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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION  
Vienna, Austria

**Organisation Development Study  
for Tool Room & Training Centre, Goa**

FINAL REPORT



TATA CONSULTANCY SERVICES

2

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**Vienna, Austria**

**Organisation Development Study  
for Tool Room & Training Centre, Goa**

**FINAL REPORT**



**TATA CONSULTANCY SERVICES**

Management Consultancy Division

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September 1998

## Executive Summary

The Asia-Pacific region is becoming the preferred centre for the manufacture of tools world wide. The emergence of new technologies such as Rapid Prototyping and Rapid Tool Making will have a far reaching impact on the tooling industry. The Indian tooling industry is also at the threshold of major change. Although it is expected that the demand for tools will grow, the share of captive tool rooms (CTRs) is likely to decrease significantly. In order to fill the gap between demand and supply, tools will be imported and procured from commercial tool rooms (CmTRs).

Companies in Goa procure tools from CTRs and CmTRs in Mumbai, Belgaum, Dharwad, and Bangalore, or import the tools. Moulds are the most widely required tooling type, and account for the largest share of the demand. Considering the existing extent of industrialisation in Goa, the demand for tools in the future will come primarily from new investments.

The Tool Room and Training Centre (TRTC) is the most advanced CmTR in Goa. However, a majority of its existing and potential customers have serious apprehensions about its capability to manufacture high quality tools. This negative perception of TRTC is due to a number of factors such as customers' experience with TRTC, word-of-mouth, and a lack of awareness. TRTC's lack of competence and professionalism has resulted in customer dissatisfaction. TRTC does not have a competitive edge, and consequently, receives fewer orders. This has led to low employee morale and confidence. In spite of this negative perception, considering the physical proximity of TRTC, and its state-of-the art equipment and tooling facilities, there is a target market that would like to do regular business with TRTC in future.

TRTC will be able to tap this potential market and attract business only if TRTC overcomes its numerous problems. However it is a moot point whether the customers will participate and assist TRTC in the process of transformation, and to what extent.

TRTC should tackle this credibility crisis with utmost urgency, seriousness of purpose, and commitment. Its organisation structure should be flat and responsive to the needs of customers. The General Manager should have adequate authority to take decisions independently. The involvement of full-time technical, design, and training consultants for the first two or three years of operations is imperative to enhance competence, boost morale, and establish credibility in the target market. As TRTC might encounter difficulties in obtaining adequate tooling orders during the initial years, TRTC should strive to achieve and maintain excellent asset utilisation by manufacturing precision products and tooling components, and by undertaking precision machining work.

Even if TRTC attracts additional business, regular and substantial investments will be required to augment the operating income and for capacity expansion. Based on conservative financial projections, TRTC should make an operating profit by the year 2002-03, and an after-tax profit latest by the year 2006-07.

As a training centre, TRTC should concentrate on conducting basic training courses that will enable unskilled and semi-skilled workers to enhance their skills. TRTC should also conduct special training courses to enable personnel in the industry to acquire cross-functional manufacturing skills. Such courses, along with TRTC's experience in the production of tools, will enable TRTC to establish its credibility and gain an edge in the tooling business in Goa. Advanced tooling, Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and Computer Aided Engineering (CAE) courses should be introduced at a later stage.

To facilitate improvement in overall performance, and in order to encourage professionalism and accountability, TRTC should constitute an Executive Board. This board should consist of personnel with the right blend of technical expertise and managerial experience. The board will be the supreme decision-making body, and will replace the Governing Council. The board will meet every two or three months. This supervisory mechanism will ensure a smooth transition to complete or partial privatisation.

## Abbreviations Used in the Report

ACGL	Automobile Corporation of Goa Limited
ATC	Advanced Training Centre
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CAM	Computer Aided Manufacturing
CIPET	Central Institute of Plastic Engineering Technology
CMIE	Centre for Monitoring Indian Economy
CNC	Computerised Numerical Control
CTR	Captive Tool Room
CmTR	Commercial Tool Room
DOT	Department of Telecommunications
EDI	Electronic Data Interchange
EDM	Electrical Discharge Machine
EOI	Expenditure Over Income
FADMA	Federation of Asian Die and Mould Associations
GATE	Graduate Aptitude Test in Engineering
GDP	Gross Domestic Product
GTTC	Government Tool Room & Training Centre (Bangalore)
HSC	Higher Secondary Certificate
igtr-A	Indo-German Tool Room – Aurangabad
IT	Information Technology
ITI	Industrial Training Institute
JARI	Japan Association of Rapid Prototyping Industry
MIS	Management Information Systems
MITI	Ministry of International Trade and Industry
MRF	Madras Rubber Factory
NTTF	Nettur Technical Training Foundation
OJT	On-the-job Training
PAT	Profit After Taxes
PSU	Public Sector Undertakings
RM	Rapid Manufacturing
RP	Rapid Prototyping
RTM	Rapid Tool Making
SDLC	System Development Life Cycle
SEB	State Electricity Boards
SLM	Straight Line Method
SSC	Secondary School Certificate
SSI	Small Scale Industrial
TAGMA	Tool and Gauge Manufacturers Association
TCS	Tata Consultancy Services
Telco	Tata Engineering and Locomotive Company
TRAI	Telecom Regulatory Authority of India
TRTC	Tool Room & Training Centre
UNIDO	United Nations Industrial Development Organisation
VSNL	Videsh Sanchar Nigam Limited

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- B. Questionnaire for User Industries
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- D. Industry Feedback about TRTC
- E. Commercial Viability Analysis: Scenario 1
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## Chapter 1 Introduction

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### 1.1 Background

The Government of Goa has established a modern “Tool Room & Training Centre (TRTC)” (also known as Metals & Plastics Industries Service & Training Centre) at Kundaim Industrial Estate, Ponda, Goa.

The focus of TRTC is:

- To offer training in the areas of Tool & Die making and CAD/CAM.
- To manufacture tooling such as jigs, fixtures, gauges, moulds, die casting dies, forging dies, and press tools.
- To provide consultancy for the industry in the areas of tooling and machining.

In this context, United Nations Industrial Development Organisation (UNIDO) has commissioned Tata Consultancy Services (TCS) to conduct a survey of the tooling and training requirements in Goa and to assess the feasibility of TRTC.

### 1.2 Scope of the Study

The scope of the study was restricted to the State of Goa. The study covered the following areas:

- Survey of demand and supply for tooling in the next decade (i.e., 1998-2010).
- Survey of training needs and the demand for qualified tooling personnel in the industry.
- Feasibility of operating TRTC on a commercial basis.

The study was confined to the following tooling categories:

- Jigs
- Fixtures
- Gauges
- Press Tools
- Moulds
- Die Casting Dies
- Forging Dies

### **1.3 Terms of Reference**

#### **Demand for Tools and Dies**

1. To estimate the demand for tools and dies, indicating types, technology levels, numbers and values per annum for the next decade.
2. To assess the supply/production of tools and dies in captive tool rooms and commercial tool rooms in terms of the types of tools, number and value per annum for each category.
3. To prepare a year-wise forecast for demand and supply for the next decade (i.e., 1998-2010).

#### **Additions to Existing Computerised Systems & Equipment**

To evaluate the capacity of existing computerised systems/machines at TRTC and suggest additional equipment in keeping with the market needs identified above.

#### **Demand for Trained Personnel and Need for Training**

1. To estimate the current demand for trained personnel in tool and die making for the existing and emerging industries in Goa.
2. To estimate the current demand for the following courses:
  - Diploma Course in tool and die making of four years duration with an eligibility qualification of class 10 with science and mathematics.
  - 1-year postgraduate course in Tool Design with eligibility qualifications of a Bachelor's degree in mechanical/production or industrial engineering.
  - Short term training courses for personnel up to the level of supervisors, which would be useful to the local industry.
3. To identify institutes offering similar courses, both existing at the time of the study and new institutes being set up or under execution, and the annual intake of students in each.

#### **CAD/CAM Training Requirements**

1. To identify the types and duration of training courses with periods in CAD/CAM needed by the industry.
2. To determine other institutes offering similar training courses with annual intake in each case.

3. To estimate the number of eligible personnel likely to be available annually for the training courses identified above.

### **Organisation Structure and Commercial Viability**

1. Suggest an organisation structure in consonance with the founding objectives, market realities and the diverse nature of activities of the organisation. Indicate the profile, roles and responsibilities of the key members of the proposed organisation.
2. Examine the feasibility of operating TRTC on a commercial basis. Sensitivity to key financial parameters will also be analysed.

## **1.4 Methodology for the Study**

The methodology adopted for the study involved the following steps:

### **a. Desk Research and Analysis of the User Industry According to Sector**

Desk research was conducted to collect secondary data on the following:

- Tooling industry trends.
- Current users of tooling.
- Current employment pattern of personnel trained in tooling.
- TRTC's existing competitors:
  - Tooling manufacturers
  - CAD/CAM training institutions

The growth trends for each sector were also analysed.

### **b. Primary Data Collection**

- i. A primary survey of select tooling users across industrial sectors was conducted to identify the characteristics of the market and to assess the extent of demand. The survey also involved collecting data on the requirements of personnel trained in tooling. The survey covered a cross-section of tooling users in large-, medium-, and small-scale industries. A semi-structured questionnaire was circulated among the users. A copy of the questionnaire is given in Appendix B. Appendix C presents a list of the organisations that were covered during the survey.
- ii. Experts in the tooling industry were contacted to understand their views on the current and emerging trends in the industry.

**c. Analysis of Market Characteristics**

The characteristics of the market were analysed to determine the tooling usage, requirement, and supply pattern in the following sectors of the industry:

- Auto Ancillary
- Electrical
- Electronics and Telecom
- Foundry
- General Engineering
- Packaging
- Plastics
- Rubber

**d. Estimation of Demand for Tooling**

On the basis of the analysis of the characteristics of the market, the current demand for tooling was estimated in terms of the value and type of tooling. Depending on the requirements of existing users, the growth trends in various sectors of the industry, and the trend of new investments in Goa, the demand for tooling was projected for each year up to the year 2009-10.

**e. Assessment of Demand for Trained Personnel**

The demand for personnel trained in the design and manufacture of tooling was estimated on the basis of the information collected during the survey of the industry.

**f. Assessment of Additional Equipment Requirements**

The trends in tooling technology were studied in conjunction with the requirements of the industry. TRTC's existing equipment was reviewed on the basis of this study, and after taking into consideration the size of the target market.

**g. Identification of the Training Courses Offered by TRTC**

Institutes offering courses on tooling were surveyed. On the basis of the survey, and the requirements of the industry, the type and duration of the training courses that TRTC should offer were identified.

**h. Organisation Structure**

TRTC's existing organisation structure was reviewed and restructured after taking into consideration TRTC's objectives, the existing business environment, and key financial parameters that have an impact on TRTC's commercial viability.

**i. Commercial Viability**

TRTC's commercial viability was assessed on the basis of the following:

- TRTC's objectives.
- Current and past financial information.
- Demand projections for tooling.

## **1.5 Organisation of the Report**

This report has been divided into 5 parts. Each part consists of one or more chapters. The report consists of 9 chapters (including this chapter) and 7 appendices.

### **Part A**

**Chapter 1** profiles TRTC, presents the background to the study, details the scope and terms of reference of the study, and outlines the methodology adopted by TCS to conduct the study.

**Chapter 2** presents an overview of the tooling industry.

### **Part B**

**Chapter 3** details the characteristics of the tooling market in Goa.

**Chapter 4** presents an analysis of the various sectors and the demand for tooling in these sectors in Goa.

**Chapter 5** presents an estimate of the demand for tooling for the period 1998-2010.

### **Part C**

**Chapter 6** presents the TCS' recommendations regarding TRTC's training courses.

### **Part D**

**Chapter 7** presents a study of TRTC's existing organisation structure, the rationale for reviewing and redesigning the organisation structure, and proposed organisation structure (including the roles and responsibilities of key personnel).

**Chapter 8** presents an analysis of the commercial viability of TRTC.

**Chapter 9** summarises the conclusions of the study.

## **Appendices**

- A** Industry Participation
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Chapter 2  
**The Tooling Industry**

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This chapter identifies the existing trends in the tooling industry world wide. It also presents an overview of the existing state of the tooling industry in India, particularly in Goa.

## **2.1 Global Scenario**

### **Market Trends**

The Asia-Pacific region is emerging as the preferred centre for the manufacture of tools world wide. Established in 1992, the Federation of Asian Die and Mould Associations (FADMA) has eleven member countries — China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan, Thailand, and Philippines. In 1996, these countries accounted for 45 percent of the estimated world output of moulds and dies. This figure is expected to touch 80 percent by the year 2000.

Taiwan has emerged as the one of the leading manufacturers of tools in the Asia-Pacific region. Taiwan is the fifth largest manufacturer of tools in the world, with annual revenues exceeding US\$ 1 billion. Taiwan has been able to gain an edge over the competition by manufacturing quality tools at competitive prices, and with short delivery lead times. A number of commercial tool rooms in Taiwan that operate on a large scale have cut down on the cost and time taken to manufacture tools by adopting standardised components and modular design concepts, and using CAD/CAM processes.

In Hong Kong, approximately 60 percent of the industry's output caters to the local market while approximately 15 percent of the output is exported to China. Nearly a third of the manufacturers in Hong Kong are equipped with CAD/CAM systems and a good number of other manufacturers have Electrical Discharge Machines (EDMs) and other CNC machines. Recently, one of Hong Kong's leading tool rooms developed a software to meet the specific information and business process requirements of commercial tool rooms. This software is probably the first of its kind in the world.

As the competition from tool makers in the Asia-Pacific region increases, tool makers in Germany are forming groups consisting of 30-40 tool makers (each with a different area of expertise) in order to manufacture high quality tools. This trend to form groups has been observed especially in projects that involve plastics and metal. No other region in the world is performing such a high number of consortia activities. However, manufacturers in regions other than the Asia-Pacific region are less inclined to form groups.



## **Technology Trends**

Rapid Prototyping (RP) is perceived world wide as an important technological advancement that will influence the tooling industry. RP helps bridge engineering and manufacturing. RP facilitates integrated product and process design, and enables users to assess whether a proposed design can be manufactured. RP leverages the benefits of CAD solid modelling to produce product samples in a very short time frame. It is most effective for building complex parts.

Organisations in Japan and Europe are channelling their talent and research funds into the development and application of RP technologies. Japan has taken a long-range approach to understand market needs and requirements while refining stereolithography. Most companies are using RP on an experimental basis. Several companies in Japan have formed the Japan Association of Rapid Prototyping Industry (JARI) with the support of the Ministry of International Trade and Industry (MITI). The Japanese government is also offering tax incentives to encourage the purchase of RP systems by small- and medium-sized companies.

Most European countries, with the exception of Germany, are less focused on the development of new system technology. Instead, they concentrate on the application of existing technologies, and on research and educational needs and opportunities.

Rapid Tool Making (RTM) is probably an emerging paradigm for tool making. When RTM is implemented effectively within a concurrent engineering environment, it has the potential to improve dramatically the speed and cost of product development. Tooling costs and development times can be reduced by more than 75 percent by using CAD, electronic data transfer, process simulation, and RTM technologies.

RTM is especially useful when tool geometry makes traditional machining difficult. The benefits are greatest for such sectors as consumer electronics, automotive components, and toys that produce in large volumes and that value reduced time to market. Currently, limitations of accuracy, speed, and capability have restricted the application of RTM to prototype and low volume tooling.

With the introduction of RTM, it is expected that manufacturers will improve traditional tool making technologies to remain competitive. Companies such as Ford, Texas Instruments, and United Technologies are already encouraging their parts suppliers and tool makers to adopt RTM technologies. Several leading tool makers such as Santin Engineering, Laserform, and Techni-products have implemented RTM technologies.

Tool makers may choose to invest in a range of technologies for implementing RTM and offer one-stop tooling services, or opt to enter into strategic alliances in order to offer team-based tooling services.

## **2.2 Tooling Industry in India**

The Captive Tool Rooms (CTRs) of the manufacturers cater to their tooling requirements. In case of shortfalls in volumes, the volume required is imported. The Commercial Tool Rooms (CmTRs) mainly fulfil the training and development needs of the manufacturers.

Globalisation is likely to have a major impact on the structure and orientation of the tooling industry in India as there will be an increase in competition and enhanced market penetration. Consequently, there will be an increase in the demand for tools. The increase in the demand for tools will be driven by the following factors:

- New products
- New investments
- Capacity expansion
- Replacement
- New processes
- Design modifications
- Research and development

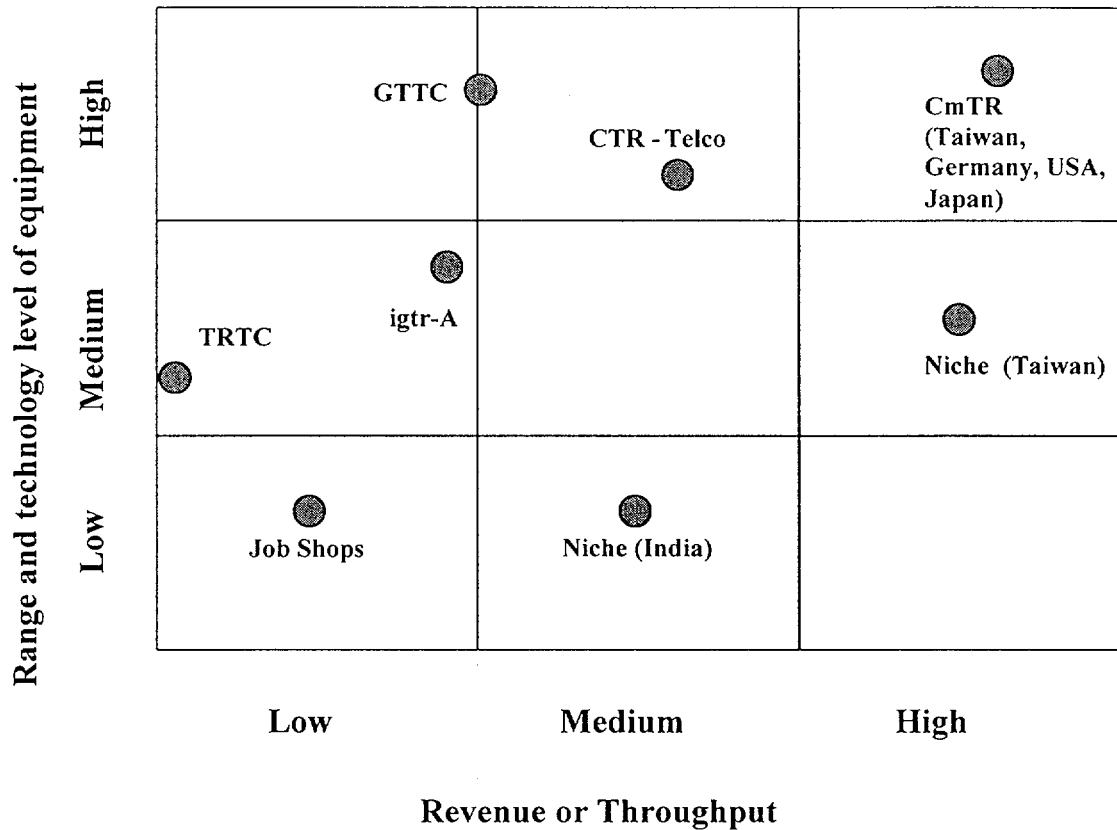
However, it is expected that manufacturers may not make additional investments in their CTRs, due to the following reasons:

- Manufacturers' focus on manufacturing products
- High cost and long lead times for manufacturing tools in the CTRs
- Scarcity of trained and competent tool makers
- Lack of adequate funds for modernising and expanding the CTRs

As the demand increases, and considering the capacity and preparedness of the CmTRs, the output will not meet the requirements. The shortfall in volumes will be met primarily through imports. As the gap between demand and supply widens, some manufacturers may even close their CTRs.

According to Tool and Gauge Manufacturers Association (TAGMA), there will be the overall demand in India will be approximately Rs. 32,000 million in the year 2000, and the supply will fall short of the demand by Rs. 12,000 million. The installed capacity is estimated to be approximately Rs. 20,000 million, including CTRs, CmTRs, and miscellaneous job shops.

The widening gap between demand and supply will necessitate reorientation of the tooling industry in India, and modernisation and expansion or closure of the CTRs and CmTRs. Figure 3.1 illustrates the relative position of tool rooms (qualitative).



**Figure 3.1 Relative position of Tool Rooms (Qualitative)**

The tooling industry in India is no longer competitive in terms of price, quality, and delivery time. The industry is losing business to tool rooms in countries such as Hong Kong, Taiwan, and South Korea, which have received large import orders.

TAGMA has studied the problems faced by tool rooms in India. These problems are listed below under the appropriate heads.

#### 1. Investment

- High cost of imported machines and equipment
- High cost of operating and maintaining machines and equipment
- Low return on investment due to:
  - Long development time as tooling involves customisation
  - High working capital requirements as 85-90 percent of the tool costs are due to value-addition and only 10-15 percent of the costs are due to materials
  - Inability to educate user industries about value-pricing and the benefits of high quality tools

#### 2. Knowledge and Skills

- Scarcity of tooling engineers
- High attrition rate of skilled tool makers

- Lack of co-ordination between tool designers and tool makers
- Lack of knowledge-sharing. Consequently, tool designers and manufacturers have to learn from experience.

### 3. Tool Manufacturing

- High cost of procuring and processing tools due to:
  - Unavailability of good quality steel in India for manufacturing tools (*See the note at the end of this list*)
  - High import costs and duties for importing steel for manufacturing tools
  - Delays in procuring raw materials and tool components
  - Enhanced frequency of orders leading to high costs as tool manufacturing requires small quantities, and large varieties and sizes to be cost-effective
- Inadequate heat treatment facilities due to:
  - High cost of procuring, operating, and maintaining modern facilities
  - Quality-related problems associated with older facilities
  - Poor knowledge of heat treatment procedures
  - Unprofessional work attitude and compromises in quality
- Absence of retail outlets for standard tooling elements such as ejector pins and sleeves, piercing punches, guide pins, bushes, special springs, collapsible cores, and sensors leading to:
  - High import costs and duties for imported tool components
  - Delays in procurement
- Poor support and service from CNC/CAD suppliers leading to:
  - Under-utilisation of technology
  - Longer and frequent breakdowns of machines due to unavailability of spares and incompetence of service engineers
- Lack of communication support for facilitating the rapid development and deployment of tools

#### Note

As a result of the problems in manufacturing tools from Indian-made steel, companies such as Godrej and Boyce, which have leading tool rooms in India, have suggested that the steel for manufacturing tools should be imported from international firms such as Assab of Sweden, Thyssen of Germany, and Bohler of Austria. Problems with Indian-made steel include:

- Abnormal variations in the composition of different alloying elements
- Internal defects such as cracks, rolling flakes, and excessive gas porosity
- Poor harden-ability, non-uniform hardness, and high distortion
- Poor maintainability
- Surface defects such as pitting, and excessive de-carbonisation
- Variations in sizes and geometrical configurations
- Waviness leading to twists and bends

#### 4. Others

- Procedural delays in tool rooms
- Inability to deliver quality tools on schedule consistently
- Inadequate marketing of tool making capabilities
- Poor system of interaction between user industries and the tool rooms
- Lack of accreditation for tool rooms leading to proliferation of small tool makers manufacturing inferior and substandard tools

### 2.3 Tooling Industry in Goa

The tooling industry is nascent. Most firms in Goa procure the tools they require from established manufacturers in Maharashtra and Karnataka, or through imports.

There are ten major industrial estates in Goa where developed industrial plots are available on lease basis, and built-up sheds are available on rental basis. The electrical power for the industries is obtained from neighbouring states. The industrial estates are located at:

- Bethora
- Bicholim
- Corlim
- Cuncolim
- Kundaim
- Mapusa
- Margao
- Sancoale
- Tivim
- Verna

There are ten CTRs in Goa. These are:

- Automobile Corporation of Goa Limited
- Chemtrols Engineering
- Crompton Greaves
- Dempo
- Goa Auto Accessories Limited
- IFB
- National Auto Accessories Limited
- Pentagon Engineering
- Phil Corporation
- Sesa Goa

Besides TRTC, there are several small machining shops that repair tools.

*[Sources: TCS, Primary survey, Internet, DieMould India-98 Directory, Working Group Report on Tool Room Industry (by TAGMA)]*

## Chapter 3

# Market Characteristics

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This chapter presents an analysis of the results of the primary survey that was conducted by TCS' consultants, and details the characteristics of the tooling market in Goa. The chapter presents an analysis of the usage, production, and purchasing pattern, and attributes of tools in Goa.

According to Centre for Monitoring Indian Economy (CMIE), the Gross Domestic Product (GDP) of industry in Goa is 0.4 percent of the GDP of the total Indian industry. This implies that industrial development in Goa is still in its infancy, and there is a vast scope for growth. Primarily, the industries in Goa have been developed in the following sectors:

- Auto Ancillary
- Electrical
- Electronics and Telecom
- Foundry and Forging
- Packaging
- Plastics and Chemicals
- Rubber

As Goa is the largest tourist centre in India, it has been declared a non-polluting zone. Consequently, industries in sectors that are environmentally hazardous (such as Petrochemicals, Fertilisers, Cement, and Steel) cannot be developed in the state.

The industry in Goa can be classified into three main categories — Large, Medium, and Small. Large category companies are companies with a sales turnover of more than Rs.100 million. The Medium category consists of companies with a sales turnover between Rs. 10 million and Rs. 100 million constitute, and the Small category consists of companies with a sales turnover of less than Rs. 10 million. A majority of the companies fall in the Small category. The break-up of the companies surveyed in Goa according to category is as follows:

- Small — 140
- Medium — 20
- Large — 20

During the period 1995-98 the growth in the number of companies in the Large and Medium categories was 9 percent, which is a healthy trend. However, there has been a decline in the growth of Goa's small-scale industries over the last five years.

### 3.1 Tooling Usage Pattern

This section presents an analysis of the tooling usage pattern under the following heads:

- Tooling usage according to category and company size (in terms of value)
- Tooling usage according to category and industry (in terms of value)

#### 3.1.1 Tooling Usage According to Company Size

On the basis of the findings of the primary survey, the Figures 3.1 through 3.3 illustrate the percentage usage (in terms of value) of the various tooling types in Small, Medium, and Large companies. Moulds are the most widely used tooling type in all categories of companies.

