

**Defining the Role of Government in
Trans-nationalization Efforts of Indian
SMEs
in Machine Tool Sector**

Prepared for

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1 INTRODUCTION

1.1 Trans-nationalization of small and medium enterprises

Trans-nationalization has become increasingly important to the competitiveness of enterprises of all sizes. Even small and medium-sized enterprises (SMEs) with a global strategy can move quickly to exploit opportunities for revenue growth and enhance capabilities for long-term competitiveness.

SME trans-nationalization can take different forms - including exporting, alliances / mergers across national borders, technology transfers and the establishment of operations or offices in other countries. The process is often sequential with clearly identifiable stages –

- i. Exports of products (directly, through agents or buyback arrangements)
- ii. Alliances - sales via licensing or franchising, technology transfers
- iii. Foreign Direct Investment (FDI) including overseas mergers / acquisitions

This approach has the advantage of minimizing risk and investment required at each stage of growth while allowing for learning and experience gathering before further expansion. The benefits and challenges at each stage of trans-nationalization is summarized below –

Table 1: Stages of trans-nationalization:

| | Exports | Alliances | FDI |
|-------------------|---|---|---|
| Benefits | Low investment, cost/commitment | Requires limited resources and market knowledge | Development of new knowledge and capabilities |
| | Flexible, fast | | Minimizes transaction related risks |
| | Lower risk | | Location based advantages |
| | | | |
| Challenges | Tariffs and non tariff trade barriers | Identifying the right partner | Complex, time consuming |
| | Transportation costs of goods can be high | Structuring partnership | High upfront investment and greater risk |
| | | | Least flexible |

1.2 Role of public policy

Despite the broad acceptance of the importance of trans-nationalization of SMEs, there are significant internal and external barriers that impede its progress. Public policy at local, regional and national levels can play a significant role in reducing these barriers and also pro-actively promoting trans-nationalization through interventions in areas where private sector initiatives are absent or inadequate.

As a first step, data is needed about the SME population in a given country and industry before appropriate actions or policies can be developed. Once the SMEs are identified, they should be segmented according to size and growth orientation. Further assessment is then required to determine the needs of those groups of SMEs. It is important to reach out to SMEs and get their perspective on the challenges and opportunities they face.

There are a number of areas in which actions can be taken to reduce the barriers to conducting business abroad and many efforts are already in place or being tested in various countries and regions, as shown below.

Table 2: Policy measures

| Policy Area | Measures |
|---|--|
| Creating an openness to trans-nationalization | Promoting successful firms as role models to create awareness of international business opportunities |
| Information dissemination | Providing information on tax rules, regulation and finance in foreign countries |
| Provision of business support services | Counseling, consulting and competence development through functional workshops and related activities |
| Reforming education | More international content in curricula, encouraging faculty with international experience, creating internships for young students to work in foreign countries |
| Building networks | Cluster development programmes, collaborative research and technology transfers between public and private institutions |
| Financial assistance and incentives | Export marketing funds |
| Legal framework | Protection of intellectual property, enforcement of laws on anti-competitive and unfair trade practices that hurt SMEs |

1.3 Importance of the machine tool industry

The machine tool industry is universally recognized as a strategic industry for driving industrialization of a country. Known as a ‘mother industry’, it produces capital goods such as lathes and machining centres for a broad spectrum of the manufacturing sector. The demand for machine tools is largely from the automotive (including ancillaries and component manufacturers), capital goods and consumer durable sectors. Intermediate goods sectors such as auto ancillaries, bearings and electronic components are also important sources of demand.

Measured in terms of output and employment, the machine tool sector is amongst the smallest in the manufacturing industry in the developed countries. At the peak of US dominance in the late seventies, the sector accounted for only 0.3% of total value of manufactured goods in that country. The industry also tends to be heterogeneous in the product offerings and comprises of large number of small firms. The situation, in the Indian context, is similar.

Despite its small size, the machine tool industry is far more important than its share of industrial value add or employment would suggest. Machine tools are the core machinery in the metal working sectors of industry. Moreover, the organization and control of production in the metal working industry is closely tied to the characteristics of the machine tools used. Therefore the machine tool sector plays a very important role in influencing the productivity and competitiveness of larger manufacturing sectors. Several industry experts have argued that leading industrialized countries have invariably had a strong domestic machine tool sector and that the decline of US manufacturing is a direct consequence of the loss of competitiveness of its domestic machine tool industry.

Beneficiaries of advanced manufacturing processes enabled by new machine tool technologies are producers who use machine tools. The benefits to them include improved productivity; shorter product cycle times, energy savings, and improved product quality. Another major beneficiary of machine tool technologies is the consumer who buys the products made by the tools. The principal benefits to the consumer are lower prices, improved quality, greater reliability, and higher energy efficiency. Benefits also flow to the overall economy as inflation is held in check, the global competitive position improves, workers acquire training and skills concomitant with the new technologies, and productivity growth spurs real wage growth.

The role of manufacturing in job creation is an issue of enormous importance to India. Manufacturing currently employs about 45 million people (or 11% of the workforce). It also

serves as a transitional alternative to manpower in agriculture. In expanding manufacturing, India creates a channel through which low skilled labour in agriculture can access more value added jobs. Manufacturing has the highest “multiplier effect” among all economic sectors as a manufacturer’s need for raw materials, suppliers, distributors and other services spurs the creation of jobs, investment and innovation in the rest of the economy. Several global economic studies have estimated that every job created in manufacturing has a multiplier effect, creating 2-3 jobs in services. Also, there is an increasing level of 'software' or services involved in manufacturing.

There is growing optimism that India can become a primary sourcing and manufacturing base for skill intensive sectors such as automobiles and auto components. Research by the McKinsey, the global consulting firm, indicates that the export potential for auto components from India could be about \$ 25 billion by 2015. Leading Indian suppliers possess world-class product and process engineering capabilities. Almost all big global automakers already source components in India. Many automakers are now creating engineering and design centres in India to capitalize on these skills.

The automobile and machine tool sectors have a symbiotic relationship. The Japanese auto industry has had an enormous impact on that country’s machine tool sector. Data from the Japan Association of Machine Tool Builders indicates that domestic auto and auto part makers create about 30-40% of induced domestic demand for machine tools. This point is well reflected by the fact that the Japanese machine-tool industry was the largest producer in the world one year after the Japanese became the world’s largest automakers. If India has to emerge as an important global sourcing base for automobiles and auto components, the machine tool sector will have a crucial role to play.

Viewed in this perspective, the role of the machine tool sector in India has crucial strategic importance. A vibrant domestic machine tool industry is the key to increasing competitiveness of Indian manufacturing. The strengths of the Indian machine tool industry can also be leveraged to increase its scale and competitiveness in international markets.

1.4 Scope of study

Recognizing the link between competitiveness and the degree of trans-nationalization of an industry, the Department of Scientific and Industrial Research (DSIR), New Delhi initiated a study for defining the role of government to promote trans-nationalization efforts of Indian small/medium enterprises (SMEs) in the machine tool industry. The study had the following objectives -

- a) Evaluate trans-nationalization objectives of Indian SMEs in the machine tools sector.
- b) Benchmark technological capabilities of Indian SMEs vis-à-vis global competition.
- c) Identify impact of industrial policy for machine tool sector adopted by leading machine tool manufacturing countries e.g. Japan, Korea, China, US and European Union with special reference to:
 - i. strengthening industry linkages
 - ii. raising local content
 - iii. Foreign Direct Investment (FDI) strategy
 - iv. Research & Development support
- d) Recommend policy measures to support the Indian machine tool sector through innovation & technology development, entrepreneurship promotion, infrastructure and enabling facilities, trade and fiscal policy.

2 STUDY METHODOLOGY

2.1 Industry definition

The machine tool industry comprises manufacturers of the following types of machinery and its accessories -

- a) Metal cutting machinery such as lathes, milling machines, drilling / boring machines, and
- b) Metal forming machinery such as presses, punches, forges jigs and fixtures etc.

Based on technology, machine tools can be classified into Computerized Numerically Controlled (CNC) and some NC machines and Conventional.

The machine tool component industry includes manufacturers of the following systems-

- CNC systems: A form of programmable automation in which the machine tool is controlled by a program in computer memory.
- Servo motors: A servo motor is an automatic device which uses error-sensing feedback to correct the performance of a mechanism. The term applies to systems where the feedback or error-correction signals help control mechanical position or other parameters.
- Spindles, bearings, guide ways and ball screws
- Cast iron products such as beds, columns and saddles
- Hydraulic systems: Hydraulic machinery refers to the machines and tools which use fluid power to do work.

2.2 Survey design

- a) A structured questionnaire comprising the following five sections was developed and the same is provided in Annexure.
 - i. **Unit** : year of establishment, initial investment in plant & machinery, nature of products and by-products produced, number of workers, both skilled and unskilled, number of supervisory, technical and managerial staff, their qualifications, experience, entrepreneurial background, etc.
 - ii. **Technology**: nature of technology in use, its cost, capacity and capabilities, etc.
 - iii. **Product**: capacity of production, number, quantum and value of output, capacity utilization, etc.
 - iv. **Innovation** : development of new / improved products / processes, substitution of raw materials, reverse engineering, quality improvement, cost reduction, etc. and facilities available for the same.
 - v. **Internationalization strategy**: products / markets for export, closest competitors, sales channel, foreign investment plans etc.
- b) 90 machine tool industrial units were identified for the survey, from the following sources:
 - IMTMA Directory
 - Participants in the IMTEX 2007 machine tool exhibition
 - Participants in EMO-Hanover machine tool fair – see Annexure
 - Suppliers to major machine tool manufactures such as HMT, ACE Designers, MICO Bosch and Bharat Fritz Werner.
 - Export details as per shipment data

The following criteria was adopted to select units for the survey –

- i) All IMTMA member units with export sales – both assembly and accessory manufacturers
 - ii) Coverage of units in all major machine tool manufacturing centres in India – Bangalore, Coimbatore, Hyderabad, Mumbai, Rajkot, Indore and Pune
 - iii) Select machine tool importers and multi-national firms – to get a perspective of technology trends in the industry.
- c) Subsequent to e-mailing of questionnaire to all the 90 machine tool units identified for Survey, field visits to 63 machine tool manufacturers and ancillary units were carried out in Bangalore, Hyderabad, Mumbai, Rajkot, Indore and Coimbatore.
- d) Details of industrial policy on machine tool sector in countries such as Japan, US, European Union, China and South Korea have been obtained from academic journals and trade publications that have addressed this subject. Information from the commercial department of the Indian embassy in Germany was also obtained.

2.3 Respondent summary

A total of 63 firms responded to the survey and questionnaire. The table below provides a summary of the size and business focus of these firms. Details are provided in Annexure . As firms did not provide information on the size of their investment in plant & machinery, the classification as small, medium and large enterprises was made subjectively based on turnover (below 50 cr-small; 50-100 cr-medium and above 100 cr-large).

Table 3: Survey respondent summary

| Item | No. of Respondents |
|--|--------------------|
| Unit operations: | |
| Assembling and marketing machine tools | 22 |
| Assembling and selling jigs, fixtures & accessories | 28 |
| Tools, dies, moulds | 10 |
| Supplying imported CNC packages | 3 |
| TOTAL | 63 |
| Size of units: | |
| Large units (turnover more than Rs.100 crores) | 10 |
| Medium units (turnover Rs.50 to 100 crores) | 4 |
| Small units (turnover below 50 crores) | 46 |
| MNCs | 3 |
| TOTAL | 63 |
| No. of employees: | |
| Total number of employees above 100 | 10 |
| Total number of employees 50 to 100 | 11 |
| Total number of employees below 50 | 43 |
| TOTAL | 63 |
| Exporting units: | |
| No of firms exporting or with other trans-nationalization operations | 21 |
| No of firms deriving more than 50% of turnover from exports | 3 |
| Large units | 15 |
| MNCs – importers | 3 |
| Medium size units | 7 |
| Small units | 38 |
| Location of units: | |
| Bangalore | 43 |
| Coimbatore | 10 |
| Hyderabad | 3 |
| Mumbai | 2 |
| Indore | 2 |
| Rajkot | 3 |
| Total | 63 |

Note: Firms based in Pune did not respond to the survey questionnaire.

3 GLOBAL MACHINE TOOL INDUSTRY

3.1 Industry characteristics

Highly heterogeneous

It is estimated that there are over 3000 different types and sizes of machine tools. The machine tool industry is made of mostly small and medium sized firms. In Germany, for example, there are about 320 machine tool companies employing 65,000 employees with an annual turnover of about \$ 10 billion. Only 3% of the manufacturers employ more than 1000 people. Similarly, the industry in Italy comprises of about 450 firms, 70% of which employ less than 50 people.

High capital intensity

This results from the large requirements for working capital due to small batches, low degree of automation in production and large variety of products.

Foreign direct investment is low though international trade is significant

The small size of machine tool firms makes foreign investment impractical while the presence of wide network of machine tool distributors worldwide often makes it unnecessary.

3.2 Key statistics

Source: Gardner Inc (2007 World Machine Tool Output and Consumption Survey)

- The global machine tools industry had a turnover of about US\$ 59.55 billion in 2006.
- Japan is the leading machine tool manufacturing country, accounting for about 23% of global production.
- China is the leading consumer of machine tools, with US\$ 12.94 billion worth of consumption – approx. 21% of machine tools consumed worldwide.
- Germany is the largest exporter with exports totaling US\$ 7.52 billion or 25 % of world trade in machine tools.
- International trade is a very important feature of the industry – 55% of total production is exported.
- Globally, India ranks 18th in production (US \$ 0.41 billion) and 11th in consumption (US \$ 0.88 billion).

