tooling segment has an important input to machine tool manufacture.

Each one of the segments depends on specialist capabilities to varying degrees. Tooling especially is oriented to custom design and build of its output, but so is machine tools and precision machining in Australia and only cutting tool manufacture has a significant proportion of repetition processing. The whole sector has common issues regarding training and education, technology diffusion, large movements in demand, scale of operations and industry coordination, shared vision and image.

The significance of the industry in Victoria extends right through the rest of manufacturing. The automotive industry for one relies strongly on the capability and depth of experience and capacity available within the local tooling segment of the industry. The segment is a vital base to manufacturing and a key part of the supply chain leading from raw materials to the consumer sector in the form of the everyday use of vast numbers of products produced from tooling.

Other industry sectors seek people trained and developed in the PEI for their skills and experience. Most manufacturing companies employ people involved in precision engineering at varying degrees of skill including skilled toolmakers and engineering technicians. There is an analogy with other forms of employment. For example, the number of accountants undertaking accounting activities would easily exceed the number employed by firms whose main activity was the provision of accounting services.

Direct employment in 2001 in enterprises classified as “ machine tools and parts manufacturing”, the classification that is meant to capture those enterprises whose prime activity is precision engineering, is stated at around 3,000 people in Victoria⁴. Based on input from a special working group of the PEI, direct employment in the PEI in Victoria is more like 7,000 people⁵. The inclusion of the dependent supplier and other support industries to the PEI would extend the total direct and indirect employment to at least 10,000 people.

Education and training is a very important issue for the PEI industry. The more effective and competitive the industry, the more benefit it will provide for a wide range of other manufacturing industries. This reflects the capabilities provided by the enabling nature of the PEI industry and the employment of people with tool making competencies in other manufacturing industries.

Not only does the PEI industry provide crucial inputs to virtually all other industries, the industry is becoming increasingly concentrated in Victoria. There are a number of very successful companies in the industry and several comparatively new firms that appear to have excellent growth prospects.

The PEI has now become a successful exporter with Victorian exports representing almost 20% of turnover in 2001. Further, total sector export growth has strengthened in recent years with an increase of more than 60% over the last four years. The machine tool segment increased by 27% and the tooling segment nearly tripled exports in the same period.

5.2 Importance of the Automotive Industry

The precision engineering industry (PEI) is extremely dependent on the state of the automotive industry, with around 65% of output being directed to either auto assemblers or their tier 1 suppliers.

The auto industry is the prime cause of sales volatility through all segments of the PEI. New models and existing model face-lifts occur infrequently and often activity in the industry between models is lower with turnover falling in absolute terms.

There is little attention given to strategy planning in the industry. The result has been that companies regularly move from high to low levels of activity with no real industry wide attempt to even out sales volatility within the industry.

The auto industry exercises its strong bargaining position within the industry and is becoming more demanding by increasing the number of tools required per order to tool makers and insisting on continued price reductions on orders placed with suppliers as a pre condition for them to retain the business. The corollary is that the assembly plants (Ford, Toyota, Mitsubishi and Holden) are internationally competitive and that a major contributor to this situation has been the ability of local suppliers to meet the increasingly exact standards of the assemblers. These increasingly exacting standards have been forced on them to maintain globally competitive operations.

⁴ ABS

⁵ PEI Working Group assessment, 2001

5.3 Industry Performance

5.3.1 Market

The PEI market in Australia has been estimated to total some \$2.05 billion annually and has increased at an average of about 2% per year during the past eight years. The Victorian market is slightly under 45% of the Australian total at about \$0.9 billion but has shown slightly larger growth than the total market⁶. The largest market segment is tooling followed by machine tools and then cutting tools. Note that PEI statistics from members of the industry are considered more realistic than ANZSIC classified ABS data.

The Australian automotive manufacturing industry comprises about 65% of the local PEI marketplace with aerospace, electrical components, whitegoods, packaging furniture and domestic goods and equipment being the bulk of the remainder. With the historic gradual decline in some industries, the PEI has seen slow domestic growth during the last 20 years but greater threat from import competition, particularly now from Asia.

Chart 2 – PEI Market - Australian & Victorian 1993 to 2001

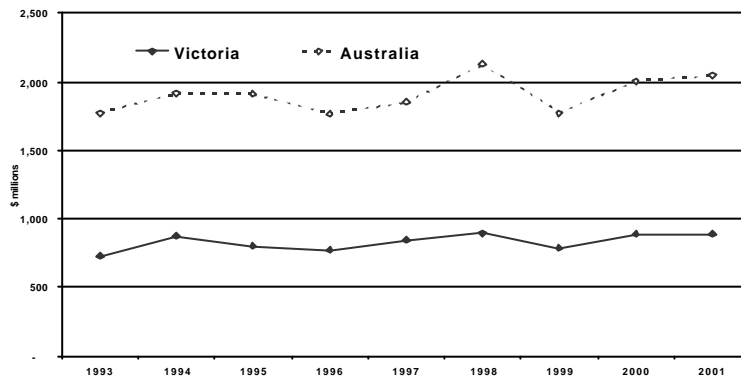
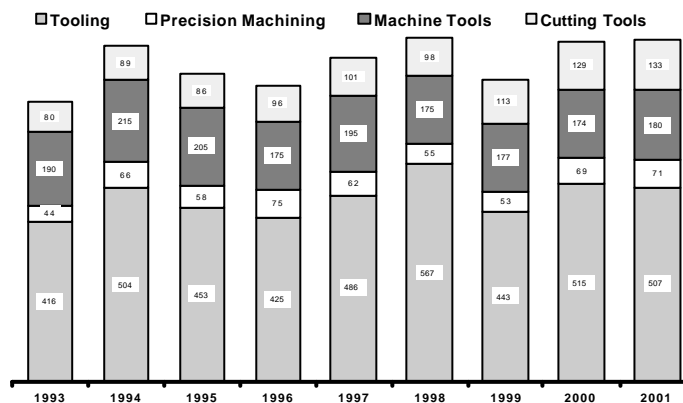


Chart 3 – Market by Segments – Victoria



⁶ All audit statistics are from Table shown in Appendix 6

5.3.2 Production

Industry turnover has been erratic over the past eight years but increased in nominal terms by an average of over 4.3% per annum between 1993 and 2001 from \$575 million to \$775 million. The average increase masks the actual annual figures that show the significant market peaks and troughs that affect the industry as shown in the chart below.

Chart 4 – PEI Segments 2001

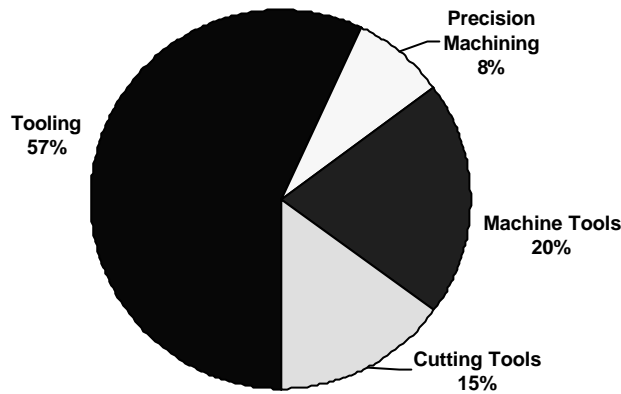
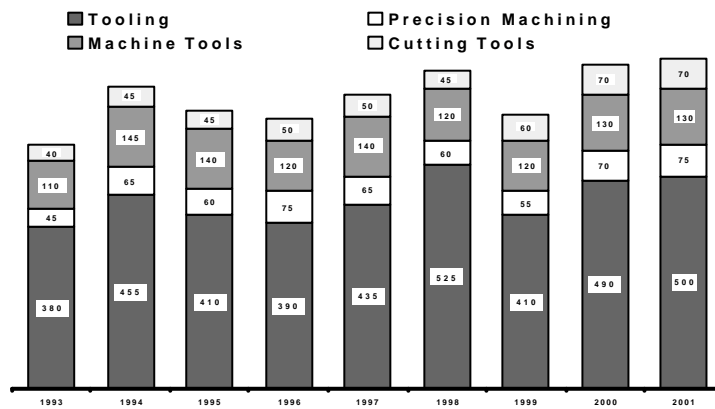
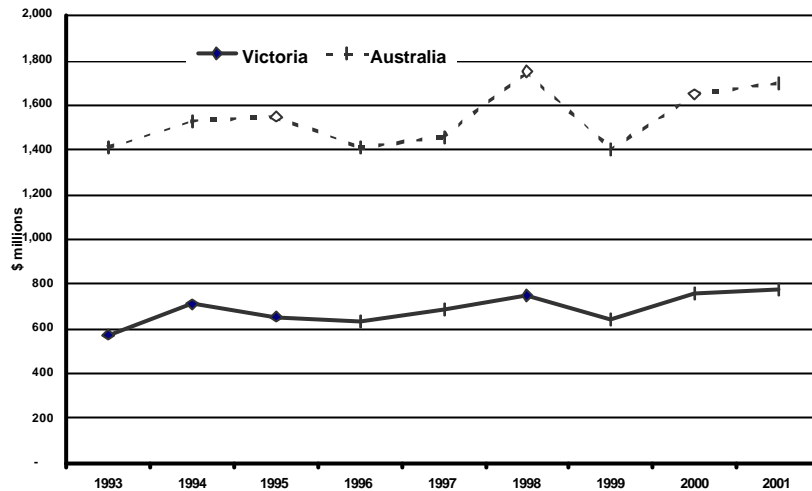


Chart 5 – PEI Turnover 1993 to 2001 - Victoria



The share of the national turnover represented by Victoria has risen significantly by almost five percentage points since 1993 from 41% to 46%. The industry therefore is clearly concentrated in Victoria.

