

Draft Detailed Project Report

ESDM Focused Technology Centre at
Bengaluru - Technology Centre Systems
Program

Submitted To

The Office of Development Commissioner -MSME
Ministry of MSME, Govt. of India
Maulana Azad Road, New Delhi -110001

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Building a better
working world

25 May 2016

Director (Tool Room)

Office of Development Commissioner (MSME), Ministry of MSME

Nirman Bhawan, Maulana Azad Road,

New Delhi -110108

Dear Sir,

As part of our engagement to provide Consulting services for establishment of Program Management Unit (PMU) for designing the project, undertaking the pre-project activities and providing implementation support during the course of the Technology Centre Systems Program (TCSP), we hereby submit the revised Draft Detailed Project Report for setting up of Technology Centre at Bengaluru for your kind perusal. The earlier version of the DPR submitted in August 2015, has been updated based on the revised cost estimates for the construction of the TC submitted by the Construction Management Consultant.

We have not sought to confirm the accuracy of the data or the information and explanations provided by the O/o DC MSME. Our work has been limited in scope and time and we stress that more detailed procedures may reveal other issues not captured here. The procedures summarized in our Draft Detailed Project Report do not constitute an audit, a review or other form of assurance in accordance with any generally accepted auditing, review or other assurance standards, and accordingly we do not express any form of assurance. This Draft Detailed Project Report is intended solely for the information and use of the Office of DC-MSME and is not intended to be and should not be used by anyone other than this specified party.

We appreciate the cooperation and assistance provided to us during the preparation of this report. If you have any questions, please contact the undersigned.

Very truly yours,

Amar Shankar

Partner - Advisory Services

Disclaimer

This Draft Detailed Project Report for development of technology centre at Bengaluru as part of consulting services to establish a Programme Management Unit (PMU) for designing the project, undertaking the pre-project activities and providing implementation support during the course of the Technology Centre Systems Program (TCSP) has been prepared by Ernst & Young LLP (hereinafter referred to as 'EY' or 'Ernst & Young' or 'Us') and delivered to the 'Office of Development Commissioner - Ministry of Micro, Small & Medium Enterprise (O/o of DC-MSME)' (hereinafter referred to as 'the Client').

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Also, we must extend our sincere thanks to all the stakeholders including Department of Industries, **industry associations such as CLIK, ELCINA and IESA, Government Institutes and ancillary units** who gave us their valuable time and insights with respect to various dimensions of the ESDM industry and its support requirements. Without their help, capturing of the industry insights would not have been possible.

Abbreviations

AICTE	All India Council For Technical Education
ARISE	Advanced Repair and Industrial Skills Enhancement
AWAKE	Association of Women Entrepreneurs of Karnataka
BAP	Bengaluru Aerospace Park
BCIC	Bangalore Chamber of Industry and Commerce
BEL	Bharat Electronics Limited
BMIC	Bangalore Mysore Infrastructure Corridor
BT	Biotechnology
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CAGR	Compound Annual Growth Rate
CAM	Computer Aided Manufacturing
CDGI	Centre for Development of Glass Industries
CFTI	Central Footwear Training Institute
CGTMSE	Credit Guarantee Trust for Micro Small and Medium Enterprises
CIHT	Central Institute of Hand Tools
CII	Confederation of Indian Industry
CITD	Central Institute of Tool Design
CLCSS	Credit Linked Capital Subsidy Scheme
CLIK	Consortium of Electronic Industries of Karnataka
CMC	Construction Management Consultant
CNM	Cluster Network Manager
CST	Central Sales Tax
CTR	Central Tool Room
CTTC	Central Tool Room & Training Centre
DGM	Deputy General Manager
DIC	Department of Industries and Commerce
DTE	Department of Technical Education
EDA	Electronic Design Automation
EHS	Environment, Health, and Safety
ELCIA	Electronics City Industries' Association
ELCINA	Electronic Industries Association of India
EMC	Electronic Manufacturing Cluster
EMS	Electronic Manufacturing Services
ESDM	Electronic System Design and Manufacturing

ESTC	Electronics Service and Training Centre
ETDC	Electronics Test and Development Centre
FAB	Fabrication Facilities
FFDC	Fragrance and Flavour Development Centre
FICCI	Federation of Indian Chamber of Commerce and Industry
FKCCI	Federation of Karnataka Chambers of Commerce and Industry
FMCG	Fast Moving Consumer Goods
FSSP	Full Social Screening Process
GC	Governing Council
GDDP	Gross District Domestic Product
GDP	Gross Domestic Product
GESIP	Gender, Equity and Social Inclusion Plan
GM	General Manager
GT&TC	Government Tool Room and Training Centre
HAL	Hindustan Aeronautics Limited
HDI	Human Development Index
HR	Human Resource
HSRL	High Speed Rail Link
IDEMI	Institute for Design of Electrical Measuring Instruments
IDTR	Indo Danish Tool Room
IESA	India Electronics and Semiconductor Association
IPSSP	Indigenous People's Social Screening Process
ISRO	Indian Space Research Organization
IT	Information Technology
ITES	Information Technology Enabled Services
ITI	Industrial Training Institute
KEONICS	Karnataka State Electronics Development Corporation Limited
K-BITS	Karnataka Biotechnology and Information Technology Services
KIADB	Karnataka Industrial Areas Development Board
KSIIDC	Karnataka State Industrial & Infrastructure Development Corporation Limited
KSSIDC	Karnataka State Small Scale Industries Development Corporation
KVTSDC	Karnataka Vocational and Skill Development Corporation
LA	Location Attractiveness
MAIT	Manufacturers' Association for Information Technology
MSME	Micro, Small and Medium Enterprises
NAL	National Aerospace Laboratories
NCVT	National Council for Vocational Training