Figure 1: Global machine tool production- 2006

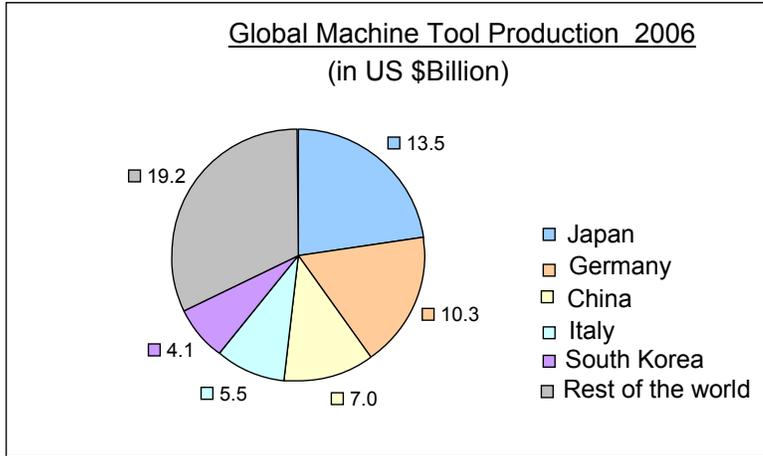


Figure 2: Global machine tool exports - 2006

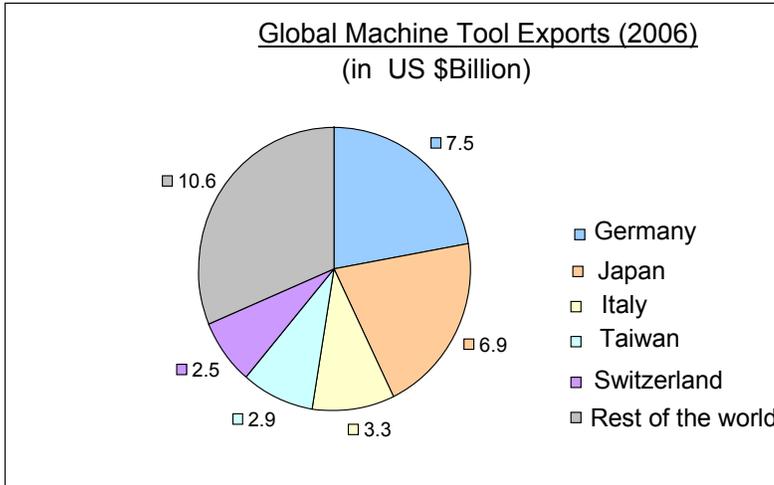


Figure 3: Global machine tool imports – 2006

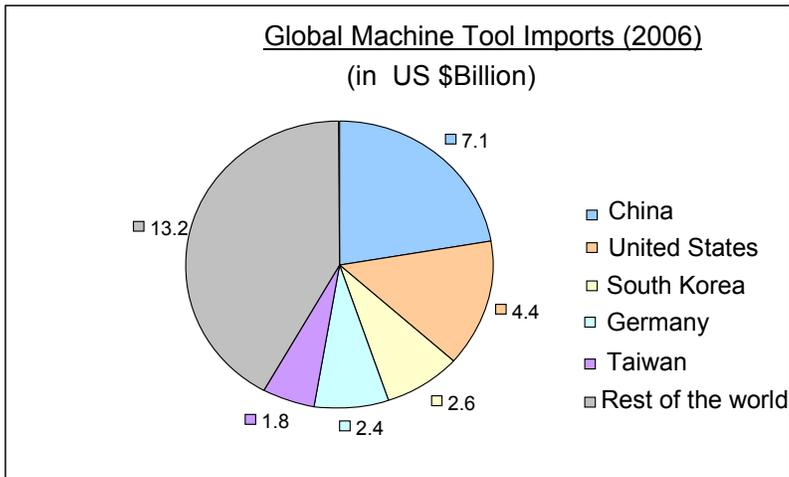
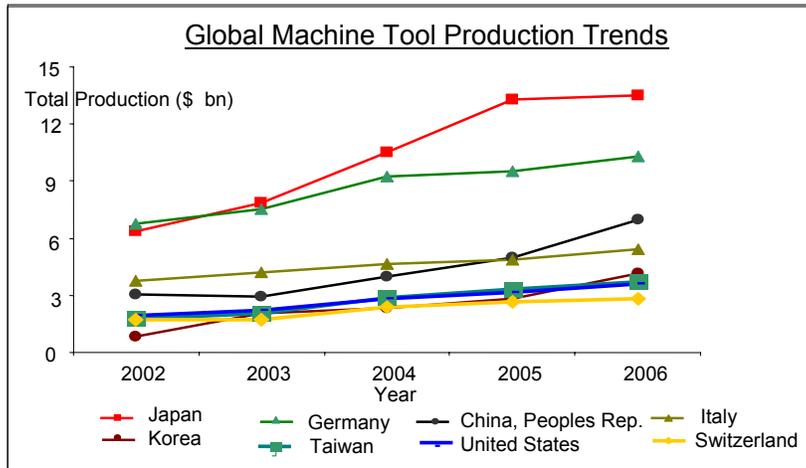


Figure 4: Trend in machine tool production



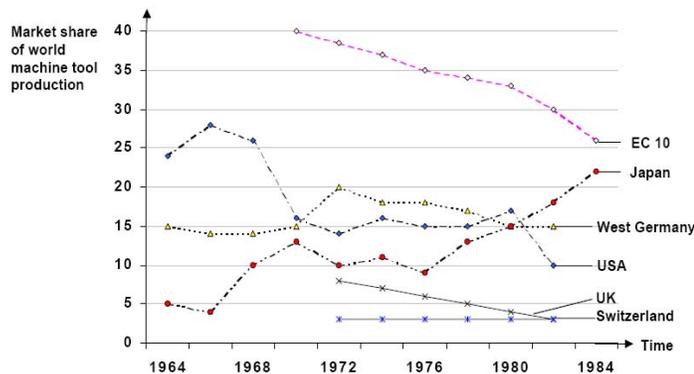
3.3 Technology trends

✚ **Historically, technological innovation has had a considerable impact on the industry structure and the competitive strength of companies.**

The introduction of Numerical Control (NC) and later Computer Numerical Control (CNC) technology in the late seventies catapulted Japanese manufacturers to a dominant position in the global market. The US machine tool industry suffered a major decline.

In conventional machine tools, the machine tool manufacturers themselves produced the hydraulic and pneumatic controls. Companies that had perfected the art of producing machines with high accuracy gained significant competitive advantage. But numerical controls soon enabled most manufacturers to produce accurate machines.

Figure 5: Machine tool market share



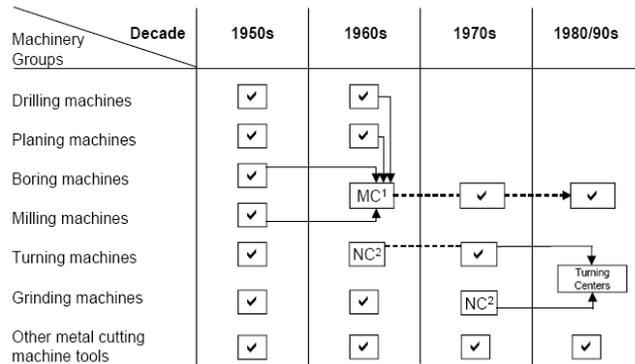
Source: “The recent history of the machine tool industry and the effects of technological change”, Institute for Innovation Research and Technology Management, University of Munich – Nov 2001

i. Changes in machine tool technology have fundamentally changed the nature of the product itself.

The shift to computer-based and particularly microcomputer-based numerical controls considerably increased the versatility and flexibility of machine tools, simplified

programming and allowed for more functions to be controlled automatically. Several machine tool groups, each representing one specific function, converged into multi-purpose machines.

Figure 6: Technology evolution in machine tools



Source: “The recent history of the machine tool industry and the effects of technological change”, Institute for Innovation Research and Technology Management, University of Munich – Nov 2001

The Japanese success can be attributed to the creation of two specific products - NC multifunctional machining centres and NC lathes. Both types of machines are standardized general purpose machine tools.

ii. Technology development occurred outside the machine tool industry and went beyond the mechanical technology base of the typical machine tool company.

In CNC machine tools, the technologies involved directly are mechanical engineering, control engineering, and computer software engineering. A CNC machine tool also depends on a number of generic technologies, e.g. semiconductor, laser, fiber optics, and heat treatment technologies.

In the early years of CNC technology, the technological superiority of the Japanese was sustained by the close technological collaboration between CNC manufacturers and the machine tool producers. The relationships were usually exclusive and long term in nature.

The contribution of CNC makers to the machine-tool industry is considerable. This point can be partially confirmed by the cost ratio of CNC-related parts and software to the total cost of machine-tool building. It sometimes amounts to even 30- 40%.

iii. General purpose machine tool building has become primarily an assembly operation

The quality of a machine tool depends enormously on key sub systems namely – servo motors, spindles, guide ways, precision bearings and ball screws. As is the case with CNC systems, these sub systems can be sourced from leading global manufacturers. This has reduced machine tool building to a mere assembly operation. The value creation in the industry occurs mainly in the machine tool ancillary industry.

iv. However, many special purpose machines require high degree of technical sophistication

There is a clear trend toward greater use of multi-configuration machine tools. Tools are becoming increasingly complex in terms of being multi-functional, multi-spindle with sub-spindles, multi-turret, and multi-axis. Lathes with 12 or so axes are being put into production, and the use of four-axis lathes and turn / mill machines is commonplace. The milling capability is comparable to that of some machining centres. Parts that previously required multiple turning and milling machines are now being produced on a single machine. This requires advanced software to effectively use the machines and may also requires powerful

postprocessors to drive the tools. However, the savings in setup time and the increase in production efficiency can be significant.

v. Technology improvements are incremental in core machining functionality

VDW, the German Machine Tool Builders Association, has identified the following current trends in machine tool technology.

- 1 High performance machining
- 2 Reduction of machining time by increase of cutting speeds.
- 3 Dry machining
- 4 Reduction or elimination of coolants in machining to limit environmental damage
- 5 Micro-processing
- 6 Metal-cutting and non-metal-cutting processes for generation of miniaturized components, partially having geometric dimensions in the micron and surfaces
- 7 Rapid prototyping
 - Rapid realization of prototypes and preproduction series of new products for geometrical and functional testing

vi. While, exciting developments are occurring in machine tool software

Availability of off-the-shelf PC software applications has forced the more traditional control manufacturers to re-examine their core competencies and differentiate their products by introducing the control architecture itself. CAD/CAM developers are striving to undertake much of the toolpath conditioning functions traditionally considered to be the domain of control manufacturers.

Significant improvement is being made in software for machine simulation, tool-path verification, and rendering. Realistic simulation of the entire machining process including the machine tool, holders, machine components, cutting tools and stock can be made. Simulation of the tool path is provided to verify its accuracy. Gouges, undercuts and any discrepancies between the target part and the machined part are shown. Users can compare the in-process model with the designed work-piece. Rendering software provides for photorealistic images of the machined part.

Software is evolving from the use of basic instructions to full-process automation. For instance, wizards can be used for processes such as electrode design or tooling assembly creation. Full five-axis processes including the machine tool, controller, tool path generator and postprocessor are available from some vendors for milling of intricate products such as impellers, turbine blades, tubes, pipes, aerospace components, dies and deep cavities within moulds.

3.4 Market trends

i. Manufacturers are responding to customer demands for more automation

Development in the machine tool industry is moving towards unattended machining. High speed machining equipment is moving forward with better controls and machine drives. Automated parts' loading; tool changers backed by tool life management; spindle sensors to

guard against broken cutters; automated tool length sensing; and advance machine controls and data management are features that make “lights out” machining possible.

A survey done by the Fraunhofer [23] Institute for System and Innovation Research (ISI), Germany predicts that in the near future machine tools will be fitted with self-monitoring, failure protection and tele-service functions.

ii. Machine tool manufacturers are emphasizing customer orientation rather than just product development

- Success of Italian machine tool manufacturers in the US market is attributed to the emphasis on application engineering and service presence.
- Significant investments made in infrastructure for product and technical support in key markets.
- Italian manufacturers have moved their personnel and setup relationships with distribution channels.

iii. New business models are emerging [24]

The European Union has initiated a 4 year (2005-09) project titled “NEXT Generation Production Systems (NEXT)”, which aims to take the European production machinery industry to new frontiers in diverse fields. The project has made the following observations on demand trends in the machine tool industry.

- a. Customers in end user industries are focusing more on product engineering, branding and marketing. Investment in production equipment and manufacturing are no more considered as a pre-requisite for competitiveness. Customers are more interested in buying machine tool functions rather than the product itself.
- b. As product life cycles are getting shorter and demand for production capacity more uncertain, customers want to adopt flexible production systems. Investment in machine tools is viewed as being incompatible with this strategy.
- c. More than ever before, customer focus is on life cycle costs of machine tools rather than upfront purchase costs.

The project included a survey of new business concepts in nineteen machine tool companies in Germany, Italy, UK, Austria and Spain during Nov. 2005 to may 2006. The survey revealed that these firms had a variety of business practices-

- i. Build- own – operate at customer site
- ii. Own and operate at customer site with final purchase option
- iii. Multi-ownership for big and complex projects - operating joint venture company established by different stakeholders owns production machines that are operated and maintained by the equipment supplier.
- iv. Machine tool producer acting as an ancillary vendor to the customer

The study suggests that there is a discernible shift in customer preference, especially in the European markets, that will require machine tool builders to transform themselves from product vendors to service providers.

4 GOVERNMENT POLICIES

4.1 Country specific policy interventions

4.1.1 Japan [25]

- i. Ministry of International Trade & Industry (MITI) attempts to rationalize the industry through mergers and divestments of product lines.
- ii. Recommendation to focus on CNC technology
- iii. Government funding for R&D to be coordinated by the machine tool association
- iv. Special depreciation allowances to stimulate purchase of CNC machines by Japanese firms
- v. Setting up of state owned laboratories, nationwide, to assist small medium businesses in adopting NC technology.