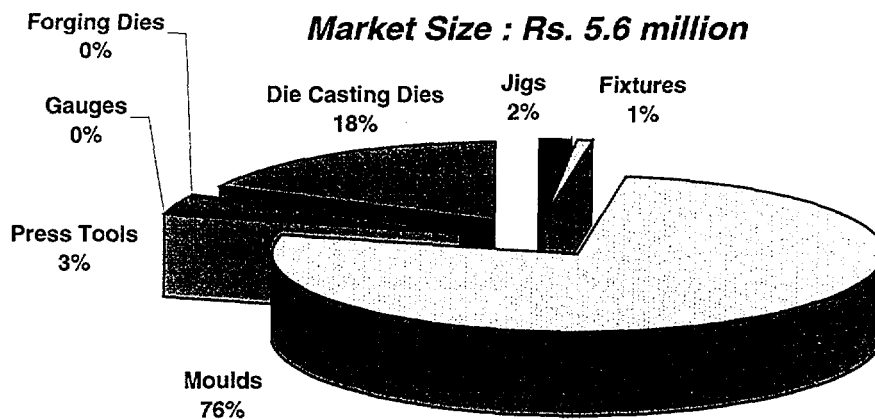


Figure 3.1 Tooling Demand for Small Firms in Goa for 1997-98

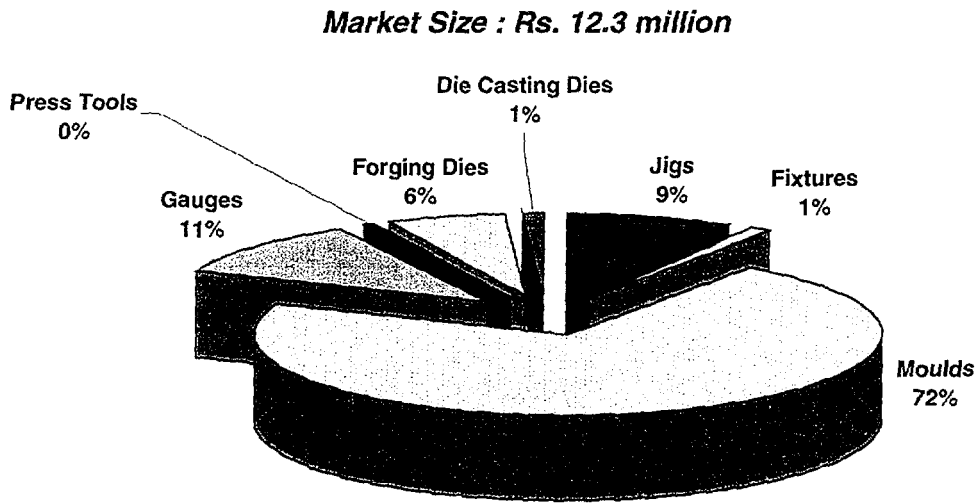


Figure 3.2 Tooling Demand for Medium Firms in Goa for 1997-98

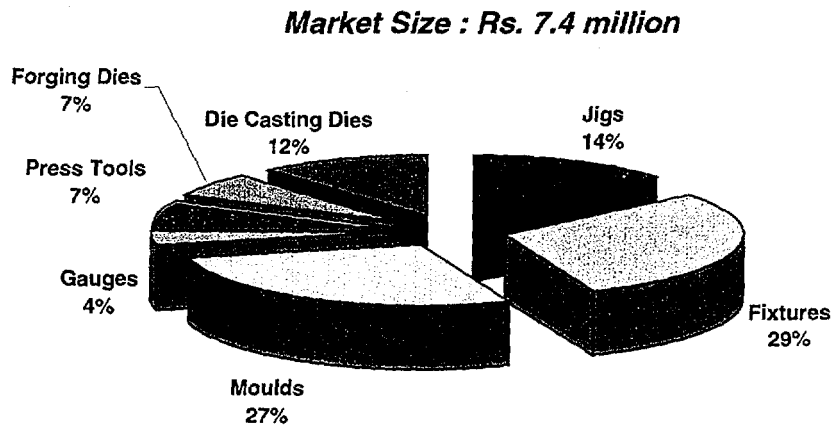
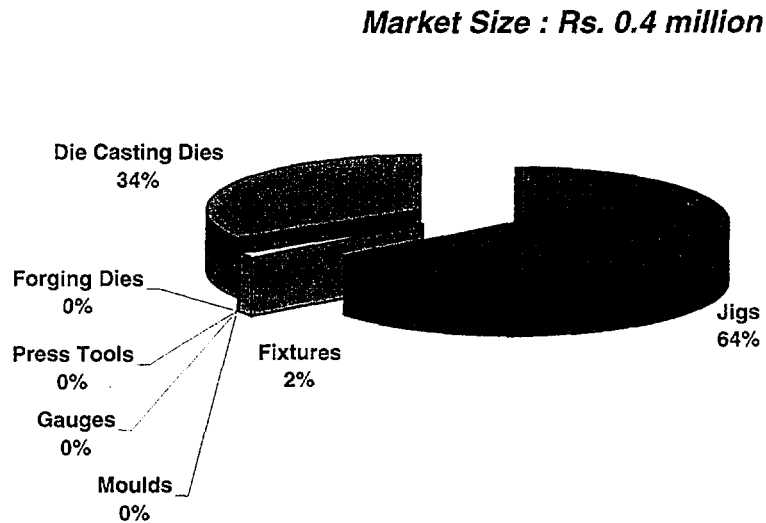


Figure 3.3 Tooling Demand for Large Firms in Goa for 1997-98



### 3.1.2 Tooling Usage According to Category Across Industries

On the basis of the findings of the primary survey, Figures 3.4 through 3.11 illustrate the percentage usage (in terms of value) of the various tooling types across industries. Moulds are the most widely used tooling type in the Rubber, Plastics, Electronics and Foundry industries. Jigs are the most widely used tooling type in the Auto Ancillary and Electrical industries. Fixtures and Die-Casting Dies are the two most widely used tooling types in the General Engineering industry.



**Figure 3.4 Tooling Demand for Auto Ancillary Firms in Goa for 1997-98**

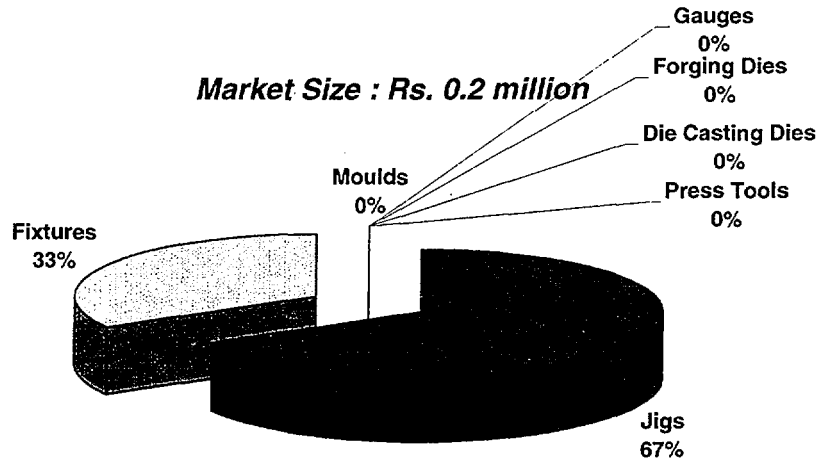


Figure 3.5 Tooling Demand for Electrical Firms in Goa for 1997-98

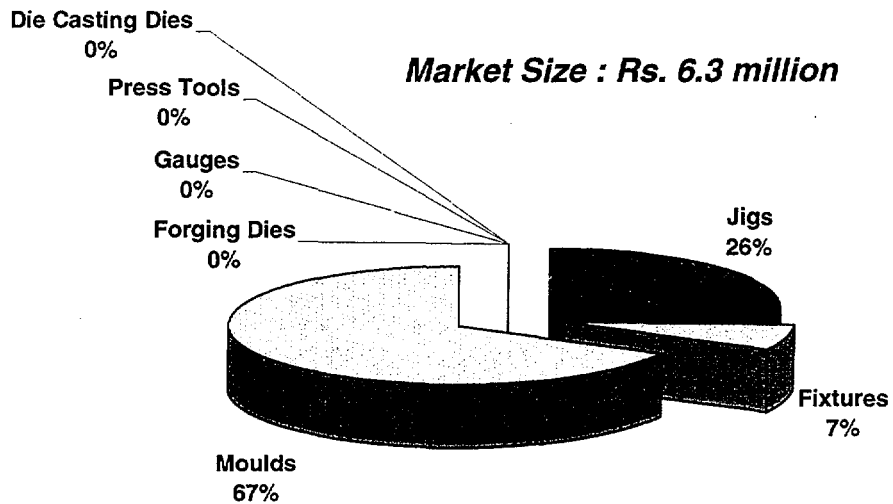


Figure 3.6 Tooling Demand for Electronics & Telecom Firms in Goa for 1997-98

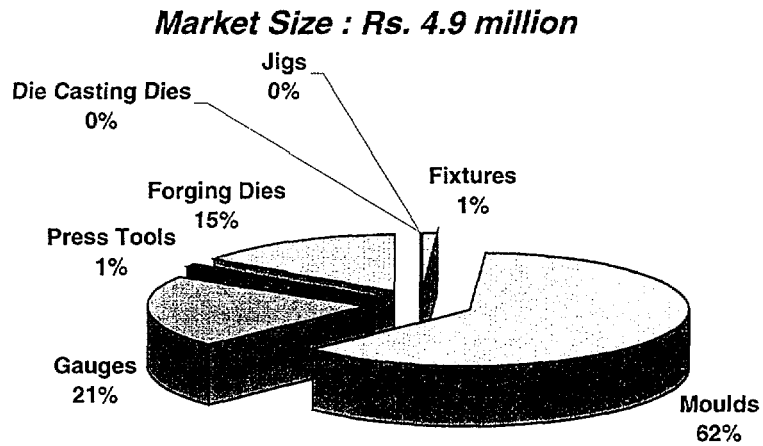


Figure 3.7 Tooling Demand for Foundry & Forging Firms in Goa for 1997-98

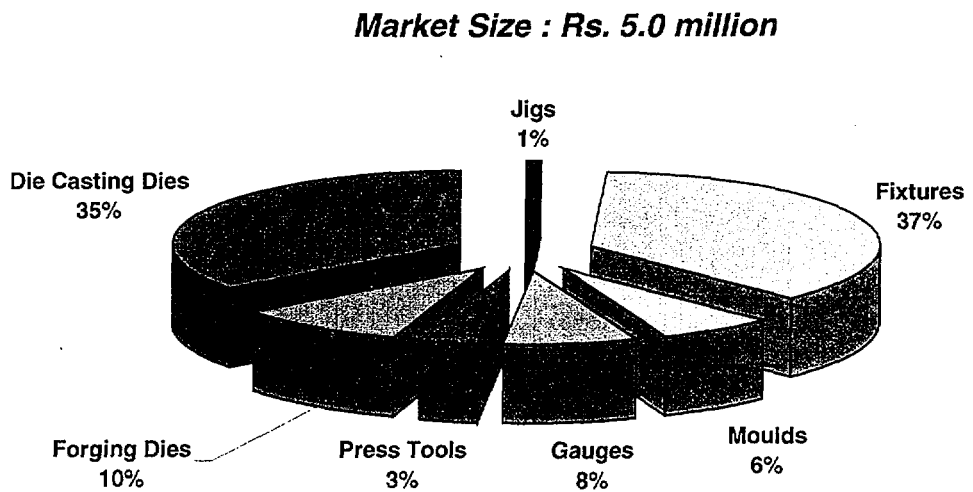


Figure 3.8 Tooling Demand for General Engineering Firms in Goa for 1997-98

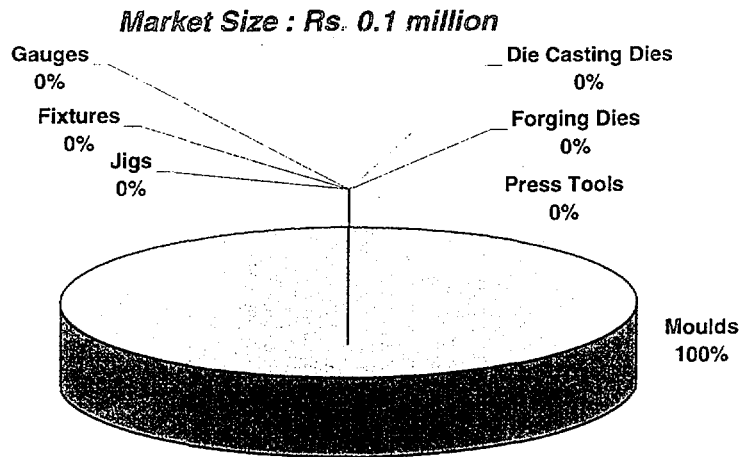


Figure 3.9 Tooling Demand for Packaging Firms in Goa for 1997-98

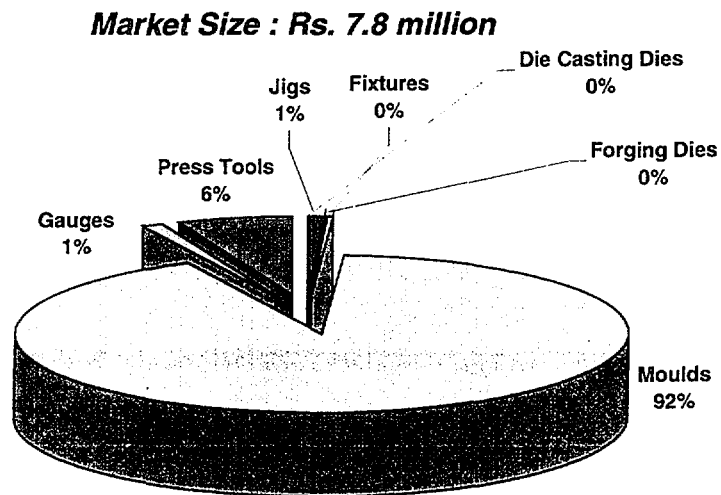


Figure 3.10 Tooling Demand for Plastic Firms in Goa for 1997-98

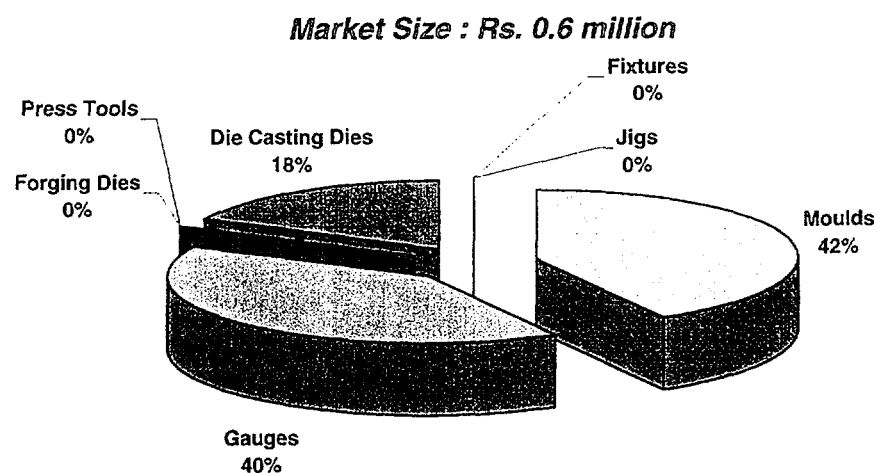


Figure 3.11 Tooling Demand for Rubber Firms in Goa for 1997-98

### 3.2 Tooling Supply

Tooling is procured from the following sources:

- CTRs
- CmTRs
  - Government Tool Rooms
- Small-scale Tool Manufacturers
- External Domestic Manufacturers (that is, from states other than Goa)
- Imports

### 3.2.1 Tooling Supply Pattern

Figure 3.12 illustrates the tooling supply pattern.

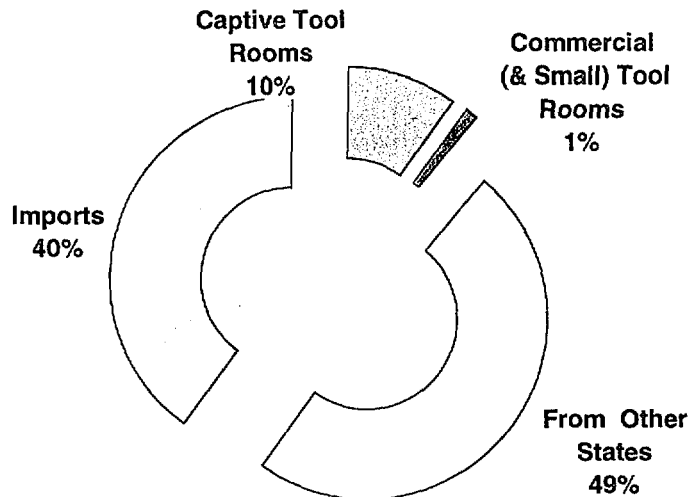


Figure 3.12 Tooling Supply Sources in Goa

#### i) Captive Tool Rooms

Currently, the existing CTRs perform the following activities:

- Designing and manufacturing tooling
- Servicing tooling
- Sub-contracting the manufacture of smaller tooling to small-scale tool manufacturers
- Sub-contracting job-work to workshops with specialised facilities

On the basis of the primary survey, the production of CTRs during 1997-98 is estimated to be approximately Rs. 4 million. The CTRs considered for preparing the estimate are Phil Corporation, Crompton Greaves, Chemtrols Engineering, and Pentagon Engineering Industries. The CTRs of ACGL and IFB have not been considered.

#### ii) Commercial Tool Rooms

Currently, TRTC is the only CmTR in Goa.

#### iii) Imports and Other Sources

During the period 1997-98, tooling worth Rs. 35 million was imported for Goa. Industries in Goa are making sizeable imports of moulds and dies. Some tooling is imported from European and South-East Asian countries as these countries supply tooling at competitive prices and with shorter lead times. Another reason for importing tooling from Europe and

America is that the parent company of many multinational corporations has a well-developed network of vendors in countries such as UK, Germany, and USA.

The other tooling sources include small and medium scale tool manufacturers in other states. Most companies source tooling from Bangalore and Belgaum (Karnataka) and Mumbai (Maharashtra).

### **3.2.2 Tooling Supply by Category**

The tooling supply pattern as determined by primary survey findings is summarised below:

- Precision moulds and dies are usually sourced from commercial tool rooms outside Goa or are imported. This is done even by those companies who have a captive tool room facility.
- Jigs and fixtures are usually procured from Goa or nearby states and those companies who have a captive tool room, manufacture them on their own.
- Press tools are mainly manufactured in captive tool rooms in Goa.
- Gauges are rarely made-to-order. Standard gauges are easily available off the shelf.

### **3.3 Tooling Attribute Analysis**

An analysis was performed identify the various tooling attributes that have an impact on buyers in user industries, and to determine the relative importance of these attributes.

Table 3.1 presents the results of the attribute analysis.

**Table 3.1 Relative Importance of Attributes**

<b>Attribute</b>	<b>Relative Importance (Rank)</b>	<b>Percentage Ranking Most Important</b>
Precision / Quality	1	62%
Price	2	19%
Lead Time (for Tools delivery)	3	7%
Accessibility of Tool Manufacturer	4	5%
Manufacturer's Facilities	5	2%
Tool Manufacturer	6	5%

*Source: TCS Primary Survey Estimate*

## Chapter 4 Analysis of Sectors

This chapter presents a brief analysis of those sectors of Goa's industry that have tooling requirements. These sectors are as listed below.

- Auto Ancillary
- Electrical
- Electronics and Telecom
- Foundry
- General Engineering
- Packaging
- Plastics
- Rubber

The review of these sectors is based on secondary literature and industry findings. Each section in this chapter presents the analysis of a particular sector, and details the tooling-related aspects that are specific to the sector.

### 4.1 Auto-Ancillary Industry

Table 4.1 presents an analysis of the Auto Ancillary industry.

**Table 4.1 Auto Ancillary Industry Analysis**

<p style="text-align: center;"><b><u>Positives</u></b></p> <ul style="list-style-type: none"> <li>• The industry is quality conscious.</li> <li>• Talented professionals are available.</li> <li>• The availability of cheap labour and the efficient management of overheads management result in lower costs.</li> </ul>	<p style="text-align: center;"><b><u>Negatives</u></b></p> <ul style="list-style-type: none"> <li>• The industry is affected by fluctuations in the prices of raw materials.</li> <li>• Buyers have considerable bargaining power.</li> </ul>
<p style="text-align: center;"><b><u>Potential/ Future Direction</u></b></p> <ul style="list-style-type: none"> <li>• As the number of automobiles increases, it is expected that the demand arising from the replacement of auto components and Original Equipment Manufacturers (OEM) will increase.</li> <li>• Major auto manufacturers are planning to set up their manufacturing facilities in India. The outsourcing of component production by these manufacturers will expand the scope of the market.</li> <li>• If the cost of production is reduced, there is a potential market for exports.</li> </ul>	<p style="text-align: center;"><b><u>Constraints/ Threats</u></b></p> <ul style="list-style-type: none"> <li>• The purchasing power of end-users in the automotive sector is not sustainable.</li> <li>• The industry suffers from infrastructure deficiencies.</li> <li>• There are a number of manufacturers who produce spurious goods.</li> </ul>

*(Source: TCS estimate)*



According to the December-January 1998 issue of Express Investment Week, the Auto Ancillary industry is expected to grow at a slow rate as top-tier companies are supplying finished sub-assemblies to automobile manufacturers while low-tier companies are supplying components to the sub-assembly manufacturers. The industry is going through a phase during which inventories are being reduced, processes re-engineered, and costs minimised.

The Auto Ancillary industry is dominated by one firm, Automobile Corporation of Goa Ltd. (ACGL), as can be seen from the figures presented in Table 4.2.

**Table 4.2 Auto Ancillary Industry Characteristics**

	Number of Firms	Sales Turnover
Total Market in Goa	4	Rs. 926 million*
Top Contributing Firms	1	Rs. 830 million (that is, 90 percent of the total market in Goa)

(Source: TCS estimate)

\* Does not include the turnover of Goa Auto Accessories Ltd.

Unlike in Maharashtra, Tamil Nadu, Haryana, and Gujarat where there is a considerable demand for tools from diverse sources in the automotive and Auto Ancillary industry, the demand for tools from the Auto Ancillary industry in Goa is largely from ACGL (which is a subsidiary of Telco). However, as ACGL manufactures the large and complex tools that it requires in its own CTR, the potential demand will be marginal, unless there is a significant change in this skewed demand structure.

## 4.2 Electrical Industry

The growth of the electrical industry is primarily due to the Power and the Consumer Durable sectors.

Table 4.3 presents an analysis of the Electrical industry.

**Table 4.3 Electrical Industry Analysis**

<u>Positives</u>	<u>Negatives</u>
<ul style="list-style-type: none"> <li>The gap between demand and supply is increasing.</li> <li>There is a growing market for world class quality, and state-of-the-art technology products.</li> </ul>	<ul style="list-style-type: none"> <li>Most of the business is with the cash-strapped Public Sector Undertakings (PSU) and State Electricity Boards (SEB).</li> <li>Tariffs are being subsidised.</li> <li>Transmission and distribution losses reduce profits.</li> </ul>

<u>Potential/ Future Direction</u>	<u>Constraints/ Threats</u>
<ul style="list-style-type: none"> <li>Investments in the power sector will result in a high growth in the production of transmission and distribution equipment.</li> <li>It is expected that in the years to come India will be one of the largest markets for power-related equipment.</li> <li>The huge pool of technically skilled person-power could be employed for manufacturing various products for export.</li> </ul>	<ul style="list-style-type: none"> <li>Unstable governments, and inconsistent and populist policies affect adversely the implementation of power projects.</li> <li>The reduction in industrial production and investment have had an adverse impact on the industry.</li> <li>The industry is sensitive to problems in fuel supply.</li> </ul>

(Source: TCS estimate)

The analysis of the Consumer Durable sector is identical to that of the Electronics sector which is presented in the following section.

The Electrical industry in Goa is dominated by two firms, Crompton Greaves and IFB, as can be seen from the figures presented in Table 4.4.

**Table 4.4 Electrical Industry Characteristics**

	Number of Firms	Sales Turnover
Total Market in Goa	11	Rs. 264 million
Top Contributing Firms	2	Rs. 260 million (that is, 99 percent of the total market in Goa)

(Source: TCS estimate)

As in the case of the Auto Ancillary industry, the demand structure for the Electrical industry in Goa is also skewed. Consequently, in addition to the demand due to new investments, the demand for tools will be influenced mainly by the top two companies.

### 4.3 Electronics and Telecom Industry

Table 4.5 presents an analysis of the Electronics industry.

**Table 4.5 Electronics Industry Analysis**

<u>Positives</u>	<u>Negatives</u>
<ul style="list-style-type: none"> <li>Several companies have tied up with companies of international repute thereby, ensuring that products of world class quality are made available to customers.</li> <li>Several companies of international repute dealing in white goods are entering the Indian market.</li> <li>The number of models and brands competing for positioning space is increasing.</li> </ul>	<ul style="list-style-type: none"> <li>Too many companies are concentrating only on the upper strata of the Indian middle-class the purchasing potential of which has been grossly overestimated.</li> <li>The industry is sensitive to fluctuations in prices.</li> </ul>

<ul style="list-style-type: none"> <li>There will be a sustainable demand due to the growing class of consumers with specific preferences.</li> </ul>	
<p style="text-align: center;"><b><u>Potential/ Future Direction</u></b></p> <ul style="list-style-type: none"> <li>If the cost of production is low, there is a potential market for exports.</li> <li>Innovative financing schemes are being introduced to woo customers.</li> <li>Perceptions about the products are changing due to innovations, and enhancements in the features and definition of products.</li> <li>Advertisements that aim to educate the consumer will have a significant impact, and will make consumers consider factors other than the price.</li> </ul>	<p style="text-align: center;"><b><u>Constraints/ Threats</u></b></p> <ul style="list-style-type: none"> <li>The industry is affected adversely by the government's policy on the import of parts and components for the manufacture of electronic and consumer durables.</li> <li>The industry suffers from deficiencies in infrastructure such as poor quality of power supply.</li> <li>The industry needs to adapt products to suit Indian conditions.</li> </ul>

(Source: TCS estimate)

Table 4.6 presents an analysis of the Telecom industry.