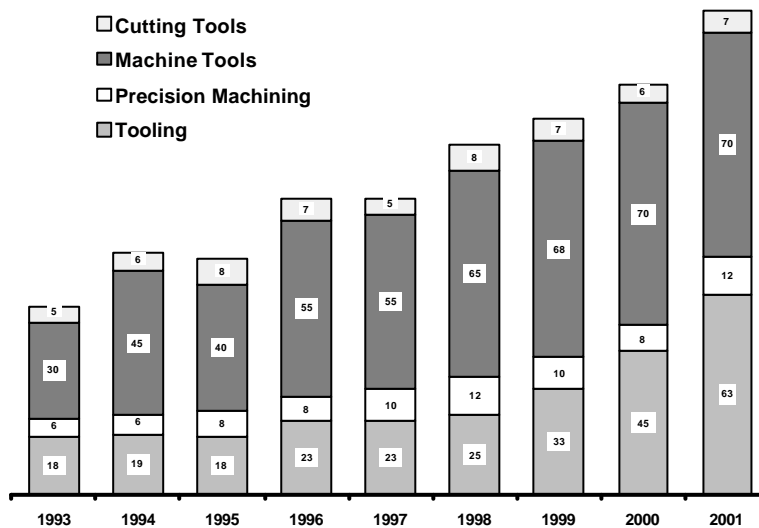
Chart 6 – PEI Turnover – Victoria and Australia



5.3.3 Exports and Imports

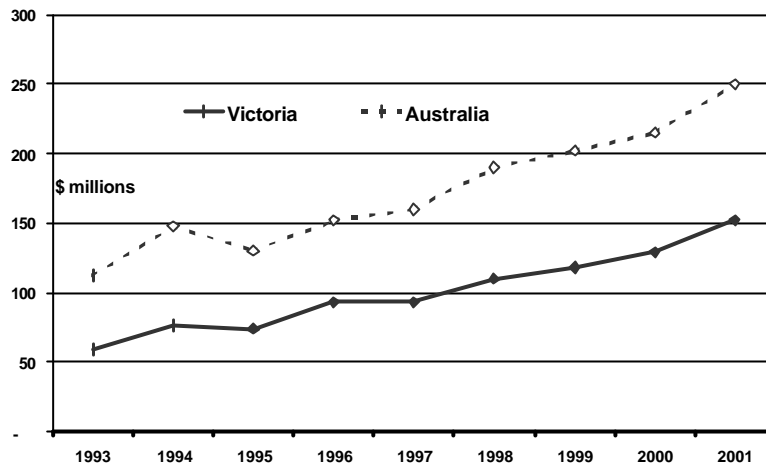
The rate of growth of the Victorian PEI is clearly indicated in the Charts below. Exports have steadily increased from \$59 million in 1993 to \$152 million in 2001. This shows that over the past eight year period exports have increased by over 155%. In the same period exports of machine tools rose by 133% and tooling rose by 250%. Tooling actually rose by 150% within just the last three years.

Chart 7 – Exports by Segment – Victoria 1993 - 2001



PEI exports from Victoria as a percentage of turnover have doubled from 10% in 1993 to 20% in 2001. Victoria's share of national exports rose from 53% to 61% in the same period.

Chart 8 – Exports – Victoria & Australia 1993 - 2001



Very clearly PEI growth is being driven by exports, particularly the tooling and machine tool segments that combined comprise 88% of the sector exports.

Imports are still substantial at \$268 million, 30% of the market in 2001, but have increased less firmly over the same period. Imports have been substantially of machine tools and have risen a total of 25% over the period. There has therefore been an improvement in the import to export ratio from 3.6 to 1.8 during the period.

5.3.4 Employment

Employment in the Precision Engineering Industry in Victoria has declined over the past 5 years, although employment levels have risen by almost 13% since the low point in 1996.

Employment in the PEI is forecast to remain firm over the next two years due to activity in the local automotive industry and increasing successes in the exports of tooling and machine tools.

The employment figures referred to in Chart 9 are based on ABS data adjusted by industry estimates and is made up of all direct employment in the industry and includes in house activities associated with precision engineering.

5.4 The Industry in the Context of World's Best Practice

The Victorian PEI has many firms at or near world's best practice level. The development and continuation of exports of machine tools and tooling to major corporations around the world prove this. However there are many more that are not at that level.

There are various ways to benchmark world's best practice. However not all criteria can be met by all in the industry. Practices in countries other than Australia are often different to the ways here. For instance, the average age of machine tools in use in Australia is fourteen years. When compared with Japan, which is considered at world's best practice level, the average age of machine tools is seven years. Japan has had a very strong machine tool manufacturing industry. Most major firms using those machine

tools in Japan work “24/7” (24 hours a day, seven days a week). As new machines come on the market the old ones are relegated to third world country subsidiaries and the age factor adjusts accordingly.

Many Victorian PEI firms utilise the latest equipment on the basis of running “24/7”, but also many others cannot afford to buy new equipment regularly because, due to smaller demand they are working only one shift, the usage rate is not as high as Japan. Some larger firms producing large tools or equipment do have machine tools with much wider range of capability but they are more likely to have a higher proportion of older equipment because of their size and equivalent cost. It appears that in Australia this is offset to some degree with machine re-builds and up-grades.

The major reason therefore of the higher age level of equipment in Australia appears to be the debilitating local market demand fluctuations. Even many of the larger best performing firms seem to suffer in making difficult investment decisions due to this irregular market phenomena. This is particularly the case with the machine tool and tooling segments of the PEI where production is all virtually pure jobbing contracts.

A key reason for many firms attempting to market outside Australia is that the local market phenomena is predicted to worsen ironically due to improvements in technology and local productivity. It is obvious to many in the PEI that exports hold the key to sustaining growth and more even loading within their businesses.

Despite the age of equipment compared with the world’s best practice country, Australia and the Victorian PEI in particular is proving world competitive. There are several factors involved in the reasons for this. The PEI still has a comprehensive infrastructure superior to all other countries outside the OECD and over half of them within it. Within the major criteria sought by buyers of PEI product globally, Victorian firms are competitive on price, are known to produce first class quality product and complete contracts within required lead times. This has been adequately proved by the improving success of several exporters over the past three years. Most of the criticism derives from clients who try to obtain PEI product during times of peak demand and are frustrated due to inadequate capacity in the industry, and also from those who underestimate the value of the product, demand ridiculously cheap prices and get what they pay for.

Global procurement practices increasingly demand larger and more system oriented packages of equipment – tooling and machine tools from the PEI in the main. To date with a few exceptions most exports have constituted minor proportions of tooling firms’ total sales and token use of networking and consortia. Because the fluctuations in demand are becoming more severe and more difficult to handle, there is the likelihood that without major success in exports, the industry will be further weakened and become like many industries that have already faded away. Even the strongest would suffer because as the industry shrinks the infrastructure of supporting suppliers and services, quality systems, researchers, designers, educators and trainers would also weaken. However, although this infrastructure is now becoming more delicate there is still time to rejuvenate and strengthen it to support the PEI in its push for an export-dominated industry.

Because of the vital importance of the PEI to all of Victoria’s manufacturing industry it must be given encouragement to increase its exports by a very large proportion as quickly as possible.

The PEI worldwide is a high value adding industry and the turnover per employee figure would vary considerably to other manufacturing industries. The average turnover per employee in the Australian tooling segment is \$110,500. The spread would be from a high of about \$170,000 down to under \$90,000 per employee with most under the average. Japan's average turnover per employee is around the higher Australian figure.⁷

The areas of weakness where smaller firms require additional skills are considered to correlate to management and strategy planning, marketing, benchmarking and best practice. There are sections of the PEI that must improve capability, quality and understanding of "best practice" or else they will leave the industry soon.

While there is a vast range of courses available a useful exercise would be to identify the best training programs relevant to the needs of the PEI industry. It would appear that an education promotion program is required to increase the awareness of the best identified training courses and more importantly, to persuade smaller firms to lift their priority given to management training.

The Internet provides further scope to access global markets and a number of PEI firms are using it successfully. For example, Sutton Tools in Thomastown has considerable success in selling its cutting tool products worldwide because more companies now purchase products within global procurement programs.

One unanticipated finding from the audit interviews was that many companies did not consider e-commerce (B2B) and its applications as a major issue affecting the continued growth of their business - yet. Some consider that as it is not too difficult to do then they will implement it when their clients show they want it. However larger tooling firms have already been told by their clients it would be to their advantage and are already bidding for work using e-commerce (B2B) and TIFA is upgrading its website to facilitate the introduction of an industry portal for use by industry members, suppliers and customers.

The industry has an important challenge to promote the e-commerce (B2B) strategy and explain the benefits to the PEI industry. To promote the benefits of using the Internet, successful manufacturing users could be called upon to explain aspects of their success to the industry overall.

⁷ Industry estimates

6 Detailed Segment Performance

Each segment has unique performance characteristics although the whole sector is to some degree affected by the same economic and market factors.

6.1 Tooling Segment

The tooling segment of the PEI has vital significance as it underpins the whole of national manufacturing industry. For example, tooling is essential in the Australian manufacture and export of automotive vehicles and components that have totalled over \$9.0 billion in 2001. The export figure for components in this period was over 4.5 billion.