4.1.2 South Korea

- i. The government sponsored the establishment of the Korea Institute for Science & Technology (KIST) KIST was instrumental in developing the first CNC machine in Korea with Hwacheon in 1977.
- ii. Direct investment policy was made attractive to foreign semiconductor companies such as Fairchild, Motorola and Toshiba.
- iii. The government provided financial incentives to the chaebols (large business conglomerates) to enter the CNC machine tool industry. Daewoo, for example, was provided with government guaranteed loans to absorb the investment risks.
- iv. On the demand side, the government established a buyers' credit system made up of the Procurement Fund for Locally-Produced Machinery for domestic users and Long-term Export Credit Financing for foreign buyers.
- v. The government established Korea Institute of Machinery & Material and Changwon National University in the regional base of Changwon Machinery Industrial District. The two institutions developed CNC technologies since their establishment. Most CNC machine tool builders and user firms were based in the region.
- vi. The Korean government also provided financial support to Korea Industrial Electronics, a joint venture of Korean firms for developing CNC control technology. The company had a foreign partner, Allen Bradley, with relevant technology expertise.

Table 4: Government support for machine tool industry in South Korea [26]

| | Embryo (before 1977) | Infant (1977–1987) | Adolescent (after 1987) |
|---------------------------------|--|--|--|
| Industrial organization | <ul style="list-style-type: none"> • 'Conventional' machine tool industry consisting of 154 firms was developed • The emergence of the Chaebol system | <ul style="list-style-type: none"> • Hwacheon first produced a CNC lathe for commercialization (1977) • CNC machine tool industry consisting of 9 firms (mainly chaebol affiliates such as Daewoo, Kia, Hyundai, etc.) was developed | <ul style="list-style-type: none"> • The industry consisted of 31 builders • Foreign users entered in the system as a new actor • The emergence of venture capital firms |
| Institutional infrastructure | <ul style="list-style-type: none"> • Korea Institute of Science and Technology (KIST) (1966) • Many universities had machinery and electronic engineering department | <ul style="list-style-type: none"> • Korea Institute of Machinery and Material (1981) | <ul style="list-style-type: none"> • Korea Institute of Industrial Technology (1990) • CNC technology – focused research centers at major universities |
| Technological infrastructure | <ul style="list-style-type: none"> • The emergence of semiconductor technology (1966) | <ul style="list-style-type: none"> • The accumulation of technological knowledge through technology transfer from foreign builders • The development of 4D RAM | <ul style="list-style-type: none"> • The reinforcement of technological infrastructure by the R&D partnerships |
| Government policy | <ul style="list-style-type: none"> • HCI drive policy | <ul style="list-style-type: none"> • Credit policy • Import restriction • The stimulation of demand | <ul style="list-style-type: none"> • 'G7' Project (1992) • Mid-term Technology Development Project (1995) |
| Major interactions/connectivity | <ul style="list-style-type: none"> • Imports of CNC machine tools | <ul style="list-style-type: none"> • Interactions within a Chaebol • Technological cooperation between domestic and foreign builders | <ul style="list-style-type: none"> • R&D cooperation among domestic firms • Industry-university-research organization linkages • Foreign user-domestic builder linkages |
| Critical mass | | <ul style="list-style-type: none"> • Entrepreneur • Chaebol system | <ul style="list-style-type: none"> • Cooperation induced by government's R&D programs |
| Bridging institutions | | <ul style="list-style-type: none"> • KOMMA | <ul style="list-style-type: none"> • The government (MOICE) |

Source: The evolution of a technological system: the case of CNC machine tools in Korea, Journal of Evolutionary Economics, 2003

4.1.3 China

The Chinese government has established a Cabinet level program to nurture its machinery manufacturers to become globally competitive by 2010. Precision machine tools are specifically targeted as an industry to be built up. The National Development and Reform Commission stated in June 2006, that “*our country's machining industry is weak in innovation and heavily reliant on foreign involvement, the industry's structure is irrational and it is not internationally competitive.*” To build up the machining industry, the Chinese government will encourage the purchase and use of China-made equipment in key projects.

Several incentives have been created for Chinese industry to buy from domestic producers -

- i) China's notification to the World Trade Organization (WTO) shows that if Chinese producers buy die products produced by one of 160 specified Chinese die manufacturers, they would be eligible to get 70 % value-added tax (VAT) refund.
- ii) China's notification to the WTO stated that if Chinese purchasers bought casting or forging products from one of 284 specialized Chinese casting and forging companies rather than purchasing foreign imports, they could get a refund equal to 35 % of the VAT paid on those products.
- iii) 70 Chinese machine tool companies making computer numerically controlled (CNC) machine tools and related products can have 50% of the VAT rebated to them. As the VAT rate is 17%, it gives them a significant competitive advantage over import competition.

The following are key objectives laid down in China's technology policy (11th Plan 2006-2010) for the machine tool industry [27]:

- i. Reduce dependence on imports
- ii. Develop all important mechanical components
- iii. Develop its own CNC, motors and drives
- iv. Develop CNC turning, machining, milling and boring machines; high precision, 4+ axes machines, high precision grinders, EDM and wire EDM, metal forming and special machines
- v. Eventually, export these machines

4.1.4 European Union (EU)

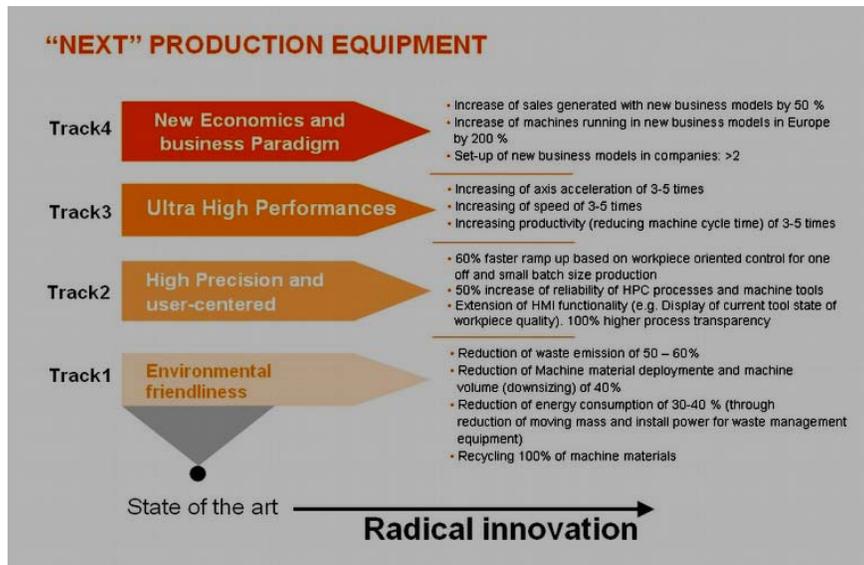
The EU's NEXT programme has the identified five major objectives –

- a) Performance - 5x improvement in machine productivity, as well as an order of magnitude improvement in machine accuracy, compared to current available machines
- b) User centricity - get machines that help the operator in all his tasks by providing a complete set of features (added applications, ergonomic aspects, improved maintenance aspects) to automatically recognize machining tasks, process conditions etc
- c) Environment friendliness - aim is to develop machines that consider environmental aspects through their entire life-cycle: use of recycled materials for machine elements, reduction of energy consumption, zero waste production, dismantling and recycling of machines.
- d) Training - academic and professional training, by the generation of new contents arising from the research and establishing the means to reach the target audience - machine using and building SMEs all over Europe
- e) New business concepts – Promoting new business models to achieve full life cycle service orientation

The NEXT project brings together institutions from several scientific disciplines - Mechanical Engineering / Mechatronics / Material Science / Microsystems & Adaptronics / Automation & Control / Manufacturing Processes / Industrial Design / Ergonomics & Eco-Design / Marketing.

The approach has been to employ multi-disciplinary teams that span the complete value chain of the production machinery industry to provide a strategic direction to the industry at large. As can be seen from the illustration below, the goals of the project have been clearly defined in terms of the technical capabilities that next generation machine tools will be required to possess.

Figure 7: European Union’s NEXT initiative



The program has a budget of 24 million EUR with EU and various national funds contributing 70% of the corpus.

4.1.5 Taiwan

- i. Establishment of Industrial Technology Research Institute to accelerate industrial technology development. ITRI helped advance Taiwan's machine tool industry to the level of process-intensive precision production, assisting local manufactures outgrowing the conventional tool production. More than 50 new machine tool models have been developed.
- ii. Taiwan’s Ministry of Economic Affairs is promoting the Taichung Precision Machinery Technology and Innovation Pak to assisting product development by providing machine tool makers with technological support from various research institutes and industry development centres.
- iii. National support programme for developing linear motors and advanced spindles.

4.2 Promotion of trans-nationalization

The primary objective of government support in all these countries was to create an advanced indigenous machine tool technology capability. Trans-nationalization itself is not an explicitly stated goal in the policy statements. But it can be convincingly argued that the support provided by the government greatly improved the technological capability and competitiveness of the respective machine tool industries which later contributed to the success of their export strategy.

4.3 Results of policy interventions

It is widely accepted that government policies played a key role in crafting Japan's dominance in machine tools. The Japanese share of the world market (excluding Japan, i.e., exports only) for CNC lathes grew, in terms of units, from 12.6 percent in 1975 to nearly 50 percent in 1984. During the same period, Japan's market share in total machine tool production increased from 9% to about 22%, making Japan the global leader overtaking the United States and erstwhile West Germany

South Korea was a late comer to the machine tool industry but has rapidly caught up with leaders such as Japan and Germany. The first CNC machine was produced in the country in 1977, 25 and 19 years respectively after similar developments in the United States and Japan. By the late 1990s, the South Korean industry could produce all kinds of CNC machine tools such as CNC lathes, machining centres, CNC milling machines, etc. Technological competences also increased. The number of CNC machine tool-related patents applied to Korean Intellectual Property Office by domestic applicants increased from 10 (36% of the total) in 1986 to 56 (86%) in 1995.

Government policy interventions were both extensive and evolutionary. In the early stages (pre 1987), machine tool industry policy in South Korea sought to provide direct support to individual firms, especially the chaebols. In the adolescent stage, government support has been more indirect in nature. It consisted of measures such as providing a "vision for the future" and acting as a bridging institution by creating linkages between industry, academic and research institutions.

5 STUDY FINDINGS

5.1 Indian machine tool industry – current status

✚ Industry is fragmented

The Indian machine tool industry comprises about 450 units spread all over the country. Of these, only about 150 can be considered as organized sector units with annual turnover of more than Rs.2 crore. Moreover, the number of units assembling complete machine tools is much lower.

The ten largest firms, comprising industrial groups such as HMT Machine Tools, Ace Designers, Jyoti CNC, Bharat Fritz Werner (BFW), Ace Manufacturing Systems, Lakshmi Machine Tools (Machine Tool Division), TAL Manufacturing Solutions, Perfect Machine Tools, Lokesh Machines and PARI account for more than 50% of India's assembled machine tool production.

There are about 25 units such as Pragati Automation (Bangalore), Electropneumatics (Pune), Janatics Pneumatic (Coimbatore) and ISGEC (Noida) that have sales in the range of Rs. 40 - 100 crores. The product range of these companies are very wide. ISGEC manufactures hydraulic and mechanical presses. Janatics manufactures valves, cylinders, silencers etc. Electropneumatics specializes in the manufacture of hydraulic and pneumatic presses and some special purpose machines. Pragati manufactures machine tool components like turrets, tool changers.

In the Rs. 5 crore to Rs. 50 crore turnover range, there are about 60 units spread all over the country. They mainly assemble for larger brands mentioned above or manufacture accessories.

Source: IMTMA

✚ Machine tool exports from India is insignificant – valued at just over Rs 60 crore in 2006-07, as can be seen in Table 5. It should be noted that this represents export numbers reported by IMTMA members only.

Table 5: India machine tool exports and imports

| Type | Quantity - nos | | Value (Rs cr). | | Growth | |
|------------------------------------|----------------|-------------|----------------|-------------|-------------|----------------|
| | 2005-06 | 2006-07 | 2005-06 | 2006-07 | 2006-07 nos | 2006-07 value. |
| Metal cutting | | | | | | |
| Domestic | 6640 | 7300 | 1173 | 1535 | 10% | 31 |
| Imports - new | 7477 | 11328 | 1891 | 2892 | 52% | 53% |
| Imports - used | 8828 | 10498 | 387 | 557 | 19% | 44% |
| Exports | 208 | 284 | 40 | 63 | 37% | 56% |
| Exports (% of domestic production) | 3% | 3.8% | 3.4% | 4.1% | | |
| | | | | | | |
| Metal forming | | | | | | |
| Domestic | 924 | 1853 | 248 | 468 | 83% | 89% |
| Imports - new | 1537 | NA | NA | NA | NA | NA |
| Imports - used | 992 | NA | NA | NA | NA | NA |
| Exports | 14 | 15 | 2.4 | 2.9 | 7% | 9.6% |
| Exports (% of domestic production) | 1.5% | 0.9% | 1.0% | 0.6% | | |

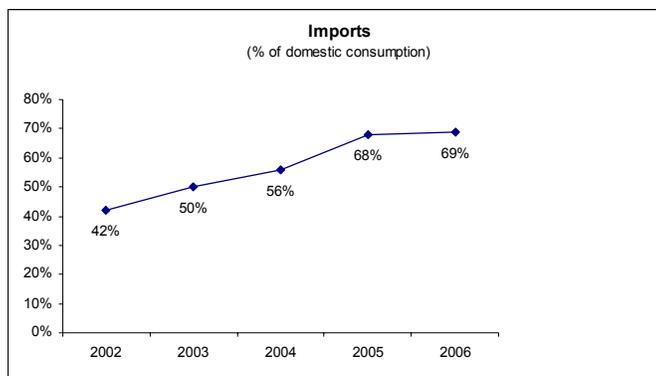
Source: As reported by IMTMA members

Note: Data reported for metal cutting machines (codes 8456-8461 under the Harmonized Tariff System) and for metal forming machines (8462-8463) are for complete machines only, not including parts or rebuilt machines.

- ✚ Industry has experienced strong growth in recent years but is rapidly losing market share to imports

Riding on a buoyant domestic economy, the Indian machine tool industry has grown at over 35% p.a. during the last five years. But its inability to meet domestic demand because of capacity limitations and technology limitations, has led to a surge in imported machine tools. Anecdotal evidence suggests that even second hand machine tools are being imported from countries such as Germany. Imports now account for 70% of domestic machine tool consumption, up from 42% in 2002.