**Table 4.6 Telecom Industry Analysis**

<p style="text-align: center;"><b><u>Positives</u></b></p> <ul style="list-style-type: none"> <li>There is a growing market for world class quality and state-of-the-art technology products.</li> <li>There is a growing trend towards the Internet, intranets, and networked environments.</li> </ul>	<p style="text-align: center;"><b><u>Negatives</u></b></p> <ul style="list-style-type: none"> <li>The current number of telephone lines is below the targeted number.</li> <li>The amount of investment required is not available due to the lack of funds.</li> <li>Long distance communication has not been privatised leading to a monopoly by the Department of Telecommunications (DOT) and Videsh Sanchar Nigam Limited (VSNL).</li> </ul>
<p style="text-align: center;"><b><u>Potential/ Future Direction</u></b></p> <ul style="list-style-type: none"> <li>Value-added services (such as radio paging and mobile telephony) will be introduced, and basic telephone services will be expanded.</li> <li>Privatisation and liberalisation of the sector will result in competition between service providers, and ensure the availability of better services to customers.</li> </ul>	<p style="text-align: center;"><b><u>Constraints/Threats</u></b></p> <ul style="list-style-type: none"> <li>The industry has been affected adversely by the delay in the formation of, and processing by regulatory bodies such as Telecom Regulatory Authority of India (TRAI).</li> <li>DOT and TRAI have been assigned conflicting roles.</li> <li>The industry suffers from deficiencies in infrastructure.</li> <li>The industry has been affected adversely by successive unstable governments.</li> <li>The industry has been affected adversely by the government's inconsistent policies.</li> </ul>

(Source: TCS estimate)

The Electronics and Telecom industry in Goa is dominated by three firms, namely, Sparrow Electronics, Goa Telecommunications and Systems Ltd., and Anant Electronics Industries, as can be seen from the figures presented in Table 4.7.

**Table 4.7 Electronics & Telecom Industry Characteristics**

	Number of Firms	Sales Turnover
Total Market in Goa	13	Rs. 657 million
Top Contributing Firms	3	Rs. 480 million (that is, 73 percent of the total market in Goa)

(Source: TCS estimate)

The demand for tools from the Electronics and Telecom sectors in Goa varies widely and is independent of the turnover of the firms.

#### 4.4 Foundry Industry

Table 4.8 presents an analysis of the Foundry industry.

**Table 4.8 Foundry Industry Analysis**

<p style="text-align: center;"><b><u>Positives</u></b></p> <ul style="list-style-type: none"> <li>• It is difficult to establish new ventures as large capital investments are required.</li> <li>• The cost of production in India is low due to the availability of skilled person-power and cheap labour.</li> </ul>	<p style="text-align: center;"><b><u>Negatives</u></b></p> <ul style="list-style-type: none"> <li>• The industry is significantly dependant on the automobile sector.</li> <li>• The Forging industry accounts for 65-70 percent of the demand, and the Castings industry accounts for 60 percent of the demand.</li> </ul>
<p style="text-align: center;"><b><u>Potential/ Future Direction</u></b></p> <ul style="list-style-type: none"> <li>• Major automobile manufacturers are interested in setting up dedicated foundries in India.</li> <li>• It is expected that there will be a large demand for pollution control products.</li> </ul>	<p style="text-align: center;"><b><u>Constraints/Threats</u></b></p> <ul style="list-style-type: none"> <li>• There are pressures on the buyer industry to minimise costs by integrating backwards and building in-house foundries to meet internal needs. This will reduce the bargaining power of the Foundry industry.</li> <li>• Innovations in processes and products are eliminating the need for products manufactured by the Foundry industry.</li> </ul>

(Source: TCS estimate)

The Foundry industry in Goa is dominated by one firm, Goa Invescast Ltd., as can be seen from the figures presented in Table 4.9.

**Table 4.9 Foundry Industry Characteristics**

	Number of Firms	Sales Turnover
Total Market in Goa	8	Rs. 33 million
Top Contributing Firms	1	Rs. 30 million (that is, 90 percent of the total market in Goa)

(Source: TCS estimate)

The demand for tools from this sector may increase exponentially when the project for Texid, s.p.a, which is an Italian company, is executed.

#### 4.5 General Engineering Industry

The General Engineering sector consists of various segments including those manufacturing bearings, diesel engines, oil and gas equipment, wagons, welding equipment, boilers, compressors, and pumps.

Table 4.10 presents an analysis of the General Engineering industry.

**Table 4.10 General Engineering Industry Analysis**

<p style="text-align: center;"><u>Positives</u></p> <ul style="list-style-type: none"> <li>• Talented professionals are available.</li> <li>• The cost of production in India is low due to the availability of inexpensive labour.</li> </ul>	<p style="text-align: center;"><u>Negatives</u></p> <ul style="list-style-type: none"> <li>• A low cost structure is required for the industry to be sustainable.</li> <li>• The designs of most products are developed outside India and involve higher margins.</li> <li>• A large working capital is required due to the high levels of inventories.</li> <li>• An extensive distribution network is required in order to capture the replacement and international markets.</li> </ul>
<p style="text-align: center;"><u>Potential/ Future Direction</u></p> <ul style="list-style-type: none"> <li>• The huge pool of technically skilled person-power could employed for manufacturing various products for export.</li> <li>• Major international engineering firms have evinced an interest in outsourcing their production requirements from India.</li> <li>• Companies are entering into joint ventures and marketing tie-ups with vendors of international repute.</li> </ul>	<p style="text-align: center;"><u>Constraints/ Threats</u></p> <ul style="list-style-type: none"> <li>• The industry is sensitive to economic recession.</li> <li>• There are a number of manufacturers producing spurious goods.</li> </ul>

(Source: TCS estimate)

The General Engineering industry in Goa is dominated by four firms, namely, Titanor Components, Chemtrols Engineering, Crompton Greaves, and Tata Infotech, as can be seen from the figures presented in Table 4.11.

Table 4.11 General Engineering Industry Characteristics

	Number of Firms	Sales Turnover
Total Market in Goa	138	Rs. 2,767 million
Top Contributing Firms	4	Rs. 1,880 million (that is, 68 percent of the total market in Goa)

(Source: TCS estimate)

## 4.6 Packaging Industry

Table 4.12 presents an analysis of the Packaging industry.

Table 4.12 Packaging Industry Analysis

<p><b><u>Positives</u></b></p> <ul style="list-style-type: none"> <li>Flexible packaging systems are being used increasingly.</li> <li>The popularity of composite plastic laminates is growing.</li> <li>Rust-free and durable tin plates, and aluminium are replacing metal packaging.</li> </ul>	<p><b><u>Negatives</u></b></p> <ul style="list-style-type: none"> <li>The perception abroad is that the quality of products manufactured in India is poor. This has resulted in low exports.</li> </ul>
<p><b><u>Potential/ Future Direction</u></b></p> <ul style="list-style-type: none"> <li>Perceptions about the product are changing.</li> </ul>	<p><b><u>Constraints/Threats</u></b></p> <ul style="list-style-type: none"> <li>There are pressures to improve the recycling of packaging materials in order to minimise their environmentally hazardous effects.</li> </ul>

(Source: TCS estimate)

The Packaging industry in Goa is dominated by two firms, namely, Courtaulds Packaging and Essel Packaging, as can be seen from the figures presented in Table 4.13.

Table 4.13 Packaging Industry Characteristics

	Number of Firms	Sales Turnover
Total Market in Goa	22	Rs. 256 million
Top Contributing Firms	2	Rs. 230 million (that is, 90 percent of the total market in Goa)

(Source: TCS estimate)

The demand for tools is primarily from Courtaulds Packaging. However, considering the nature and complexity of the moulds required by Courtaulds, it does not fit TRTC's target customer profile. In fact, the company has already purchased the tools that it will require for next three years.

## 4.7 Plastics Industry

Table 4.14 presents an analysis of the Plastics industry.

**Table 4.14 Plastics Industry Analysis**

<p style="text-align: center;"><u><i>Positives</i></u></p> <ul style="list-style-type: none"> <li>Plastics are being used increasingly as substitutes for other materials.</li> </ul>	<p style="text-align: center;"><u><i>Negatives</i></u></p> <ul style="list-style-type: none"> <li>The perception abroad is that the quality of products manufactured in India is poor. This has resulted in low exports.</li> <li>The industry is sensitive to the fluctuations in petroleum prices.</li> </ul>
<p style="text-align: center;"><u><i>Potential/ Future Direction</i></u></p> <ul style="list-style-type: none"> <li>The huge pool of technically skilled person-power could employed for manufacturing various products for export.</li> <li>There is a growing trend towards the use of engineering and speciality plastics.</li> </ul>	<p style="text-align: center;"><u><i>Constraints/Threats</i></u></p> <ul style="list-style-type: none"> <li>There are concerns about the environmentally hazardous effects of recycling plastics.</li> </ul>

(Source: TCS estimate)

The Plastics industry in Goa is dominated by two firms, namely, Phil Corporation Ltd. and Kodak India Limited, as can be seen from the figures presented in Table 4.15.

**Table 4.15 Plastics Industry Characteristics**

	Number of Firms	Sales Turnover
Total Market in Goa	47	Rs. 3,724 million
Top Contributing Firms	2	Rs. 2,930 million (that is, 79 percent of the total market in Goa)

(Source: TCS estimate)

The size, volume, complexity, and value of the demand for tools from the Plastics industry varies widely.

## 4.8 Rubber Industry

Table 4.16 presents an analysis of the Rubber industry.

**Table 4.16 Rubber Industry Analysis**

<p style="text-align: center;"><u><i>Positives</i></u></p> <ul style="list-style-type: none"> <li>The industry manufactures international quality products.</li> </ul>	<p style="text-align: center;"><u><i>Negatives</i></u></p> <ul style="list-style-type: none"> <li>The industry depends to a large extent on the automobile industry.</li> </ul>
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<ul style="list-style-type: none"> <li>Each company caters to a different segment.</li> </ul>	<ul style="list-style-type: none"> <li>The industry is affected by fluctuations in the production and price of rubber.</li> <li>There is a local shortage of raw materials.</li> <li>Domestic production costs are higher than international production costs.</li> </ul>
<p><b><i>Potential/ Future Direction</i></b></p> <ul style="list-style-type: none"> <li>The per capita consumption of rubber is low (approximately 0.63 kg).</li> <li>The huge pool of technically skilled person-power could employed for manufacturing various products for export.</li> </ul>	<p><b><i>Constraints/Threats</i></b></p> <ul style="list-style-type: none"> <li>The cost of imports is low.</li> </ul>

(Source: TCS estimate)

The Rubber industry in Goa is dominated by one firm, Madras Rubber Factory (MRF), as can be seen from the figures presented in Table 4.17.

**Table 4.17 Rubber Industry Characteristics**

	Number of Firms	Sales Turnover
Total Market in Goa	15	Rs. 7,607 million
Top Contributing Firms	1	Rs. 7,600 million (that is, 99 percent of the total market in Goa)

(Source: TCS estimate)

Considering the size, volume and complexity of the tools required by MRF, it does not fit TRTC's target customer profile , and may therefore, not be a potential customer.



**Chapter 5**  
**Demand Estimation**

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This chapter describes the methodology adopted for estimating the demand for tooling in Goa. It lists the assumptions that were made to arrive at the estimate, and presents the projections for the period 1998-99 to 2009-10.

### **5.1 Methodology**

The demand for tooling was determined for the current year (that is, for 1997-98) and projections have been made for the period 1998-99 to 2007-08.

The demand for tooling was estimated on the basis of the following:

- Stated demand projections by existing industries
- Impact of the following demand drivers:
  - New products
  - New investment
  - Capacity expansion
  - Replacement
  - New processes
  - Design modifications
  - Research and development
- Analysis of user industries

The demand for tooling up to 2000-01 was estimated on the basis of the anticipated tooling requirements as indicated in the primary survey. The estimates for the period 2001-2010 were arrived at after taking into consideration the dependency of the demand on permutations and combinations of the demand drivers. To analyse the impact of new user industries in Goa, the investment profile and the number of tooling users among the new companies established in Goa in the last three years was studied. Section 5.3 lists the assumptions that were made to arrive at the estimates.

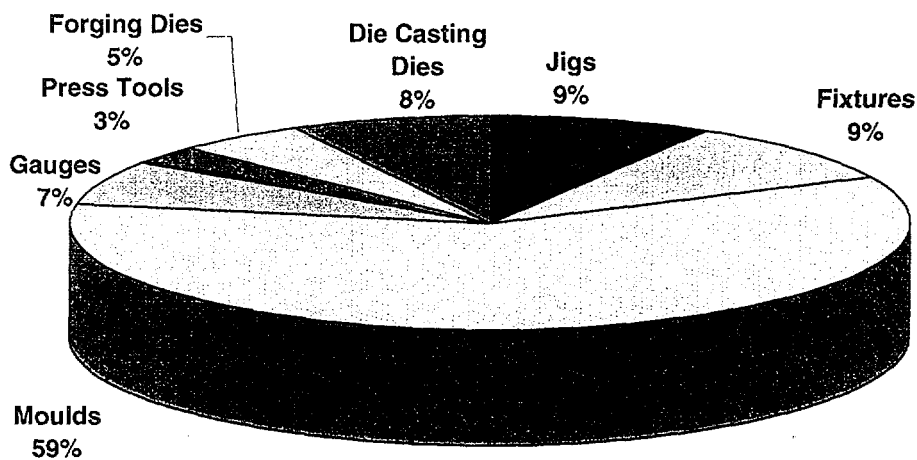
The existing industries in Goa were analysed. The results of the analysis are listed below.

- The demand for tooling in Goa is highly sensitive as there are a limited number of Large and Medium firms.
- The demand for tooling does not follow a pattern.
- In most industries, 1-4 firms account for 80-95 percent of the sales for that industry. Such firms import the tooling they require (large size and/or complex tools), purchase them from Tool Rooms outside Goa, or manufacture the tooling in their CTRs (if they have CTRs).
- The tooling demand for TRTC can be classified as follows:
  - Demand from existing industries, which will be marginal.

- Demand from new industries that are established, which will form the bulk of the demand in future.

## 5.2 Estimated Current Demand (1997-98) for Tooling

Figure 5.1 illustrates the overall demand for tooling (in terms of value), according to tooling type.



*Market Size : Rs. 25.3 million*

Figure 5.1 Overall Tooling Demand in Goa for 1997-98

## 5.3 Assumptions used for demand projections

The assumptions made in order to estimate the demand for tooling for the period 1998-2010 are as follows:

1. All the projections and growth rates reflect constant prices.
2. All the estimates for the demand for, and supply of, tooling are specific to Goa.
3. The introduction of new products will account for **70** percent of the demand for tooling. This demand will grow at the rate of **15** percent.
4. The replacement of existing products will account for **30** percent of the demand for tooling. This demand will grow at the rate of **10** percent.
5. A non-coverage allowance of **20** percent has been added to the demand estimates to take into account the impact of sectors that have not been covered during the study.
6. **40** percent of the new investments will have an impact on the demand for tooling.

7. Tooling purchases account for **one** percent of the proposed investments in relevant user industries.
8. Tooling orders will be placed at the beginning of the **third** year of the proposed investments in relevant user industries.
9. The tooling demand requirements of ACGL and Courtaulds Packaging have not been taken into account.
10. Due to the complexity, quality, and prices of locally made tooling, **40** percent of the demand is imported (imported tooling market).
11. Due to the inherent technology, skills, and capacity constraints of TRTC, the target market will be **50** percent in Goa.
12. Demand estimates for the period up to 2000-01 are based on the findings of the primary survey.

### 5.3.1 Tool-wise demand up to 2001

Figure 5.2 illustrates the demand for moulds, and Figure 5.3 illustrates the demand for tooling other than moulds for the period up to 2001.

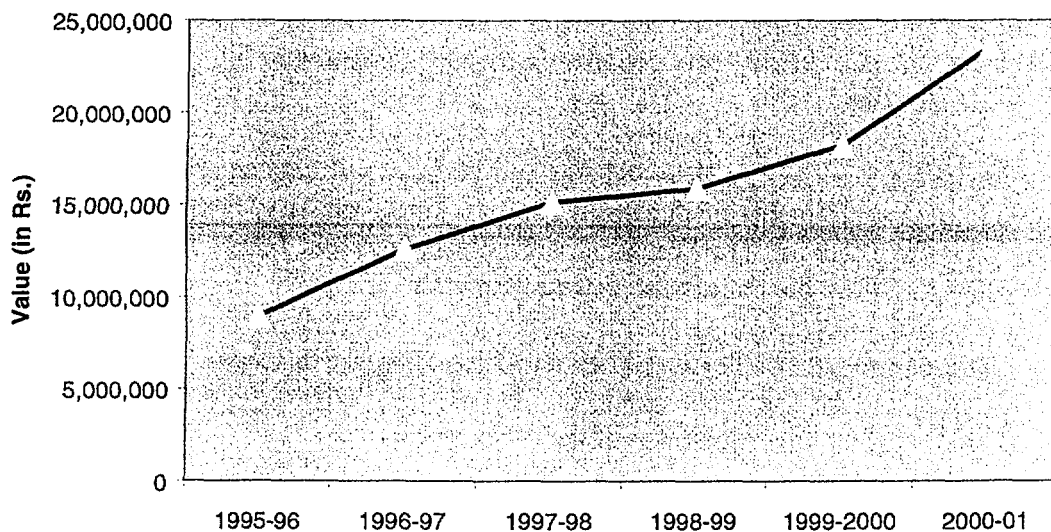


Figure 5.2 Demand for Moulds in Goa for 1995-2001

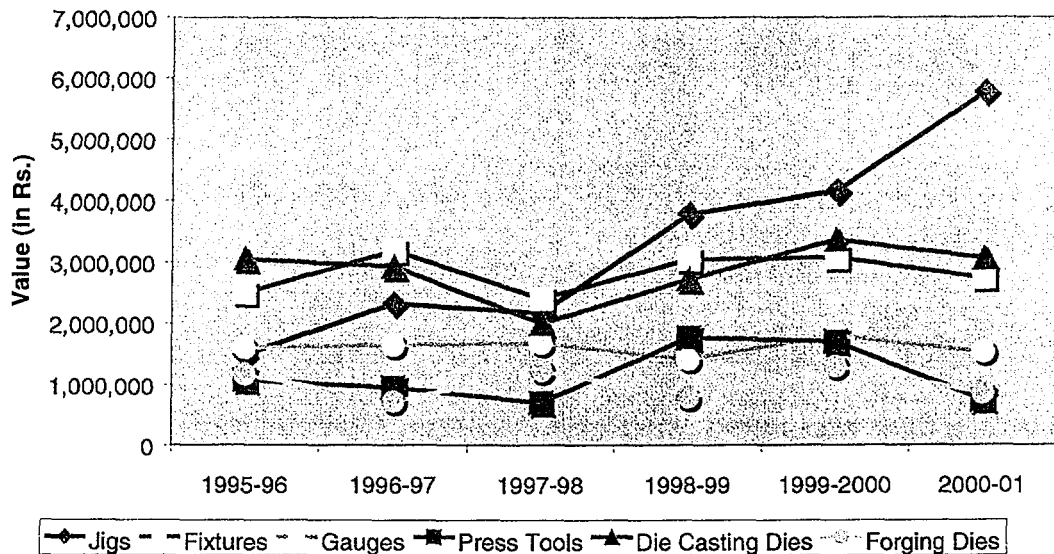


Figure 5.3 Demand for Tooling Other Than Moulds in Goa for 1995-2001

An analysis of the figures given above indicates:

- Moulds are the most widely required tooling type. This peculiar situation is due to the increase in the number of new products and new investments in the Plastics and Packaging industry.
- The demand for Die Casting Dies and Jigs and Fixtures will reduce gradually due to a decline in the requirements of industries such as Auto Ancillary, Foundry, Electrical, Electronics and Telecom. The Electrical, and Electronics and Telecom industries will require Jigs and Fixtures mainly for assembly operations.
- Although the demand for Forging Dies and Press Tools will remain constant, these tooling types will be the least required. That is, the demand percentage for these tooling types will be lower than that of the other types.

### 5.3.2 Industry-wise tooling demand up to 2010

Figure 5.4 illustrates the demand for tooling according to existing industries for the period up to 2002, and Figure 5.5 illustrates the demand for tooling according to existing industries for the period 2002-2010.

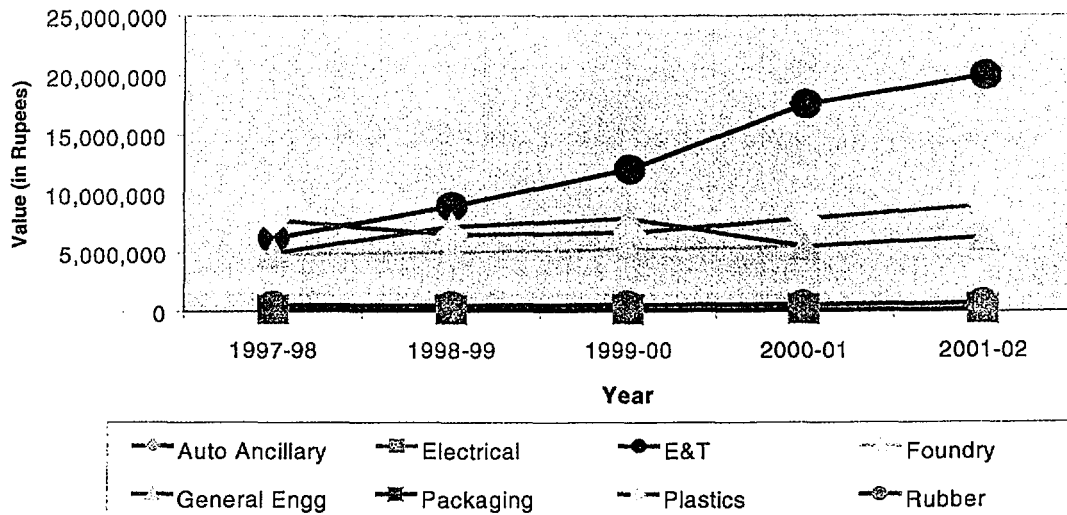


Figure 5.4 Future Total Tooling Demand for Existing Industries in Goa for 1997-2002

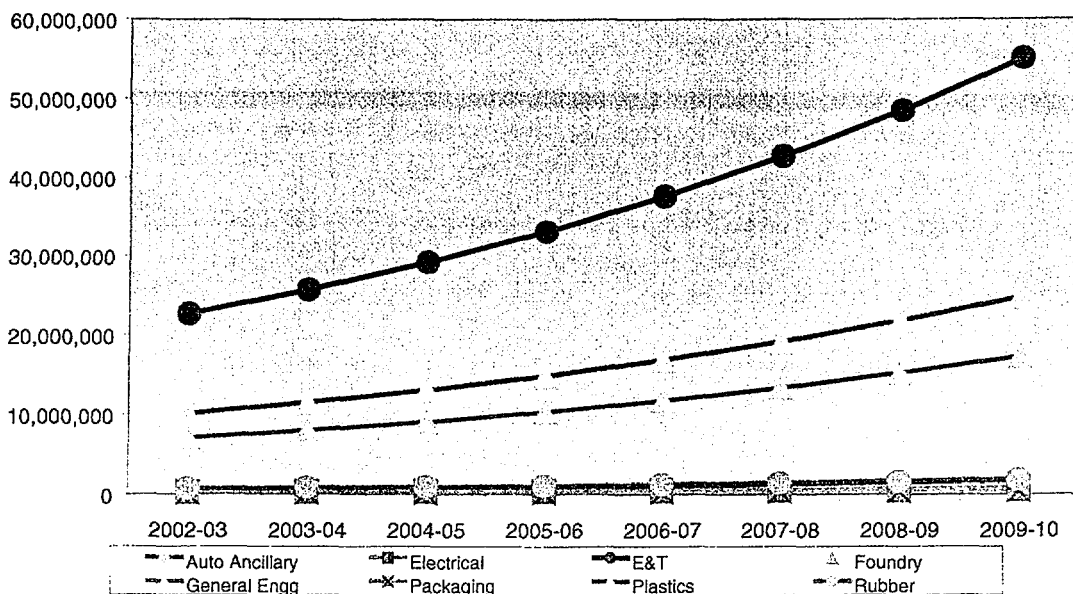


Figure 5.5 Future Total Tooling Demand for Existing Industries in Goa for 2002-10

The Packaging, Electronics and Telecommunication, and Plastics industries (in that order) will account for the bulk of the demand for tools. Most of these industries are highly automated and require few personnel. The requirements of new industrial setups in the state will account for a substantial part of the demand.

It is estimated that the total tooling demand will be:

- Rs. 37 million by 1998-99
- Rs. 80 million by 2000-01
- Rs. 300 million by 2004-05
- Rs. 855 million by 2009-10

Figure 5.6 illustrates the estimated total tooling demand in Goa.

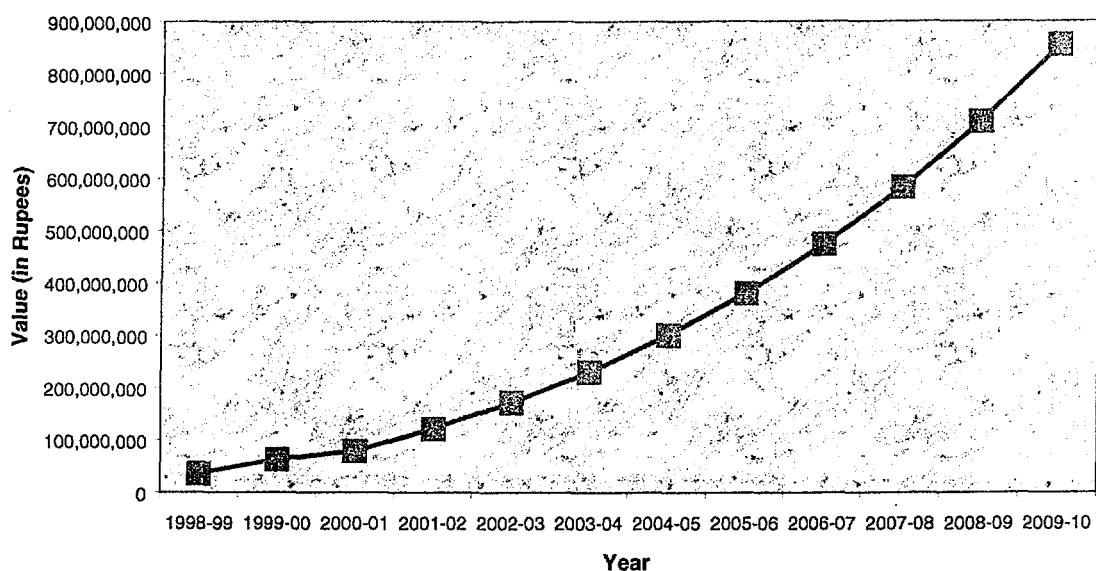


Figure 5.6 Estimated Total Tooling Demand in Goa for 1998-2010

## Chapter 6

# Training Courses

This chapter presents TCS' recommendations regarding TRTC's training courses. These recommendations have been made on the basis of the feedback received from user industries. The training courses have been categorised as follows:

- Short-term courses
- Long-term courses
- Postgraduate courses

### 6.1 Market Realities

Table 6.1 presents the percentage of respondents to the questionnaire, which was circulated as part of the primary survey, who were aware about TRTC and the training facilities it offers.