Of importance also is the standard of tooling made in Australia. The standard of tooling from many Australian tooling firms is considered equal to the best in the world. Part of this is due to the long-term experience of the Australian industry in supporting manufacturing and part is due to the existence of competent automotive design and manufacture here for the last 100 years. The influence of American, German and Japanese based vehicle manufacturing practices for many years on local toolmakers should not be underestimated because it has given Australia an edge on all but the major auto producing nations. This situation, although little known to the rest of the world until recently, enables many local toolmakers to supply products to almost any user who demands high quality and reliability. The problem the segment has is that many users in the rest of the world have not heard of Australia as a place to go to obtain tooling. TIFA is attempting efforts in promoting the industry overseas, but more resources are needed to raise the awareness in terms of image and competitiveness.

Based on industry estimates⁸, the turnover of the global tooling market is about \$200 billion. There are about 300 tooling businesses in Victoria⁹ employing about 5,000 people and producing about \$0.5 billion value of tooling. A large number of small firms and in-house operations comprise the tooling segment of the PEI with some medium sized operations by world standards being the largest companies.

The largest toolmaking entities in Victoria in terms of employment are:

- Ford Motor Company Australia Ltd, Geelong
- Diecraft Australia, Reservoir (part of Tupperware, USA)
- Metro Tool and Die, South Oakleigh (part of Venture Industries, USA)
- DMG Industries, Dandenong
- Columbia Die Sinking Co. Pty Ltd, Cheltenham

The Australian tooling industry is subject to very large fluctuations in local demand. It therefore has inadequate capacity in periods of strong demand and excess capacity when industry demand lessens. These cycles are based on the auto industry cycles. The auto industry has four basic models and they all tend to go through new design, re-design or facelifts at much the same time.

⁸ TIFA composite estimates

⁹ Source TIFA

Ford Australia, who make tooling for several overseas companies as well as for local car makers, have stated they expect a drop in demand for vehicle body tooling after 2002 with a demand recovery during the next major re-design planned for release about 2005. Demand for cockpit and exterior trim tooling usually runs simultaneously or closely follows the demand for steel body tooling, but also is demanded every time there is a cosmetic face-lift, re-fresh, re-design or complete new platform. It would be expected that the total demand for plastic tooling would be steadier than for sheet metal dies. The demand for under-hood tooling is different again, as it tends to follow changes to engine, drive train and suspension systems that may occur at varying times.

The current Victorian production of some \$0.5 billion value of tooling has been slowly increasing over the past 10 years and is now increasingly fuelled by recent export successes. Current Australian exports have increased from less than \$60 million in 1993 to over \$150 million in 2001 and in the last six years tooling exports from Victoria have risen by 250% to over \$60 million¹⁰. Of particular note is the rate of increase of percent over the last four years.

The local automotive industry has been the traditional driver of demand for tooling but the increasing global demand for high quality tooling is opening up immense opportunities and hence exports is the driver of future growth. While exports in aggregate are small they are increasing and currently some 27 firms are exporting tooling. The main export markets are the United States, China, India, Thailand, EU, New Zealand and Malaysia.

Provided the present thrust by tooling enterprises is sustained and encouraged by Governments and assisted by TIFA, long term growth in this segment is projected to be 8 to 10% per annum, based on the continuation of the trend in export growth opportunities. That is, most of the growth in this segment is expected to come from exports and, as the scale of the industry increases, some more growth will be due to import replacement.

A number of Victoria's significant tooling companies have been competing internationally for several years. These companies are not only internationally competitive but they have internationally respected capabilities. These include Diecraft, Metro, Ford, Columbia, DMG and Centre Tooling. Now more firms are proving they are internationally competitive having invested the effort in searching out new opportunities in several regions of the world. There are some success stories in this segment and there is a need to demonstrate their capabilities on the world stage.

Several exporters of tooling have stated that they are increasing their prospects in several overseas destinations for a number of reasons. Metro, for example, believes that they are up to 30% more competitive than toolshops in the United States. Metro has been extensively involved in producing complete tooling for major new car developments in Malaysia and Russia, and also supply tooling to major vehicle companies in Germany and to US and German joint venture companies in China. Diecraft have also been able to successfully compete for domestic plastic ware tooling requirements against strong overseas competition from several countries including the United States, Portugal, Italy and Japan.

¹⁰ Reference Appendix 6 Table

The introduction of new technologies useful to the industry is also an important issue for the segment. The Tooling Industry Forum of Australia (TIFA), with assistance from the Victorian Department of Innovation, Industry and Regional Development (*\$100,000 announced May 2001*) (DSRD) and the Federal Department of Industry, Tourism and Resources (DITR), have taken the step to put in place regional technology managers to conduct the means of implementing the diffusion process throughout the tooling industry. In this matter the identification and adoption of world's best practice technology is an extremely important issue to the whole of the PEI. TIFA also devotes a considerable amount of its small resources in the effort to measure and monitor the position of local toolmakers relating to best practice.

As with all segments of the PEI, the availability of skilled labour has for many years been a major issue. However, the changing nature of required skills is also an increasingly important issue.

Skilled labour will be adversely affected for the next five years due to apprenticeship numbers having declined over the past 15 years. The shortage will continue until the skill requirements have been addressed and more people make their career in the industry. For example, many companies like Metro and Diecraft continue to receive poor responses to their advertisements for new apprenticeship places. Both companies consider that this can be traced partly to the poor image of manufacturing in general as a career.

The structure of customer purchasing is constantly evolving. With the exception of the tooling for the products they produce in-house including sheet metal body parts and engines, the auto assemblers have over the years gradually passed more of the responsibility for tooling purchases down the supply chain to their 1st and 2nd tier system and component suppliers. The auto assemblers do however require financial data on the costs associated with tooling purchases. In turn, the 1st and 2nd tier suppliers are now showing preference to obtain their tooling in full system projects. Currently few tooling firms are capable of meeting the demands for complete systems of tools from the auto assemblers and Tier 1 suppliers. The tooling segment of the PEI needs to address this matter urgently.

In summary the tooling segment needs to:

- improve its image to attract more clients and more skilled people,
- invest in more new technology,
- develop less dependency on the demands of the local market by exporting globally
- improve its industry cooperation and networking locally and overseas
- collaborate on major projects
- consider synergistic amalgamations and rationalisations
- be proactive in addressing education and training needs
- improve its response to client needs and methods
- develop a R & D and product testing/validation centre

6.2 Machine Tools

Globally, production of automobiles, aeroplanes, power plants, home and office appliances, farm machinery, construction and mining equipment and most other products would be impossible without machine tools.

In Australia the major purchases of machine tools are for production of automobiles, fabricated metal products, tooling, domestic products and transportation equipment. Machine tools are therefore a crucial input into almost all areas of manufacturing requiring materials to be cut or shaped in some way. However, machine tools are high capital cost items and require maintenance and software upgrades to retain their edge as an investment for a manufacturing business.

The Victorian market for imported and locally produced machine tools in 1993 was estimated to be about \$190 million with local production contributing 58%. In 2001 it was at \$180 million but with local contribution rising to 72%. During the intervening years the Victorian market has been very erratic with a high of \$215 million in 1994 and a low of \$174 million in 2000.

The machine tool segment turnover growth has averaged around 2% per year¹¹ with growth sustained by exports against falling purchases of local production.

As stated in the definitions previously, the segment is made up of local manufacturers who design and build various types of machine tools, specialist operators who repair, modify and upgrade machine tools, and vendors who provide sales and servicing of imported machine tools.

There are only a few local manufacturers in Australia of which the two largest are ANCA in Melbourne and Kirby Engineering in Sydney. Both depend on exports with around 90 % of their sales being into global niche markets. ANCA manufacture state of the art tool and cutter grinders and other niche machine tools. Other smaller manufacturers such as Farley and Bristow who both make laser profiling machines, and Techni Automation who make water jet cutting machines are smaller niche players in the global marketplace. With the exception of the four mentioned above, most other manufacturers make special purpose machine tools and systems or the smaller bench types of machining or grinding equipment. The audit team did not find any local manufacturers of portable electric or pneumatic hand tools in Australia.

Both locally and internationally competition is intense and machine tool prices have been declining globally for the past five years. The local Australian market is small and fiercely competitive, too small to attract any major global players to manufacture in Victoria.

There has been an increasing trend for European machine tool manufacturers to establish plants in central Europe to take advantage of low operating costs in a region adjacent to the main European market. There is a clear competitive advantage in being located close to manufacturing clients and being able to deal directly with them rather than use import agents.

¹¹ Based on industry interviews and ABS data

The local machine tool market has been depressed for some years but remains very competitive. There are very few significant new incremental investments being made and the risk is further disinvestment out of Australia. Machine tool manufacture also requires a very high level of R&D investment, at least in the order of 8 % of sales, which must be sustained continually to allow companies to remain internationally competitive.

Most machine tools are imported from Japan, Europe, USA, China, Korea and Taiwan. European producers are extremely competitive particularly the Swiss and Germans. There are approximately 50 import distributors of machine tools in Victoria competing for an average annual market of 400 units¹². The value of imports into Victoria is around \$120 million. Many of the machine tools imported are simple lathes. Standard lathes were last made in Australia some 20 years ago.

There is active importing of second hand machine tools, particularly for the section of the market where the equipment is destined to potential intermittent use, and high accuracy and efficiency is not as critical. If Australia wishes to be at the forefront of the precision engineering industry then this practice will do little to enhance it. Firms that are compelled to buy imported second hand machines to avoid the much higher costs of new machines must cope with the lower speeds and capability and the resulting inefficiencies.