Figure 8: Market share of imported machine tools



- ✚ Besides, import content of domestically manufactured machine tools is high, especially for CNC machines

The industry is dependent on imports for critical items such as

- Linear guides and ball screws
- Precision bearings
- Servo motors, drives and CNC systems
- Spindles

- ✚ However, export of machine tool accessories is significant – over Rs 600 cr in 2006-07

Data provided by the Director General of Commercial Intelligence & Statistics indicates that exports of accessories are about 55% higher than the total exports of assembled machine tools – both cutting and forming machines.

Table 6: Machine tool accessory exports

| Harmonized Tariff no./ITEM | 2005-06 Rs cr. | 2006-07 Rs cr. | Export destination |
|---|-------------------|-------------------|---|
| 8456- special m/c tools- removal my laser, photon beam etc | 21 | 14 | Germany, USA, Mexico |
| 8457- machining centres, unit construction machines | 9 | 15 | UAE, USA, Italy, Nigeria |
| 8458-lathes, turning centres | 63 | 93 | USA, South Africa, Nigeria, Thailand, Singapore |
| 8459- unit head machines-drilling, tapping, milling, treading etc | 39 | 67 | UAE, USA, South Africa, Singapore, Nigeria, Indonesia |
| 8460-deburring, sharpening etc | 21 | 25 | USA, Singapore, Sri Lanka, |
| 8461- shaping, slotting, grinding etc. | 32 | 30 | USA, Kuwait, USA |
| 8462 – Metal forming- presses, forge and hammers | 111 | 115 | UAE, China, South Korea, Germany, USA |
| 8463- other machine tools | 28 | 28 | USA, UAE, Australia, Belgium |
| Total: Assembled machine tools (cutting and forming) | 324 | 387 | |
| 8466 –parts & accessories for all above machines | 556 | 607 | UAE, USA, Mexico |
| TOTAL : assembled machine tools and accessories | 880 | 994 | |

Source: Director General of Commercial Intelligence and Statistics (DGCIS)

Note: Export figures provided by DGCIS will not match those reported by IMTMA because of issues related to product classification and partial reporting by IMTMA members.

Many units covered in the survey derive a large proportion of their sales from exports of accessories to developed markets.

Table 7: Leading machine tool / accessory exporters

| Company | Products | Exports Rs. cr – FY 2006-07 | Exports (% sales) FY 2006-07 | Strategy & Countries |
|--|---|-----------------------------------|------------------------------------|--|
| Pragati Automation, Bangalore | Tool turrets, automatic tool changers | 32 | 45.7% | Exhibitions, country office, distributors: Germany, Brazil, Italy, Spain |
| ETA Technology, Bangalore | Friction welding, valve straightening | 12 | 29.27% | Unique product, collaboration: Europe, China |
| UCAM, Bangalore | Rotary index tables, pallet changer | 3 | 12% | Exhibitions, direct selling: UK, Italy, China, Iran, Taiwan |
| Jyoti CNC Automation, Rajkot | Turning centres, vertical machining centres | 30 | 10.7% | Distributors, acquisition of French company: Europe, Canada |
| Lakshmi Automatic Loom Works, Coimbatore | CNC tool holders | 12 | 50% | Collaboration & buy back arrangement with Eppinger Tooling Asia Private Limited, Germany |
| Shanthi Gears, Coimbatore | Gear boxes, gears | 30 | 12 | Agents, R&D for product development, exhibitions: Germany, China |

✚ Technology gap vis-à-vis leading global competitors persists

Indian machine tools lag behind in the following features –

- High speed, high productivity machining
- Multi-axes, multi – function capabilities
- Higher accuracy, form and surface finish
- Ability to machine hard components
- Sustained accuracy, high reliability
- Active vibration control
- Automation

The following table illustrates the technology gap that Indian manufacturers have to bridge. It is clear that key sub-systems are not manufactured in India and that India lags considerably behind even China in this respect.

Table 8 : Technology benchmarking

| Parameter | State of technology | China | India |
|---------------------------|--|---|----------------------------------|
| Spindle speeds | ➤ Highest speeds upto 75,000 rpm | ➤ Less than 15,000 rpm | ➤ Spindle motors imported |
| Tool changers | ➤ now a part of all CNC machines, including lathes and milling machines ➤ Robotic arm tool change time of < 1.5 seconds ➤ Change time quoted in machine specifications | ➤ Tool change time : 3-4 seconds | ➤ Tool change time : 1-2 seconds |
| Precision ball screws | ➤ Precision: 0.002 / 300mm ➤ Speed: 80-160 m/min | ➤ Precision: 0.004 / 300mm ➤ Speed: 45 m/min | ➤ Indian and Imported |
| Way covers | ➤ Speed: 30-40 m/min | ➤ 15 m / min | ➤ 30 m/min |
| Numerical Control systems | ➤ Mean Time Between Failure : 30,000 hours | ➤ Mean Time Between Failure : 10,000 hours | ➤ Imported |
| Linear guideways | ➤ Precision: 0.003/1,000mm ➤ Speed: 200 m/min | ➤ Precision: 0.005 /1,000mm ➤ Speed: 100 m/min | ➤ Imported |
| Lathes | ➤ with live milling spindles, the lathe is evolving into a multifunction machining centre ➤ full tool changers and auto parts loaders | ➤ Manufactured in China | ➤ Imported |
| Machine frames | ➤ fabricated thin metal hollow filled with poly cement to provide mass and compressive structure with the added advantage of dampening vibration | ➤ N.A | ➤ Cast iron / steel frames |
| Grinding | ➤ 7-axis CNC cutter grinders are now standard ➤ CNC OD grinders can now cut flat-sided OD and unique shapes | ➤ Manufactured in China | ➤ Manufactured in India |
| Axis drive systems | ➤ for high speed machines ball screws have a cooling passage | ➤ N.A | ➤ Imported |

Source: Canadian Tooling & Machining Association, China Machine Tool Builders' Association

5.2 Other findings

The following is a summary of other key survey responses and opinions expressed by industry experts interviewed for the study -

- ✚ The Indian machine tool industry and automobile industry are not moving in step with each other. Unlike the experience of Japan, South Korea or Germany, the Indian machine tool industry has not capitalized on tremendous growth of the automobile and auto-component industry. The Indian automobile industry prefers to import high precision machine tools at significantly higher costs as Indian machine tools are perceived to be less reliable and accurate.
- ✚ India is falling behind other major world competitors such as Korea, Taiwan, Japan and China in machine tool technology. Indian manufacturers are being propelled by a cyclical upturn in the economy but structural weaknesses in the industry are significant.
- ✚ With the exception of a few firms, the Indian machine tool industry has not pursued transnationalization. However, firms that have actively targeted export markets have achieved encouraging results.

✚ Broadly three strategies adopted by machine tools exporters are discernible –

- i) Export of standard products where absence of branding is not a constraint – adopted by HMT, BFW, Ace Designers and others

These are value for money products that include CNC machines, drilling / milling machines, low cost presses etc. The primary export markets for these products are emerging markets in Asia as well as developed countries.

- ii) Riding on the brand image of the importer - adopted by LMW and Jyoti CNC.

The focus here is on exporting machine tools to advanced markets such as Switzerland, Germany, USA and Italy. This strategy is adopted by the larger companies in India who have developed long term relationships with the principal overseas manufacturers. The relationship is usually collaboration or a contract manufacturing arrangement. An example of this is the strategy that has been adopted by LMW, BFW which export machines to be sold under the importers' brand name.

A related development is the establishment of wholly owned subsidiaries in India by foreign machine tool manufacturers. TUSSOR, a Spanish company has a manufacturing facility in Coimbatore for manufacturing machines for export under their brand name. Some of the components/sub assemblies are supplied by local vendors.

- iii) Export of complete projects, which include machine tools built by a third party – adopted by MICO Bosch (for their captive consumption in BOSCH plants worldwide)

These are turnkey projects involving engineering design, erection and commissioning. Engineering and design often accounts for 40%-50% of the total project cost. Machine tools are exported as a part of the total project solution and can be sourced from many suppliers.

- ✚ Barriers to exports and other trans-nationalization measures by SMEs from India are – (in order of importance)
 - Capacity constraints
 - High marketing costs
 - Extreme competition on price from Korean, Chinese and Taiwanese manufacturers
 - Inability to attain quality and accuracy levels required by foreign buyers
 - Many customers increasingly want suppliers to offer total solutions rather than individual machine tools
 - Human resource talent shortage
 - Non tariff barriers in export markets such as China

- ✚ Investment in R&D is negligible. What is often claimed as product development is usually a case of reverse engineering of machines manufactured abroad. There is no significant investment in basic/applied R&D in machine tools. Even the Central Manufacturing Technology Institute, Bangalore is engaged in testing and building advanced machines and tools for defence, space and atomic energy rather than in machine tool R&D.

- ✚ The most advanced machine tools are manufactured and imported into India by world leaders like DMG (Germany), Mazak, Makino (Japan).

- ✚ Exports of engineering design and process services for manufacturing industry are growing, especially from cities such as Bangalore and Pune. But these are mainly for auto and aerospace companies abroad, not for machine tools.

- ✚ Participation of Indian companies in international machine tool exhibitions is poor. For example, at the EMO Hanover (the industry's most prestigious trade show) in 2007, there were only 29 companies from India of which only seven were machine tool companies, rest being either tooling companies or component/accessory manufacturers. Estimates of the number of participants from the industry in China and Taiwan are much higher – 70 to 100.

6 TRANS-NATIONALIZATION OF INDIAN MACHINE TOOL INDUSTRY

6.1 Current status

Stage 1: Exports

To better understand the approach of Indian SMEs to exports, survey respondents can be segmented into four categories as shown in the framework below –

Table 9: Export orientation of Indian SMEs

| Segment | Description | Firms | Markets | Marketing strategy |
|------------------------------|---|--|---|--|
| Domestic marketing | The firm is only interested in the domestic market and does not export at all. The firm is not interested or willing to experiment with exporting. The export/sales ratio is nil | About 63% of the firms surveyed are entirely focused on the Indian market and have no plans to export. | ---- | ---- |
| Pre - export | The firm searches for information and evaluates the feasibility of exporting activities. The export/sales ratio is at or near 0. | Bombay Machines, Acumac Machine Tools etc., mostly small firms | ---- | Agents, Participation in exhibitions |
| Active involvement | There is a systematic effort to increase sales through export to multiple countries. A suitable organizational structure is in place to support these activities. The export/sales ratio usually varies from 10-39 percent. | <u>Component vendors</u> UCAM, Shanti Gears, VJ Industries, Bipico Industries, Fenwick & Ravi, , Janatics Pneumatics, Kladon Design <u>Machine Tool Builders</u> Maxpreci, India Precision Engineers, CNC India Tools, Shoma Enterprises, Mecpros Machine Tools, Macpower CNC Machines, Shailesh Machines, Forbes Gokak, Lokesh Machines, HMT, Ace, BFW | China, Taiwan, Iran, US, Russia, Europe Asia, Europe, Africa | Agents, Participations in exhibitions, direct sales |
| Committed involvement | The firm depends heavily on foreign markets. Firm is continuously faced with choices for the allocation of limited resources to either domestic or foreign markets. The export/sales ratio is 40 percent or more. | Pragati Automation, ETA Technology, Lakshmi Automatic Loom Works | Italy, UK, Spain, Germany, Brazil, China | Overseas offices, exhibitions, buy-back arrangements |

Framework : From Gankema, Harold , Snui, Henoch , Zwart, Peter , The Internationalization Process of Small and Medium-sized Enterprises: An Evaluation of Stage Theory, *Journal of Small Business Management*, October 2000.

Analysis of the export orientation of Indian firms reveals that firms have adopted a range of different export marketing strategies simultaneously – direct sales, appointing agents, participating in exhibitions and buy back arrangements.

Firms with buy-back arrangements with foreign companies have been able to sustain high level of exports consistently. Significantly, these exports are often to developed markets. Indotech and ITL in Indore export bandsaw machines to Germany. Bharat Fritz Werner produces sophisticated 5 axes machining centres for Starrag Heckert of Switzerland.

Stage 2: Alliances

Indian firms have not used franchising or technology licensing in overseas markets. However they have entered into technical collaborations to upgrade their technology. Examples of such firms are Micromatic Grinding which has a collaboration with Toyoda of Japan and Lokesh Machines with Grob of Germany.

Stage 3: Foreign Direct Investment

There are a few instances of Indian firms setting up manufacturing facilities or acquiring companies abroad and even these are recent in origin.

Table 10: FDI by Indian machine tool firms

| Firm | Nature of investment | Rationale |
|---------------------------|--|---|
| Jyoti CNC Automation | Acquired French high precision CNC machine manufacturer - Huron Graffestaden. | Access to customers in the Aerospace and Automobile industries in developed markets of Europe |
| Batliboi | Acquisition of Quickmill Inc, Canadian company manufacturing large area CNC Gantry and Bridge Milling and Drilling Machines. | Access to wider markets in several industries and developed countries. |
| Electronica Machine Tools | i) Marketing office in Switzerland ii) Assembly plant in China | Access to European market Lower operational costs in China |
| ACE Group | Established local office in China | Sales and support centre |

6.2 Experience of companies through Joint export marketing:

Towards early part of 2000s several Indian machine tool companies joined together to export machines to Germany and European markets through a distributor based in Germany. The idea was to share the cost of establishing a showroom in Germany which is very high. Marketing was arranged through a distributor who also set up the showroom at his cost and recovered the proportional cost on the sale price of the machines. The product range consisted of general purpose and CNC machines. The plan however was not entirely successful due to the high cost of the establishment and the cost of holding machines in Germany while generating orders. These added substantially to the end price of the machines, which already was required to be around 20% cheaper than equivalent Korean brands. Thus the prices became non competitive, and the experiment had to be closed within a short period.