**Table 6.1 TRTC Awareness Among Firms in Goa**

Firm	No. Of Firms	Aware
Large	20	60%
Medium	20	35%
Small	140	16%
<b>Total</b>	<b>180</b>	<b>23%</b>

*(Source: TCS primary survey)*

Table 6.2 presents the break-up of the number of personnel currently employed for tooling purposes in Large, Medium, and Small companies in Goa.

**Table 6.2 Tooling Personnel by Firm Size in Goa**

Firm	ITI	Diploma (TDM*)	Engineer	Graduate	Semi-Skilled	Unskilled	Total
Large	53	14	20	8	-	-	<b>95</b>
Medium	10	5	4	-	7	-	<b>26</b>
Small	9	5	-	1	41	34	<b>90</b>
<b>Total</b>	<b>72</b>	<b>24</b>	<b>24</b>	<b>9</b>	<b>48</b>	<b>34</b>	<b>211</b>

\* Tool & Die Making

*(Source: TCS primary survey)*

#### Note

- Large companies — Annual turnover more than Rs. 100 million
- Medium companies — Annual turnover between than Rs. 10 million and Rs. 100 million
- Small companies — Annual turnover less than Rs. 10 million

Table 6.3 presents the break-up of the number of personnel currently employed for tooling purposes in various industrial sectors.

Table 6.3 Tooling Personnel by Industrial Sector in Goa

Firm	ITI	Diploma (TDM*)	Engineer	Graduate	Semi-Skilled	Unskilled	Total
Auto Ancillary	10	17	2	-	-	-	29
Electrical	-	-	-	-	-	7	7
Electronics & Telecom	22	-	1	6	7	-	36
Foundry	6	-	1	-	-	-	7
General Engineering	8	5	-	-	15	9	37
Packaging	2	-	-	1	-	-	3
Plastics	2	-	-	1	-	-	3
Rubber	22	2	20	1	26	18	89
<b>Total</b>	<b>72</b>	<b>24</b>	<b>24</b>	<b>9</b>	<b>48</b>	<b>34</b>	<b>211</b>

\* Tool &amp; Die Making

(Source: TCS primary survey)

The survey revealed that most companies do not have any company-sponsored continuous training programmes other than on-the-job training (OJT). Due to the paucity of skilled labour in Goa, most organisations have selected personnel simply on the basis of years of work experience. This shows that there is a potential demand for short-term training courses.

## 6.2 Short-term courses

In Goa, industries across sectors have not shown any interest in short duration packaged courses to upgrade the skills of their tooling personnel. This is due to the following factors:

- A majority of the companies are not aware of the facilities offered by TRTC.
- Some large companies that have automated process plants feel that it is not necessary to train personnel in high precision tooling.
- Most small companies feel that training courses are unaffordable in terms of both time and money.
- Some companies do feel that it is not necessary to train their personnel.
- Some companies are sceptical about TRTC's capability to impart good training due to TRTC's track record with respect to tooling jobs.

The demand for short-term courses depends on the following factors:

- Introduction of new technology (machines) necessitating training in machining.
- New investments in Goa.
- Need for existing personnel in user industries to upgrade their skills so that they can perform several functions.

TRTC should introduce training courses depending on the following factors:

- Expectations of the industry
- Market realities



- Types of courses offered by competing institutes
- Demand for existing courses

Currently, TRTC should focus on the following opportunities:

- Courses to enable unskilled and semi-skilled workers to improve their skills
- Special courses on cross-functional manufacturing skills

### **Skills improvement for unskilled and semi-skilled workers**

For unskilled and semi-skilled workers in small and medium scale enterprises, TRTC could provide short-term courses in general machining operations. To encourage industry participation, these courses could be subsidised in the initial stages to build a positive image amongst the local industry and to facilitate business prospects.

### **Special courses on cross-functional manufacturing skills**

For trained workers in small- and medium-scale enterprises, TRTC could introduce refresher courses covering the following:

- Basic Fitting Practices
- Engineering Measurements and Mechanical Testing
- Modern Cutting Tools
- Rotational Machining Practice
- Specific Machining
- Tool Design
- Tooling Process Planning

It is recommended that the duration of the course range from 2-4 days to 7-10 days, depending on the technology, the degree of detail of the curriculum, and the existing knowledge of the students.

Currently, there is a marginal demand for CAD/CAM skills within Goa. The use of technology in an average company is limited, and no significant upgrades have been made to conventional machining. Also, some quality conscious companies operate fully automated process plants that do not have CAD/CAM interface. The industry's demand for CAD/CAM courses will depend on the number and size of the new companies requiring CAD/CAM inputs for tool design and manufacture. Meanwhile, TRTC may target fresh and unemployed ITIs, polytechnic diploma holders, and graduate engineers who are looking for *better employment opportunities outside Goa* for its CAD/CAM training programmes. However, CAD/CAM training will be really useful for trainees who have a reasonable understanding of tool design and of the machines that are used conventionally, and who have relevant hands-on experience. The potential trainees in Goa are perceived to be less competent than their counterparts in Maharashtra and Karnataka.

TCS recommends courses covering areas such as the following:

- CAD/CAM/CNC Training
- Design for Manufacture and Assembly

- Finite Element Analysis
- Flexible Manufacturing Systems
- Metrology
- Mould Flow Analysis
- Process Planning for Tools
- RM, RP, and RTM

### 6.2.1 Competing Institutes Providing Short-term Courses

There is no training centre in Goa other than TRTC that provides short-term training in tooling or CAD/CAM. However, as Goa's neighbouring states have a developed manufacturing base, it is possible that meritorious students or company-sponsored candidates may prefer to enrol in the short-term courses in tooling and/or CAD/CAM conducted by the following reputable institutes:

- Advanced Training Centre (ATC)
- Central Institute of Plastic Engineering Technology (CIPET)
- Government Tool Room and Training Centre (GTTC)
- Indo-German Tool Room — Aurangabad (igtr-A)
- Nettur Technical Training Foundation (NTTF)

## 6.3 Long-term courses

Long-term courses are offered by various training centres across India to provide opportunities for Secondary School Certificate (SSC), Higher Secondary Certificate (HSC), ITI, and diploma holders to acquire specialised skills related to the manufacture of tools. Even engineering graduates can pursue courses in the design and manufacture of tools using high-end CAD/CAM packages.

TRTC is the only training institute in Goa that offers a 4-year diploma course in tool and die making. Annually, 15 students are enrolled. There is a high demand for the course due to the following reasons:

- Only course of its kind in Goa.
- Perceived employment potential for course graduates

### 6.3.1 Competing Institutes Providing Long-term Courses

There is no training centre in Goa other than TRTC that provides long-term training in tooling. However, as Goa's neighbouring states have a developed manufacturing base, it is possible that meritorious students may prefer to enrol in the long-term courses in tooling conducted by the following reputable institutes:

- GTTC
- NTTF

Table 6.4 presents the details of long-term courses currently offered by GTTC and NTTF.

**Table 6.4 Long-term Courses Offered on Tooling**

Type (Degree/Diploma/Certificate)	Duration & Timing	Exposure to CAD/CAM	Entry Qualification
Certificate in Tool and Die Making	2 ½ Years (including Industrial Training)	1 Month in CNC Machine operation and CAD (2-Dimension)	10 <sup>th</sup> Pass/ ITI Trade Certificate in Turning/ Fitting/ Machinist
Diploma in Tool Engineering	4 Years (including 1 year Industrial Training)	6 Months in CAD/CAM courses	10 <sup>th</sup> /12 <sup>th</sup> Pass / ITI Trade Certificate

(Source: TCS database)

Table 6.5 presents the break-up of the number of students enrolled by GTTC and NTTF in these long-term courses.

**Table 6.5 Number of students enrolled in Long-term Courses on Tooling**

Type (Degree/Diploma/ Certificate)	Other Institutes (Number of students enrolled)
Certificate in Tool and Die Making	GTTC — 15 NTTF — 27
Diploma in Tool Engineering	GTTC — 25 NTTF — 48

(Source: TCS database)

Unlike GTTC and NTTF, CIPET offers long-term training in plastic processing and plastic moulds.

## 6.4 Postgraduate Courses

Postgraduate personnel are especially required by organisations that design tools in-house. However, TRTC should delay the introduction of the 1-year postgraduate course in tool design because of the following reasons:

- TRTC lacks the skills and the technical capability required to conduct such a course.
- Currently, user industries with CTRs do not design complex tools, or do not design tools on a regularly.
- TRTC itself has not yet received an assignment on tooling design.

An opportune time to begin this course would be when user industries demand rapid design and development of tools. This would require tool rooms to have significant tool design assignments.

#### 6.4.1 Competing Institutes Providing Postgraduate Courses

There is no training centre in Goa that imparts postgraduate training in tooling. However, as Goa's neighbouring states have a developed manufacturing base, it is possible that meritorious students may prefer to enrol in the postgraduate courses in tooling conducted by the following reputable institutes:

- GTTC
- NTTF

Table 6.6 presents the details of postgraduate courses currently offered by GTTC and NTTF.

**Table 6.6 Postgraduate Courses Offered on Tooling**

Type (Degree/Diploma/Certificate)	Duration & Timing	Exposure to CAD/CAM	Entry Qualification
Post-Diploma in CAD/CAM	1 Year Full Time or 2 Year Part Time	Focus on CAD/CAM in Tool Design & Manufacturing	Diploma in Mech. Engg.
Post-Graduation in Tool Engineering	2 Years	Focus on use of High-end CAD/ CAM/ CAE packages	Degree in Mechanical Engineering/ Production Engineering & GATE Score

(Source: TCS database)

Table 6.7 presents the break-up of the number of students enrolled by GTTC and NTTF in these postgraduate courses.

**Table 6.7 Number of Students Enrolled in Postgraduate Courses on Tooling**

Type (Degree/Diploma/ Certificate)	Other Institutes (Number of students enrolled)
Post-Diploma in CAD/CAM	GTTC — 15
Post-Graduation in Tool Engineering	GTTC — 10 NTTF — 8

(Source: TCS database)

TRTC should introduce courses along the lines of courses conducted by these institutes only after Goa is sufficiently industrialised.

## **6.5 Other Recommendations**

To improve the quality of the training courses, TRTC should engage a Training Consultant on a contract basis. TRTC should also obtain feedback from course participants. TRTC should target these courses at companies on the basis of information pertaining to such aspects as capacity addition, new machinery, new investments, and process redesign. TRTC should periodically review and upgrade the course content, the teaching methodology adopted, and the practical exercises assigned to the participants. The review should be based on an assessment of the technology available with the user industries, and developments in the industry not only in India but world wide.

## **Organisation Structure**

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This chapter presents a review of the existing organisation structure of TRTC. After taking into consideration TRTC's objectives, the existing business environment, and the key financial parameters that have an impact on TRTC's commercial viability, TCS' consultants have proposed a new organisation structure. This chapter details the proposed organisation structure and the plan for its implementation. The chapter also highlights the roles and responsibilities of the key personnel in the proposed structure and the expected benefits of the structure.

### **7.1 Objectives of TRTC**

The objectives of TRTC are:

1. To design and manufacture tools commercially.
2. To provide facilities for the collection of metrics for product inspection, quality control, and standard testing.
3. To create a data bank and library for information on tooling.
4. To provide consultancy to tiny-, small-, and medium-scale industries for facilitating product development, optimum capacity utilisation, and cost reduction.
5. To provide short term training courses in tooling and machining.
6. To provide long term training courses in tool and die making.

## 7.2 Existing Organisation Structure

In the existing organisation structure, the General Manager is responsible for the day-to-day management of TRTC, and the Deputy General Manager is responsible for managing the training facility. Figure 7.1 illustrates the existing organisation structure of TRTC.

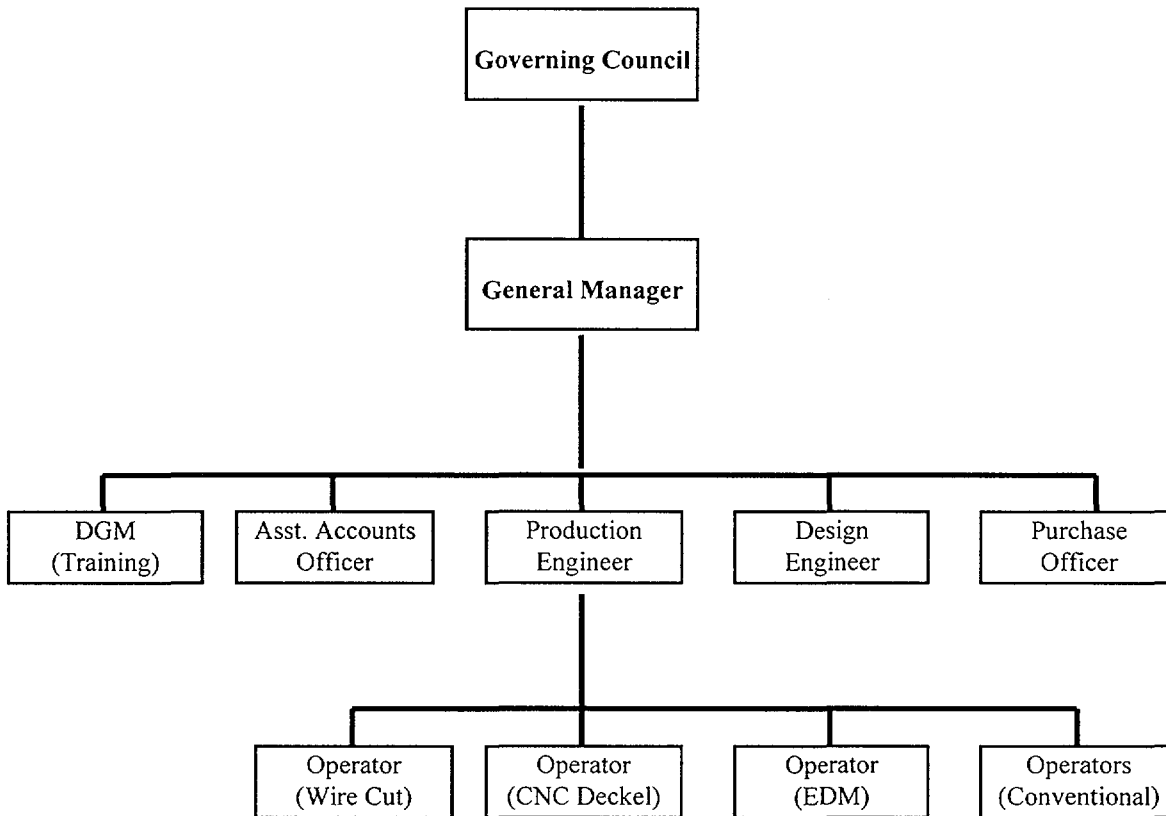


Figure 7.1 Existing Organisation Structure of TRTC

## 7.3 Existing Business Environment

Potential customers perceive TRTC either as a government organisation primarily engaged in providing training, or as a machining shop that supports small-scale industrial (SSI) units. The existing organisation structure is focused mainly on manufacturing tools. However, as TRTC does not have adequate experience in executing tooling jobs, it faces serious hurdles in attracting business. Due to TRTC's lack of technical expertise and relevant experience, customers are clearly indifferent to TRTC, and have apprehensions about its overall capability. This can be assessed from the feedback received from user industries, which is presented in Appendix D.

Customers assess the ability of an organisation to perform jobs in terms of the parameters — quality, delivery time, and price. An organisation’s performance as measured against these parameters influences the customer’s perception of the competence inventory and extent of preparedness of the organisation.

The competence inventory depends on the range of skills, experience, knowledge, and efficiency of the employees. Appropriate investments in infrastructure and facilities, suitable remuneration, and a challenging work environment attract skilled personnel to an organisation. An adequate competence inventory instils confidence in customers. Consequently, customers are willing to place orders with the organisation.

Figure 7.2 illustrates the interaction between various factors that affect the tooling business.

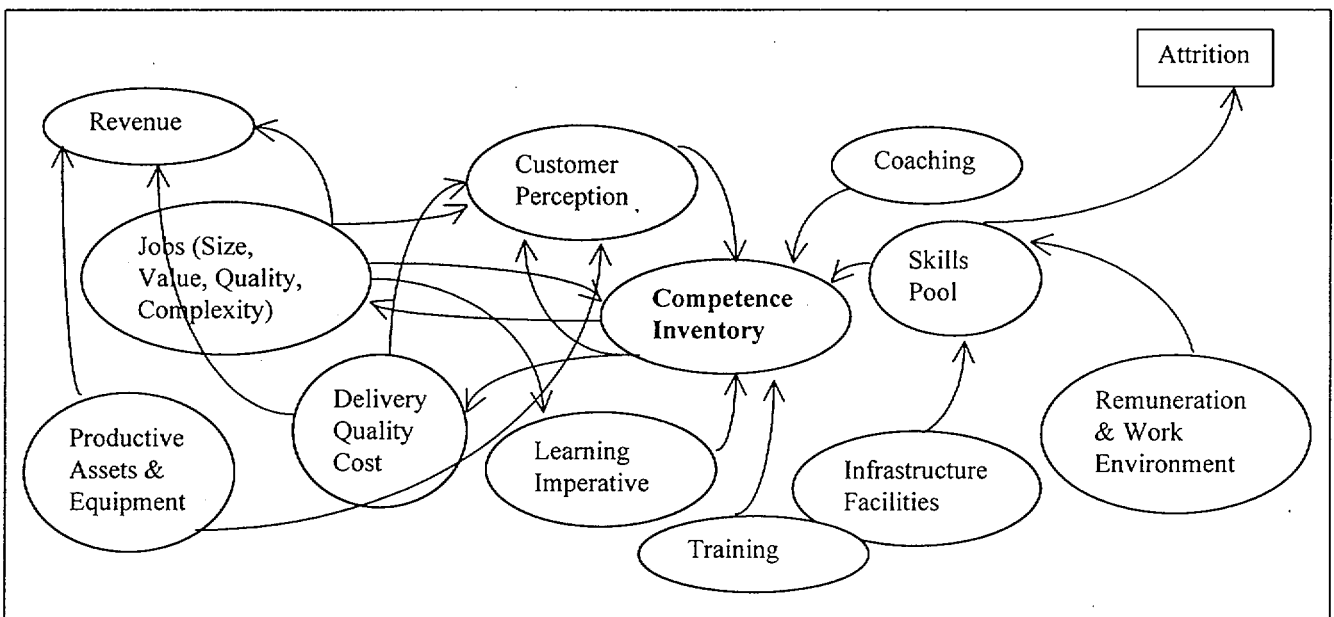


Figure 7.2 Systemic View of the Tooling Business

As the number of jobs executed by an organisation increases, the organisation is exposed to jobs involving enhanced levels of complexity and of increasing value. The enhanced complexity of the jobs enriches the knowledge base of the organisation. This in turn enhances the competence inventory of the organisation, and enables it to deliver better quality products at lower costs and with shorter delivery times.

At the same time, the increase in the value of the jobs contributes to the revenues earned, which may be invested in improving infrastructure and facilities to enable the organisation to handle jobs of increasing value, or involving larger volumes or enhanced complexity. Revenues are also used to increase remuneration, improve the quality of the training imparted, and to enhance the work environment. Consequently, the organisation is able to attract and retain skilled personnel.



The negative perception that customers have of TRTC's competence inventory is reinforced by the average quality and high prices of its products, and the long lead times for delivery. This has resulted in a vicious circle. Fewer work orders lead to under-utilisation of equipment and idle person-power, which in turn result in reduced tooling capability. Reduced tooling capability results in average quality, longer delivery times, increasing costs and higher prices and consequently, fewer work orders.

The systemic view of the tooling business indicates that it is important to understand the target market. From a marketing perspective, TRTC's target market is represented by the type of jobs that TRTC could get. The jobs are a function of two parameters, namely, value of the order (per job/unit) and complexity of the job. Matrices A and B are indicators of the target jobs of TRTC.

<b>Job Complexity</b>	<i>Very High</i>			?	XX
	<i>High</i>		√	?	?
	<i>Average</i>		√	√	?
	<i>Low</i>	X	Y/N		
		<i>Low</i>	<i>Average</i>	<i>High</i>	<i>Very High</i>

**Order Value (per job/unit)**  
*Matrix A (Year 1-3)*

<b>Job Complexity</b>	<i>Very High</i>			?	XX
	<i>High</i>		√	√	√
	<i>Average</i>		√	√	√
	<i>Low</i>	X			
		<i>Low</i>	<i>Average</i>	<i>High</i>	<i>Very High</i>

**Order Value (per job/unit)**  
*Matrix B (After Year 3)*

**Index:**

- X Addressed mainly by small operators; is not a target for TRTC.
- XX Definitely out of the reach of TRTC.
- ? Likely to be just beyond the reach of TRTC.
- Y/N Can be addressed by TRTC but is not likely to be viable for long.
- √ **Target market for TRTC.**

In the matrices given above, 'Job Complexity' represents the intrinsic complexity of the job, and the 'Order Value' is the price of each job. The complexity of the job depends on the following factors:

- Degree of difficulty in manufacturing.
- Degree of detail in which design inputs are required.

Matrix A identifies the target market that TRTC should focus on during the first three years of implementation. Specifically, the target market consists of jobs that are “average complexity-average/high order value jobs” and “high complexity-average order value jobs”. After identifying the target market, the target turnover can be estimated as:

$$\text{Target Turnover} = \Sigma(P_i * Q_i) + \Sigma(P_j * Q_j)$$

where

$P_i$  = price of a job of average complexity

$Q_i$  = number of jobs of average complexity

$P_j$  = price of a job of high complexity

$Q_j$  = number of jobs of high complexity

$i = 1 \dots m$

$j = 1 \dots n$

After the target turnover has been determined, TRTC can estimate the job quantity that must be executed for each category in order to meet the target. If TRTC meets the performance criteria, the target market can be redefined after three years, as illustrated in Matrix B.

Thus, TRTC needs to adopt a focused marketing strategy in order to get jobs from the target market. TRTC should pitch for and accept jobs that it is confident of executing while ensuring high quality, short delivery times, and competitive prices. TRTC should plan for a balanced job portfolio based on the type of target turnover that it seeks to achieve. TRTC should seek to transform the existing situation of “inadequate work generation” to a situation of “synergistic demand management”. TRTC need to make focused efforts to leverage strategic resources for enhancing the technological resource base and for increasing its target market.

## 7.4 Proposed Mission, Vision, and Goals of TRTC

After studying the objectives of TRTC, the dynamics of the tooling business, and the target market, TCS’ consultants have framed TRTC’s mission statement, defined its vision for the future, and identified its short- term goals.

### **Mission:**

*To deliver world class tooling-related services to customers in a professional, proactive, competitive, and transparent manner  
while building a sustainable, learning, and competent organisation with excellent resources  
which will act as a catalyst in the industrial development of Goa and India.*

### **Vision:**

*To achieve a turnover of Rs. one crore by the year 2004, and to achieve and maintain hundred percent placement of students of its long-term course in firms of repute.*

**Goals:**

1. To generate operating surplus.
2. To develop a competent resource base.
3. To adopt a professional approach.
4. To be customer oriented.
5. To enhance competitiveness and transparency.
6. To pursue proactively the development of business.
7. To improve the curriculum of training courses offered.
8. To achieve hundred percent placement of students of long-term courses.

**7.4.1 Strategic Options**

There are five options that TRTC could consider to achieve its goals. This section details each of the options.

**Option 1: To concentrate exclusively on production of precision products and tooling components throughout the lifetime of the organization.**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Probability of getting revenue-generating business.</li> </ul>	<ul style="list-style-type: none"> <li>• Break from the core business for which the organisation was formed.</li> </ul>
<ul style="list-style-type: none"> <li>• Reduction in the time for meeting operating expenses.</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of opportunities due to the loss of business in the tooling sector.</li> </ul>
	<ul style="list-style-type: none"> <li>• Possible under-utilisation of existing facilities and skills as these were acquired primarily for the tooling business.</li> </ul>

**Option 2: To concentrate exclusively on the production of precision products and tooling components for the first three years. Thereafter, to switch to manufacturing tools.**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Reduction in the time for meeting operating expenses.</li> </ul>	<ul style="list-style-type: none"> <li>• Customers may be confused about the positioning of the organisation.</li> </ul>
<ul style="list-style-type: none"> <li>• Probability of getting revenue-generating business.</li> </ul>	<ul style="list-style-type: none"> <li>• Break from the core business pursued in the initial years may be detrimental during the transition from precision products to tooling.</li> </ul>

<ul style="list-style-type: none"> <li>• Possibility of attracting business in the tooling sector due to the creation of a positive impression of the organisation's capabilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Possible under-utilisation of existing facilities and skills as these were acquired primarily for the tooling business.</li> </ul>
	<ul style="list-style-type: none"> <li>• Inability to acquire tooling experience and to establish its presence in the tooling business during the initial years.</li> </ul>

**Option 3: To concentrate primarily (60-65 percent) on the production of precision products and tooling components, and secondarily (35-40 percent) on tooling for the first three years. Thereafter, to switch focus and concentrate primarily (75-80 percent) on tooling and precision products, and secondarily (20-25 percent) on tooling components.**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Probability of getting revenue-generating business.</li> </ul>	<ul style="list-style-type: none"> <li>• Customers may be confused about the positioning of the organisation.</li> </ul>
<ul style="list-style-type: none"> <li>• Reduction in the time for meeting operating expenses.</li> </ul>	<ul style="list-style-type: none"> <li>• Possible under-utilisation of existing facilities and skills as these were acquired primarily for the tooling business.</li> </ul>
<ul style="list-style-type: none"> <li>• During the initial years, business can be attracted from the tooling sector to gain experience and establish credibility in the market.</li> </ul>	
<ul style="list-style-type: none"> <li>• Development of tooling knowledge to establish the "crucial" knowledge base and develop the "critical mass" of customers.</li> </ul>	

**Option 4: To concentrate primarily (70-75 percent) on tooling and secondarily (25-30 percent) on the production of precision products and tooling components for the first three years. Thereafter, to concentrate primarily (90-95 percent) on tooling (and the production of precision products and tooling components, if necessary).**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Motivation to attract as much tooling business as possible.</li> </ul>	<ul style="list-style-type: none"> <li>• Significant difficulty in getting revenue-generating business.</li> </ul>
<ul style="list-style-type: none"> <li>• Development of tooling knowledge to establish the "crucial" knowledge base and develop the "critical mass" of customers.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in the time needed to meet operating expenses.</li> </ul>
<ul style="list-style-type: none"> <li>• Opportunity to acquire experience and establish credibility in the market.</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of opportunities as a result of the loss of business in the precision products and tooling components sector due to capacity constraints.</li> </ul>

**Option 5: To concentrate exclusively on tooling production throughout the lifetime of the organisation.**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>Motivation to attract as much tooling business as possible.</li> </ul>	<ul style="list-style-type: none"> <li>Difficulty in attracting revenue-generating business.</li> </ul>
<ul style="list-style-type: none"> <li>Development of tooling knowledge to establish the “crucial” knowledge base and develop the “critical mass” of customers.</li> </ul>	<ul style="list-style-type: none"> <li>Significant increase in time needed to meet operating expenses.</li> </ul>
	<ul style="list-style-type: none"> <li>Under-utilisation of existing facilities and skills for want of adequate tooling business.</li> </ul>

TCS’ consultants recommend that TRTC adopt *Option 3*. The advantages of this option far outweigh its disadvantages. The existing demand for precision products and tooling components will be tapped to generate revenues for TRTC. This will enable TRTC to develop its knowledge base regarding the operation of various high precision machines. This knowledge base would facilitate the creation of an environment that will nurture specialised learning in tooling. The ability to produce precision products and tooling components will not only generate revenues for TRTC but will also enable it to acquire experience, and thereby, establish itself in the high precision products business. To achieve this, TRTC will require to make changes to its organisation structure and work culture so that it becomes more responsive to the needs of the market. To become successful, it is crucial that TRTC adopt a proactive approach.