Skill shortages are a concern in the machine tool manufacturing segment, as is the high cost of taking on apprentices. There are also severe skill shortage existing in the areas of repair, maintenance and installation of machine tools. The TAFE system lacks the considerable finance now required to provide training on very expensive new machine tools. The TAFE's may be able to focus on providing more intensive education on generic skills and possibly invest in virtual techniques of training with cooperation from vendors and users. This issue applies for education and training in all of the segments of the precision engineering industry.

In summary the machine tool segment needs to:

- attract more skilled people
- invest in more new technology
- develop more niche export markets
- improve its industry cooperation and networking locally and overseas
- review its education and training needs

¹² AMTIL data.

6.3 Precision Machining

The precision machining segment is made up of many small firms: contractors who do only precision machining, firms who may also make tooling and special equipment, and a few larger firms who's major output is of precision machining.

In 2001 the Victorian market was estimated at about \$70 million. The total turnover in the segment in Victoria is \$75 million, exports are relatively small at about \$12 million, work imported is some \$8 million and about 500 people are employed¹³. The segment essentially consists of firms catering to the needs of other product manufacturers who do not have sufficient justification to manufacture in-house or prefer to outsource short run or specialised requirements.

The main markets for precision machining are the automotive, aerospace, defence, tooling, communications, and medical and scientific equipment industries. But again, as with the other segments of the PEI, the automotive market is the largest.

A major problem in this segment is a continued emphasis and dependence on jobbing where companies move from one contract to another striving to remain viable. The majority of the segment is opportunistic and has little regard to strategy or identifying niches to specialise. The segment is not highly profitable in its current structure and the ways it conducts business. The healthiest firms all have some kind of complementary products or services within their portfolios to help sustain a balanced workload.

The main issue facing the precision machining segment is a lack of regular volume orders. Firms either operate on what they can get to make do from month to month because of inadequate demand, as was the case in 1998 and 1999, or they are overloaded with new orders as has been the case more recently. This extreme variability trend in demand is affecting the long-term viability of the precision machining segment.

To succeed in the sector, it is essential that firms be prepared to apply the latest technology and invest in the latest equipment. While companies continue to remain focused only on the domestic market without any substantial specialisation a variable income stream and frequent periods of insufficient work may trap them. This high industry sector risk would impede their ability to acquire the latest equipment. There are two possible solutions. One is developing and marketing their specialist capability to overseas projects utilising local raw materials. The other is to refine and enlarge their unique specialisation by strategically developing their capability and resources. Obviously there can be many possible combinations of these solutions.

Although little is done yet, exports can contribute to the maintenance of a more stable income flow and further sector growth as over the medium term little growth is expected from the domestic market. The export market offers growth potential because it is generally agreed that at current level of the Australian dollar precision machining companies in Australia are competitive with their counterparts in Asia. Like in the tooling segment, Australian producers also have a quality differential over their Asian competitors.

¹³ ABS data and industry estimates.

Some leading companies in this segment such as TED Engineering are practicing these solutions and succeeding to put themselves forward as “solutions providers” for large projects not only in Australia but also throughout the world. Such companies retain their design capabilities and project management skills but are increasingly out-sourcing major portions of machining and other processes.

These practices should be encouraged since it will lead to increased and more stable work for small firms that will be directly geared to exports. However, to encourage larger companies to out source parts of their manufacturing processes will require the management of these companies to adopt a more strategic approach and be more prepared to specialise their manufacturing activities.

Companies in this segment are inclined to retain more staff than needed during periods of lower sales as a precaution against not having enough staff when economic conditions turn around.

The issues confronting this sector have much in common with the rest of the PEI with difficulty in finding existing skills and also new people to train, the high costs of equipment and software, but the most serious appears to be the fluctuations of domestic market demand.

In summary the precision machining segment needs to:

- find ways to cope with demand fluctuations
- think strategically regarding their markets
- find better ways to invest in more new technology
- understand its education and training needs
- be able to attract more skilled people

6.4 Cutting Tools

The global market for cutting tools is estimated to be worth \$150bn.¹⁴ In 2001 the total Victorian market value was estimated to be over \$130 million. The total production turnover in the segment in Victoria was \$70 million, exports were small at about \$7 million, and imports total about \$70 million and about 500 people are employed.

Turnover has grown at an annual rate of 8% over the past 5 years¹⁵. However, according to some in the industry segment, growth is expected to reduce slightly due to the highly competitive retail market and limited growth in the construction industry. Growth in the vehicle and auto component sector due to export growth will counter some of the decline in the other market sectors.

The cutting tools segment consists of a number of small and medium sized manufacturing enterprises making a large variety of cutting tools. The majority of firms are based in Melbourne but there are a number of firms based in regional centres such as Hamilton, Maryborough and Geelong. Two of the largest manufacturers are Suttons and Cyclone Industries. Both companies have their respective wholesalers and hardware stores as distribution outlets.

¹⁴ ABS and industry estimates

¹⁵ ABS and industry estimate

There are four main segments to the cutting tool market.

- Retail
- Industrial
- Export
- Automotive

The retail market demands mainly portable hand and electric and pneumatic tool consumables such as saw blades, knife blades and twist drills for timber, metals and masonry used in building construction, small enterprise hardware manufacture and DIY workshop use. This sector of the market has been increasing modestly at around 3 to 5% per year and accounts for around 20% of the total.

The industrial market, which consists of general manufacturers in all fields except automotive, major mining and construction companies, and the other segments of the PEI, requires industrial strength tooling for cutting, drilling and metal removal on conventional and CNC machine tools. This sector of the market accounts for about 40% of the total.

Exports, mainly of retail type cutting tool products account for about 10% of the market.

The automotive market, which consists of the assemblers, component manufacturers, after-market, and repairers, represents the remaining 30% of the total cutting tool market in Victoria¹⁶.

The large hardware store groups such as Bunnings, BBC and Mitre 10 heavily dominate the retail market. These groups have very strong purchasing power and are large importers.

Large wholesalers such as Blackwoods and international vendors such as Sandvik, Sumitomo, Mitsubishi, Kennametal, Valenite or their distributors are the major suppliers in the industrial and automotive segments. These companies usually win large contracts from the metals fabrication, mining and construction industries and then sub-contract to suppliers. Larger automotive industry players may order direct from cutting tool manufacturers and there are many other smaller suppliers who fill the “gaps” in the low volume specialty and custom cutter range.

The segment relies heavily on the general level of activity in manufacturing industry in which the cutting of metals is performed – mainly automotive and industrial manufacturing fabrication sectors. The market for cutting tools has been quite strong for the past two years attributed mainly to export growth in the automotive and industrial equipment sectors.

A prime strategy for the cutting tool segment is to identify niche markets locally and overseas and produce the highest export quality.

Import competition remains intense despite the low Australian dollar. Owing to improvements in transport logistics, for example, the turnaround time to have coatings done in Taiwan is only one week.

¹⁶ Industry sector estimates by audit team.

Import competition is from China, Japan, Sweden, USA, Taiwan, Germany, South Africa, Israel and from other EU nations. Some countries have been subject to dumping allegations and the problem of dumping affecting local producers has been severe.

In summary the cutting tool segment needs to:

- think more strategically regarding niche markets
- find ways to develop unique technologies
- seek assistance on export programs
- improve the scale of specialty products

7 Key Issues and Recommendations

The total PEI has a mature infrastructure and much inherent strength shown by several successful firms increasing their exports in the tooling and machine tool segments. However there is the need for more coordination and infrastructure development within the industry and particularly in the supply chain. There is also more required of the education and training sector and the image and export marketing areas for the industry to survive and develop into a significant global player and improve the capacity to reduce the need for imports.

The industry concerns raised and developed during the workshops and particularly during the many interviews with stakeholders carried out by the audit team have been listed under the following six key issues:

- Lack of industry scale and local market size
- Coordination and cooperation by the industry stakeholders
- Application of new technologies and management techniques
- The image of the industry as a career and to investors
- Technical and professional skill shortages
- Access to funding for large local and global project work.

The challenge is to find the best strategies and actions required assisting in the resolution of the issues. The recommendations and suggested actions relevant to each of the above issues are stated at the conclusion of each of their background statements.

Lack of industry scale and local market size

Companies in the PEI cannot rely on the domestic market to achieve sustained long-term growth. Indeed, only modest growth is expected in domestic demand over the foreseeable future. The key operating strategies for all segments of the PEI is to overcome local market volatility by sharing capacity and applying the latest technology and best practices to enter and supply export markets. Some leading companies in the industry already export successfully, but with a few key exceptions, most only export irregularly and exports are not their main output.

The Australian PEI is very small, less than 0.5% of the rest of the world. The industry has been strongly influenced by the demands of its largest market sector, the vehicle industry, for many years. Historically the structure of the vehicle industry and the timing and duration of major vehicle re-designs and platform changes provided for a fluctuating but tolerable variation in workload for the PEI. More recently vehicle development timing has been reduced dramatically with the inception of powerful CAD, CAM and CAE systems cutting the time available to build tools and dies and machining systems but not changing to any great degree the frequency of new models. This has meant that during the last decade the tooling and machine tool segments of the

PEI have increasingly experienced more profound demand variations, with large swings in demand associated with new vehicle model and design changes.

During the peak demand from the auto sector the industry has insufficient capacity to supply all requirements and hence loses work to imports. However when the demand recedes there is abundant overcapacity. The industry has the major problem of sustaining sufficient workload through to the next period of demand. The debilitating effects of these changes have permeated the whole infrastructure of the PEI including the training institutions and suppliers. The PEI sees no other solution to the problem other than rebuilding the industry by exporting.