The learning from this experience is manifold:

- Unless the costs of local market presence is managed at low levels the export of machines to highly developed markets such as US and Europe is very difficult.
- Customers expect low price, immediate delivery, high quality and prompt after sale service.
- There is no alternative to having showrooms, machines in stock and a presence of marketing/sales/application engineers to get orders.
- Extensive travel is also a necessity to meet customers in different regions.

- The need for a local distributor with good market reach and customer knowledge cannot be over emphasised.
- The marketing commission alone is around 20-30 percent.
- Even in the era of “internet”, sales cannot be done over the net, it requires physical presence in the target market to instill customer confidence in Indian manufacturers.
- Competition from Korea, Spain, Brazil and Taiwan is intense.

It is necessary to build an Indian brand for machine tools through concerted effort over a period of time, as the Korean, Taiwanese, Spanish and Brazilian companies have done, with active support from their government.

6.3 Trans-nationalization – opportunity and necessity

Indian machine tool manufacturers possess the following strengths –

- i. Ability to produce standard machine tools with quality levels at par with competitors such as Korea and Taiwan. Most Indian firms now possess ISO quality certification.
- ii. Competent design skills, though there are concerns that this strength is being eroded due to attrition of talent.
- iii. Capable of building tooled up and special purpose machines engineered to meet customer needs. In this segment of the market, Indian manufacturers are very price competitive against similar machines from Europe. Korean, Taiwanese and Chinese manufacturers do not have any large presence in this segment.

Considering that world trade in machine tools is about \$ 65 billion annually, India’s presence in the global market is insignificant – less than 1%. It follows that, given the strengths of the industry and the size of the global market, Indian firms have significant export and trans-nationalization potential.

The table below provides information on important markets that Indian companies should target.

Table 11: Export market analysis

| Market | Attractiveness | Target products | Competition |
|--|---|---|---|
| ASEAN – mainly Thailand & Indonesia | Large auto component industry in the region emerging | Standard CNC machines and some Special Purpose Machines | Korea, Taiwan and China ; Japan and Europe in certain types |
| SAARC | Small market but mostly ignored by competitors | General Purpose Machines | Not significant |
| Middle East – mainly UAE and Saudi Arabia | Oil, petrochemical and steel industries | Heavy duty machines | Germany, Italy and Spain |
| Europe – mainly Germany, France, Italy & UK | Large manufacturing sector | Standard CNC machines | Korea, Taiwan, Spain apart from local cos. |
| Africa – mainly South Africa, Kenya, Nigeria, Egypt, Algeria | Nascent engineering industries ; petrochemical, auto industries | Both CNC and conventional machines | Korea and Taiwan in CNC machines ; Taiwan, China in conventional machines |

Indian firms have largely focussed on meeting only domestic demand. However, this makes them financially vulnerable during an economic downturn as was experienced during the

recession period of 1998-2002. The industry is conservative in expanding capacity because of large demand fluctuations and consequently suffers from serious capacity constraints when economic growth revives. This has allowed foreign manufacturers to enter the Indian market thereby structurally weakening the domestic industry. It is therefore imperative for Indian firms to pursue foreign markets to reduce their vulnerability to fluctuations in domestic demand.

Trans-nationalization of Indian machine tool companies, especially SMEs, is nascent - predominantly exports. As pointed out earlier, even globally, exports are the most important type of trans-nationalization in this industry. Only very large firms in the industry make direct investments in foreign markets. Therefore a focus on exports alone in the near term (3-5 years) can yield substantial benefits for Indian SMEs.

6.4 Success stories: case studies

i) Jyoti CNC Automation

Jyoti CNC was established in 1988 by P G Jadeja and S L Jadeja in Rajkot. The company initially manufactured gear boxes for small lathes. In 1994, Jyoti made a foray into manufacturing special purpose machines for the textile machinery components industry.

By 1997, Jyoti had developed the capability to design and manufacture CNC machining centres. In 2001, Jyoti developed a vertical milling centre with linear motors and in 2004 it designed and manufactured a CNC laser cutting machine for diamond industry.

In FY 2006-07, the company achieved exports of Rs 30 cr on a turnover of Rs 280 cr. Jyoti has actively participated in international machine tool exhibitions such as EMO since 2003. Jyoti obtained the ISO 9001:1994 quality certification in 2000.

Key milestones in the company's trans-nationalization strategy have been -

- 2006 – Export House Certification
- 2006 – Alliance with Huron Graffenstaden, France for contract manufacture of CNC machines
- 2007 – Acquisition of Huron Graffenstaden

The acquisition of Huron Graffenstaden in 2007 has provided the company immediate access to customers in European markets such as France, UK, Portugal, Germany, Netherlands, Hungary, Poland, Spain, Austria and Switzerland besides Canada. Jyoti is represented by agents in Italy, Czech Republic & Slovakia, US and Iran.

Jyoti CNC is perhaps the best example of an Indian machine tool company strongly pursuing trans-nationalization. The company has rapidly progressed from being a machine tool component manufacturer to a conventional machine tool builder to developing expertise in CNC machine design and development. The acquisition of Huron Graffenstaden is a bold move to establish a strong market presence in the developed markets. It has also added Huron's specialized 3 and 5 axes high speed machining centres to Jyoti's product portfolio.

The ability to design and manufacture increasingly complex machine tools coupled with a keen focus on exporting to developed markets has been key to Jyoti's success in trans-nationalization.

Product range - sample



Vertical Machining Centre with linear motors

Horizontal Machining Centre

ii) Pragati Automation

Pragati Automation, an Ace Micromatic Group company, was established in Bangalore in 1977. Pragati manufactures machine tool accessories such as tool turrets for CNC lathes, auto tool changers for machining centres, power chucking cylinders, copy turning attachments etc. The company achieved a turnover of Rs 70 cr in FY 07 with exports of Rs.32 cr.

Key features of Pragati's trans-nationalization strategy are -

- supply to all large machine tool manufacturers in India and then expand in overseas markets – Italy, Germany, Spain, USA & Brazil are some of the important export markets.
- maintain prices at same level anywhere in the world and compete all over the world for supplies to OEMs,
- maintain sales offices in key locations (USA,Italy) and use distributors in other markets
- participate in exhibitions all over the world – from China, Taiwan, Europe to USA and South Africa
- offer complete range of products to OEMs so that they need not go to other suppliers
- plan new country entry strategies with great detail and perseverance – Pragati has taken more than 2 years to enter China to break through import restrictions & barriers,

Pragati is an excellent example of a company that has placed product development and quality above everything else. It has succeeded in developing world class products and then focussed on highly efficient production to attain international price competitiveness.

Product range – sample

Automatic tool changers



Servo turrets



Index tables



iii) ETA Technology

Established in 1991 in Bangalore. ETA has been very successful in the export of its products. However, the model followed by this company is different from that followed by Jyoti CNC and Pragati Automation. ETA Technologies has selected highly specialized, niche area for its operations: it started with friction welding machines, and

subsequently took up specialized products in hot upsetting, assembly/testing machines, servo controlled presses and special automobile components.

The machines require special engineering inputs, and are custom built to user specifications. By focussing on specializations of this nature the company is relatively free from competition from the South-Asian countries, and has established a reputation in the advanced markets of the world, besides the Indian market. Its export accounts for 50% of the company's turnover. The experience of ETA Technologies clearly brings out the avenues open for companies to transnationalize in niche, high technology product areas with less competitive threats from other countries.

Important export markets for ETA are Spain, Germany, Turkey and USA.

Product range – sample

Friction welding machine



Electrical upsetter



iv) **Ace Micromatic Group**

Besides Pragati Automation, the Ace Micromatic Group consists of –

- Ace Designers - manufacturer of CNC lathes and turning solutions
- Ace Manufacturing Systems – manufacturer of vertical machining centres
- Micromatic Grinding Technologies– manufacturer of cylindrical grinders

Ace Designers was promoted by Mr Srinivas Shirgurkar, Mr A.V. Sathe, and Mr B. Machado in Bangalore in 1979 as a machine tool design company. Ace's foray into manufacturing took off with special purpose machines for the engine valve industry, followed by semi automatic multi-slide lathes for the auto industry. In 1986 Ace launched its first CNC chucker LC-16 which was adjudged as the best designed machine at IMTEX 86, the premier machine tool exhibition. In 1996, the company became the largest CNC lathe manufacturer in the country.

Having begun as a machine tool design unit, the emphasis on R&D has always been very strong at Ace. It has been the backbone of the company's strong presence in the machine tool industry and has also been responsible for the string of successful machines and the constant endeavour to make these machines affordable.

Ace began its export foray in the eighties with exports of Auto Lathes with automatic load/unload systems for the bearing Industry. A large number of these machines are in use and regularly exported to Brazil, Egypt, Germany, Spain, UK & USA. Ace has about two hundred CNC Lathes at customer sites in Italy Australia, France, and USA.

Important steps taken by Ace to trans-nationalize have been –

- setting up a wholly owned subsidiary Ace International Inc. in Michigan USA to establish a foot hold in the competitive US markets in 1992.
- establishing distributor network in Italy, France, and Australia.
- efforts are on way to set up a distributor network in Germany, Benelux, UK & Spain

Ace Manufacturing Systems (AMS) was setup in 1994 to develop CNC machining centres. The company obtained its first export order from Italy in 2000 for supplying vertical machining centres. In 2002, AMS started working with M/s. Howa Machinery & SCMS of Japan to export horizontal machining centres. In 2004, the company exported 24 horizontal machining centres to Japan.

The Ace Micromatic group achieved a turnover of Rs 560 cr in FY 07.

The strategy of the Ace Micromatic group has been to manufacture standard CNC machines in volume to high quality and export them to the advanced as well as developing markets. The products face severe competition from Korea, Taiwan, Spain brands. The foray into the USA market was not profitable due to the high costs of market presence in the USA. So the company withdrew from the US market and is now focussing on the South Asian, Middle-East, Turkey and similar emerging markets.

Product range – sample



Machining centre



Turning Centre



Auto Lathe CNC

v) **Shanthi Gears**

Shanthi Gears manufactures speciality gears that range in weight from a few grams to more than 20 tonnes. The gears are used in products ranging from looms to power-generating turbines and aircraft.

The company was started in 1969 by P Subramaniam in Coimbatore and initially produced gears for the textile machinery industry. In the late seventies the company began to manufacture worm gear boxes. By the mid eighties Shanti gears had begun to produce helical gears, bevel helical gears and geared motors.

To gain better control over production, in 1986 the company built its own foundry. This integration helped the company improve the quality and delivery times of its products. The foundry caters to the needs of grey iron and spheroidal graphite castings, as well as non-ferrous ones such as phosphor bronze, aluminium etc. As a part of backward integration, a forging plant was commissioned simultaneously.

Shanthi Gears also makes its own hobbing and milling cutters, cutting down the delivery time of special orders, which have become a hallmark of the company. With its in-house design, manufacturing and quality-control facilities, the company is able to fill orders for practically any custom-made gears. Today, nearly 50 percent of the company's business involves special orders. Shanthi Gears has a team of over 80 engineers providing engineering design solutions as an outsourced service.

The company commenced exports in the mid nineties and now has a liaison office near Duesseldorf, Germany to provide sales and service support to the European market. In 2006-07, the company had exports of Rs 30 cr. Shanthi Gears has an ISO 9001:2000 certification.

Shanthi Gears exemplifies how Indian companies can use excellence in product development and manufacturing technology to break into developed export markets. The company has always stressed high product quality as its strength in export markets.

Product range- sample

Worm gear box



Helical and bevel helical gear box



Geared motor



vi) Lakshmi Automatic Loom Works

Lakshmi Automatic Loom Works Ltd., is a leading weaving and circular knitting machine manufacturer based in Coimbatore. The company is part of the well known Lakshmi Mills group.

The company has two divisions, namely - the weaving machinery and knitting machinery.

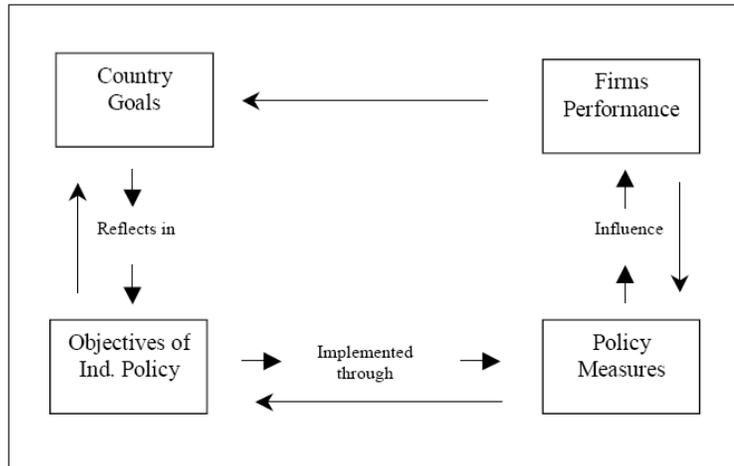
The knitting machinery division has a 100% export oriented unit manufacturing accessories such as tool holders for CNC machines. Lakshmi Automatic has entered into a buy back arrangement with Eppinger Tooling Asia Private Limited, Germany for exporting tool holders. Exports in 2006-07 were Rs 12 cr.

7 RECOMMENDATIONS

7.1 Context

Policy measures designed to improve performance of firms in the machine tool industry should be formulated within the context of national goals and the broad objectives of industrial policy.

Figure 9: Policy goals – firm performance linkage



The National Manufacturing Competitiveness Council (NMCC), an autonomous body constituted by the Government of India in 2004 serves as the policy forum for the manufacturing sector. The NMCC has articulated the need to achieve a growth rate of 14% p.a. in the manufacturing sector in the coming decade and increase its share of national GDP to 30% from the current level of 17%. To achieve this goal, NMCC has identified the following policy objectives for the manufacturing sector -

- a) Enhance Government focus on manufacturing competitiveness
- b) Creating conditions for investment in and growth of the manufacturing sector
- c) Lowering the cost of manufacturing
- d) Investing in innovation
- e) Strengthening education and training at all levels
- f) Adoption of global best practices in manufacturing
- g) Right market framework, competition and regulation
- h) Infrastructure development

The recommendations proposed in this study are within this context of national goals outlined by the NMCC.