The guidelines followed for developing the proposed organisation structure include:

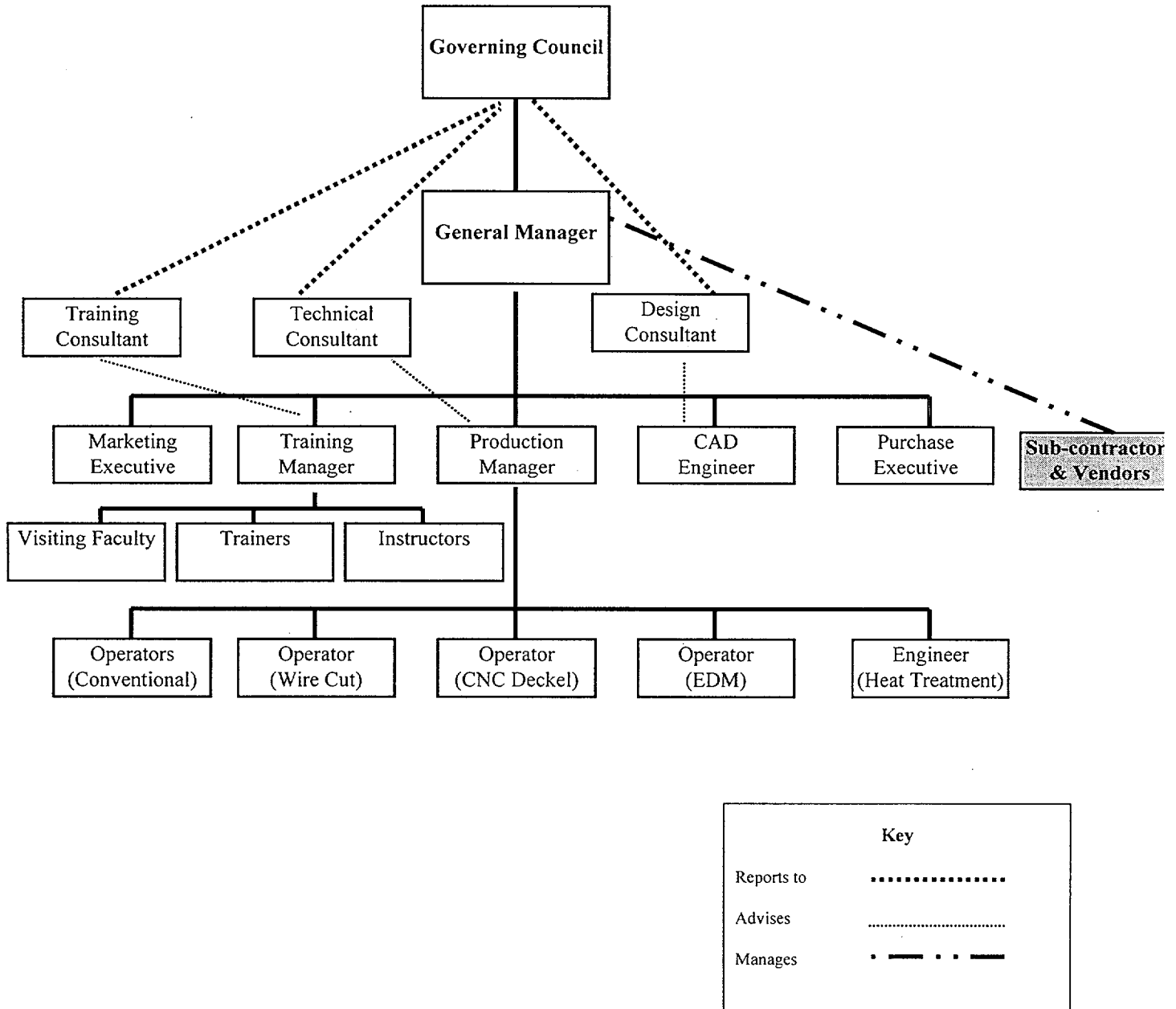
- Enhance the capability to generate and execute work orders.
- Reduce service and delivery lead times.
- Reduce the number of handoffs to a minimum.
- Improve information management.
- Provide a structure that is responsive to the requirements of the target market and the developments in technology.
- Develop a system to develop and maintain a knowledge base.
- Create a system for collecting feedback system from internal and external customers.
- Create synergistic arrangement between manufacturing and training.

## **7.5 Proposed Organisation Structure**

The proposed organisation structure will be implemented in two stages. The first stage will extend up to three years after the commencement of the restructuring effort. Thereafter, the second stage will commence. The organisation structure for both stages has been designed keeping in mind the need for the organisation structure to be flat and flexible so that it is more responsive. If TRTC is able to meet performance expectations, the level of business activity at the end of the third year will increase substantially, necessitating a change in the organisation structure implemented during the first stage.

Figure 7.3 illustrates the organisation structure proposed for the first stage of implementation, and Figure 7.4 illustrates the organisation structure proposed for the second stage of implementation.

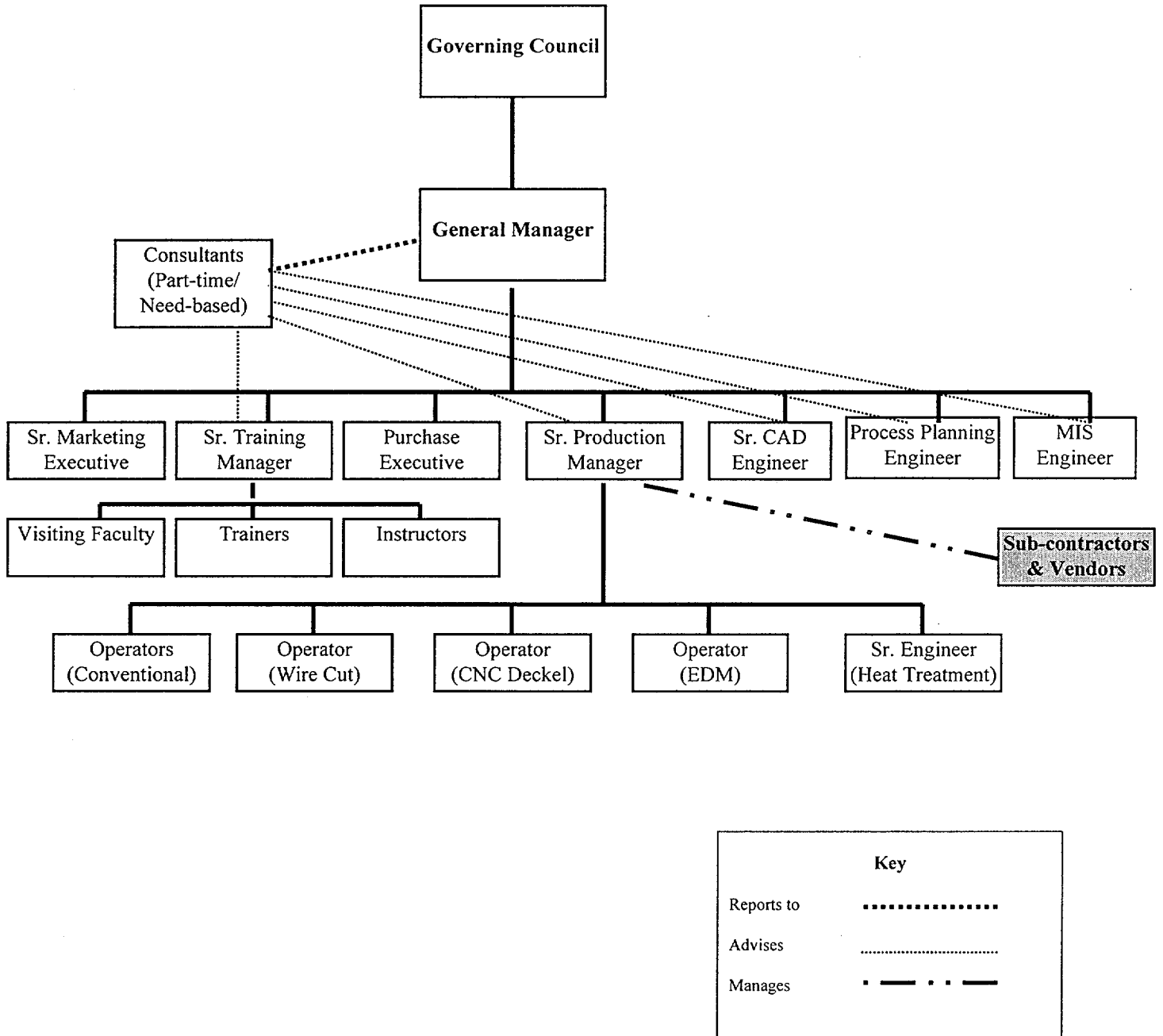
**STAGE I**  
(Years 1-3)



**Figure 7.3 Proposed Organisation Structure (Implementation Stage I)**

It is envisaged that consultants working full-time on a contract basis over the first 2-3 years after the commencement of implementation will be largely responsible for developing TRTC's competence. They will report to the Governing Council and interact daily with the General Manager.

**STAGE II**  
(Year 4 onwards)



**Figure 7.4 Proposed Organisation Structure (Implementation Stage II)**

The organisation structure for Stage II has some significant changes as compared to the structure for Stage I. It is anticipated that by the end of the third year TRTC will be



sufficiently competent. Consequently, its dependency on dedicated technical, design, and training consultants can be reduced. Instead, if required, TRTC could hire part-time consultants.

As the extent of TRTC's business activities increase, there will be an increase in the need to plan, co-ordinate, and monitor the execution of jobs. Information management will play a crucial role in co-ordinating the efforts for generating and executing business. An Management Information Systems (MIS) engineer will be required to facilitate this process.

As the volume and complexity of work increases, the responsibilities of the Training Manager, Production Manager, Marketing Executive, CAD Engineer and Engineer (Heat Treatment) will also increase. Consequently, these personnel should be suitably remunerated. The increase in competence levels should be appreciated while maintaining a flat structure.

As the volume and complexity of work increases, a dedicated Process Planning Engineer will also be required. This will enable the Production Manager to assume the responsibility for managing sub-contractors and vendors (a task performed by the General Manager during Implementation Stage I).

## **7.6 Roles and Responsibilities of Key Personnel**

### **General Manager**

#### ***Role:***

To manage day-to-day operations.

#### ***Key Responsibilities:***

- Prepare business plan and budgets.
- Interact and co-ordinate with the consultants and the Governing Council.
- Monitor the progress of various work orders.
- Control and manage finances and the working capital.
- Formulate and implement administrative policies.
- Participate in the development of human resources.
- Work with, and guide the Marketing Executive in order to procure new orders.
- Analyse the feedback received from customers, and initiate appropriate action.
- Manage sub-contractors and vendors for the first three years. Thereafter, this responsibility will be delegated to the Production Manager.

### **Training Manager:**

***Role:***

To develop, market, organise, and manage training courses on the design and manufacture of tooling.

***Key Responsibilities:***

- Work closely with the Training Consultant to design, develop, and market short- and long-term training courses.
- Recruit training personnel, and part-time and visiting faculty and trainers.
- Counsel and mentor students.
- Assist in the placement of students enrolled in the summer and final batches.
- Schedule resources and monitor the progress of various training programmes.
- Work closely with the Marketing Executive for collecting and analysing information related to training and course requirements.
- Monitor training-related developments regarding technology advancements, teaching methodology, and preferences and requirements of the user industries.

### **Technical Consultant:**

***Role:***

To develop and provide resource competency in the technical aspects of tooling manufacture.

***Key Responsibilities:***

- Provide technical expertise for executing work orders.
- Train the engineers and operators on tooling, machining, and precision product development processes and thereby, enhance the capability, competence, and confidence of these personnel.
- Plan and process the costing of work orders that are executed.
- Work closely with the General Manager and the Marketing Executive for developing business.

### **Design Consultant:**

***Role:***

To develop and provide resource competency in the design aspects of tooling.

***Key Responsibilities:***

- Provide design expertise for executing work orders.
- Develop in-house CAD expertise.
- Work closely with the Technical Consultant for developing integrated production processes.

**Training Consultant:**

***Role:***

To develop and provide resource competency in the area of training.

***Key Responsibilities:***

- Provide training expertise for conducting courses.
- Train the trainers and instructors.
- Work closely with the Training Manager for designing, developing, and marketing training courses.

**Marketing Executive:**

***Role:***

To develop and implement marketing strategies for retaining and attracting business.

***Key Responsibilities:***

- Provide information about the market.
- Develop business.
- Prepare periodically reports on the feedback received from customers on a continuous basis.
- Work closely with the General Manager and the Technical Consultant for identifying opportunities and obtaining business leads.
- Interact with the Training Manager for inputs, and provide information on training and course requirements.
- Co-ordinate with the Production Manager, the Process Planning Engineer, the CAD Engineer, and the Purchase Executive on aspects related to production schedules, jobs being processed currently, customer feedback, inventory levels, and materials required.

**Production Manager (or Sr. Engineer):**

***Role:***

To prepare and implement production schedules, and oversee day-to-day activities related to tooling manufacture.

***Key Responsibilities:***

- Schedule resources.
- Monitor the progress of work orders.
- Plan processes for executing work.
- Co-ordinate with the Technical and Design consultants.
- Train personnel on tooling, machining, and precision product development processes and thereby, enhance the capability, competence, and confidence of these personnel.
- Co-ordinate with the Marketing Executive, the Process Planning Engineer, the CAD Engineer, and the Purchase Executive on aspects related to production schedules, jobs being processed currently, and the feedback on jobs that have been executed.

**CAD Engineer:**

***Role:***

To design products, components, and tooling.

***Key Responsibilities:***

- Design products, components, and tooling for executing orders received.
- Develop an in-house knowledge base on CAD technology.
- Co-ordinate with the Marketing Executive, the Production Manager, and the Process Planning Engineer on aspects related to production schedules, jobs being processed currently, and work orders that are expected.

**Purchase Executive:**

***Role:***

To develop and implement purchase-related strategies.

***Key Responsibilities:***

- Purchase materials proactively after assessing factors such as price, quality, service, and delivery.
- Stock raw materials that are required frequently.
- Co-ordinate with the Production Manager, the Process Planning Engineer, and the Marketing Executive on aspects related to production schedules, jobs being processed currently, and work orders that are expected.

**Process Planning Engineer:**

***Role:***

To develop tooling process plans.

***Key Responsibilities:***

- Develop optimal tooling process plans.
- Co-ordinate with Production Manager for scheduling jobs.
- Co-ordinate with Marketing Executive for estimating costs and lead times.

**MIS Engineer:**

***Role:***

To provide information system support.

***Key Responsibilities:***

- Develop and implement an Information Systems Plan, including System Development Life Cycle (SDLC)
- Interact with users to identify their information requirements.
- Monitor developments in Information Technology (IT) such as electronic commerce, and Electronic Data Interchange (EDI).
- Plan and perform pre-implementation reviews and user acceptance tests, and provide post-implementation support.

Chapter 8

## Commercial Viability Analysis

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This chapter presents an analysis of the commercial viability of TRTC.

### 8.1 Assumptions

In order to assess realistically the commercial viability of TRTC, the following assumptions were made:

1. Maximum capacity utilisation is **75** percent.
2. Sales realisation is Rs. **4,375** per machine hour.
3. The Operating to Support Staff ratio is greater than **70:30** for salaries and wages.
4. Interest on working capital and loans is **15** percent.
5. Tax is calculated at **35** percent.
6. Depreciation is calculated using the **Straight Line Method (SLM)**. The rates vary with the number of shifts.
7. Expenses as a percentage of sales include administrative expenses, and expenses for raw materials, consumables, power and fuel, and repairs and maintenance.
8. TRTC's estimated target market:
  - Does **not** include the market for imported tools.
  - Is **50** percent of the total market excluding the market for imported tools.
9. Number of shifts increases from **1** to **3** with capacity saturation.
10. TRTC's sales include:
  - Manufacturing charges
  - Consultancy fees
  - Design charges
  - Heat treatment charges
  - Precision product sales
  - Miscellaneous job charges
11. Share capital indicated in the Balance Sheet includes **grants and subsidies** provided by the Government of Goa and the **cost of machinery** provided gratis by UNIDO.

## 8.2. Scenarios

In order to assess the commercial viability of TRTC, TCS' consultants examined the following three scenarios with respect to incremental funds required:

**Scenario 1** — The ratio of Share Capital to Unsecured Loans would be 100:0 for the years 1-6, thereafter, the ratio would be 70:30.

**Scenario 2** — The ratio of Share Capital to Unsecured Loans would be 70:30 for the years 1-6, thereafter, the ratio would be 50:50.

**Scenario 3** — The ratio of Share Capital to Unsecured Loans would be 40:60 for the years 1-6, thereafter, the ratio would be 20:80.

### 8.2.1. Scenario 1

For incremental funds required, the ratio of Share Capital to Unsecured Loans would be **100:0** for the years 1-6 (that is, for the period from 1998-99 up to 2003-04), thereafter (that is, for the period 2004-2010), the ratio would be **70:30**.

Table 8.1 presents the estimates for Gross Profit and Profit after Taxes (PAT).

**Table 8.1 Estimated Gross Profit and PAT for Scenario 1**

Year	Gross Profit (Rs. million)	PAT (Rs. Million)
2002-03	0.6	(3)
2004-05	8.1	0.3
2009-10	21	4.5

*(Source: TCS estimate)*

Estimates for Expenditure Over Income (EOI) are as follows:

- 2002-03 — Rs. 36.8 million
- 2004-05 — Rs. 37.3 million
- 2009-10 — Rs. 27.1 million

The detailed financial sheet is given in Appendix E.

### 8.2.2. Scenario 2

For incremental funds required, the ratio of Share Capital to Unsecured Loans would be **70:30** for the years 1-6 (that is, for the period from 1998-99 up to 2003-04), thereafter (that is, for the period 2004-2010), the ratio would be **50:50**.

Table 8.2 presents the estimates for Gross Profit and PAT.

**Table 8.2 Estimated Gross Profit and PAT for Scenario 2**

Year	Gross Profit (Rs. million)	PAT (Rs. million)
2002-03	0.6	(3.6)
2005-06	8.7	0.8
2009-10	21	4.5

(Source: TCS estimate)

Estimates for EOI are as follows:

- 2002-03 — Rs. 38.7 million
- 2005-06 — Rs. 39.3 million
- 2009-10 — Rs. 31.6 million

The detailed financial sheet is given in Appendix F.

### 8.2.3. Scenario 3

For incremental funds required, the ratio of Share Capital to Unsecured Loans would be **40:60** for the years 1-6 (that is, for the period from 1998-99 up to 2003-04), thereafter (that is, for the period 2004-2010), the ratio would be **20:80**.

Table 8.3 presents the estimates for Gross Profit and PAT.

**Table 8.3 Estimated Gross Profit and PAT for Scenario 3**

Year	Gross Profit (Rs. Million)	PAT (Rs. million)
2002-03	0.6	(4.3)
2006-07	13	0.35
2009-10	21	1.7

(Source: TCS estimate)

Estimates for EOI are as follows:

- 2002-03 — Rs. 41.4 million
- 2006-07 — Rs. 45.5 million
- 2009-10 — Rs. 46.3 million

The detailed financial sheet is given in Appendix G.

Chapter 9  
Conclusions

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1. The demand for tools in Goa during 1997-98 is estimated to be Rs. **25 million**.
2. The target market for TRTC during 1997-98 is estimated to be Rs. **7.5 million**.
3. It is estimated that TRTC's market share will be as follows:
  - 1999-2000 — **5** percent of Rs. 19 million (that is, Rs. 1 million).
  - 2002-03 — **15** percent of Rs. 51 million (that is, Rs. 8 million).
  - 2004-05 — **25** percent of Rs. 90 million (that is, Rs. 22 million).
4. It is estimated that TRTC will make an Operating Profit by the year **2002-03**.  
Estimates for PAT are as follows:
  - Scenario 1 — **2004-05**
  - Scenario 2 — **2005-06**
  - Scenario 3 — **2006-07**

*Note: The three scenarios are outlined in Chapter 8, Commercial Viability.*
5. Starting from the year 2004-05 up to the year 2008-09, TRTC should enhance its capacity by **200** percent.
6. It is recommended that TRTC adopt a *flat* organisation structure.
7. TRTC will need to employ full-time consultants for the first **2-3 years** of implementation of the proposed structure.
8. As TRTC acquires experience in executing tooling jobs, it is expected that the demand for its short-term training courses will increase.



# **APPENDICES**

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APPENDIX A

**INDUSTRY PARTICIPATION**

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## **A. Industry Participation**

A majority of TRTC's existing and potential customers in Goa have a negative perception of TRTC. As detailed in Appendix D, this negative perception of TRTC is due to a number of factors such as customers' experience with TRTC, word-of-mouth, and a lack of awareness. TRTC's lack of competence and professionalism has resulted in customer dissatisfaction. Further, the target customers have access to alternate tooling sources to meet their requirements.

In spite of this negative perception, there is a target market in Goa that would like to procure tools from TRTC on a regular basis due to the physical proximity of TRTC, and its state-of-the art machines and facilities.

TRTC will be able to tap this potential market and attract business only if TRTC overcomes its numerous problems. However it is a moot point whether the customers will participate in the painful process of transformation, and if so, to what extent, how and why. If TRTC is to make the transformation successfully, it must be responsive to the needs of customers in the user industries, who should, therefore, play an important role in the transformation process.

Three basic scenarios have been envisaged with respect to the role that will be played by the target customer in the process of transformation. Each of these scenarios are detailed below.

In Scenario 1, the target customers are passive participants. These customers expect TRTC to fend for itself, and to bring about the transformation without their participation. Such a transformation requires sustained intervention, but the customers do not play any role in it. The customers will wait until TRTC demonstrates adequate competence and professionalism. If TRTC fails to improve its performance, the customers will continue to procure the tools that they require from other sources

Figure A.1 illustrates *Scenario 1*.

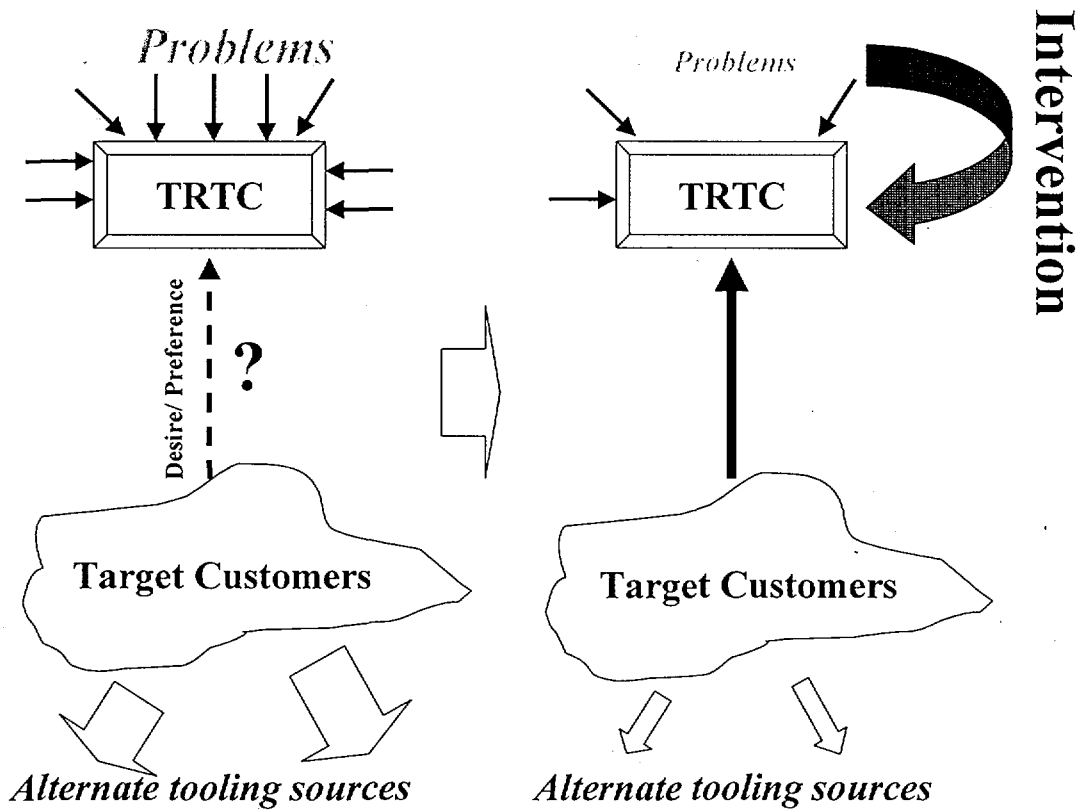


Figure A. 1 Scenario 1: Waiting for a Miracle

In Scenario 2, the target customers play the role of advisors to TRTC. The customers will provide guidance to TRTC periodically. The feedback received from customers will facilitate the process of transformation. Such feedback may help TRTC to mitigate some of its existing problems, and may facilitate the creation of a professional business environment at TRTC.