The Australian vehicle industry represents about 1% of the global vehicle demand for PEI products and services. The key global suppliers of world class PEI products are USA, Japan, Germany, Spain, Italy, France, Portugal, Canada, Ireland, Taiwan, UK and South Korea.

Those PEI firms now exporting are proof that distance is a small barrier so exports represent the clearest way of escaping the boom and bust scenario. The alternative is an increasingly bleak future for the industry.

If the capabilities of the whole PEI were more actively promoted overseas the results could be very positive. There appears to be a high respect for the quality and flexibility of export work undertaken by several of the leading Australian companies. However, there is little awareness of these capabilities on the international scene. Australia is generally not known as a precision engineering country.

The audit team considers that because of the lack of Australian industry visibility globally and because of the procurement procedures practiced by global buyers, individual firms have difficulty in extending their exports or even getting started on exporting. Also many firms have difficulties in meeting the large export opportunities owing to limited production scale. Despite this, the survival of the industry will be critically dependent on finding niche export markets directly or even indirectly through supplying to leading exporters. A key operating strategy of the whole PEI can be to share capacity and to apply the latest technologies and best practices to enter and supply export markets. This will enable more comprehensive supply to the domestic market and assist greater development of the whole Victorian manufacturing industry. Developing exports is expensive and time consuming. However there are already examples of cooperation using a two-tier approach of smaller specialised operators supplying the larger companies who can support the funding of exports both here and in other countries.

R1 The PEI, with assistance from government should develop an industry marketing strategy that:

- takes into account the differing needs of each segment
- facilitates marketing planning processes in individual SME's
- facilitates the promotion of PEI exports through publicity, government policies, e-commerce (B2B) and interactive web page capabilities information
- identifies and assists firms that can lead the export development
- provides incentives that defray export establishment costs
- ensures that all state and federal export assistance programs are extended to apply to industry associations such as TIFA and AMTIL
- assists relevant industry associations in gathering industry statistics per segment

Coordination and cooperation by the industry stakeholders

The majority of companies in the PEI are family owned small businesses operating in an isolated environment and using dated technology, with very small-scale output. Based on industry research by the audit team, it was established that over 80% of the firms in the industry are small and employ less than 20 people.

Generally the firms in the PEI in Victoria are market reactive and have not developed long term business strategies. Most firms are restricted in the range of capital equipment they can afford and those that try to search for new work often experience difficulties in tendering for and meeting larger project requirements. The dearth of strategic thinking is reflected in the lack of financial resources that in turn prevent the extension of their range of activities.

A decade ago the industry structures in the United Kingdom, Ireland, Spain and Portugal were similar to that which currently exists in Victoria. In those countries a change in strategic direction was instigated following the development of a government industry policy. Industry and business strategies were developed and their SME's became more cooperative and collaborative. They soon began specialising and marketed pro-actively with excellent results. The larger companies became the champions in developing exports with government assistance in promotion at trade fairs and in facilitating connections with major potential buyers using leverage through trade negotiations. The results in Portugal were, to say the least, remarkable.

The Portuguese PEI was originally much smaller than Victoria's, with less depth of infrastructure. Direct assistance from the government providing a centre offering specific training, tool tryout and validation and R & D facilities encouraged the development of cooperative tool shops and consolidated bidding on export projects. The project has been very successful. Portugal is now one of the largest contract tooling sources in the world exporting over \$2 billion of tooling per year to the USA, the EU and many other countries including Australia. The audit team understands that a major proportion of exports flow to the Americas. If Portugal was exporting to its nearby EU countries alone it would be difficult to make it a plausible example for Victoria to follow. Note that if the Portuguese model was fully emulated, the size of the Victorian PEI would more than double over the next ten years.

The other countries mentioned have all experienced very significant growth in their precision engineering manufacture, all have carved out niches of specialised products in various parts of the world. With regard to the infrastructure needs, three of the four countries succeeded despite the fact they do not have Australia's capability of designing and building vehicles and Portugal and Ireland are only recently assembling a small but growing number of vehicles. However, the development of the PEI capability has certainly attracted other downstream industries to both Portugal and Ireland.

There is a need to more effectively share capacity in the PEI in the good times and to even out the cyclical nature of local demand by lifting exports to become the prime source of revenue. It is the objective of TIFA to increase tooling exports as a % of industry segment sales to at least 50% in the next five years compared with the present high of 12%. There is plenty of scope in the for smaller operators to not only cooperate but to increasingly specialise in providing basic products and services to PEI 1st tier firms who are be better equipped to break into global markets.

The State Government's existing "Supply Chain Management Program" which is designed to improve the responsiveness of the whole supply chain and to unite the management of firms by greater cooperation needs to be further promoted to the PEI.

The present limits of individual capacity are one of the major impediments to industry growth. The PEI struggles to meet larger export orders simply because it does not have the scale of production among individual firms. While limited scale economies make it difficult for most firms individually to meet export orders, there will be greater scope to satisfy exports provided companies are prepared to share their capacities rather than competing actively against one another in overseas markets.

There are other important reasons why sharing capacity and capabilities to increase operation scale is important. For example, there is an increasing trend for auto assemblers to place larger orders with toolmakers and to out source an increasing amount of their tooling requirements.

There is a need for increased cooperation between firms such as, better knowing each others' capabilities and a willingness to share capacity to meet large export orders requires close attention. To effectively cooperate, there is a need for companies in the PEI to better understand their respective capabilities, especially as an aid to entering export markets and replacing imports. A useful aid to this process would be a capabilities register. This should be the responsibility of the industry through its association but the government could provide assistance to develop detailed capabilities and place them on to interactive Web sites.

In conjunction with the industry marketing strategy recommendation there would be merit in establishing a Strategic Planning Group within the industry to develop an overall industry led strategy. Its role would be to assess and facilitate ways in which firms can better collaborate to improve the industry's performance in the long term.

R2 Through the industry associations and coordinated by government, the PEI needs to develop an overall industry strategy and review the levels of improvement in cooperation and collaboration on a regular basis. These reviews should assess the changes in key parameters such as:

- exports – where, what, why,
- import replacements, enhanced liaison with the ISO,
- employment, changes in demand for skills,
- total revenue performance,
- numbers of entities,
- areas of market development effected,
- effects of assistance and facilitation implemented.

Application of new technologies and management techniques

A large number of PEI firms are not making the best use of the latest technologies available. The identification, application and adoption of new technology, techniques and processes are all vital for the ongoing global competitiveness of the PEI. However, to be coordinated these activities must be demand driven by the industry. Many firms also want to understand the basics of technology management.

Historically most firms in the industry have learned about new technologies through trade shows, magazines and machinery vendors. More recently the use of the web for new technology information has proliferated but there are many that find obtaining the information they want can be a costly and laborious exercise. As there is no formal systematic way to acquire technology information there is general concern in the industry that the cost and time required collecting information on new technology and the perception that the payback period for the investment was too long. This has discouraged many firms from seeking additional knowledge on new technologies and so there is the risk of the industry losing its competitive edge. Also any data on the availability of technology through the supply chain is poor and partly reflects the inability of operating managers to have the time to research technology developments.

Until recently technology diffusion has been slow and insufficiently promoted. There has been no disciplined attempt to identify new technologies and match these technologies with industry needs. There are however, a number of larger companies using the latest technologies. These companies usually have the capacity and linkages to afford to research them independently. Some of these companies are concerned that smaller companies lack the capacity to catch up and are willing to assist in the process of diffusion in a way limited only by their own resources.

Industry should be the principal driver of activities of an effective technology diffusion program. The PEI needs facilitative assistance for this process and any system adopted should ensure the maximum effectiveness of government support measures for diffusion activities.

Technology diffusion has two equally important aspects; extending the use of the latest existing technology and identifying and applying innovative and largely untried technology in the PEI. The need to extend the use of the latest existing technology is considered at least as important as identifying new technology and applying this technology to largely untried applications.

There is also the down side associated with new untried technology in Australia that it is likely to involve the use of imported equipment with a limited availability of local maintenance experts.

For instance there is a need for a training/skill base for machine tool diagnostics and repair. Much of the machine tool maintenance and support requires specialist skills currently unavailable from anywhere except from the vendor's overseas operations. Many small firms have a limited knowledge of advanced technology and they cannot afford the trained people needed to utilise the latest equipment.

Although Victoria has the research and IP base the diffusion of technology needs to be boosted There is a concern over the availability of local skills required to operate and

optimise the benefit of new technologies. Where the skills are not available locally, many companies recruit offshore. These concerns also extend to the quality of training on new technologies.

There are a number of options that could be applied to facilitate technology diffusion within the industry.

The industry or a segment could establish a centre that would develop the means of technology diffusion in conjunction with R&D and training facilities. There would be a need for rather substantial up front contribution by government. Some overseas examples of such centres have been successful as mentioned above but any local centres have only had mixed success. The success or failure of such a centre is thought to be due to the level of strategy development and the issue that it must be driven by industry itself, not as a handout by government.

Another option already taken into practice in one segment of the PEI is for the industry association to take on the role supported by the industry and governments. Recently the Tooling Industry Forum of Australia (TIFA) formed the Tooling Technology Support Network (TTSN), a nationally operating network directed and based from the TIFA offices in Victoria. TTSN's main role is facilitating technology diffusion to the Tooling and it's associated industries. The leader is the technologist in Melbourne and the three other technologist members of the team are based in Adelaide, Sydney and Brisbane. TTSN receives its major support from the Federal Government and TIFA members. The State Governments of Victoria, South Australia, Queensland and New South Wales also support some payroll and facilities expenses. Government funding is for 14 months. This is a good model of cooperation involving Federal and State Governments.