7.2 Machine tools - a strategic industry

The following features and developments in the machine tool industry need to be underscored -

- i. A vibrant and technologically advanced domestic machine tool industry is critical for the growth and development of India's manufacturing sector. The industry has an enormous multiplier effect on manufacturing output (typically 1:100) and hence employment generation. Economic studies suggest that a one rupee value of machine tool production creates a ten rupee output for the broader capital goods industry and a hundred rupee output in downstream consumer goods.
- ii. A technologically advanced machine tool industry is vital to meet the requirements of programmes in India's strategic sectors – Space, Defence and Nuclear Energy.
- iii. Advanced manufacturing countries have always supported the machine tool industry as a strategic industry. Most recently, China and Taiwan have revealed ambitious plans to secure global domination of the industry.
- iv. Indian machine tool industry has inherent strengths but it is not keeping pace with highly dynamic competitors such as Korea, Taiwan and China in technological capabilities.
- v. Current and future path of technology of key machine tool sub-systems is controlled by a few large global firms that are unlikely to make state-of-art technology available to Indian firms. India must ensure technological self-reliance in the machine tool industry.

We, therefore, recommend that the machine tool industry be declared a strategic industry. A national programme for developing indigenous technology must be instituted. The objective of this programme should be the development and commercialization of key machine tool components and subsystems - spindles, CNC controls, servo motors, precision bearings and guideways – for the benefit of Indian manufacturers.

7.3 Other recommendations

The study findings strongly suggest that a wide range of initiatives spanning technology development, marketing, human resources and industry co-ordination are needed to strengthen the competitive position of Indian SMEs and promote their trans-nationalization. As these initiatives are beyond the capability of individual firms and the industry collectively to implement, a set of policy recommendations are being made to the Government of India.

It is envisaged that while these measures will aid all firms in the industry, those which already have an international orientation (active and committed exporters, and firms which have made manufacturing / marketing investments abroad) are likely to be the biggest beneficiaries.

Specific policy measures that are recommended are given in Table 12 below:

Table 12: Policy recommendations

| Policy Area | Recommendation | Rationale | Implementing Agency |
|-------------------|--|---|--------------------------------|
| Technology | a) Central Manufacturing Technology Institute (CMTI), Bangalore should have a dedicated centre of excellence for machine tool technology with links to academic / R&D institutions in India and abroad. An Advanced Machine Tool Testing Facility should be set up at CMTI on priority to help SMEs and larger companies to test, upgrade and develop machines, accessories, sub-systems and parts to international standards. | CMTI is an R&D organization with facilities located in Bangalore which has the largest number of SME units. It is rendering limited assistance to the industry in the area of design, & development of machine tools, control systems and can develop this expertise provided modern facilities are set up. CMTI can also play a key role in tracking technology developments globally in machine tools. | Ministry of S&T/Heavy Industry |
| | b) Support and drive a “National Program for the Development of Machine Tool Electronics and Precision Elements” : This is a very important technology issue for SMEs and large units, all of which are solely dependent on imports for the critical components of modern machine tools. | Required for technology security and for cost reduction. The R&D program (estimated to cost around Rs.300 cr) can spawn an entirely new set of high-tech SMEs in the machine tool and industrial machinery sector with high prospects for domestic and export markets. | Ministry of S&T/Heavy Industry |
| Taxation | a) Weighted deduction for expenditure incurred on technology development/R&D should be allowed | This is already being allowed for 7 other industries and machine tools should be included as well. | Ministry of Finance |
| | b) No service tax should be levied on services utilized for machine tool exports | ST on certain inputs like inland transport, clearing/customs house charges etc. may be exempted for exports | Ministry of Finance |
| | c) Fringe Benefit Tax treatment should be at par with the IT industry | | Ministry of Finance |

| | | | |
|-------------------|--|---|----------------------------|
| Investment | a) Establish machine tool parks along the lines of software technology parks and textile parks. A Public – Private – Partnership model with international participation can be considered | <p>Geographical proximity of SME units facilitates capacity integration and economies of scale. <i>This factor has immensely benefited SMEs in Italy. Italy's machine tool industry is located in the Milan region. Most of the suppliers to the industry are likewise located in this part of the country. Machine Tool Parks have placed Taiwan among the top producers and exporters of machine tools;</i></p> <p><i>Taiwan has become one of the top machine tool producing and exporting countries through the establishment of machine tool parks, in Taichung, for instance.</i></p> | Ministry of Heavy Industry |
| | b) Establish common facility centres in at least three regions – North, South and Western India – to provide SMEs with facilities for precision machining, CAD/CAM/CAE, metrology and heat treatment | Modern facilities in core areas are required to upgrade technology among SMEs and to some extent even larger companies. | Ministry of Heavy Industry |

| | | | | |
|---------------------------|----|--|---|---|
| Market Development | a) | Establish large showrooms in important locations overseas in consultation with IMTMA. This could be taken up by Engineering Export Promotion Council (EEPC). A nominal charge can be recovered from machine tool companies. (EEPC has set up showrooms in Johannesburg and Chicago but not to accommodate machine tools) | Space requirements to display machine tools are large. Showrooms currently used by EEPC are insufficient in size. The costs of large showrooms are too high to be borne entirely by Indian SMEs. Foreign manufacturers such as Makino, Mazak and DMG have leveraged their showrooms in India to increase sales. The American Machine Tool association has also announced its intention to open a display centre for US machines. | Engineering Export Promotion Council / Ministry of Commerce |
| | b) | EEPC schemes for participation in exhibitions and market research may be administered by IMTMA and given more publicity. | The “Made in India” brand image for machine tools needs to be enhanced. Exhibitions will provide an opportunity for SMEs to market themselves as ideal partners for contract manufacturing for bigger international players. This strategy of riding on international brands should be pursued till the “Made in India” brand is established. There is a large export market for custom built machines where Indian manufacturers can compete since this segment is dominated by German manufacturers that supply very expensive machines. Market research will help SMEs identify target markets and products. | Engineering Export Promotion Council / Ministry of Commerce |
| | c) | Part fund quality training / certification programmes and consultancy services | Need for quality consciousness in the industry needs to be reinforced. | Engineering Export Promotion Council / Ministry of Commerce |
| | d) | Rupee invoicing of exports should be taken as a strategy. | Appreciation of the rupee against the dollar has had an adverse impact on Indian export competitiveness especially against China. MoC may examine steps required to promote acceptance of rupee invoicing abroad. | Ministry of Commerce |
| | e) | Establish a design and consulting company that can design and supply manufacturing facilities for automobile, auto ancillary and other engineering industries. This company could be similar to Engineers India Limited. | Customers increasingly prefer project solutions to buying individual machine tools. Expertise in engineering design, CNC programming and automation is already available in the country. Korean companies have benefitted from this model. | Ministry of Industry |

| | | | |
|-------------------------------|--|--|--|
| Manpower | Make a critical assessment of manpower and skills requirement for the next 10 years and plans to meet this through suitable upgradation of academic, vocational and training mechanisms in the country. | There is concern at the scarcity of the specialized talent that is required to continuously drive the machine tool industry to higher technology and international arena. This has to be tackled urgently | TIFAC; Ministry of HRD |
| Education and Training | <p>a) Introduce Manufacturing Engineering as a distinct discipline in engineering colleges and industrial training institutes and upgrade curriculum and facilities to suit modern requirements of machine tool and manufacturing industries.</p> <p>b) Fund overseas long duration (1-2 year) training programmes in machine tool technology for personnel in Indian SMEs. Training programmes can be designed by IMTMA in co-ordination with foreign machine tool associations.</p> <p>c) Opportunities for exchange programmes for Indian machine tool employees to work abroad; similarly for foreign professionals to work with Indian firms for 1-2 years; partially paid for by government</p> <p>d) Provide training and participation in the “World Skills” competition for machine tool related skills: will require facility creation/augmentation and training</p> | <p>There is a critical shortage of competent manpower at all levels in the machine tool industry – technicians, engineers, and sales. The problem is particularly acute in SMEs. The current Mechanical Engineering curriculum in the country does not prepare graduates for a career in manufacturing.</p> <p>Industry personnel must be exposed to best global manufacturing practices and technology. A critical mass of foreign trained engineers must be created for Indian industry to catch up with the competition. These programmes will also improve the image of the metal working industry especially in comparison to the IT industry, and help to attract and retain talent.</p> <p>Exchange visits improve skills and technology especially in Indian SMEs</p> <p>India has become a member of World Skills organization but needs great improvement to reach international skill levels. This will have a beneficiary effect on engineering skills across all industries</p> | <p>Ministry of Education/Human Resources Development</p> <p>Ministry of Human Resources Development</p> <p>Ministry of Industry</p> <p>Ministry of Education/HRD</p> |
| Trade policy | a) Include Indian machine tools in list of goods for preferential treatment in trade agreements. | Overcomes trade barriers currently experienced by the industry in export markets. | Ministry of Commerce |

8 ANNEXURES

8.1 Global Production, Consumption & Trade Data Source: Gardner Inc (2007 World Machine Tool Output and Consumption Survey)

A. Machine Tool Production - 2006

| Rank | Country | Total (US\$ billion) | Metal Cutting (US \$ billion) | Metal Forming (US \$ billion) | Metal Cutting (%) | Metal Forming (%) |
|------|----------------|-------------------------|----------------------------------|----------------------------------|----------------------|----------------------|
| 1 | Japan | 13.5 | 11.9 | 1.6 | 88% | 12% |
| 2 | Germany | 10.3 | 7.5 | 2.8 | 73% | 27% |
| 3 | China | 7.0 | 5.2 | 1.8 | 74% | 26% |
| 4 | Italy | 5.5 | 2.8 | 2.7 | 51% | 49% |
| 5 | Korea | 4.1 | 3.0 | 1.2 | 72% | 28% |
| 6 | Taiwan | 3.7 | 2.8 | 0.8 | 77% | 23% |
| 7 | USA | 3.6 | 2.9 | 0.8 | 79% | 21% |
| 8 | Switzerland | 2.8 | 2.3 | 0.5 | 84% | 17% |
| 9 | Spain | 1.2 | 0.8 | 0.4 | 64% | 36% |
| 10 | France | 1.1 | 0.6 | 0.5 | 54% | 46% |
| 11 | Canada | 1.1 | 0.7 | 0.4 | 60% | 40% |
| 12 | Brazil | 1.0 | 0.8 | 0.2 | 81% | 19% |
| 13 | U.K. | 0.9 | 0.7 | 0.2 | 78% | 22% |
| 14 | Netherlands | 0.5 | 0.1 | 0.4 | 20% | 80% |
| 15 | Czech Republic | 0.4 | 0.4 | - | 92% | 8% |
| 16 | Turkey | 0.4 | 0.1 | 0.3 | 30% | 70% |
| 17 | Austria | 0.4 | 0.3 | 0.1 | 60% | 40% |
| 18 | India | 0.4 | 0.4 | - | 88% | 12% |
| 19 | Belgium | 0.3 | - | 0.3 | 10% | 90% |
| 20 | Finland | 0.3 | - | 0.3 | 16% | 84% |

B. Machine Tool Consumption – 2006

| Rank | Country | Consumption (US\$ billion) |
|------|----------------|-------------------------------|
| 1 | China | 12.9 |
| 2 | Japan | 7.4 |
| 3 | United States | 6.3 |
| 4 | Germany | 5.2 |
| 5 | Korea, Rep. of | 5.0 |
| 6 | Italy | 3.6 |
| 7 | Taiwan | 2.5 |
| 8 | France | 1.6 |
| 9 | Canada | 1.6 |
| 10 | Brazil | 1.4 |
| 11 | India | 1.3 |
| 12 | Mexico | 1.3 |
| 13 | Spain | 1.1 |
| 14 | Turkey | 1.1 |
| 15 | Switzerland | 0.9 |
| 16 | United Kingdom | 0.9 |
| 17 | Netherlands | 0.4 |
| 18 | Czech Republic | 0.4 |
| 19 | Sweden | 0.4 |
| 20 | Russia | 0.4 |

C. Machine Tool Exports - 2006

| Rank | Country | Exports (US \$ Billion) | Exports (as % of production) |
|------|----------------|----------------------------|---------------------------------|
| 1 | Germany | 7.5 | 73% |
| 2 | Japan | 6.9 | 51% |
| 3 | Italy | 3.3 | 60% |
| 4 | Taiwan | 2.9 | 79% |
| 5 | Switzerland | 2.5 | 89% |
| 6 | USA | 1.8 | 50% |
| 7 | Korea | 1.7 | 40% |
| 8 | China | 1.2 | 17% |
| 9 | UK | 0.9 | 101% |
| 10 | Spain | 0.7 | 57% |
| 11 | Belgium | 0.7 | 219% |
| 12 | France | 0.7 | 58% |
| 13 | Czech Republic | 0.5 | 107% |
| 14 | Austria | 0.5 | 114% |
| 15 | Netherlands | 0.3 | 71% |
| 16 | Turkey | 0.3 | 69% |
| 17 | Canada | 0.3 | 25% |
| 18 | Finland | 0.2 | 82% |
| 19 | Sweden | 0.2 | 86% |
| 20 | Brazil | 0.1 | 16% |

D. Machine Tool Imports – 2006

| Rank | Country | Imports (US \$ Billion) | Imports (as % of 2006 consumption) |
|------|----------------|----------------------------|---------------------------------------|
| 1 | China | 7.1 | 55% |
| 2 | United States | 4.4 | 71% |
| 3 | Korea, Rep. of | 2.6 | 51% |
| 4 | Germany | 2.4 | 47% |
| 5 | Taiwan | 1.8 | 70% |
| 6 | Italy | 1.4 | 38% |
| 7 | Mexico | 1.1 | 98% |
| 8 | France | 1.1 | 70% |
| 9 | Turkey | 1.0 | 88% |
| 10 | United Kingdom | 0.9 | 101% |
| 11 | Japan | 0.8 | 11% |
| 12 | Canada | 0.8 | 46% |
| 13 | Belgium | 0.7 | 213% |
| 14 | India | 0.9 | 69% |
| 15 | Brazil | 0.6 | 44% |
| 16 | Spain | 0.6 | 52% |
| 17 | Switzerland | 0.5 | 62% |
| 18 | Czech Republic | 0.4 | 108% |
| 19 | Sweden | 0.4 | 92% |
| 20 | Austria | 0.3 | 119% |