In this case, the customer is a reactive participant. As the customer acts primarily as an honorary advisor, the seriousness of purpose, involvement, thorough understanding of problems, and accountability will be lacking. The benefits of this option are marginal. As in Scenario 1, a significant number of customers will continue to procure the tools that they require from alternative sources. Figure A.2 illustrates *Scenario 2*.

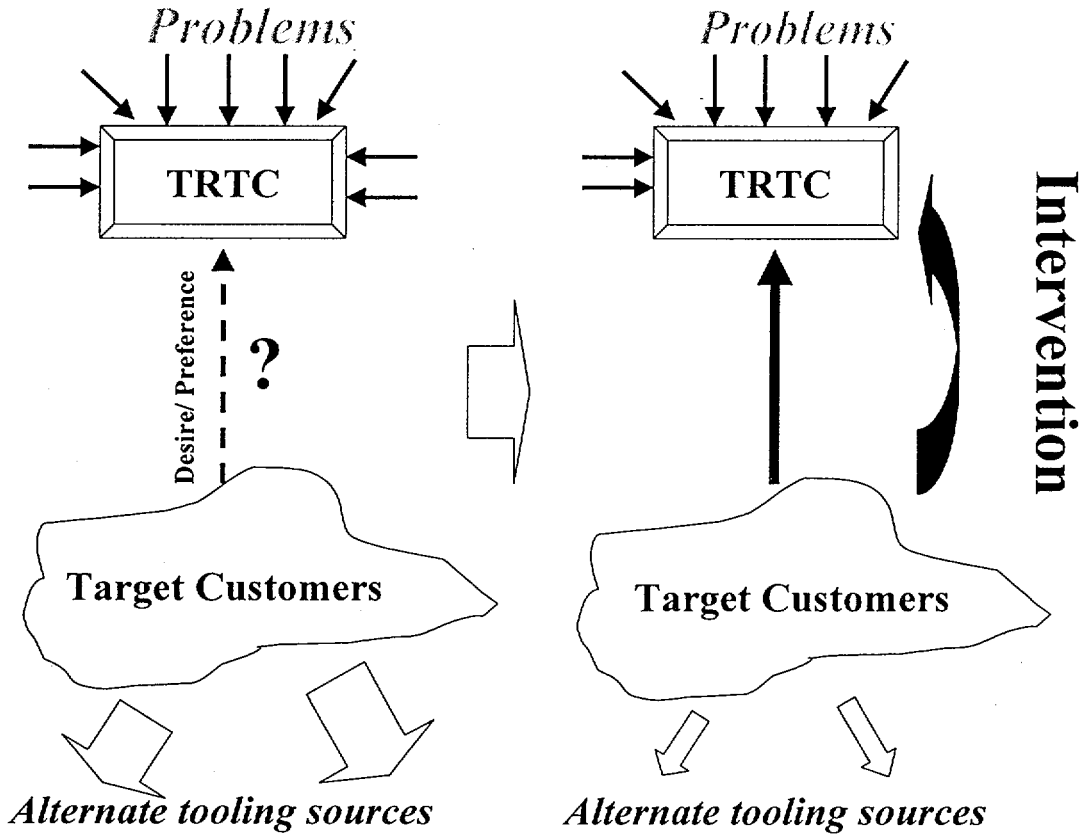
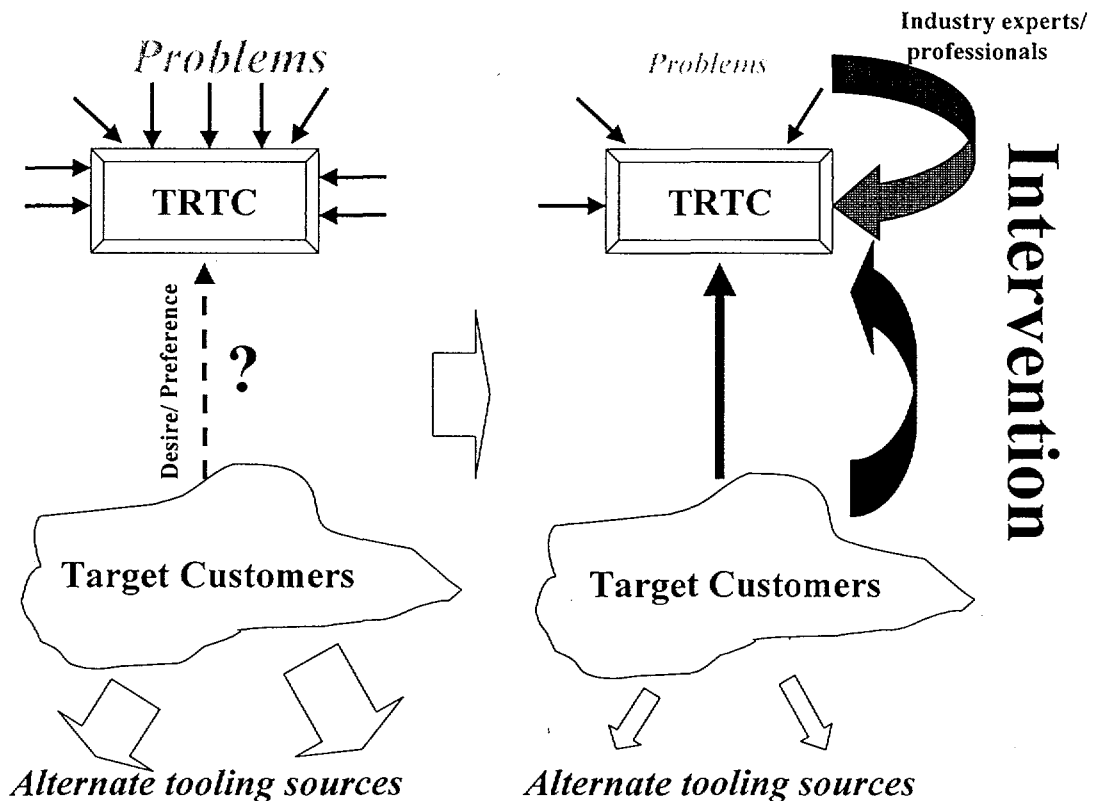


Figure A. 2 Scenario 2: Tinkering

In Scenario 3, the target customers become stakeholders in TRTC's operations. The customers, along with industry experts and professionals, will provide guidance periodically, supervise operational activities, and make strategic decisions. The customer participates proactively in the transformation process. This committed participation by the industry will enable TRTC to address its problems effectively, and facilitate the creation of a professional business environment. Such involvement by the industry will also create an awareness about TRTC in the user industries. Figure A.3 illustrates *Scenario 3*.



**Figure A. 3 Scenario 3: Teamwork**

In order to facilitate industry participation, TRTC may consider constituting the following:

1. An **Advisory Committee** consisting of key representatives of customers. Primarily, the committee will advise periodically the management of TRTC and the Governing Council.
2. An **Executive Committee** consisting of industry experts and key representatives of customers. The committee will take strategic decisions, and supervise and guide activities on behalf of the Governing Council

3. An **Executive Board** consisting of industry experts, trainers, key representatives of customers, and nominees of the Government of Goa. The board, which will replace the Governing Council, will take strategic decisions, and supervise and guide activities. The Executive Board will meet every two or three months.

4. A **Board of Directors** consisting of the owners' directors and nominees (who will represent major shareholders and the Government of Goa), industry experts, trainers, and representatives of customers. The Board of Directors will replace the Governing Council, and will be constituted after TRTC is privatised.

The following matrix presents the relative merits of these options as assessed against different parameters:

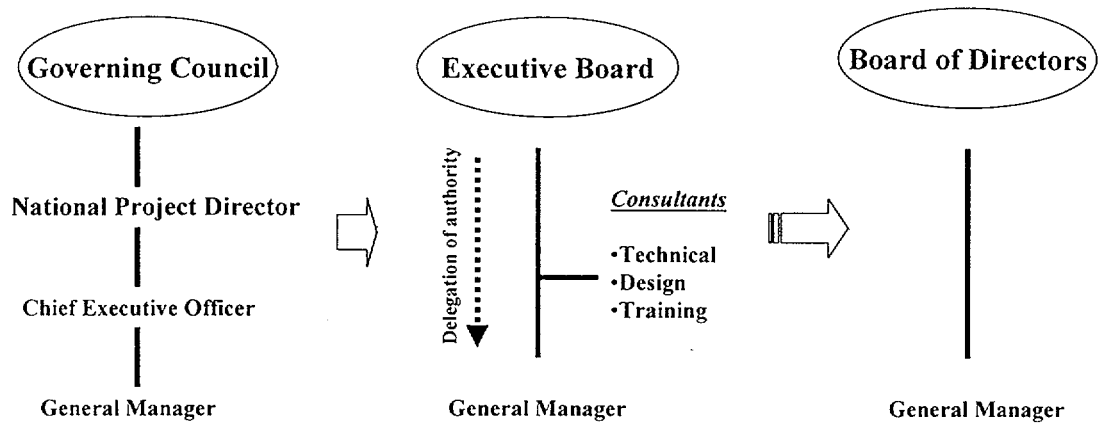
### Intervention Options Matrix

	<b>Advisory Committee</b>	<b>Executive Committee</b>	<b>Executive Board</b>	<b>Board of Directors</b>
<b>Ease of implementation</b>	V. High	High	Medium	Low
<b>Time to implement</b>	Low	Medium	High	V. High
<b>Impact on manufacturing performance</b>	Low	Medium	High	V. High
<b>Impact on training performance</b>	Low	Medium	High	High
<b>Compatibility with social objectives</b>	High	High	Medium	Medium
<b>Professionalism</b>	Low	Medium	High	V. High
<b>Accountability</b>	Low	Medium	High	V. High
<b>Financial burden on the Government of Goa</b>	V. High	High	Medium	Low
<b>Commitment/ involvement of the committee/board members</b>	Low	Medium	High	V. High

After considering the objectives of TRTC and assessing its strengths and weaknesses, TCS' consultants recommend that it is necessary to replace the Governing Council by an Executive Board. The Executive Board will consist of personnel with the right blend of expertise and experience for managing the tooling business. In addition, as discussed in Chapter 8 the technical, design, and training consultants will play a crucial role in enhancing the competence and confidence levels of the employees of TRTC.

When the Government of Goa decides to privatise TRTC, the Board of Directors will be the supreme decision-making body.

Figure A.4 illustrates the transition in the governing structure of TRTC.



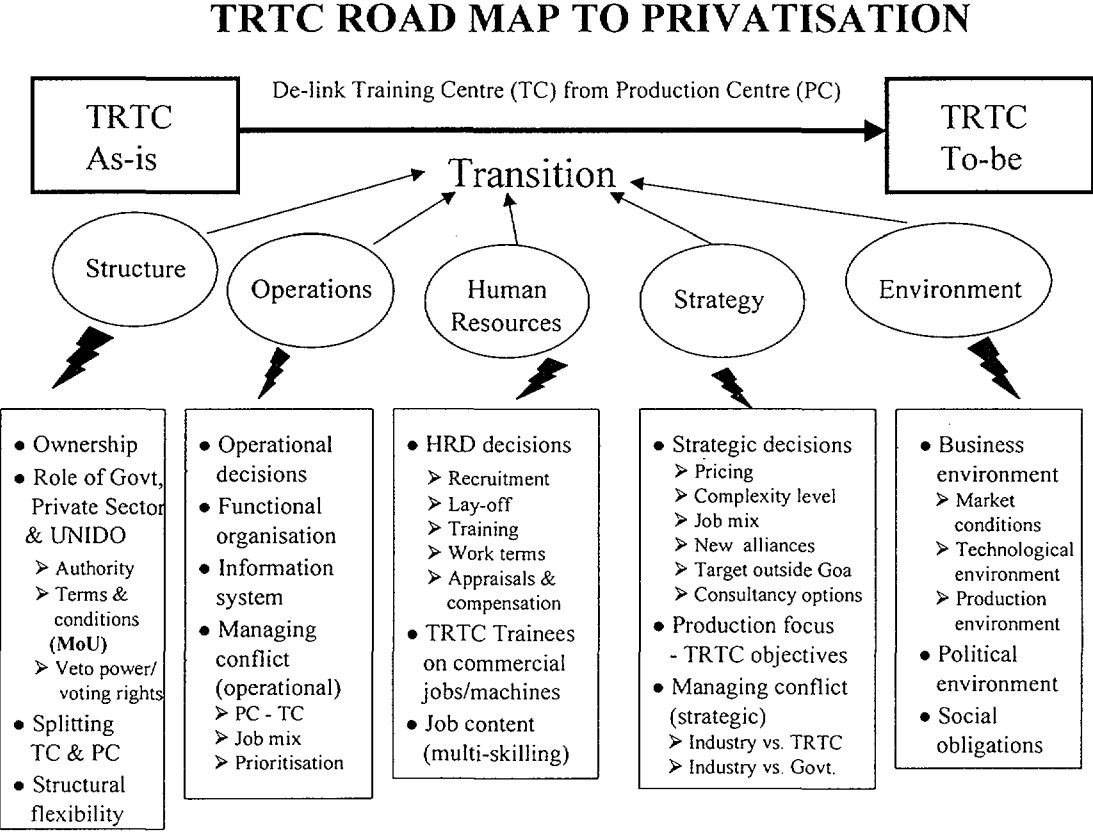
**Figure A. 4 Governing Structure Transition**

To ensure that industry participation and privatisation do not result in a change in TRTC's focus and orientation (unless necessitated by changes in the tooling business), the Government of Goa/ UNIDO should prepare a detailed Memorandum of Understanding (MoU), along with Executive Board/ Board of Directors. This MoU should covering various aspects related to policies and operations, such as:

1. Constitution of the Board and voting rights.
2. Implications of separating the training and manufacturing functions.
3. Terms of employment of the existing employees and new employees.
4. Recruitment policy.
5. Service that will be extended to companies in Goa, particularly, to small companies.
6. Pricing policy, especially for small companies
7. Utilisation of assets for training and manufacturing.
8. Trainees' exposure to machines meant for manufacturing.
9. Operational profitability with respect to job complexity and scope for learning.
10. Prioritisation of jobs and the framework for resolving conflicts.



Figure A.5 illustrates the various factors related to the transition in the governing structure of TRTC.



**Figure A. 5 Privatisation Road Map**

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**APPENDIX B**

**QUESTIONNAIRE FOR USER INDUSTRIES**

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**B. User Industry Questionnaire**  
**(Sponsored by Tool Room & Training Centre, Goa)**

*This questionnaire is being used across several sectors to determine the demand for jigs, fixtures, gauges, moulds, tools and dies (excluding Cutting tools). Please answer questions relevant to your industry only.*

*(Please attach visiting card to the questionnaire)*

• Name of Company: _____	• Location / Address: _____
• Name of Respondent: _____	• Department/ Designation: _____

**• INDUSTRY CATEGORY**

Auto Ancillary      Electrical equipment      Electronics      Foundry      General Engineering  
 Plastics      Packaging      Rubber      Shipping      Telecom      Others \_\_\_\_\_

**• PRODUCT RANGE**

Product Category	Buyer/ Customer	Installed Capacity (Units)	Production Quantity (Units)	Total Sales Turnover (Qty. In Units)	Total Sales Turnover (Value in Rs.)	Growth Rate (%) (in the last 3 years)

- What are the supply terms and conditions for the company's products (in terms of quality and delivery)?
- What are the company's / group's future plans (in terms of New Products, New Production Units and other Expansion Plans)?

• **USAGE PATTERN OF TOOLS**

(Please indicate against each tool type, the purpose for which a tool is used in terms of operations and components produced)

Type	Average age/Life of Tool	Tool Procurement / Production in 1995-96		Tool Procurement / Production in 1996-97		Imported as a %age of total value	Countries imported from
		Qty (Units)	Value (Rs.)	Qty (Units)	Value (Rs.)		
<b>JIGS</b> - Procured - Produced							
<b>FIXTURES</b> - Procured - Produced							
<b>MOULDS</b> ( for plastic/rubber/glass) - Procured - Produced							
<b>GAUGES</b> - Procured - Produced							
<b>PRESS TOOLS</b> - Procured - Produced							
<b>DIE CASTING DIES</b> - Procured - Produced							
<b>FORGING DIES</b> - Procured - Produced							

- What is the frequency of changes in product design? What impact does such changes have on the tooling requirements? Please comment on the possibility of process changes and their impact on tooling requirements.

• BUDGET / FUTURE REQUIREMENTS OF TOOLS & DIES

Type	Budget Procurement / Production		Future Yearly Requirement of tools					
	1997-98		1998-1999		1999-2000		2000-01	
	Qty. (Nos.)	Value (Rs.)	Qty. (Nos.)	Value (Rs.)	Qty. (Nos.)	Value (Rs.)	Qty. (Nos.)	Value (Rs.)
<b>JIGS</b>								
- Procured								
- Produced								
<b>FIXTURES</b>								
- Procured								
- Produced								
<b>GAUGES</b>								
- Procured								
- Produced								
<b>PRESS TOOLS</b>								
- Procured								
- Produced								
<b>DIE CASTING DIES</b>								
- Procured								
- Produced								
<b>MOULDS</b> ( for plastic/rubber/glass)								
- Procured								
- Produced								
<b>FORGING DIES</b>								
- Procured								
- Produced								

- In case of procured tools, please provide information on suppliers for different types of tools

<b>Tool Type</b>	<b>Major Suppliers</b>	<b>Locations</b>
<i>Jigs</i>		
<i>Fixtures</i>		
<i>Gauges</i>		
<i>Plastic Moulds</i>		
<i>Press Tools</i>		
<i>Die Casting Dies</i>		
<i>Forging Dies</i>		

- Problems faced with the existing tool design support and manufacturing facilities?

-In-house facilities related problems:

-External facilities related problems:

- Currently what type of facilities do you avail from external sources?

<b>Process</b>	<b>Facilities / Sub-processes</b>	<b>Brief Description</b>	<b>Service Providers &amp; Locations</b>
<i>Tool Design</i>			
<i>Tool Manufacture</i>			
<i>Tool Maintenance</i>			
<i>Tool Calibration/Testing</i>			
<i>Heat Treatment</i>			
<i>Process Planning</i>			

- Do you have tool and die making specialists in your organization? If yes, kindly provide the information as per the following table:

<b>Types of specialists</b>	<b>Number of specialists</b>	<b>Activities of the specialists in the organization</b>
<i>ITI diploma holders</i>		
<i>4-year course diploma holders in tool and die making</i>		
<i>Post-graduates in tool design</i>		
<i>Personnel undergone short-term training in tool and die making / design</i>		

- Are employees adequately trained to handle tool design and tool procurement? Are employees trained on FEM/CAD/CAM? What training courses do employees attend? Kindly indicate annual figures for number of employees trained, course types and institutes that provided training: [for **CNC operators/programmers; PPC; Autocad; FEM/CAD/CAM**]

No.	Course type	Name of Institute	No. of employees trained per year

- What training courses would /should they attend? Where? **[Indicate training needs separately for: CNC operators/programmers; PPC; Autocad; FEM/CAD/CAM]**

**Short Term (2-7 days):**

**Long Term:**

IN-HOUSE FACILITIES

- What in-house facilities exist for tool design and tool manufacture? [Captive tool room capacity, Tool design infrastructure, Type of CAD/CAM soft-wares and hard-wares, Tool Testing Facilities] (Please refer to the machine list enclosed.)
- What are the plans for expansion of existing facilities or setting up new facilities for tool design and tool manufacture? (Please refer to the machine list enclosed.)
- Are you supplying tools and dies to vendors/sub-contractors/other companies? If so, please provide a list of major customers, the type of operations or components using these tools/dies and the quantities/ values involved.



- Are you aware of the Tool Room and Training Centre (TRTC), Goa and its facilities/services? (Yes/No)
- Expectations from Tool Room and Training Centre:

Parameter	Expectations on each tool category
Lead time	
Price / Service Charges	
Quality of Service	
Facilities (Refer m/c list enclosed)	
Precision Expectation	
Easy accessibility	
Expertise available	
<b>Others</b>	

- Attribute ratings for each tool type (Kindly prioritize.)
- How frequently are tools redesigned or new tools designed (in days/weeks/months/years)?

Attribute	Rating of tool (Out of 5)
Manufacturer/Make	
Accessibility	
Price	
Quality	
Lead Time	
Facilities with Manufacturer	
Any Other:	

Type of Tool	Frequency/ Periodicity
Jigs	
Fixtures	
Gauges	
Moulds	
Press Tools	
Die Casting Dies	
Forging Dies	

• **TYPICAL LIST OF MACHINERY**

Type Of Machine/Equipment	In-House Production Facility					Is it expected in TRTC? (Yes/No)
	Imported (Yes/No)	Manufacturer	Age	Capacity	Utilisation	
3 D Co-Ordinate Measuring M/C						
3 D Hi-Speed Spindle Mould M/C						
Abrasive Cutting Off M/C						
Band Sawing M/C						
Bench Drilling M/C						
CNC Electrical Discharge M/C						
CNC Spark Erosion M/C						
CNC Universal Tool Milling & Boring						
CNC Wire Cut						
Column Drilling M/C						
Die Polishing M/C						
Die Sinking M/C						
Hack Saw M/C						
Hardening & Heating Equipment						
High Speed Precision Lathe						
Hi-Precision Surface Grinding M/C						
Hydraulic Cylindrical Grinder						
Injection Moulding M/C						
Lapping, Honing & Polishing M/C						
Laser Cutting M/C						
Metallic Cutting-Off M/C						
NC Cutter-Grinder						
NC pre-setting M/C						
Profile Projector						
Radial Drilling M/C						
Shaping M/C						
Single Spindle Auto Lathe						
Tangential Grinding M/C						
Turret Room Type Milling M/C						
Universal Milling M/C						
Vertical Milling M/C						

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**APPENDIX C**

**TARGET FIRMS FOR MARKET SURVEY**

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### C. Target Firms For Market Survey

Serial No.	Firm	Location	Industry
1	Aargee Enterprises	Bethora	General Engg.
2	Aarkay Industries	Mapusa	General Engg.
3	Acqua Plast	Corlim	Foundry
4	Aditya Plastics	Kundaim	Plastics
5	Advanced Composites Pvt. Ltd.	Bicholim	General Engg.
6	Aerocoach Automotive Bodybuilders	Bethora	General Engg.
7	Aleluia Menezes & Sons	Panjim	General Engg.
8	Alpha Tech	Bethora	General Engg.
9	Alpine Engg. Works	Tivim	General Engg.
10	Anand Engineers	Tivim	General Engg.
11	Anand Rolling And Forgings Pvt. Ltd.	Bicholim	General Engg.
12	Anant Electronics Industries	Mapusa	Electronics & Telecom
13	Anvesh Plastic Products	Bethora	Plastics
14	Apex Packaging	Kundaim	Packaging
15	Appliance Craft	Kundaim	General Engg.
16	Arc India	Bicholim	General Engg.
17	Aruna Engineering Works	Kundaim	General Engg.
18	Asha Santosh Enterprises	Bethora	General Engg.
19	Ashish Industries	Bethora	General Engg.
20	Automac Industries	Bicholim	General Engg.
21	Automobile Corporation of Goa Ltd	Honda, Sattari	Auto Ancillary
22	B. D. Metal Pvt. Ltd.	Kundaim	General Engg.
23	Bal Bandhoo Company	Mapusa	General Engg.
24	Banco Components	Bethora	Electrical
25	Bandekar Speciality Valve Corpooration	Sancoale	General Engg.
26	Bangle Industries	Kundaim	Plastics
27	Bhandary Industries Metals Pvt. Ltd.	Kundaim	General Engg.
28	Bhandary Precision Balls	Kundaim	General Engg.
29	Bharat Engineers	Bicholim	General Engg.
30	Bharat R. Pednekar	Corlim	Packaging
31	Bharat Rubber	Margao	Rubber
32	Bharti Duroline	Verna	General Engg.
33	Binani Glass Fibre	Colvale	Others
34	Bipson Plastics	Margao	Plastics
35	Blowcan Industries	Bethora	General Engg.
36	Bonpack Private Limited	Margao	Packaging
37	Boro Plast	Sancoale	Foundry
38	Brr Ye Tips Pvt. Ltd.	Kundaim	Plastics
39	Canvass Shoes	Tivim	Others
40	CG-PPI Adhesives	Kundaim	Plastics
41	Chemtrols Engineering	Kundaim	General Engg.
42	Chodancar Engg. & Services	Alto De Porvorim	General Engg.
43	Churi Industries	Kundaim	General Engg.
44	Cira Fibreglass	Tivim	Others

Serial No.	Firm	Location	Industry
45	Classic Extrusion Pvt. Ltd.	Margao	General Engg.
46	Courtaulds Packaging	Verna	Packaging
47	Crompton Greaves - Tivim	Tivim	Electrical
48	Crompton Greaves (Fans)	Bethora	General Engg.
49	Crompton Greaves (FHP)	Kundaim	General Engg.
50	Crown Techno Appliances	Verna	General Engg.
51	Cyatron	Verna	General Engg.
52	D Link	Verna	General Engg.
53	D.C. Hydrolics	Bicholim	General Engg.
54	Damodar Mangalji Mining Co.	Curcholem	Others
55	Damodar Works	Bicholim	General Engg.
56	Datson Plastics	Margao	Plastics
57	Decibell Electronics Ltd.	Verna	Electronics & Telecom
58	Dempo Mining Corporation Pvt. Ltd.	Margao	Others
59	Desai & Desai Industries	Cuncolem	General Engg.
60	Diamond Nuts & Bolts	Bethora	General Engg.
61	Dilip Manilal Gosalia	Curcholem	General Engg.
62	Dinocraft Industries	Tivim	General Engg.
63	Durga Plastics	Margao	Plastics
64	Dynaflo Metallice	Kundaim	General Engg.
65	Dynaplast Tech	Tivim	General Engg.
66	Dynaquip Hydraulics	Tivim	General Engg.
67	Eagle Industries	Kundaim	General Engg.
68	Electro Services	Tivim	General Engg.
69	Electro Tech	Tivim	General Engg.
70	Essel Packaging	Kundaim	Packaging
71	Finolex Essex	Usgao	General Engg.
72	Fire Equipment (Goa) Private Limited	Sancoale	Rubber
73	FRP & Insulation Services	Sancoale	Electrical
74	Funskool	Corlim	Plastics
75	G K Enterprises	Mapusa	General Engg.
76	Gajanan Plastic Industry	Margao	Plastics
77	Gauri Ganesh Electricals	Bethora	Electrical
78	Goa Cables	Corlim	Electrical
79	Goa Capacitors Private Limited	Corlim	Electrical
80	Goa Electronics	Verna	Electronics & Telecom
81	Goa Horological Industries	Mapusa	General Engg.
82	Goa Hydraulics	Tivim	General Engg.
83	Goa Instruments Industries	Mapusa	General Engg.
84	Goa Invescast Ltd.	Kundiam	Foundry
85	Goa Metal Alloys And Castings	Corlim	General Engg.
86	Goa Metal Pressings	Kundaim	General Engg.
87	Goa Mouldcrafters Pvt. Ltd.	Margao	Plastics
88	Goa Packs Caps & Packagings	Tivim	Packaging
89	Goa Plast	Corlim	Foundry
90	Goa Plastics	Bicholim	Plastics