The audit team has observed the early results of the TTSN process and would recommend that the process needs to be ongoing and requires significant enhancement to be fully effective. Therefore TTSN should continue to be part funded by governments and industry. The overall direction of work undertaken by the Unit should continue to be industry led. The overall task envisaged is very large and will require more facilities and technical staff. Because of the continuing global technology development, obviously those involved will have to undertake the required tasks on a continuous basis. The TTSN format TIFA has developed can multiply benefits through the PEI and related manufacturing industries. Refer to Appendix 2 for more details on TTSN.

To better understand what technologies are being applied in major overseas manufacturing countries, investigative delegations should be arranged and supervised by industry associations such as TIFA and AMTIL and be part-funded by the State Government as well as Austrade and industry. Delegations of this nature should be undertaken regularly by industry representatives and involve representatives of TTSN. Information gained from these delegations would be stored in a central location and distributed to industry members on a dedicated and interactive Web system.

While research and development in the PEI is very active by the nature of the industry, it appears that CRC's have not benefited smaller companies of the industry as much as larger ones. Existing R&D programs favour larger companies and yet the PEI is mainly composed of small firms. In most instances, larger companies are understandably not prepared to share their R&D unless they see it as beneficial to themselves. However several of the larger companies are already helping to promote the accessibility of R&D assistance from governments to the smaller companies in the PEI.

R3. The government should ensure that adequate assistance is available to the PEI in developing stronger industry infrastructure support, particularly:

- technology diffusion in all segments including management technologies and the enhancement of the existing TTSN program
- the software and hardware servicing needs of the industry
- specific centres to develop greater capabilities for exporting and for major projects –examples are in the areas of design, machine tool training (using virtual reality simulation), product testing, validation and processing R&D
- disseminating knowledge and implementation of relevant R&D assistance programs

The image of the industry as a career and to investors

The Forum convened by the audit team in December 2000 recommended that the State Government should work with industry associations to develop a program to improve the image of Victoria's manufacturing both in Australia and to overseas. The promotion campaign should be the joint responsibility of Government and industry.

The Australian manufacturing industry does not have a developed international reputation and yet it will need to develop a much higher profile and international reputation as a means of differentiating itself as a means of minimising the impact of global competition. A detailed capabilities register for existing companies in the industry will need to be developed and promoted in Australia as well as globally.

There needs to be a detailed marketing and strategic plan to develop and promote the manufacturing industry in this State. The image problem of manufacturing is pervasive and applies to most manufacturing segments.

Integral to the promotion campaign will be the need to promote the career opportunities available in manufacturing to secondary school students. Companies in the industry will need to be receptive to school visits.

Industry associations will have an important role to play in developing the image program as it relates to the PEI industry as will other leading industry associations for other manufacturing industries.

All stakeholders will have an important role to play in promoting manufacturing including:

- Industry associations
- Employer associations
- Employee associations
- Professional associations
- Government departments
- Semi-Government organisations
- Industry training boards
- Group training companies

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- TAFE institutes
 - Universities and research institutes
 - Area consultative committees
 - Local learning and employment networks
 - School to industry groups
 - Individual employers
 - Individual employees

The strong recommendation on industry image from the Forum held on the PEI was supported by virtually every interview undertaken. It was also thought that part of the promotion should include highlighting success stories, and in the PEI there are many. The poor career image of manufacturing has reduced the popularity of engineering and trade courses and apprenticeships with students and increased the difficulty of promoting these courses.

The community has very little idea of the PEI. There is a very limited focus on manufacturing in school curricula. Teaching professionals at all levels do not have adequate understanding and appreciation of manufacturing and the pre-requisites for a career in it. Few would understand the high levels of skill and training requirements of precision engineering employees or the remuneration or job satisfaction that such a career would bring. The PEI is very aware that it has not done very much to change this over the years, but the PEI has indicated it is very prepared to do what it can to remedy the situation.

An effective promotion campaign for manufacturing would clearly benefit investment attraction and exports. The promotion of manufacturing and the PEI industry must be multi faceted. Not only will it need to be targeted to potential importers and investors overseas, it will definitely have to be promoted to parents, teachers and school children. The issue of promoting manufacturing is particularly important to the PEI industry because, by its nature, it is a supplier of enabling technology.

Many stakeholders of the PEI feel that both the Federal and State governments should more proactively promote manufacturing industry in any way to the community, internationally or to investors.

The industry has been impacted by the slowdown in Victorian manufacturing during the past decade or so. The rapid dismantling of tariff protection has largely brought this about. Other countries, especially those in Asia, have not followed such rates of reduction of protection to the same extent. Deriving from this is the considerable industry scepticism about “economic rationalism” and its advocacy of free trade and the so-called “ level playing field”. Industry members who witness the non-tariff barrier methods used by many other countries are quite frustrated by this advocacy. It is understood that most of these issues have not been either the doing or the responsibility of the State Government but the legacy of discontent remains and has to be dealt with by the Victorian PEI.

There is a real concern that many firms in manufacturing should be able to know more the government’s industry assistance programs. In the process of conducting this audit it became clear that the PEI welcomed the initiative of undertaking strategic industry audits of Victorian industry and looks forward to a constructive approach from Government and the Office of Manufacturing as to the outcome. In particular, the view

was often expressed that the Government should conduct regular information sharing seminars where it could take the opportunity of clearly explaining how its programs can assist firms and how the government sees the outlook for the particular manufacturing industry the seminar is addressing. At the same time there would be an opportunity to obtain industry views of the government's manufacturing policy.

R4. As part of the more generic approach to improving the manufacturing industry image the PEI and Government:

- must tackle the overall manufacturing image problems and this is a priority of the OOM
- need to highlight the particular problems the PEI has with its image
- must develop suitable promotional material aimed at the community and at both its domestic and global clientele
- need to develop a detailed capabilities register available on the WEB (TIFA has this already for the tooling segment)
- should be represented on the MICC for ongoing development

Technical and professional skill shortages

The PEI has undergone enormous change over the last decade. Improved technologies have changed the way in which much of the work is done in the industry. Much of the laborious tasks have been reduced significantly which has seen a growth in output with comparatively lower increase in employee levels. Despite the changes, to a large extent the PEI experiences extreme difficulty attracting young people into its ranks particularly as apprentices. This appears to reflect a range of factors, the main issues being a decline in the traditional manufacturing base in Victoria and the poor image manufacturing has as a career option for young people.

There has also been a progressive ageing in the skilled workforce over the past 10 years owing to a continuous reduction in apprentice numbers. In 1999 the age profile of employees in the tooling segment of the industry indicates that over 60% of employees were over 35 years of age and 15% were over 55 years of age¹⁷. According to the industry this profile has aged further during the last two years. The ageing of the skilled workforce is a concern and it will be increasingly important to retain the services of more experienced skilled labour.

The PEI sees there will be a stronger demand in future for young people who can understand more complex equipment and contribute to further industry development. Existing employees will need to develop different skills, for example as programmers or project planners or managers and fully understand the whole industry process and the needs of the market. The equipment being used today requires an additional new type of education in areas of computer control and programming and higher level engineers with more specific skills.

There is also seen to be scope to employ retired or older skilled workers in mentoring roles in workplaces, assisting in the training processes particularly oriented to the many poorly documented techniques that remain essential to the industry despite the introduction of new technologies.

¹⁷ ESTB (Vic) Inc. Victorian Toolmaking Industry "Employment & Training Profile, Sep 1999.

A number of firms in the industry have expressed dissatisfaction to the audit team regarding TAFE training on a number of grounds. This summary list is not necessarily to be taken as the industry opinion, but as comments made by various industry members who have voiced their opinions to the team on their dissatisfaction with the training provided by the TAFE system:

- Institutes now lack the latest equipment to comprehensively train apprentices.
- Training options offered by individual institutes are often not sufficiently relevant.
- Training resources used by institutes often no longer match new competency based training programs.
- New training packages do not meet the competency needs of all workplaces and it is difficult to have changes made.
- TAFE trainers are often not up to date with the latest technology.
- It appears that recent staff development has been poorly targeted, and that recent TAFE amalgamations, retrenchments and declining apprenticeship numbers has led to a decline in morale among teachers.
- It is still normal for apprentices to be trained for general-purpose machining etc. and on traditional hand skills. Hand skills remain important but have diminished in need with the advent of more sophisticated equipment where new skills relate to planning, comprehension of 3D modelling, product design, tool development and programming machine tools.

It is the contention of the Engineering Skills Training Board (ESTB) and the Department of Education, Employment and Training (DEET), that accredited training programs are sufficiently flexible to meet the needs of the industry. However, further assistance should be provided to TAFE institutes to enable them to fully implement the flexibility afforded by existing programs and devise ways of implementing these programs in particular for smaller industry groups.

The PEI sees a greater role being played by industry in specific training as the latest technology is not fully available through the existing training institutions.

Also mentioned was the limited focus on manufacturing in primary and secondary school curricula, which appears to add to the industry career image problem. The PEI seems in no doubt that secondary teachers do not have an adequate understanding and appreciation of manufacturing, and very little knowledge of the PEI.

Some employers in the PEI consider that apprenticeship courses are needlessly long with the result that industry is not supporting training at certificate levels 4, 5 and 6. An important reason for the lack of interest in long training courses is that they tie up resources for protracted periods of time and they are very expensive to the employer. For example, on average, three tradesmen are involved supporting the on-the-job training of one apprentice. Employers would however be required to pay full trades' wages to apprentices who complete their training in a shorter period.