8.2 Survey questionnaire

Defining the Role of Government in Trans-nationalization Efforts of Indian SMEs in Machine Tool Sector

1. Name & address of respondent company –
2. Name & address of respondent –
3. Year of establishment of business –
4. Names of sister concerns within the group-
5. List of main customers –
 - a. India-
 - b. Abroad
6. Main products of the company (*collect brochures*) -
 - a. –
 - b. –
 - c. –
7. Number of employees -
8. Data on turnover- (value Rs. Lakhs)

| | 2005-06 | 2006-07 |
|--|---------|---------|
| Turnover from Machine Tools – | | |
| Number of machine tools sold | | |
| Turnover from other products – | | |
| Turnover from supply of spares and other accessories | | |
| Income from consultancy, design etc. (if any) – | | |
| Purchase of outsourced local components from vendors | | |

9. Details on imports (details of main imported items) – value Rs. Lakhs

| TOTAL IMPORTS | 2005-06 | 2006-07 |
|---|---------|---------|
| Direct imports of Machine Tools - attachments/ tooling | | |
| Import of other products CNC elements | | |
| Import of tooling | | |
| Purchase of imported assemblies from agents/ stockists | | |
| Purchase of design and drawings from abroad (if any) – | | |

10. Details on exports (details of main export items)- value Rs. Lakhs

| TOTAL EXPORTS | 2005-06 | 2006-07 |
|--|---------|---------|
| Turnover from export of Machine Tools – | | |
| Turnover from export of other products – | | |
| Export of technical consultancy | | |
| Export of design and detailing | | |
| Any other exports (kindly give details) | | |

11. If no exports give reasons –
12. What are the names of other manufacturers in India in the SME sector (turnover below Rs. 60 crores) in India who compete with you in the product range you have?
13. Have you tried for any risk capital for funding up gradation of technology in your unit or your group?
YES/ NO
14. In case you have competed with imported machine tools in some customer enquiries within the country and did not get the contract, kindly give the reasons for loosing the order –

- a. Lack of appropriate technology-
- b. Lack of capacity-
- c. Tight delivery schedules-
- d. Lack of high tech automation components-
- e. Could not match customer's requirements of design –
- f. Imported machines were much cheaper (kindly give details of how cheap the machines were)-

15. Do you know of any technology funding programmes from Government of India? **YES / NO**
16. If **YES** what are the programmes?
17. Have you ever competed in enquiries from overseas Companies? **YES / NO**
18. If **YES** which country and the details of outcome of enquiry-
19. Have you attended any of the machine tool exhibitions in India and abroad in the last few years- kindly give a list-
20. What should be the focus countries for Indian machine tool manufacturers in the SME sector to become globally competitive?
21. Are you interested in setting up a manufacturing facility abroad as Joint Venture or supply of turnkey projects? **YES / NO**
22. If **YES** what are the constraints faced and facilities required?

8.3 List of Participants in EMO-Hanover 2007 Trade Fair

| | | |
|----|--|---------------|
| 1 | M. K. International | Aurangabad |
| 2 | Gaurav Engineers | Aurangabad |
| 3 | ACE Designers Ltd | Bangalore |
| 4 | Bharat Fritz Werner Ltd | Bangalore |
| 5 | Cobra Carbide Pvt. Ltd | Bangalore |
| 6 | Fenwick and Ravi | Bangalore |
| 7 | Pragati Automation Pvt. Ltd | Bangalore |
| 8 | Uday Computer Aided Mfg. Pvt. Ltd. | Bangalore |
| 9 | Proteck Circuits and Systems Pvt. Ltd | Chennai |
| 10 | Airtech Private Ltd | Dharwad |
| 11 | Micromatic Grinding Technologies Limited | Ghaziabad |
| 12 | ITL Industries Ltd. | Indore |
| 13 | Sharp Chucks & Machines Ltd. | Jalandhar |
| 14 | Khushbu Engineers | Kolhapur |
| 15 | Bipico Industries (Tools) Pvt. Ltd. | Mumbai |
| 16 | Forbes Gokak Ltd | Mumbai |
| 17 | Krishna International | New Delhi |
| 18 | Shobha Industries | New Delhi |
| 19 | Ind-Sphinx Precision Limited | Parwanoo - HP |
| 20 | Carbtools (India) Pvt. Ltd | Pune |
| 21 | Electronica Machine Tools Ltd. | Pune |
| 22 | Universal Engg. & Mfg. Industry | Pune |
| 23 | Jyoti CNC Automation Pvt. Ltd. | Rajkot |

8.4 Survey respondents

Bangalore

(Fig for FY 2006 – 07)

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|-------------------------------|-----------|-------------------------|---------------------------|-------------------------|------------------------|-------|--|-----------------------|--|
| 1 | ETA Technology Pvt. Ltd | Bangalore | P.S.Nair. M.D. | 29 | 12 | 41 | Small | Friction welding, CNC Grinding | niche market designs | niche market, direct orders- very less competition worldwide |
| 2 | UCAM P Ltd | Bangalore | Lakshmi, Finance Dir. | 22 | 3 | 25 | Small | Rotary Tables, Indexing table | high quality products | participate in exhibitions- direct marketing & agents |
| 3 | Maxpreci Machines Pvt. Ltd | Bangalore | Thamby Alapat, E.D. | 3 | 0.9 | 3.9 | Small | Eng. Rebuilding m/cs | niche product | give good margin to agents in Dubai & Sri Lanka |
| 4 | Indian Precision Engineers | Bangalore | Thirumala, GM | 1.4 | 0.35 | 1.75 | Small | Electromagnetic clutches & brakes | niche product | direct sales |
| 5 | CNC India Tools | Bangalore | V. Phadnis, Astt. Mgr | 1.7 | 0.6 | 2.3 | Small | Toolings & reconditioning | service based tooling | direct sales-agents |
| 6 | Shoma Enterprise | Bangalore | K.Appunni, Mgr | 1.6 | 0.4 | 2 | Small | CNC Machines- aerospace, press tools | design based products | indirect exports through m/c tools |
| 7 | Fenwick & Ravi | Bangalore | Fenwick Thomas, Partner | 5.5 | 1 | 6.5 | Small | CNC Lathe accessories | Own designs | exhibitions, agents |
| 8 | Kladon Designs Pvt. Ltd | Bangalore | Suresh, Director | 3.6 | 0.45 | 4.05 | Small | Product design, sound proof enclosures | custom designs | indirect exports through m/c tools |
| 9 | Mecprosyst M/c tools Pvt. Ltd | Bangalore | Suryanarayan, M.D. | 1.8 | 0.2 | 2 | Small | Fixtures, auto m/c tools | None | indirect exports through m/c tools |

(Fig for FY 2006 – 07)

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|------------------------|-----------|------------------------|---------------------------|-------------------------|------------------------|-------|---|-----------------|-------------------------------|
| 10 | Tool Grinding Tech | Bangalore | Santosh Prabhu | 6 | 0 | 6 | Small | CNC Tool and Grinding m/c, Cutting Tools | None | None |
| 11 | Cosmos Engg | Bangalore | Biswas S | 5 | 0 | 5 | Small | Pressed Products | None | In process |
| 12 | VJ Industries | Bangalore | Nagabhushan | 5.5 | 1.5 | 7 | Small | Pressed Comp, Sheet Metal Prod | None | US export |
| 13 | Sunmas Machine Tools | Bangalore | Shiva Shankar DGM | 4 | 0 | 4 | Small | Special Purpose M/C | None | None |
| 14 | Enconpass | Bangalore | KR Saji | 5.25 | 0 | 5.25 | Small | Control Panels | None | No orders |
| 15 | Metalica Pressings | Bangalore | Ranjith K | 3.5 | 0 | 3.5 | Small | Pressed Products | None | No orders |
| 16 | Chandra Engg Works | Bangalore | Rakesh | 4.15 | 0 | 4.15 | Small | SPM assemblies, parts for earth movers | None | Not Tried, already overloaded |
| 17 | Ashwini Engg Works | Bangalore | Suresh Kumar | 4.1 | 0 | 4.1 | Small | CNC m/c Comp | None | None |
| 18 | Radiant Tech | Bangalore | Mrs. Rama - Proprietor | 4 | 0 | 4 | Small | Aerospace Components | None | In process |
| 19 | Technomech Engineering | Bangalore | Suresh M | 3.7 | 0 | 3.7 | Small | Cutting Tools, Dyes and Bushes | None | Bargaining |
| 20 | Acumac Machine Tools | Bangalore | Milind Jalihal | 3.13 | 0 | 3.13 | Small | CNC Internal Grinding m/c, Centre Hole Grinding m/c, Spindles | None | Market Penetration Difficult |

(Fig for FY 2006 – 07)

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|-------------------------------------|-----------|-----------------------------------|---------------------------|-------------------------|------------------------|-------|--|-----------------|---|
| 21 | Machine Elements | Bangalore | Harish Asrani - Partner | 2.9 | 0 | 2.9 | Small | MTA, MTS, Reconditioning of m/c tools | None | None |
| 22 | Protocol Ind | Bangalore | V.Shankar | 2.5 | 0 | 2.5 | Small | Pressed Components, Brass Precision Thermal | None | None |
| 23 | Sushma Industries | Bangalore | Ravi Kumar Marketing Manager | 2.3 | 0 | 2.3 | Small | Testing Eqp, Instrumentation Software soln | None | Lack infrastrucutre to export |
| 24 | Unique Instruments & Mfrs Pvt. Ltd. | Bangalore | Jatil Bhavsar - Marketing Manager | 2.19 | 0 | 2.19 | Small | Caliberation Inspections, Precision measurements, CNC millings | None | Trying to export |
| 25 | V.M. Engg, | Bangalore | Chandra Kumar, CEO | 2 | 0 | 2 | Small | Spark Erosion m/c, CNC Engraving m/c | None | Lack quality for exports |
| 26 | Akshaya Special m/c Pvt Ltd | Bangalore | Arivalagan - MD | 1.3 | 0 | 1.3 | Small | Special m/c tools | None | technology & manpower |
| 27 | Krafield Tool Room, | Bangalore | Kishore Kumar | 1.15 | 0 | 1.15 | Small | Tooling, Diemaking and Aerospace Comp | None | Bargaining,getting enquiries |
| 28 | Pratham Pressings | Bangalore | Yogesh Shah | 1.14 | 0 | 1.14 | Small | Pressed Comp, Electro plated pressed tools | None | Planning to export |
| 29 | Geetha Consulting Engg | Bangalore | Chiranjeev Sharma | 0.92 | 0 | 0.92 | Small | Design and Consultancy for m/c tools | None | Small Co., Less Delivery time, Short on Man-power |

(Fig for FY 2006 – 07)

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|-------------------------------------|-----------|--------------------------------------|---------------------------|-------------------------|------------------------|--------|--|--------------------------|---|
| 30 | Jyothi Industries | Bangalore | Sharath Kumar, Partner | 0.6 | 0 | 0.6 | Small | m/c Tool accessories, SPM for metal cutting tables | None | Not Ventured into Export Brands |
| 31 | Bombay Machines | Bangalore | Girish Hosmani Director | 0.27 | 0 | 0.27 | Small | M/C Tools, CNC Lathe | None | not decided, lack of finance |
| 32 | MICO BOSCH | Bangalore | N.Umesh, GM & B.H. | 45 | 8 | 53 | Medium | Industrial Equipments | None | BOSCH- gets orders |
| 33 | Batliboi Ltd. | Bangalore | H.K.Prasanna Kumar, Sales Mgr | 87 | 5 | 92 | Medium | Milling m/c, CNC lathe | SPMs | order basis- no strategy |
| 34 | HMT Ltd | Bangalore | A.V.Kamat, CMD | 340 | 8 | 348 | Large | M/c tools | None | Direct through HMT International |
| 35 | HMT Machine Tools Ltd | Bangalore | K.H.Suresh, GM | 280 | 6 | 286 | Large | M/c tools | N.A. | N.A |
| 36 | BFW Ltd | Bangalore | Ashok N Badhe, GM | 278 | 25 | 303 | Large | M/c Tools | R&D center in Pune | Swiss buyer- back to back technology transfer |
| 37 | Micromatic Machine Tools Pvt. Ltd., | Bangalore | T.K.Ramesh, Vice President | 560 | 10 | 570 | Large | M/c tools | None | None |
| 38 | Kennametal India Ltd | Bangalore | J.Prabhakar, Sr. Mgr | 288 | N.A. | 288 | Large | SPMs | SPMs | N.A. |
| 39 | Pragati Automation Pvt. Ltd | Bangalore | Atul S. Bhirangi, M.D. | 38 | 32 | 70 | Large | Tool Turrets, Tool Disc | own designs- new formats | direct offices, agents, exhibitions |
| 40 | DMG India Pvt. Ltd | Bangalore | S.G.Narayan, M.D. | N.A. | N.A. (importer) | | NA | Imported m/c tools | N.A. | N.A |
| 41 | Siemens India | Bangalore | Raghavendra Mutalik | N.A. | N.A. (importer) | | NA | CNC Systems & drives | N.A. | N.A |
| 42 | Fanuc India Pvt. Ltd | Bangalore | Ms. Sonali Kulkarni, President & CEO | N.A. | N.A. (importer) | | NA | CNC systems | N.A. | N.A |
| 43 | Liebherr Machine Tools India Ltd | Bangalore | Anil Aggrawala, MD. | N.A. | N.A. | | NA | Gear cutting/ gear hobing | SPMs | N.A. |