Serial No.	Firm	Location	Industry
91	Goa Press Tools	Margão	General Engg.
92	Goa Resistors Private Limited	Collem	General Engg.
93	Goa Rubber Limited	Tivim	Rubber
94	Goa Rubber Products	Corlim	Rubber
95	Goa Steel Rolling Mill & Allied Industries	Bicholim	General Engg.
96	Goa Telecom & Systems Limited	Porvorim	Others
97	Goa Telecommunications & Systems ltd.	Mapusa	Electronics & Telecom
98	Goa Telematics Limited	Kundaim	General Engg.
99	Goa Thermostatic Instruments	Mapusa	General Engg.
100	Goa Thermostatic Instruments Pvt. Ltd.	Bicholim	Electronics & Telecom
101	Goa Wire And Allied Products	Tivim	General Engg.
102	Golden Plastic Industries	Mapusa	Plastics
103	Goldstar Electronics Pvt. Ltd.	Margao	Electronics & Telecom
104	Gomantak Press Tools	Verna	General Engg.
105	Gozalia Rubber Industries	Savare	Rubber
106	Gripwell Tyres Ltd.	Sancoale	Rubber
107	Hemant Steel Fabricators	Bicholim	General Engg.
108	Himalaya Enterprises	Tivim	General Engg.
109	Himcast	Kundaim	Foundry
110	HiTech Lenses	Tivim	General Engg.
111	Hi-Tech Press Tools	Kundaim	General Engg.
112	Hosemann Goa Pvt. Ltd.	Kundaim	Rubber
113	Hoysala Coach Builders	Mapusa	Auto Ancillary
114	Hydropack Industries	Tivim	Packaging
115	IFB - Corlim	Corlim	Electrical
116	IFB - Verna	Verna	Electrical
117	Indo Pack	Margao	Plastics
118	Ion Exchange India Ltd	Verna	Plastics
119	Jayanti Business Machines	Verna	General Engg.
120	Jogi & Sons	Sancoale	General Engg.
121	Jordan Dental Care Products Ltd	Margao	Plastics
122	Joseph Cuts Ltd.	Bethora	General Engg.
123	Kamaca Plastics	Bethora	Plastics
124	Karthik Alloys	Cuncolim	General Engg.
125	Karthik Inductions	Kundaim	General Engg.
126	Kaushik Metal Profiles	Kundaim	General Engg.
127	Kayaar Industries	Kundaim	General Engg.
128	Kaykay Crown Corks Pvt. Ltd.	Bicholim	Packaging
129	Keerti Plastics	Kundaim	Plastics
130	Kin Plast	Margao	Foundry
131	Kodak India Limited	Verna	Plastics
132	Kores India Ltd.	Verna	General Engg.
133	Kunda Polymers	Margao	Others
134	Laxmi Engineering Works	Bethora	General Engg.
135	Legacy Rubber	Bethora	Rubber
136	Legacy Tips Pvt. Ltd.	Kundaim	Plastics

Serial No.	Firm	Location	Industry
137	Linc Pen & Plastics	Corlim	Plastics
138	Living Room Lifestyle Ltd.	Tivim	Others
139	Lloyd Industries	Kundaim	General Engg.
140	Lokmanya Soap Works	Mapusa	Others
141	Madras Rubber Factory	Usgao	Rubber
142	Mandovi Plastics	Corlim	Plastics
143	Manekar Industry	Tivim	General Engg.
144	Manohar Packaging	Mapusa	Packaging
145	Mapusa Bottles	Tivim	Plastics
146	Mayur Plastics	Bethora	Plastics
147	Menezes Electronics	Margao	Electronics & Telecom
148	Merwyn Tools	Navelim	General Engg.
149	Metal Craft Industries	Bicholim	General Engg.
150	Micro Interconnection	Corlim	Electronics & Telecom
151	Midwest Instruments	Tivim	Plastics
152	Minced Metal Products	Kundaim	General Engg.
153	Minco Pvt. Ltd.	Tivim	General Engg.
154	Modi Measurement Systems Pvt. Ltd.	Verna	General Engg.
155	Mormugao Steel Limited	Margao	Others
156	N. S. Structures	Sancoale	General Engg.
157	Narayan Plastics	Margao	Plastics
158	Natekar Industries	Bethora	Packaging
159	National Auto Accessories Ltd.	Margao	Auto Ancillary
160	National Controls	Corlim	General Engg.
161	National Splicing Co.	Sancoale	Rubber
162	Navatara Fabrication	Tivim	General Engg.
163	Navdurga Metal Ink	Bethora	General Engg.
164	Nestle India Ltd.	Usgao	Others
165	Nevgi Fasteners	Tivim	General Engg.
166	Nikita Accumulators	Bicholim	Electrical
167	Omkar Plastics	Ponda	Plastics
168	Oriental Engineering Works	Corlim	General Engg.
169	Packmaster	Tivim	General Engg.
170	Panduranga Timblo Industries	Margao	Others
171	PAP	Tivim	General Engg.
172	Parab Engineering Industry	Bethora	General Engg.
173	Pentagon Engineering Industries	Bethora	General Engg.
174	Petals Engineers Pvt. Ltd.	Kundaim	General Engg.
175	Phil Corporation Ltd.	Tivim	Plastics
176	Plastic Crafts	Tivim	Plastics
177	Plasto Pack	Corlim	Packaging
178	Polyset Plastics	Verna	Plastics
179	Pooja Ferro Alloys Ltd.	Cuncoim	General Engg.
180	Possible Electronics	Margao	Electronics & Telecom
181	Prabha Engineering Works	Bicholim	General Engg.
182	Prasad Packaging	Kundaim	Packaging

Serial No.	Firm	Location	Industry
183	Premier Plastics	Kundaim	Plastics
184	Progress Corrugating & Packing Industries	Corlim	Packaging
185	Purvatron Industries	Margao	General Engg.
186	Pushparati Packs	Tivim	Packaging
187	Pyro Electric Instruments Goa Pvt. Ltd.	Bicholim	General Engg.
188	Rajendra Iron & Steel Works	Bicholim	General Engg.
189	Ram Cabines Pvt. Ltd.	Tivim	General Engg.
190	Ram Plastics	Bicholim	Plastics
191	Rex Instruments Pvt. Ltd.	Margao	General Engg.
192	Ritika Packaging Pvt. Ltd.	Sancoale	Packaging
193	Rivon Engineering Co.	Margao	General Engg.
194	Rocha Industries	Cuncolem	General Engg.
195	Rodal Circaprints Electricals	Kundaim	Electrical
196	S. R. Enterprises	Corlim	Packaging
197	S.S. Fabs	Kundaim	General Engg.
198	Safari Auto Springs	Corlim	General Engg.
199	Saha Electronic Industries	Bethora	Electronics & Telecom
200	Sai Extrusions	Tivim	General Engg.
201	Sai Plastics Associates	Kundaim	Plastics
202	Sai Shant Die Casting Industries	Bethora	General Engg.
203	Sainath Engineering Works	Bethora	General Engg.
204	Saini Enterprises	Sancoale	General Engg.
205	Sakib Industries	Bethora	General Engg.
206	Salgaocar Mining Industries	Margao	Others
207	Salgaonkar Rubber Industries	Mapusa	Rubber
208	Samco Polypack	Bethora	Packaging
209	Samruddhi Industries	Kundaim	General Engg.
210	Samtech Engineers	Sancoale	General Engg.
211	Saphire Machines	Tivim	General Engg.
212	Satpurush Fabrication	Tivim	General Engg.
213	Schematics	Bethora	General Engg.
214	Servex Engineering	Margao	General Engg.
215	Servo Plast	Kundaim	Foundry
216	Servocare Enterprises	Kundaim	General Engg.
217	Sesa Goa Pvt. Ltd.	Margao	Others
218	Shaha Pack & Print	Kundaim	Packaging
219	Shanta Durga Engg.	Bicholim	General Engg.
220	Sherly Rubber Co.	Kundaim	Rubber
221	Shivam Industries	Margao	General Engg.
222	Shivmudra Packaging	Bethora	Packaging
223	Shree Tools	Bicholim	General Engg.
224	Shri Swami Samarth Engineering Works	Kundaim	General Engg.
225	Shriram Glass	Tivim	Others
226	Shubh Plast	Margao	Foundry
227	Siemens Limited	Verna	Electronics & Telecom
228	Silver Springs	Verna	Plastics



Serial No.	Firm	Location	Industry
229	Skylark Engineering Works	Kundaim	General Engg.
230	Smart Instruments	Verna	Plastics
231	Smita Engineering Works	Kundaim	General Engg.
232	Sohan Rubber Products	Corlim	Rubber
233	Southern Engineering Projects	Kundaim	General Engg.
234	Southern Filters	Bicholim	General Engg.
235	Sparrow Electronics	Verna	Electronics & Telecom
236	Special Bearings	Tivim	General Engg.
237	Stafford Equipment Pvt. Ltd.	Tivim	General Engg.
238	Stallion Sales And Tips	Kundaim	Plastics
239	Standard Packers	Tivim	Packaging
240	Stardom Tyres	Margao	Rubber
241	Sterling Home Products Pvt. Ltd.	Kundaim	Plastics
242	Structural India	Verna	Plastics
243	Styrofoam Cups & Containers	Sancoale	Plastics
244	Subhash Plastic Enterprises	Kundaim	Plastics
245	Sunita Packagings	Tivim	Packaging
246	Sunshine Electric Company	Kundaim	Electrical
247	Suprinda Platics	Margao	Plastics
248	Swan Enamels Pvt. Ltd.	Kundaim	Plastics
249	Syndicate Marine Enterprises	Sancoale	General Engg.
250	Taparia Tools	Margao	General Engg.
251	Tata Infotech	Mapusa	General Engg.
252	Technostat Components	Bethora	Electrical
253	Tirupathi Steel Pvt. Ltd.	Cuncolim	General Engg.
254	Titan Time Products	Verna	General Engg.
255	Titanor Components	Kundaim	General Engg.
256	Top Brass Mfg. Co. Ltd.	Tivim	General Engg.
257	Topline Writing Instruments Pvt. Ltd.	Sancoale	Plastics
258	Tough Seals	Bethora	Rubber
259	Trinity Plastics	Mapusa	Plastics
260	Ultra Tech Auto Components	Verna	Auto Ancillary
261	Unicoat Associates	Bethora	General Engg.
262	Unidiam Abrasives	Verna	General Engg.
263	Unique Glass Fibre Composites	Kundaim	Others
264	Unitek	Bethora	General Engg.
265	Universal Engineers	Margao	General Engg.
266	Usha Polymers Ltd.	Mapusa	Plastics
267	Vaibhav Industries	Kundaim	General Engg.
268	Vasco Galvanizing & Fab	Kundaim	General Engg.
269	Venus Chemicals	Bicholim	Others
270	Vinayak Plastics Private Limited	Bicholim	Plastics
271	Vinoy Industries	Kundaim	General Engg.
272	Vividh Plastics	Kundaim	Plastics
273	Wilman Packaging Pvt. Ltd.	Bethora	Packaging
274	Wires And Profiles	Sancoale	General Engg.

<b>Serial No.</b>	<b>Firm</b>	<b>Location</b>	<b>Industry</b>
275	Zedd Telecom Limited	Bethora	Electronics & Telecom
276	Zuari Engineering works	Sancoale	General Engg.

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APPENDIX D

**INDUSTRY FEEDBACK ABOUT TRTC**

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## D. Industry Feedback about TRTC

### Companies hesitate to give jobs to TRTC because:

- a) Doubts about the "technical operational capability"
  - Due to less experience on tooling assignments, the impression is that TRTC personnel have more theoretical and less practical knowledge
  - Incompetent team – no good tool makers, no engineers, not enough skilled people
  - Lack of technical skills in performing high precision jobs
  - Lack of technical knowledge on tool maintenance and process planning
  - Technical difficulties due to lack of skilled people for high precision machines leading to longer machine hours, reworks and high costs
- b) Quotations for jobs are higher than market rates
  - Improper utilisation of machines, hence unreasonable billing to customers is possible
  - Lot of idle machines
  - Non-optimal shop floor layout creating congestion
  - Unsure about productivity and product costing approach
- c) Quality of jobs is a suspect
  - Concerns about technical capability to meet tight (import quality) specifications
  - Suspicions about inexperienced trainees instead of experts working on the jobs
- d) Incapable of handling big jobs due to:
  - Absence of handling facilities such as cranes
  - Size constraints due to shop floor layout
- e) Serious concerns about meeting delivery time schedules
- f) Bad word-of-mouth from other customers of TRTC on:
  - Inability to meet delivery schedules
  - Monopolistic product pricing attitude
  - Lack of trained and skilled personnel
- g) Systemic bottlenecks at TRTC:
  - Board members are given preference while SSI customers are made to wait for 30-60 minutes at the TRTC facility
  - Bigger companies are given preference over SSI units in all aspects of customer handling
  - SSI customers are not allowed to visit production area even to check on their jobs
  - Customer concerns on critical aspects of tooling are not paid attention to
  - Communication problems abound due to frequent handoffs between various persons at TRTC

- h) Lack of customer orientation
- Never reached out to SSI units
  - High lead time
  - Poor response to cold calls as the key contact person is always busy or missing
  - Concerns about after-job services such as breakdown maintenance
  - Never followed up with old customers at Tivim
  - Laid back attitude
  - Do not co-operate very much with non-Goan Entrepreneurs
- i) Company cannot deal with a service provider who has been black listed by its primary (major) customer.

**Company-impressions on jobs performed by TRTC:**

- a) Unable to be meet delivery schedules:
- Blaming power supply for job delays
  - Production delays due to material shortage
- b) Exorbitant pricing (three times the price quoted by a Belgaum supplier)
- c) Unacceptable quality and degree of accuracy
- d) Communication, co-ordination and commitment problems
- e) Design mismatch as there is no system to ensure authenticity and get necessary approvals
- f) Technology slack
- g) Manufacturing process slack
- h) Additional burden on customers to procure raw materials
- i) Lack of customer orientation
- Bad service
  - No priority give to "urgent" jobs
  - Indifferent towards customers
  - Production personnel were not co-operative
  - No customer feedback system
- j) Poor work attitude and technical competence:
- Non-repairable damage to a product given for repair work
  - SSI jobs carelessly handled – assemblies that came with the job were misplaced
  - Jobs from SSI units are used to train apprentices at TRTC
  - Bickering about penalties accrued for violating contract

**Companies expect TRTC to:**

- a) Manufacture precision products
- b) Meet international standards of precision
- c) Ascertain that product quality is right the first time and there is no rework
- d) Deliver on schedule
- e) Provide maximum lead time of 10-15 days
- f) Provide quotations within a week upon receipt of Request for Quotations
- g) Quote highly competitive market-driven pricing
- h) Be willing to negotiate on price and service terms
- i) Consolidate clusters of job to get economies of scale
- j) Reduce idle capacity by taking new orders with short term price cuts and discounts
- k) Perform materials management instead of relying on customers to do the purchasing function for every job
- l) Provide excellent (world class) service
- m) Follow up with customers periodically
- n) Should be easily accessible for expertise
- o) Address the market of auto components where a latent demand exists due to
  - Component warping
  - Need for fixtures and coiling tools
- p) Perform other activities such as to:
  - Invest on confidence-building exercises
  - Initiate interactions with Production Managers of large and medium companies
  - Provide training in repairing and servicing machines
  - Produce good heat treatment jobs
  - Conduct workshops for SSI units
  - Provide facilities for calibration and testing gauges
  - Help companies to set up captive tool rooms

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APPENDIX E

**COMMERCIAL VIABILITY ANALYSIS : SCENARIO 1**

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## E. COMMERCIAL VIABILITY ANALYSIS : SCENARIO 1

### NOTES:

	First 3 years	After 3 years
Manufacturing charges as a percentage of Sales	20.00%	20.00%
Design charges as a percentage of Sales	2.50%	2.50%
Consultancy fees as percentage of Sales	2.50%	2.50%
Heat Treatment charges a percentage of Sales	5.00%	5.00%
Precision product sales as a percentage of Total Sales	60.00%	6.00%
Miscellaneous jobs charges a percentage of Sales	10.00%	5.00%
Administrative expenses as a percentage of Sales (year 6 onwards)	8%	
Administrative expenses - year 1	300,000	
Increase in Administrative expenses - year 2 to year 5	10%	
Raw material as a percentage of Sales	15%	
Consumables as a percentage of Sales	10%	
Power & fuel as a percentage of Sales	8%	
Repairs & Maintenance as a percentage of Sales	5%	
Installed Capacity	2000	machine hours
Sales Realisation (incl 25% allowance for handwork)	4375	Rs./ machine hour
%age of wages given to Operating staff	70%	
%age of wages given to Support staff	30%	
Max. Manufacturing charges generated in a year with 1 shift	Rs. 6500000	
Depreciation rate for Building	1.63%	
Depreciation rate for P&M and Misc.assets (1 shift)	5.18%	
Depreciation rate for P&M and Misc.assets (2 shifts)	5.09%	
Depreciation rate for P&M and Misc.assets (3 shifts)	11.31%	
Interest on Net Working Capital	15%	
Interest on Other loans	15%	
Other Income includes short term training fees and jobs done by the trainees		
Other Income as a percentage of sales (year 1 - year 4)	5%	
Other Income as a percentage of sales (year 5 - year 12)	2.5%	
Share Capital (year 1 - year 6)	100%	
Share Capital : Unsecured loans (year 7 onwards)	70:30	
Tax	35%	



## PROFITABILITY PROJECTIONS

(All figures are in Rupees unless otherwise specified)

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Installed Capacity (machine hours)	2,400	2,400	2,400	2,400	2,400	2,400	2,400	3,600	3,600	4,800	6,000	7,200
Production (machine hours)	114	229	457	914	1,829	3,657	5,150	6,531	8,139	10,004	12,163	14,655
Number of shifts (Number)	1	1	1	1	2	3	3	3	3	3	3	3
Capacity Utilization	5%	10%	19%	38%	38%	51%	72%	60%	75%	69%	68%	68%
Demand	11,213,214	19,080,269	24,024,473	36,728,877	51,747,986	69,419,595	90,126,169	114,300,433	142,431,634	175,072,570	212,847,453	256,460,724
Market share (%)	4%	5%	8%	11%	15%	23%	25%	25%	25%	25%	25%	25%
<b>Sales</b>	500,000	1,000,000	2,000,000	4,000,000	8,000,000	16,000,000	22,531,542	28,575,108	35,607,908	43,768,143	53,211,863	64,115,181
Manufacturing	100,000	200,000	400,000	3,200,000	6,400,000	12,800,000	18,025,234	22,860,087	28,486,327	35,014,514	42,569,491	51,292,145
Design	12,500	25,000	50,000	100,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,602,880
Consultancy	12,500	25,000	50,000	100,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,602,880
Heat Treatment	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Regular jobs	300,000	600,000	1,200,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Miscellaneous jobs	50,000	100,000	200,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Training Income (long term)	150,000	300,000	450,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Other Income (incl. short term training)	25,000	50,000	100,000	200,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,602,880
<b>Expenses</b>												
Raw Materials	75,000	150,000	300,000	600,000	1,200,000	2,400,000	3,379,731	4,286,266	5,341,186	6,565,221	7,981,779	9,617,277
Consumables	50,000	100,000	200,000	400,000	800,000	1,600,000	2,253,154	2,857,511	3,560,791	4,376,814	5,321,186	6,411,518
Power and Fuel	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Salaries & Wages	2,500,000	2,500,000	2,500,000	2,500,000	4,250,000	6,000,000	6,000,000	9,000,000	9,000,000	12,000,000	15,000,000	18,000,000
Consultants' fees	1,500,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0
Repairs & Maintenance	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Administrative & Miscellaneous	800,000	880,000	968,000	1,064,800	1,171,280	1,200,000	1,689,866	2,143,133	2,670,593	3,282,611	3,990,890	4,808,639
<b>Total Operating Cost</b>	4,975,000	5,230,000	5,668,000	4,964,800	8,221,280	12,800,000	15,575,905	21,144,421	24,133,361	30,601,461	37,615,042	45,248,952
<b>Gross Profit</b>	-4,300,000	-3,880,000	-3,118,000	-164,800	578,720	4,200,000	8,118,925	8,745,065	12,964,745	14,860,886	17,527,118	21,069,109
Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
<b>Profit Before Interest &amp; Tax</b>	-6,642,503	-6,222,503	-5,460,503	-2,507,303	-2,961,396	-651,786	1,130,391	1,756,530	3,839,462	3,598,854	4,128,339	7,670,329
Interest												
Term Loans	0	0	0	0	0	0	0	0	0	0	0	0
Net Working Capital	0	0	0	22,626	66,313	177,534	280,205	338,218	448,768	540,054	651,515	785,920
Other loans	0	0	0	0	0	0	421,117	0	451,472	874,353	1,131,181	0
<b>Profit Before Tax</b>	-6,642,503	-6,222,503	-5,460,503	-2,529,929	-3,027,709	-829,321	429,069	1,418,312	2,939,222	2,184,447	2,345,643	6,884,409
Tax	0	0	0	0	0	0	150,174	496,409	1,028,728	764,557	820,975	2,409,543
<b>Profit After Tax</b>	-6,642,503	-6,222,503	-5,460,503	-2,529,929	-3,027,709	-829,321	278,895	921,903	1,910,495	1,419,891	1,524,668	4,474,866

PROJECTED BALANCE SHEET

	Year												
	0	1	2	3	4	5	6	7	8	9	10	11	12
<b>ASSETS</b>													
Fixed Assets													
Gross Block	53,994,000	56,944,000	56,944,000	56,944,000	56,944,000	56,944,000	56,944,000	75,836,558	75,836,558	94,729,115	113,621,673	132,514,230	132,514,230
Accumulated Depreciation	8,946,000	11,282,503	13,625,006	15,967,510	18,310,013	21,850,129	26,701,915	33,690,450	40,678,984	49,804,267	61,066,298	74,465,077	87,863,857
Net Fixed Assets	45,054,000	45,661,497	43,318,994	40,976,490	38,633,987	35,093,871	30,242,085	42,146,108	35,157,573	44,924,848	52,555,374	58,049,153	44,650,373
Expenditure pending capitalisation	2,450,000	0	0	0	0	0	0	0	0	0	0	0	0
Current Assets	5,445,000	71,918	143,836	287,671	575,342	1,150,685	2,301,370	3,240,838	4,110,118	5,121,685	6,295,418	7,653,761	9,222,047
Loans & Advances	611,000	611,000	611,000	611,000	611,000	632,158	4,113,149	611,000	5,327,231	611,000	611,000	611,000	10,047,498
Expenditure over Income	12,884,000	19,523,503	25,746,006	31,206,510	33,736,439	36,764,147	37,593,468	37,314,573	36,392,670	34,482,176	33,062,285	31,537,617	27,062,752
<b>Total Assets</b>	<b>66,941,000</b>	<b>65,867,918</b>	<b>69,819,836</b>	<b>73,081,671</b>	<b>73,556,768</b>	<b>73,840,863</b>	<b>74,250,072</b>	<b>83,312,520</b>	<b>80,987,593</b>	<b>85,139,709</b>	<b>92,524,077</b>	<b>97,851,531</b>	<b>90,982,579</b>
<b>LIABILITIES</b>													
Shareholder Funds													
Share Capital	63,000,000	63,456,959	69,395,863	72,007,589	73,132,264	73,132,264	73,132,264	79,132,264	79,132,264	60,000,000	64,000,000	67,000,000	67,000,000
Loan Funds													
Term Loans	0	0	0	0	0	0	0	0	0	0	0	0	0
Unsecured Loans & Deposits	2,871,000	0	0	0	0	0	0	2,807,449	0	3,009,812	5,629,920	7,541,265	0
Current Liabilities	1,070,000	410,959	433,973	474,082	424,504	708,598	1,117,808	1,372,807	1,855,330	2,129,898	2,695,058	3,310,326	3,982,579
<b>Total Liabilities</b>	<b>66,941,000</b>	<b>65,867,918</b>	<b>69,819,836</b>	<b>73,081,671</b>	<b>73,556,768</b>	<b>73,840,862</b>	<b>74,250,072</b>	<b>83,312,520</b>	<b>80,987,594</b>	<b>85,139,710</b>	<b>92,524,078</b>	<b>97,851,531</b>	<b>90,982,579</b>

## DEPRECIATION SCHEDULE

### DEPRECIATION: STRAIGHT LINE METHOD

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Civil Works</b>												
Opening Balance of Assets	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885
Land	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Building	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885
Recurring Capital Expenditure	0	0	0	0	0	0	0	0	0	0	0	0
Closing Balance	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885
Depreciation	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645
<b>Plant and Machinery and Miscellaneous Fixed Assets</b>												
Opening Balance of Assets	37,785,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	59,627,673	59,627,673	78,520,230	97,412,788	116,305,345
Recurring Capital Expenditure							18,892,558		18,892,558	18,892,558	18,892,558	
Capitalised during the year	2,950,000											
Closing Balance	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	59,627,673	59,627,673	78,520,230	97,412,788	116,305,345	116,305,345
Depreciation	2,097,858	2,097,858	2,097,858	2,097,858	3,295,471	4,607,142	6,743,890	6,743,890	8,880,638	11,017,386	13,154,135	13,154,135
<b>Total Depreciation on Straight Line Method</b>	<b>2,342,503</b>	<b>2,342,503</b>	<b>2,342,503</b>	<b>2,342,503</b>	<b>3,540,116</b>	<b>4,851,786</b>	<b>6,988,535</b>	<b>6,988,535</b>	<b>9,125,283</b>	<b>11,262,031</b>	<b>13,398,779</b>	<b>13,398,779</b>