On site training through the provision of short courses is popular in the industry because of the shorter time taken to train young people in ways appropriate to the needs of their particular company and the use of the latest equipment during their training.

More effort needs to take place to align this training to the achievement of competency standards and hence reduce the amount of time the apprentice spends away from the workplace. However, care should be taken to ensure that workplace-based training

received by an apprentice would still provide a truly portable qualification with recognition beyond the immediate workplace.

There was a number of perturbing comments made by industry representatives that indicated that all the problems with training are certainly not the workings of TAFE. Some companies expressed no surprise with the lack of inclination of young people to take up trades when there are stories of some firms use their apprentices as a cheap form of labour and also the restrict range of their training experience to suit their own purposes. The current review into data collection and field officer numbers by the Office of Education, Training and Employment (ETTE) may help in alleviating this problem. It is claimed by some companies that it is too easy under the current system to minimise the TAFE component of apprenticeships after the first year and train students on site on a limited number of machines. This should not be possible given the existence of a formal Training Agreement and the broad skill requirements of the apprenticeship qualifications, therefore further investigation of these claims is warranted.

There have been two TAFE institutes that were praised by industry representatives, the Gordon Institute in Geelong and the Wodonga TAFE. The Ford Motor Company in Geelong currently places some 10 apprentices each year and has had no problems either in finding apprentices or with their TAFE training in Geelong. One of the reasons Ford has been able to find apprentices, as do some other leading companies in the industry, is that they are prepared to pay a premium on the normal apprentice wage. The difference may also be that Ford's tooling facilities are located in Geelong, a city that has had and still does have a strong connection and dependence on the manufacturing industry. In Geelong, the image of manufacturing appears stronger than in metropolitan Melbourne and in other provincial centres and is strongly promoted by the City Council. Further, there is a keen awareness that manufacturing is important to the local economy.

Some TAFE colleges explained that there is a greater proportion of funds being deployed into subjects other than basic engineering skills and this seriously limits their ability to employ the latest training equipment. Although it should be recognised that engineering training is a high cost activity, requiring more funds than many other industry sectors, it is also the case that this diversion of funds originally intended for engineering is due more to lack of demand than for any other reason.

R5. To determine future skilling needs and direction the PEI should:

- conduct a skills audit of the industry in each of its sub-segments,
- develop a database of short and long term skill requirements,
- work cooperatively with the training providers,
- seek information about how they can employ technicians, provide training, pay a training wage, and receive a federal subsidy,

R6. With a whole of industry, whole of government approach, undertake a study to examine the role that primary and secondary education plays in the demand for apprenticeships and consider that:

- the industry educate and equip schoolteachers, employers and career advisers to have an understanding of the PEI and the career options it offers,
- manufacturing related training material be developed to accompany school curricula.

R7. To improve the skills and technology training the PEI needs assistance from Government to:

- work with TAFE institutions to enable development of flexible training programs that provide generic skills required to operate and maintain machine tools, with industry providing practical on site experience
- determine, with TAFE, the viability of elements of new technologies skills training being carried out utilising the web and virtual reality methods,
- develop more effective mechanisms to help disseminate existing education and also most recent technology training programs more effectively and to determine new training requirements,
- the PEI and government to create programs to develop management, strategic and entrepreneurial skills specifically for each of the sub-segments.

R8. The PEI in conjunction with Government to consider education and training methods that can be useful to the industry such as:

- promoting the “Mentoring program” modified to reflect the particular circumstances of the PEI
- companies training their own staff assisted with incentives such as Payroll Tax exemptions similar to the provisions available for apprenticeships.

Access to funding for large local and global project work

The PEI industry has always been a capital-intensive business. However, its low material costs and high value adding processes that are based on the need for highly skilled labour have always meant that the labour costs loomed as the major performance factor. New technology equipment has meant that many labour intensive tasks have been superseded, but the cost of new capital equipment remains a hurdle and in reality the industry is becoming rapidly more capital intensive. An offset to this is that the high technology equipment brings faster production and a lower proportion of labour costs. It remains that the initial step into the new technologies can be beyond the financial strength of many of the small firms.

Finance is also needed to fund working capital for the increasingly larger blocks of work required by the customers of the PEI. The procurement methods have ramped up significantly over the last five years and often the terms of contracts must be funded through the full term of manufacture as opposed to the previous interim payment method.

The industry needs access to capital funding that could provide concessional but repayable loans to assist businesses to acquire the latest equipment and fund additional operating cost incurred in meeting larger domestic contracts and replacing imports. The collateral for these loans would be based on the value of confirmed sales contracts.

While the industry remains dominated by a large number of small firms, funding will remain an important issue. However, a greater degree of collaboration and specialisation to more efficiently supply leading firms would provide some easing in the pressure on funding associated with meeting larger orders.

R9. To assist the tooling and machine tool segments of the PEI in funding major capital equipment and for supply of major project works:

- PEI to explore collaborative arrangements and approaches to major equipment acquisition
- the Government should more effectively market its services especially in regard to assistance available and the alternative sources of funds that could be available to the manufacturing sector both from the Government and private sector. There is a need to fully understand what existing schemes exist and to have this information more effectively disseminated.

Appendices

1 - Interviews

Name	Position	Company or Organisation
Dennis Batiste	Head of Department	Victoria University of Technology
Milan Brandt	Associate Professor	Industrial Research Institute Swinburne
Gary Bourne	Operations Manager	Metro Tool & Die
J Graeme Brophy	Company Secretary	Sutton Tools Ltd
Terry Byrnes	Economist	Australia Bureau of Statistics (Melb)
Brian Cook	Director	WorkCover Safety
Peter Canavan	Manager	Engineering Skills Training Board
Prof Nelson Chen	Head of Department	RMIT University
James Clark	Manufacturing Manager	Cyclone Industries Pty Ltd
David Cragg	Executive Officer	AMWU
Michael Crogan	Group CEO	Sutton Tools Pty Ltd
Marianne Durack	Economist	Australia Bureau of Statistics
Jim Elder	General Manager	Diecraft Australia
David Ellul	Director	Marand Precision Engineering Pty Ltd
Tony Ellul	Director	Marand Precision Engineering Pty Ltd
Kevin Fogarty	Director Manufacturing	Bendix Mintex Pty Ltd
Troy Harris	Superintendent	Ford Motor Company Ltd
Shane Infanti	Chief Executive Officer	Australian Machine Tool Institute Ltd
Tony John	Managing Director	Meratek Pty Ltd
Sabu John	Course Coordinator	RMIT University
Peter Johnson	Prof Mechanical Eng	RMIT University
Paul Kennet	General Manager	Engineering Skills Training Board
Peter Kerley	Sales Manager	Hosico Engineering Pty Ltd
Peter Hof	Managing Director	Hosico Engineering Pty Ltd
Roger LaBrooy	Associate Professor	RMIT University
Jim Leckey	Industry Client Manager	Office of Manufacturing DIIRD
Richard Lewcruk	Program Manager	Victoria University
Roy Lilley	Executive Director	Industrial Supplies Office (Vic)
Ian McConnell	Manufacturing Manager	Australian Defence Industries
Peter McDougall	Industry Manager	VECCI
Mehdi Mahdavian	Senior Lecturer	RMIT University
David Manterfield	Head of School	University of Ballarat
Ian Manton	Managing Director	Valcor Pty Ltd
Leigh Maylor	Director	Southern Grampians Shire Council
Trevor Morgan	President	Selected Machine Tools Pty Ltd
Peter Nicholls	Managing Director	Production Parts Pty Ltd
Lionel Nicholas	Manager, Manufacturing Processes	Office of Manufacturing DIIRD
Denis Payton	Executive Director	Tooling Industry Forum of Australia
Tony Pensabene	National Manager	Australian Industry Group
Roland Perry	General Manager	Cyclone Industries Pty Ltd
Michael Ramsey	Managing Director	Lovitt Technologies Australia
Ged Rodgers	Regional Consultant	Industrial Supplies Office (Vic)
Geoff Sadler	Human Resources Mgr	Diecraft Pty Ltd
Ray Schenk	Program Manager	University of Ballarat
David Smith	Production Manager	Australian Defence Industries
Prof. Elias Siores	Chair Mechanical Engineering	Industrial Institute of Swinburne
Richard Strates	Industry Development Officer	Southern Grampians Shire
John Sweetman	Group General Manager	VECCI
Peter Taylor	Managing Director	TED Engineering Pty Ltd
Dale Templeton	Director	Ultracut Tools Pty Ltd
Tony Thornhill	Director	Thornhill Machine Tools Pty Ltd
Ed Walsh	Contracts Manager	Marand Precision Engineering Pty Ltd
Dianne Williams	Associate Director	Victoria University of Technology

2 – Industry Reference Group members

Name	Position	Company or Organisation
Pat Boland	Managing Director	ANCA Pty Ltd
Nelson Chen	Head of Department, Mechanical & Manufacturing Engineering	RMIT University
Michael Grogan	Group CEO	Sutton Tools Pty Ltd
Tony John	Past President	Tooling Industry Forum of Australia
Peter McDougall	Manager, Manufacturing Industry	Victorian Employers' Chamber of Commerce and Industry
Bill Shorten	State Secretary	Australian Workers Union
Elias Siores	Executive Director	Industrial Research Institute Swinburne
John Speight	Organiser, Melbourne Office	Australian Manufacturing Workers Union
Peter Taylor	Managing Director	T.E.D. Engineering Australia Limited
Dianne Williams	Associate Director, Engineering	Victoria University of Technology

3 – Industry Working Group members

Name	Position	Company or Organisation
Pat Boland	Managing Director	ANCA Pty Ltd
Milan Brandt	Associate Professor	Industrial Research Institute Swinburne
Denis Payton	Executive Director	Tooling Industry Forum of Australia
Paul Kennett	General Manager	Engineering Skills Training Board
Mark Pratt	Managing Director	Dolphin Products Pty Ltd
Geoff Sadler	Human Resources Manager	Diecraft Australia
Shane Infanti	Chief Executive Officer	Australian Manufacturing Technology Institute
Tony Ellul	Managing Director	Marand Precision Engineering
Brian Jasper	Managing Director	T & D Tooling
Jim Leckey	Industry Client Manager	Office of Manufacturing, DIIRD
Lionel Nicholas	Manager, Manufacturing Processes	Office of Manufacturing, DIIRD

4 - The prime responsibilities of TTSN

The Tooling Industry Forum of Australia (TIFA) is responsible for the operation and outcomes of the Tooling Technology Support Network (TTSN). The TTSN was set up by TIFA and is funded by TIFA members and by the Federal Government and the State Governments of Victoria, New South Wales, Queensland and South Australia.