Rajkot:**(Fig for FY 2006 – 07)**

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|---------------------------------|----------|----------------------|---------------------------|-------------------------|------------------------|--------|--|----------------------------------|--|
| 1 | Shailesh Machines Pvt Ltd | Rajkot | Shailesh Kawa, MD | 25 | 5 | 30 | Small | Presses, lathes | None | African countries, dealers |
| 2 | Macpower CNC Machines Pvt. Ltd. | Rajkot | Rupesh J Mehta, M.D. | 54 | 8 | 62 | Medium | CNC Turning centers, VMC m/c | standard m/cs | export to Africa & UK-known distributors |
| 3 | Jyoti CNC Automation Pvt. Ltd | Rajkot | P.G.Jadeja, M.D | 250 | 30 | 280 | Large | CNC Turning centers, turn-mill centers | collaborate with European majors | join with large European manufacturers |

Mumbai:

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|---------------------------|----------|------------------|---------------------------|-------------------------|------------------------|-------|--------------------------|-----------------|--|
| 1 | Bipico Industries Pvt Ltd | Mumbai | Pramitbhai Patel | 15 | 2.5 | 17.5 | Small | Metal cutting saws | none | export to Russia, Europe, Asia |
| 2 | Forbes Gokak Ltd | Mumbai | Abhay Jain | 35 | 4 | 39 | Small | Tapping /threading tools | own metallurgy | target developed markets -direct selling |

Hyderabad:

(Fig for FY 2006 – 07)

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|---------------------|-----------|-----------------------|---------------------------|-------------------------|------------------------|-------|-----------------------------------|-------------------------------|-------------------------------|
| 1 | Precision Tools | Hyderabad | Narasimha Reddy, M.D. | 1.1 | N.A. | 1.1 | Small | Surface & centerless grinding m/c | NA | NA |
| 2 | Praga Tools Ltd | Hyderabad | M.Shankar, Chief Mktg | 13 | N.A. | 13 | Small | Lathes, machining centers | NA | NA |
| 3 | Lokesh Machines Ltd | Hyderabad | M.Lokeswara Rao, M.D. | 110 | 4 | 114 | Large | Range of m/c tools | low cost high volume products | exports on low prices |

Indore:

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|---------------------|----------|------------------|---------------------------|-------------------------|------------------------|--------|------------------|--|-------------------------------|
| 1 | ITL Industries Ltd. | Indore | S.B.Naik, M.D. | 26 | 13 | 39 | Small | Bandsaw machines | technology partner-Kasto - Germany | buy back with partners |
| 2 | Indotech Machines | Indore | Mukul Gogate, GM | 44 | 18 | 62 | Medium | Bandsaw machines | technology partner-Bomar-Czech & Exact Cut-Germany | buy back with partners |

Coimbatore:

(Fig for FY 2006 – 07)

| No | Name of unit | Location | Person contacted | Domestic Turnover (Rs cr) | Export Turnover (Rs cr) | Total turnover (Rs Cr) | size | Products | Product Feature | Transnationalization strategy |
|----|------------------------------|------------|--|---------------------------|-------------------------|------------------------|--------|--|--|---|
| 1 | PSG Industrial Institute | Coimbatore | Subramaniam- Production and vendor development incharge | 4 | N.A. | 4 | Small | Complete range of m/c tools | N.A. | N.A |
| 2 | Gedeewailer | Coimbatore | Nithiayanandam | 12 | N.A. | 12 | Small | Range of m/c tools | N.A. | N.A |
| 3 | Teakrafts | Coimbatore | Sangeet Bagaria | 21 | 1.2 | 22.2 | Small | Tea Processing Mechanisation, Agro m/c | develop own designs | export through large export house |
| 4 | Lakshmi Automatic Loom Works | Coimbatore | Mani N | 12 | 12 | 24 | Small | CNC Tool Holders | collaboration & reverse engineering | buy back arrangement |
| 5 | G-Tech Engg | Coimbatore | Ganesan | 11 | N.A. | 11 | Small | Injection Moulding m/c, Hydraulic, Rubber moulding m/c | N.A. | N.A |
| 6 | Reshmi Industries | Coimbatore | Murali | 30 | 10 | 40 | Small | Conewinding machines | Niche product | West Africa |
| 7 | Janatics India Pvt. Ltd. | Coimbatore | Ganapathy Subramaniam, | 60 | 2 | 62 | Medium | Pneumatic Items, Industrial Automations | reverse engineering | N.A |
| 8 | Lakshmi Ring Travellers Ltd | Coimbatore | Anbalagan, Prodn Head | 650 | N.A. | 650 | large | Ring Travellers for spinning mills | N.A. | N.A |
| 9 | Shanti Gears Ltd., | Coimbatore | Kurup | 220 | 30 | 250 | Large | Gear Box, Motors, CNC m/c tool | specislised in gear & gear box designs | export high tech machines, agent in Germany |
| 10 | Laksmi Machine Works | Coimbatore | Annandurai | 110 | 5 | 115 | Large | Spinning mill m/c, Machine Tools | collaboration & reverse engineering | exhibitions, projects |

8.5 Survey respondents contact list and addresses

BANGALORE

| No | Name of unit | Person contacted | Address |
|----|-------------------------------|-------------------------|--|
| 1 | ETA Technology Pvt. Ltd | P.S.Nair. M.D. | # 484 D, 13th Cross, 1vth phase,Peenya |
| 2 | UCAM P Ltd | Lakshmi, Finance Dir. | # A-11/A-12, 1st stage, 1st cross,Peenya, |
| 3 | Maxpreci Machines Pvt. Ltd | Thamby Alapat, E.D. | # A-373, 4TH Main, 8th Cross, Peenya |
| 4 | Indian Precision Engineers | Thirumala, GM | # 8/9, Shankarmutt Rd |
| 5 | CNC India Tools | V. Phadnis, Astd. Mgr | #349,Srinivasa Complex, 1 st Floor, 6 th Main, Outer Ring Rd. Narasimha Layout |
| 6 | Shoma Enterprise | K.Appunni, Mgr | # C-28, 2nd Stage, Peenya |
| 7 | Fenwick & Ravi | Fenwick Thomas, Partner | #10/3, Lakshmipura Main Road, Abbigere |
| 8 | Kladon Designa P. Ltd | Suresh, Director | # Lakshmi Venkateswara Ind. Est, No. 1 8 th Main Rd.,Peenya 2 nd stage |
| 9 | Mecprosyst M/c tools Pvt. Ltd | Suryanarayan, M.D. | # B-178, 4TH Main Road, 2nd Stage,Peenya |
| 10 | Tool Grinding Tech | Santosh Prabhu | #467-469, 4th Phase, 12th Cross, Peenya |
| 11 | Cosmos Engg | Biswas S | #B-246, 4th Main, 2nd Stage, Peenya |
| 12 | VJ Industries | Nagabhushan | #A290, 6th Main, 2nd Stage, Peenya |
| 13 | Sunmas Machine Tools | Shiva Shankar DGM | #432/1, 4th Main, 12th Cross, 4th Phase, Peenya |
| 14 | Enconpass | KR Saji | #74/2A, Krishnappa Ind Estate, Hegganahalli |
| 15 | Metalica Pressings | Ranjith K | #B-192, 2nd Stage, Peenya |
| 16 | Chandra Engg Works | Rakesh | #52, Koramangala Ind Estate |
| 17 | Ashwini Engg Works | Suresh Kumar | #14, 4th Cross, 4th Stage, Rajajinagar Ind Town |
| 18 | Radiant Tech | Mrs. Rama - Proprietor | #177/26, 4 Main Road, Ind Towm, Rajajinagar |

| No | Name of unit | Person contacted | Address |
|----|-------------------------------------|-----------------------------------|---|
| 19 | Technomech Engineering | Suresh M | #12, 4th Main, 4th Cross, Rajajinagar Ind Town |
| 20 | Acumac Machine Tools | Milind Jalihal | #472-A, 12th Cross, 4 Phase, Peenya |
| 21 | Machine Elements | Harish Asrani - Partner | #48, 2nd Phase, Peenya Ind Estate |
| 22 | Protocol Ind | V.Shankar | #192/A, 7th Main, 6th Cross, Rajajinagar |
| 23 | Sushma Industries | Ravi Kumar Marketing Manager | #18E, Block B, 1st C Main Road, 2nd Phase, Peenya |
| 24 | Unique Instruments & Mfrs Pvt. Ltd. | Jatil Bhavsar - Marketing Manager | #423, 11th Cross, 3rd Main, Peenya |
| 25 | V.M. Engg, | Chandra Kumar, CEO | #B-30, 1st Stage, 1st Cross, Peenya |
| 26 | Akshaya Special m/c Pvt Ltd | Arivalagan - MD | #A-279, 2nd stage, Peenya Industrial Estate Bangalore |
| 27 | Krafield Tool Room, | Kishore Kumar | #9/2, 4th main, 6th Cross, Rajajinagar Ind town |
| 28 | Pratham Pressings | Yogesh Shah | #D-432, 10th Main, Peenya |
| 29 | Geetha Consulting Engg | Chiranjeev Sharma | #1297, 8th Cross, 1st Phase, JP Nagar |
| 30 | Jyothi Industries | Sharath Kumar, Partner | # A-18, HMT Ind Estate |
| 31 | Bombay Machines | Girish Hosmani Director | # C-88, 2nd Stage, Peenya |
| 32 | MICO BOSCH | N.Umesh, GM & B.H. | # Hosur Road |
| 33 | Batliboi Ltd. | H.K.Prasanna Kumar, Sales Mgr | # 99/2,N.R.Road |
| 34 | HMT Ltd | A.V.Kamat,CMD | # 59, Bellary Rd. |
| 35 | HMT Machine Tools Ltd | K.H.Suresh, GM | # HMT P.O. |
| 36 | BFW Ltd | Ashok N Badhe, GM | # off Tumkur Rd |
| 37 | Micromatic Machine Tools Pvt. Ltd., | T.K.Ramesh, Vice President | #533, 10 th Main, 4 th Ph. Peenya |

| No | Name of unit | Person contacted | Address |
|----|----------------------------------|--------------------------------------|---|
| 38 | Kennametal India Ltd | J.Prabhakar, Sr. Mgr | # Tumkur road |
| 39 | Pragati Automation Pvt. Ltd | Atul S. Bhirangi, M.D. | # 413, Ivth Phase, Peenya |
| 40 | DMG India Pvt. Ltd | S.G.Narayan, M.D. | # Al Latheef, no.2/1,Union Street |
| 41 | Siemens India | Raghavendra Mutalik | # Du Park Trinity, M.G.Road |
| 42 | Fanuc India Pvt. Ltd | Ms. Sonali Kulkarni, President & CEO | # 41 A, Electronics City |
| 43 | Liebherr Machine Tools India Ltd | Anil Aggrawala, MD. | #353-354, 9th Cross, 4th Main, Ivth Phase, Peenya |

RAJKOT

| No | Name of unit | Person contacted | Address |
|----|---------------------------------|----------------------|---|
| 1 | Shailesh Machines Pvt Ltd | Shailesh Kawa, MD | #10, Bhaktinagar Station Plot,Rajkot - 360 002 |
| 2 | Macpower CNC Machines Pvt. Ltd. | Rupesh J Mehta, M.D. | # Plot 2234, GIDC, METODA, Kranti Gate,Lodhika Vill. Metoda, Rajkot |
| 3 | Jyoti CNC Automation Pvt. Ltd | P.G.Jadeja, M.D | # G-506, Lodhika, GIDC, Vill. Metoda, Rajkot Distt |

MUMBAI

| No | Name of unit | Person contacted | Address |
|----|---------------------------|------------------|--|
| 1 | Bipico Industries Pvt Ltd | Pramitbhai Patel | #506-A, Lotus House, 5th Floor, 11, Sir V. Thackersey Road, Mumbai-020 |
| 2 | Forbes Gokak Ltd | Abhay Jain | # Saki Powai Road, Chandivili, Mumbai |

HYDERABAD

| No | Name of unit | Person contacted | Address |
|----|---------------------|-----------------------|---|
| 1 | Precision Tools | Narasimha Reddy, M.D. | # Balanagar Indl Area, Hyderabad |
| 2 | Praga Tools Ltd | M.Shankar, Chief Mktg | #6-6-8/32, Kavadiguda Rd., Secunderabad |
| 3 | Lokesh Machines Ltd | M.Lokeswara Rao, M.D. | # B-29, EEIE, Stage 2, Balanagar, Hyderabad |

INDORE

| No | Name of unit | Person contacted | Address |
|----|---------------------|------------------|--|
| 1 | ITL Industries Ltd. | S.B.Naik, M.D. | #111, Sector B, Sanwer Road Industrial Area-452015 |
| 2 | Indotech Machines | Mukul Gogate, GM | #28-29, RR Private Indl. Est., Nr. Shivna Spinners Sanwer Rd,indore-452015 |

COIMBATORE

| No | Name of unit | Person contacted | Address |
|----|------------------------------|---|--|
| 1 | PSG Industrial Institute | Subramaniam- Production and vendor development incharge | # Peelamedu, Coimbatore |
| 2 | Gedeweiler | Nithiyanandam | # VELLALORE, Coimbatore |
| 3 | Teakrafts | Sangeet Bagaria | #18, SIDCO, Kurichi, Coimabtoe |
| 4 | Lakshmi Automatic Loom Works | Mani N | # Singarampalyam, Kinathukadavu Post |
| 5 | G-Tech Engg | Ganesan | #3, 2nd Street, Textool, Ganapathy |
| 6 | Reshmi Industries | Murali | #Ammankulam Road, Pappanaickenpalayam |
| 7 | Janatics India Pvt. Ltd. | Ganapathy Subramaniam, | #E-25, SIDCO, Kurichi, Coimbatore |
| 8 | Lakshmi Ring Travellers Ltd | Anbalagan, Prodn Head | # Unit 2, Muthugoundermpudur, Coimbatore |
| 9 | Shanti Gears Ltd., | Kurup | #304A, Singanallur |
| 10 | Laksmi Machine Works | Annandurai | # Perianaickempalayam |

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