## WORKING CAPITAL

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Total days in a year	365											
Raw Material Inventory (days)	90											
Receivables (days)	30											
Payables (days)	70											
Payables (Power & Fuel - days)	60											
<b>Current Assets</b>												
R M & Consumables Inventory	30,822	61,644	123,288	246,575	493,151	986,301	1,388,931	1,761,479	2,195,008	2,698,036	3,280,183	3,952,306
Receivables	41,096	82,192	164,384	328,767	657,534	1,315,068	1,851,908	2,348,639	2,926,677	3,597,382	4,373,578	5,269,741
<b>Current Liabilities</b>												
Payables - Power & Fuel	4,110	8,219	16,438	32,877	65,753	131,507	185,191	234,864	292,668	359,738	437,358	526,974
Payables - Others	406,849	425,753	457,644	391,627	642,845	986,301	1,187,616	1,620,466	1,837,230	2,335,319	2,872,968	3,455,605
<b>Net Working Capital</b>	-339,041	-290,137	-186,411	150,838	442,087	1,183,562	1,868,031	2,254,789	2,991,788	3,600,360	4,343,435	5,239,468

**CASH PROFIT ANALYSIS**

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Profit After Tax	-6,642,503	-6,222,503	-5,460,503	-2,529,929	-3,027,709	-829,321	278,895	921,903	1,910,495	1,419,891	1,524,668	4,474,866
add: Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
less: Increase in NWC	-4,714,041	48,904	103,726	337,249	291,248	741,475	684,470	386,757	736,999	608,572	743,075	896,033
<b>Cash Surplus / (Deficit)</b>	414,041	-3,928,904	-3,221,726	-524,675	221,159	3,280,991	6,582,959	7,523,680	10,298,778	12,073,349	14,180,372	16,977,613

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APPENDIX F

**COMMERCIAL VIABILITY ANALYSIS : SCENARIO 2**

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## F. COMMERCIAL VIABILITY ANALYSIS : SCENARIO 2

### NOTES:

	First 3 years	After 3 years
Manufacturing charges as a percentage of Sales	20.00%	80.00%
Design charges as a percentage of Sales	2.50%	2.50%
Consultancy fees as percentage of Sales	2.50%	2.50%
Heat Treatment charges a percentage of Sales	5.00%	5.00%
Precision product sales as a percentage of Total Sales	60.00%	5.00%
Miscellaneous jobs charges a percentage of Sales	10.00%	5.00%
Administrative expenses as a percentage of Sales (year 6 onwards)	8%	
Administrative expenses - year 1	800,000	
Increase in Administrative expenses - year 2 to year 5	10%	
Raw material as a percentage of Sales	15%	
Consumables as a percentage of Sales	10%	
Power & fuel as a percentage of Sales	8%	
Repairs & Maintenance as a percentage of Sales	5%	
Installed Capacity	2400 machine hours	
Sales Realisation (incl 25% allowance for handwork)	4375 Rs./ machine hour	
%age of wages given to Operating staff	70%	
%age of wages given to Support staff	30%	
Max. Manufacturing charges generated in a year with 1 shift	Rs. 6500000.	
Depreciation rate for Building	1.83%	
Depreciation rate for P&M and Misc.assets (1 shift)	5.15%	
Depreciation rate for P&M and Misc.assets (2 shifts)	8.09%	
Depreciation rate for P&M and Misc.assets (3 shifts)	11.31%	
Interest on Net Working Capital	15%	
Interest on Other loans	15%	
Other Income includes short term training fees and jobs done by the trainees		
Other Income as a percentage of sales (year 1 - year 4)	5%	
Other Income as a percentage of sales (year 5 - year 12)	2.5%	
Share Capital : Unsecured loans (year 1 - year 6)	70:30	
Share Capital : Unsecured loans (year 7 onwards)	50:50	
Tax	35%	

# PROFITABILITY PROJECTIONS

(All figures are in Rupees unless otherwise specified)

	Year											1
	1	2	3	4	5	6	7	8	9	10	11	
Installed Capacity (machine hours)	2,400	2,400	2,400	2,400	2,400	2,400	2,400	3,600	3,600	4,800	6,000	6,000
Production (machine hours)	114	229	457	914	1,829	3,657	5,150	6,531	8,139	10,004	12,163	12,163
Number of shifts (Number)	1	1	1	1	2	3	3	3	3	3	3	3
Capacity Utilization	5%	10%	19%	38%	38%	51%	72%	60%	75%	69%	68%	68%
Demand	11,213,214	19,080,269	24,024,473	36,728,877	51,747,986	69,419,595	90,126,169	114,300,433	142,431,634	175,072,570	212,847,453	256,411,111
Market share (%)	4%	5%	8%	11%	15%	23%	25%	25%	25%	25%	25%	25%
<b>Sales</b>	500,000	1,000,000	2,000,000	4,000,000	8,000,000	16,000,000	22,531,542	28,575,108	35,607,908	43,768,143	53,211,863	64,111,111
Manufacturing	100,000	200,000	400,000	3,200,000	6,400,000	12,800,000	18,025,234	22,860,087	28,486,327	35,014,514	42,569,491	51,211,111
Design	12,500	25,000	50,000	100,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,611,111
Consultancy	12,500	25,000	50,000	100,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,611,111
Heat Treatment	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,211,111
Regular jobs	300,000	600,000	1,200,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,211,111
Miscellaneous jobs	50,000	100,000	200,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,211,111
Training Income (long term)	150,000	300,000	450,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Other Income (incl. short term training)	25,000	50,000	100,000	200,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,611,111
<b>Expenses</b>												
Raw Materials	75,000	150,000	300,000	600,000	1,200,000	2,400,000	3,379,731	4,286,266	5,341,186	6,565,221	7,981,779	9,611,111
Consumables	50,000	100,000	200,000	400,000	800,000	1,600,000	2,253,154	2,857,511	3,560,791	4,376,814	5,321,186	6,411,111
Power and Fuel	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,211,111
Salaries & Wages	2,500,000	2,500,000	2,500,000	2,500,000	4,250,000	6,000,000	6,000,000	9,000,000	9,000,000	12,000,000	15,000,000	18,000,000
Consultants' fees	1,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0
Repairs & Maintenance	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,211,111
Administrative & Miscellaneous	800,000	880,000	968,000	1,064,800	1,171,280	1,200,000	1,689,866	2,143,133	2,670,593	3,282,611	3,990,890	4,811,111
<b>Total Operating Cost</b>	4,975,000	5,230,000	5,668,000	4,964,800	8,221,280	12,800,000	15,575,905	21,144,421	24,133,361	30,601,461	37,615,042	45,211,111
<b>Gross Profit</b>	-4,300,000	-3,880,000	-3,118,000	-164,800	578,720	4,200,000	8,118,925	8,745,065	12,964,745	14,860,886	17,527,118	21,011,111
Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
<b>Profit Before Interest &amp; Tax</b>	-6,642,503	-6,222,503	-5,460,503	-2,507,303	-2,961,396	-651,786	1,130,391	1,756,530	3,839,462	3,598,854	4,128,339	7,611,111
Interest												
Term Loans	0	0	0	0	0	0	0	0	0	0	0	0
Net Working Capital	0	0	0	22,626	66,313	177,534	280,205	338,218	448,768	540,054	651,515	711,111
Other loans	80,640	258,795	520,063	527,958	582,099	105,824	1,313,612	205,052	1,191,247	1,610,946	2,113,556	2,113,556
<b>Profit Before Tax</b>	-6,723,143	-6,481,298	-5,980,566	-3,057,887	-3,609,808	-935,145	-463,426	1,213,260	2,199,447	1,447,854	1,363,268	6,811,111
Tax	0	0	0	0	0	0	0	424,641	769,806	506,749	477,144	2,411,111
<b>Profit After Tax</b>	-6,723,143	-6,481,298	-5,980,566	-3,057,887	-3,609,808	-935,145	-463,426	788,619	1,429,640	941,105	886,124	4,400,000



**PROJECTED BALANCE SHEET**

	Year												
	0	1	2	3	4	5	6	7	8	9	10	11	1
<b>ASSETS</b>													
Fixed Assets													
Gross Block	53,994,000	56,944,000	56,944,000	56,944,000	56,944,000	56,944,000	56,944,000	75,836,558	75,836,558	94,729,115	113,621,673	132,514,230	132,514,230
Accumulated Depreciation	8,940,000	11,282,503	13,625,006	15,967,510	18,310,013	21,850,129	26,701,915	33,690,450	40,678,984	49,804,267	61,066,298	74,465,077	87,806,586
Net Fixed Assets	45,054,000	45,661,497	43,318,994	40,976,490	38,633,987	35,093,871	30,242,085	42,146,108	35,157,573	44,924,848	52,555,374	58,049,153	44,707,644
Expenditure pending capitalisation	2,950,000	0	0	0	0	0	0	0	0	0	0	0	0
Current Assets	8,446,000	71,918	143,836	287,671	575,342	1,150,685	2,301,370	3,240,838	4,110,118	5,121,685	6,295,418	7,653,761	9,205,000
Loans & Advances	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000
Expenditure over Income	12,881,000	19,604,143	26,085,441	32,066,007	35,123,894	38,733,702	39,668,846	40,132,272	39,343,653	37,914,013	36,972,908	36,086,784	31,600,000
<b>Total Assets</b>	<b>66,941,000</b>	<b>65,948,558</b>	<b>70,159,270</b>	<b>73,941,169</b>	<b>74,944,224</b>	<b>75,589,258</b>	<b>72,823,301</b>	<b>86,130,218</b>	<b>79,222,345</b>	<b>88,571,546</b>	<b>96,434,700</b>	<b>102,400,698</b>	<b>88,907,644</b>
<b>LIABILITIES</b>													
Shareholder Funds													
Share Capital	63,000,000	65,000,000	68,000,000	70,000,000	71,000,000	71,000,000	71,000,000	76,000,000	76,000,000	76,500,000	83,000,000	85,000,000	85,000,000
Loan Funds													
Term Loans	0	0	0	0	0	0	0	0	0	0	0	0	0
Unsecured Loans & Deposits	2,871,000	537,599	1,725,299	3,467,087	3,519,720	3,550,680	705,493	8,757,472	1,367,015	7,941,649	10,739,642	14,090,371	14,090,371
Current Liabilities	1,070,000	410,959	433,973	474,082	424,504	708,598	1,117,808	1,372,807	1,855,330	2,129,898	2,695,058	3,310,326	3,905,000
<b>Total Liabilities</b>	<b>66,941,000</b>	<b>65,948,558</b>	<b>70,159,271</b>	<b>73,941,169</b>	<b>74,944,224</b>	<b>75,589,258</b>	<b>72,823,301</b>	<b>86,130,219</b>	<b>79,222,345</b>	<b>88,571,547</b>	<b>96,434,700</b>	<b>102,400,697</b>	<b>88,907,644</b>

## DEPRECIATION SCHEDULE

### DEPRECIATION: STRAIGHT LINE METHOD

	Year												
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Civil Works</b>													
Opening Balance of Assets	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885
Land	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Building	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885
Recurring Capital Expenditure	0	0	0	0	0	0	0	0	0	0	0	0	0
Closing Balance	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885
Depreciation	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645
<b>Plant and Machinery and Miscellaneous Fixed Assets</b>													
Opening Balance of Assets	37,785,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	59,627,673	59,627,673	78,520,230	97,412,788	116,305,345	116,305,345
Recurring Capital Expenditure							18,892,558		18,892,558	18,892,558	18,892,558	18,892,558	18,892,558
Capitalised during the year	2,950,000												
Closing Balance	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	59,627,673	59,627,673	78,520,230	97,412,788	116,305,345	116,305,345	116,305,345
Depreciation	2,097,858	2,097,858	2,097,858	2,097,858	3,295,471	4,607,142	6,743,890	6,743,890	8,880,638	11,017,386	13,154,135	13,154,135	13,154,135
<b>Total Depreciation on Straight Line Method</b>	<b>2,342,503</b>	<b>2,342,503</b>	<b>2,342,503</b>	<b>2,342,503</b>	<b>3,540,116</b>	<b>4,851,786</b>	<b>6,988,535</b>	<b>6,988,535</b>	<b>9,125,283</b>	<b>11,262,031</b>	<b>13,398,779</b>	<b>13,398,779</b>	<b>13,398,779</b>

**WORKING CAPITAL**

	Year											
	1	2	3	4	5	6	7	8	9	10	11	1
Total days in a year	365											
Raw Material Inventory (days)	90											
Receivables (days)	30											
Payables (days)	30											
Payables (Power & Fuel - days)	60											
<b>Current Assets</b>												
R M & Consumables Inventory	30,822	61,644	123,288	246,575	493,151	986,301	1,388,931	1,761,479	2,195,008	2,698,036	3,280,183	3,912,221
Receivables	41,096	82,192	164,384	328,767	657,534	1,315,068	1,851,908	2,348,639	2,926,677	3,597,382	4,373,578	5,248,294
<b>Current Liabilities</b>												
Payables - Power & Fuel	4,110	8,219	16,438	32,877	65,753	131,507	185,191	234,864	292,668	359,738	437,358	524,829
Payables - Others	406,849	425,753	457,644	391,627	642,845	986,301	1,187,616	1,620,466	1,837,230	2,335,319	2,872,968	3,447,465
<b>Net Working Capital</b>	-339,041	-290,137	-186,411	150,838	442,087	1,183,562	1,868,031	2,254,789	2,991,788	3,600,360	4,343,435	5,248,294

**CASH PROFIT ANALYSIS**

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Profit After Tax	-6,723,143	-6,481,298	-5,980,566	-3,057,887	-3,609,808	-935,145	-463,426	788,619	1,429,640	941,105	886,124	4,474,000
add: Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
less: Increase in NWC	-4,714,041	48,904	103,726	337,249	291,248	741,475	684,470	386,757	736,999	608,572	743,075	886,124
<b>Cash Surplus / (Deficit)</b>	<b>333,401</b>	<b>-4,187,699</b>	<b>-3,741,789</b>	<b>-1,052,633</b>	<b>-360,940</b>	<b>3,175,167</b>	<b>5,840,639</b>	<b>7,390,396</b>	<b>9,817,924</b>	<b>11,594,564</b>	<b>13,541,829</b>	<b>16,987,000</b>

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APPENDIX G

**COMMERCIAL VIABILITY ANALYSIS : SCENARIO 3**

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## G. COMMERCIAL VIABILITY ANALYSIS : SCENARIO 3

### NOTES:

	First 3 years	After 3 years
Manufacturing charges as a percentage of Sales	20.00%	20.00%
Design charges as a percentage of Sales	2.50%	2.50%
Consultancy fees as percentage of Sales	2.50%	2.50%
Heat Treatment charges a percentage of Sales	5.00%	5.00%
Precision product sales as a percentage of Total Sales	60.00%	5.00%
Miscellaneous jobs charges a percentage of Sales	10.00%	5.00%
Administrative expenses as a percentage of Sales (year 6 onwards)	8%	
Administrative expenses - year 1	800,000	
Increase in Administrative expenses - year 2 to year 5	10%	
Raw material as a percentage of Sales	15%	
Consumables as a percentage of Sales	10%	
Power & fuel as a percentage of Sales	5%	
Repairs & Maintenance as a percentage of Sales	5%	
Installed Capacity	2400	machine hours
Sales Realisation (incl 25% allowance for handwork)	4375	Rs./ machine hour
%age of wages given to Operating staff	70%	
%age of wages given to Support staff	30%	
Max. Manufacturing charges generated in a year with 1 shift	Rs. 650,000	
Depreciation rate for Building	1.63%	
Depreciation rate for P&M and Misc. assets (1 shift)	5.15%	
Depreciation rate for P&M and Misc. assets (2 shifts)	3.09%	
Depreciation rate for P&M and Misc. assets (3 shifts)	11.31%	
Interest on Net Working Capital	15%	
Interest on Other loans	15%	
Other Income includes short term training fees and jobs done by the trainees		
Other Income as a percentage of sales (year 1 - year 4)	5%	
Other Income as a percentage of sales (year 5 - year 12)	2.5%	
Share Capital : Unsecured loans (year 1 - year 6)	40.60	
Share Capital : Unsecured loans (year 7 onwards)	20.80	
Tax	35%	

## PROFITABILITY PROJECTIONS

(All figures are in Rupees unless otherwise specified)

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Installed Capacity (machine hours)	2,400	2,400	2,400	2,400	2,400	2,400	2,400	3,600	3,600	4,800	6,000	7,200
Production (machine hours)	114	229	457	914	1,829	3,657	5,150	6,531	8,139	10,004	12,163	14,655
Number of shifts (Number)	1	1	1	1	2	3	3	3	3	3	3	3
Capacity Utilization	5%	10%	19%	38%	38%	51%	72%	60%	75%	69%	68%	68%
Demand	11,213,214	19,080,269	24,024,473	36,728,877	51,747,986	69,419,595	90,126,169	114,300,433	142,431,634	175,072,570	212,847,453	256,460,724
Market share (%)	4%	5%	8%	11%	15%	23%	25%	25%	25%	25%	25%	25%
<b>Sales</b>	500,000	1,000,000	2,000,000	4,000,000	8,000,000	16,000,000	22,531,542	28,575,108	35,607,908	43,768,143	53,211,863	64,115,181
Manufacturing	100,000	200,000	400,000	3,200,000	6,400,000	12,800,000	18,025,234	22,860,087	28,486,327	35,014,514	42,569,491	51,292,145
Design	12,500	25,000	50,000	100,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,602,880
Consultancy	12,500	25,000	50,000	100,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,602,880
Heat Treatment	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Regular jobs	300,000	600,000	1,200,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Miscellaneous jobs	50,000	100,000	200,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Training Income (long term)	150,000	300,000	450,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Other Income (incl. short term training)	25,000	50,000	100,000	200,000	200,000	400,000	563,289	714,378	890,198	1,094,204	1,330,297	1,602,880
<b>Expenses</b>												
Raw Materials	75,000	150,000	300,000	600,000	1,200,000	2,400,000	3,379,731	4,286,266	5,341,186	6,565,221	7,981,779	9,617,277
Consumables	50,000	100,000	200,000	400,000	800,000	1,600,000	2,253,154	2,857,511	3,560,791	4,376,814	5,321,186	6,411,518
Power and Fuel	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Salaries & Wages	2,500,000	2,500,000	2,500,000	2,500,000	4,250,000	6,000,000	6,000,000	9,000,000	9,000,000	12,000,000	15,000,000	18,000,000
Consultants' fees	1,500,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0
Repairs & Maintenance	25,000	50,000	100,000	200,000	400,000	800,000	1,126,577	1,428,755	1,780,395	2,188,407	2,660,593	3,205,759
Administrative & Miscellaneous	800,000	880,000	968,000	1,064,800	1,171,280	1,200,000	1,689,866	2,143,133	2,670,593	3,282,611	3,990,890	4,808,639
<b>Total Operating Cost</b>	4,975,000	5,230,000	5,668,000	4,964,800	8,221,280	12,800,000	15,575,905	21,144,421	24,133,361	30,601,461	37,615,042	45,248,952
<b>Gross Profit</b>	-4,300,000	-3,880,000	-3,118,000	-164,800	578,720	4,200,000	8,118,925	8,745,065	12,964,745	14,860,886	17,527,118	21,069,109
Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
<b>Profit Before Interest &amp; Tax</b>	-6,642,503	-6,222,503	-5,460,503	-2,507,303	-2,961,396	-651,786	1,130,391	1,756,530	3,839,462	3,598,854	4,128,339	7,670,329
<b>Interest</b>												
Term Loans	0	0	0	0	0	0	0	0	0	0	0	0
Net Working Capital	0	0	0	22,626	66,313	177,534	280,205	338,218	448,768	540,054	651,515	785,920
Other loans	257,110	642,878	1,148,396	1,267,173	1,314,321	1,369,790	2,359,075	2,192,348	2,858,684	4,100,857	4,958,660	4,240,975
<b>Profit Before Tax</b>	-6,899,614	-6,865,381	-6,608,899	-3,797,102	-4,342,030	-2,199,110	-1,508,889	-774,036	532,011	-1,042,056	-1,481,837	2,643,434
Tax	0	0	0	0	0	0	0	0	186,204	0	0	925,202
<b>Profit After Tax</b>	-6,899,614	-6,865,381	-6,608,899	-3,797,102	-4,342,030	-2,199,110	-1,508,889	-774,036	345,807	-1,042,056	-1,481,837	1,718,232

**PROJECTED BALANCE SHEET**

	Year												
	0	1	2	3	4	5	6	7	8	9	10	11	12
<b>ASSETS</b>													
Fixed Assets													
Gross Block	53,994,000	56,944,000	56,944,000	56,944,000	56,944,000	56,944,000	56,944,000	75,836,558	75,836,558	94,729,115	113,621,673	132,514,230	132,514,230
Accumulated Depreciation	8,940,000	11,282,503	13,625,006	15,967,510	18,310,013	21,850,129	26,701,915	33,690,450	40,678,984	49,804,267	61,066,298	74,465,077	87,863,857
Net Fixed Assets	45,054,000	45,661,497	43,318,994	40,976,490	38,633,987	35,093,871	30,242,085	42,146,108	35,157,573	44,924,848	52,555,374	58,049,153	44,650,373
Expenditure pending capitalisation	2,950,000	0	0	0	0	0	0	0	0	0	0	0	0
Current Assets	5,445,000	71,918	143,836	287,671	575,342	1,150,685	2,301,370	3,240,838	4,110,118	5,121,685	6,295,418	7,653,761	9,222,047
Loans & Advances	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000	611,000
Expenditure over Income	12,881,000	19,780,614	26,645,994	33,254,894	37,051,996	41,394,026	43,593,136	45,102,025	45,876,061	45,530,254	46,572,310	48,054,147	46,335,915
<b>Total Assets</b>	<b>66,941,000</b>	<b>66,125,028</b>	<b>70,719,824</b>	<b>75,130,055</b>	<b>76,872,325</b>	<b>78,470,741</b>	<b>80,249,740</b>	<b>91,099,971</b>	<b>90,470,984</b>	<b>96,187,788</b>	<b>106,034,103</b>	<b>114,368,061</b>	<b>110,255,743</b>
<b>LIABILITIES</b>													
Shareholder Funds													
Share Capital	63,000,000	64,000,000	66,000,000	67,000,000	68,000,000	69,000,000	70,000,000	74,000,000	74,000,000	75,000,000	76,000,000	78,000,000	78,000,000
Loan Funds													
Term Loans	0	0	0	0	0	0	0	0	0	0	0	0	0
Unsecured Loans & Deposits	2,871,000	1,714,089	4,265,851	7,655,973	8,447,821	8,782,143	9,131,932	15,727,164	14,615,654	19,057,890	27,333,047	33,057,735	28,273,184
Current Liabilities	1,070,000	410,959	433,973	474,082	424,504	708,598	1,117,808	1,372,807	1,855,330	2,129,898	2,695,058	3,310,326	3,982,579
<b>Total Liabilities</b>	<b>66,941,000</b>	<b>66,125,028</b>	<b>70,719,824</b>	<b>75,130,055</b>	<b>76,872,325</b>	<b>78,470,741</b>	<b>80,249,740</b>	<b>91,099,971</b>	<b>90,470,984</b>	<b>96,187,788</b>	<b>106,034,103</b>	<b>114,368,061</b>	<b>110,255,743</b>



**DEPRECIATION SCHEDULE**

**DEPRECIATION: STRAIGHT LINE METHOD**

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Civil Works</b>												
Opening Balance of Assets	15,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885
Land	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Building	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885	15,008,885
Recurring Capital Expenditure	0	0	0	0	0	0	0	0	0	0	0	0
Closing Balance	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885	16,208,885
Depreciation	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645	244,645
<b>Plant and Machinery and Miscellaneous Fixed Assets</b>												
Opening Balance of Assets	37,785,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	59,627,673	59,627,673	78,520,230	97,412,788	116,305,345
Recurring Capital Expenditure	2,950,000						18,892,558	18,892,558	18,892,558	18,892,558	18,892,558	18,892,558
Capitalised during the year	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	40,735,115	59,627,673	59,627,673	78,520,230	97,412,788	116,305,345	116,305,345
Closing Balance	2,097,858	2,097,858	2,097,858	2,097,858	3,295,471	4,607,142	6,743,890	6,743,890	8,880,638	11,017,386	13,154,135	13,154,135
Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
<b>Total Depreciation on Straight Line Method</b>												

**WORKING CAPITAL**

Total days in a year  
 Raw Material Inventory (days)  
 Receivables (days)  
 Payables (days)  
 Payables (Power & Fuel - days)

365  
 90  
 30  
 30  
 60

Year

1 2 3 4 5 6 7 8 9 10 11 12

**Current Assets**

R M & Consumables Inventory	30,822	61,644	123,288	246,575	493,151	986,301	1,388,931	1,761,479	2,195,008	2,698,036	3,280,183	3,952,306
Receivables	41,096	82,192	164,384	328,767	657,534	1,315,068	1,851,908	2,348,639	2,926,677	3,597,382	4,373,578	5,269,741

**Current Liabilities**

Payables - Power & Fuel	4,110	8,219	16,438	32,877	65,753	131,507	185,191	234,864	292,668	359,738	437,358	526,974
Payables - Others	406,849	425,753	457,644	391,627	642,845	986,301	1,187,616	1,620,466	1,837,230	2,335,319	2,872,968	3,455,605

**Net Working Capital**

	-339,041	-290,137	-186,411	150,838	442,087	1,183,562	1,868,031	2,254,789	2,991,788	3,600,360	4,343,435	5,239,468
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**CASH PROFIT ANALYSIS**

	Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Profit After Tax	-6,899,614	-6,865,381	-6,608,899	-3,797,102	-4,342,030	-2,199,110	-1,508,889	-774,036	345,807	-1,042,056	-1,481,837	1,718,232
add: Depreciation	2,342,503	2,342,503	2,342,503	2,342,503	3,540,116	4,851,786	6,988,535	6,988,535	9,125,283	11,262,031	13,398,779	13,398,779
less: Increase in NWC	-4,714,041	48,904	103,726	337,249	291,248	741,475	684,470	386,757	736,999	608,572	743,075	896,033
<b>Cash Surplus / (Deficit)</b>	156,931	-4,571,782	-4,370,122	-1,791,848	-1,093,163	1,911,201	4,795,176	5,827,741	8,734,091	9,611,402	11,173,868	14,220,979