The prime responsibilities of the TTSN are as follows:

- ❑ To audit the capabilities of the industry
- ❑ To identify new technologies being developed both in Australia and overseas that could enhance the capabilities of existing firms in the industry.
- ❑ To directly assist enterprises with technology diffusion by means of forums, seminars, workshops, demonstration and awareness projects, and individual cooperation
- ❑ To undertake detailed benchmarking exercises
- ❑ To manage the interface between appropriate research and educational institutions, the government and industry.
- ❑ To understand the major research needs of the industry and match these needs to developments overseas.
- ❑ To identify new tooling technologies and processes that are currently not undertaken in Australia, but could be undertaken by some companies on a globally competitive basis and to promote these companies and processes overseas.
- ❑ To identify leading edge R&D and targeting the application of that R&D to specific companies and or groups of companies that have the capability to commercialise and export the applications.

TIFA has the responsibility to monitor the outcomes of the TTSN and to regularly report these to all government and industry stakeholders.

5 - Abbreviations

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACIS	Automotive Competitiveness and Investment Scheme
ACS	Australian Customs Service
ADCA	Australian Die Casting Association
AECM	Advanced Engineering Centre for Manufacturing
AIG	Australian Industry Group
AMTIL	Australian Manufacturing Technology Institute Limited
AMWU	Australian Metal Workers Union
ANZSIC	Australian and New Zealand Specialised Industry Codes
APC	Australian Productivity Council
Austrade	Australian Trade Commission
AWU	Australian Workers Union
B2B	Business to Business (e-commerce)
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CAF	Computer Aided Fabrication
CAM	Computer Aided Manufacture
CAST	CRC for Alloy and Solidification Technologies
CBN	Cubic Boron Nitride
CIBM	Centre for Innovation Business and Manufacturing (was SACFM)
CIM	Computer Integrated Manufacturing
COMET	Commercialising Emerging Technologies
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific Industrial Research Organisation
DFAT	Department of Foreign Affairs and Trade
DITR	Department of Industry, Tourism and Resources
DIIRD	Department of Industry, Innovation and Regional Development
EBA	Enterprise Bargaining Agreement
EDI	Electronic Data Interchange
EDM	Electrical Discharge Machining
EMDG	Export Marketing Development Grant
ESTB	Engineering Skills Training Board
ETMs	Elaborately Transformed Manufactures
EU	European Union
FAPM	Federation of Automotive Products Manufacturers
FCAI	Federal Chamber of Automotive Manufacturers
FDM	Fused Deposition Modelling
GDP	Gross Domestic Product
GIRD	Government Expenditure - Research & Development

Abbreviations continued:

IBIS	IBIS Business Information
IMMA	Institute of Metals & Materials Australia
IMS	Intelligent Manufacturing Systems
IRG	Industry Reference Group (SAVI)
IRIS	Industrial Research Institute Swinburne
ISO	Industrial Supplies Office
ISO	International Standards Organisation
LTI	Lost time injury
ManSA	Manufacturers Society of Australia
MFI	Metals Fabrication Industry
MICC	Manufacturing Industry Council
MTI	Medical treated injury
NCMC	National Cast metals Council
NEITL	North Eastern
OEM	Original Equipment Manufacturer
OoM	Office of Manufacturing (DIIRD)
PEI	Precision Engineering Industry
PETE	Office of Post Compulsory Education, Training and Employment
R & D	Research & Development
RMIT	Royal Melbourne Institute of Technology University
SACFM	South Australian Centre For Manufacturing (now CIBM)
SAVI	Strategic Audit of Victorian Industry
SCA	Sustainable Competitive Advantage
SME's	Small to Medium sized Enterprises
START	Strategic Assistance for Research
STM's	Simply Transformed Manufactures
TAFE	Technical And Further Education
3D	Three Dimension
TIFA	Tooling Industry Forum of Australia
TTSN	Tooling Technology Support Network
UK	United Kingdom
USA	United States of America
VECCI	Victorian Employers Chamber of Commerce and Industry
VET	Vocational Education and Training
VIPP	Victorian Industry Participation Policy

6 - Industry Statistics

Data	Category	Actual									Forecast			
		1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Employee numbers	Tooling	5,360	4,930	5,500	4,430	5,070	5,100	4,930	5,000	5,000	5,000	5,300	5,600	6,200
	Precision Machining	540	490	550	440	510	530	490	500	515	525	540	580	620
	Machine Tools	1,070	990	1,100	890	1,010	950	985	1,000	1,000	1,050	1,100	1,200	1,300
	Cutting Tools	535	490	550	440	505	480	490	500	500	500	540	540	570
	Total Victoria	7,505	6,900	7,700	6,200	7,095	7,060	6,895	7,000	7,015	7,075	7,480	7,920	8,690
	Total Australia	17,300	17,300	17,700	16,500	16,100	16,600	16,000	16,100	16,200	16,500	17,300	18,500	20,000
	Victoria's employee share	43%	40%	44%	38%	44%	43%	43%	43%	43%	43%	43%	43%	43%
Turnover	Tooling	380	455	410	390	435	525	410	490	500	525	570	620	680
	Precision Machining	45	65	60	75	65	60	55	70	75	80	85	90	95
	Machine Tools	110	145	140	120	140	120	120	130	130	135	145	160	175
	Cutting Tools	40	45	45	50	50	45	60	70	70	70	75	75	80
	Total Victoria	575	710	655	635	690	750	645	760	775	810	875	945	1,030
	Total Australia	1,410	1,530	1,550	1,410	1,460	1,750	1,400	1,650	1,700	1,750	1,850	2,000	2,080
	Victoria's share of Turnover	41%	46%	42%	45%	47%	43%	46%	46%	46%	46%	47%	47%	50%
Exports	Tooling	18	19	18	23	23	25	33	45	63	88	123	173	242
	Precision Machining	6	6	8	8	10	12	10	8	12	15	22	28	35
	Machine Tools	30	45	40	55	55	65	68	70	70	75	80	85	90
	Cutting Tools	5	6	8	7	5	8	7	6	7	7	8	8	9
	Total Victoria	59	76	74	93	93	110	118	129	152	185	233	294	376
	Total Australia	112	148	130	152	160	190	202	215	250	300	375	470	585
	Victoria's share of Exports	53%	51%	57%	61%	58%	58%	58%	60%	61%	62%	62%	63%	64%
Imports	Tooling	54	68	61	58	74	67	66	70	70	70	65	55	45
	Precision Machining	5	7	6	8	7	7	8	7	8	9	10	11	12
	Machine Tools	110	115	105	110	110	120	125	114	120	140	160	180	200
	Cutting Tools	45	50	49	53	56	61	60	65	70	75	83	88	96
	Total Victoria	214	240	221	229	247	255	259	256	268	294	318	334	353
	Total Australia	476	533	491	509	549	567	576	569	596	653	707	742	784
	Victoria's share of Imports	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Market (to less exports plus imports)	Tooling	416	504	453	425	486	567	443	515	507	507	512	502	483
	Precision Machining	44	66	58	75	62	55	53	69	71	74	73	73	72
	Machine Tools	190	215	205	175	195	175	177	174	180	200	225	255	285
	Cutting Tools	80	89	86	96	101	98	113	129	133	138	150	155	167
	Total Victoria	730	874	802	771	844	895	786	887	891	919	960	985	1,007
	Total Australia	1,774	1,915	1,911	1,767	1,849	2,127	1,774	2,004	2,046	2,103	2,182	2,272	2,279
Trade Balance Australia		-364	-385	-361	-357	-389	-377	-374	-354	-346	-353	-332	-272	-199

Notes on Table:

1. All data has been derived from ABS statistics (which are only specific for some categories of product in the PEI) and from industry and stakeholder information.
2. The "Market" data represents the total sales into Victoria and Australia from any source local or offshore of products capable of being produced by the Victorian Precision Engineering Industry.
3. The "Trade Balance" data indicates the net of products exported less products imported. In all cases the net is negative showing a clear trade imbalance in favour of imports.
4. The "Forecast" data are industry projections based on the more recent success in increasing exports, particularly from the Tooling segment. Provided the Victorian PEI develops a successful plan to increase its share of global markets the "Trade Balance" is forecast to steadily change.