NPSP	National Portal Service Provider
NSSP	No Social Screening Process
O/o DC (MSME)	Office of Development Commissioner - Micro, Small, and Medium Enterprises
OEM	Original Equipment Manufacturer
PCB	Printed Circuit Board
PMU	Program Management Unit
POC	Proof of Concept
PPDC	Process and Product Development Centre
R&D	Research and Development
RFP	Resettlement Policy Framework
SCVT	Skill Council for Vocational Training
SEZ	Special Economic Zone
SMT	Surface Mount Technology
STPI	Software technology Parks of India
TC	Technology Centre
TCSP	Technology Centre Systems Program
TP	Technology Partner
TR	Tool Room
TRTC	Tool Room & Training Centre
UPS	Uninterrupted Power Supply
VAT	Value Added Tax
VLSI	Very Large Scale Integration

Revision History

Version	Issue date	Amendment description	Prepared by	Reviewed by
V1	7 th August, 2015	First Draft	Dhruv Mangal Aliya Bhandari	Prakash Singh Utsav Mishra
V2	14 th August, 2015	Quality review of all sections	Dhruv Mangal Aliya Bhandari	Prakash Singh Utsav Mishra
V2.1	24 th August, 2015	Review of DPR by Director TR, O/o DCMSME. Key changes include: ▶ Inclusion of medical electronics, industrial electronics, avionics as focus areas for the TC. ▶ Addition of legal advisory services and legal expert under the design and innovation centre	Dhruv Mangal Aliya Bhandari	R.K. Rai, Dir TR
V3.0	25 th May, 2015	Revised Financial Model based on updated cost of construction submitted by the CMC	Devesh Gautam Dhruv Mangal	Dr. Milind Mujumdar

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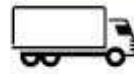
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Executive summary

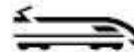
Objective of DPR: Evaluate the feasibility of the proposed new TC in Bengaluru.

Key Components	Opportunity and need assessment
	Social and Environmental assessment
	Technology & Skillset requirement
	Investment & Return

Location Overview



- Located on National Highway NH 4



- Connectivity with major cities like Delhi, Chennai, Mumbai and other major cities in India



- Bengaluru International Airport at Bengaluru

Opportunity and need assessment

Bengaluru: Competitive Advantage

- IT & Electronics hub of India
- Cluster of IT, biotech, aerospace, defence and electronics-related industries
- 4th largest start-up hub in the world

Bengaluru Catchment Area

- Manufacturing hub of auto majors like Volvo, Toyota, Kirloskar, Telco etc
- Large number of ESDM companies in Hosur

Industrial goods Production In Bengaluru catchment

38% of IT exports from India



4th largest startup hub

4936 MSMEs in the ESDM sector in the catchment area

More than 200 engineering colleges

Stakeholder discussions



Key Stakeholders

- O/o DC-MSME,
- Government of Karnataka,
- MSME-DI (Bengaluru)
- KSIIIDC, CII-Bengaluru
- OEMs, Tier I & II suppliers,
- Industrial Association
- Government Institutes
- MSMEs

Key Training Requirement

- High-end e.g. Embedded System
- Skilled manpower in hardware repair

Key Tech Requirement

- Testing and Calibration
- Product assessment and prototyping

Focus area of the Technology Centre

1 Innovation and Design Centre

- Concept creation support
- Product design support (product architecture and specifications, electronic design, mechanical design)
- Patent registration and harnessing
- Entrepreneur club
- Other consultancy services

2 Prototyping, Assembly, Testing and Calibration

Over 50% of total revenue

- Rapid PCB Prototyping facility
- Basic electronic assembly facility for low vol. production
- Testing facility for environmental, safety, EMI / EMC, ingress and performance testing
- Secondary level calibration facility
- 3D additive machines for mechanical components

3 Training

- Electronic Design and Manufacturing - Embedded Systems, VLSI, PCB Design and Manufacturing, Electronic Assembly
- Electronic Repair and Maintenance
- Computer Hardware and software

4 Manufacturing Incubation Centre

- Shell infrastructure
- Business facilities
- IT support
- Electricity and power connection
- Registrations and Clearances

IRR: 12.2%
Positive income after depreciation is projected to be registered in 7th year

Financials

Total Capital Expenditure: INR 129.5 Cr
Production Machines: INR 55.52 Cr
Training Machines: INR 10.28 Cr
Construction Cost inc. contingency: INR 57.72 Cr
Other Infra. and Pre-Operative cost: INR 5.98 Cr

Revenue (INR in Cr)



Introduction



1. Introduction

1.1 Background and project rationale

India is one of the largest and dynamic emerging markets with vast economic potential. India's GDP in 2012 was USD 1.8 trillion ranking 10th amongst all countries¹. The objective of the Government of India's, 12th Five-Year Plan (FY2013-17) is to return to GDP growth rates in excess of 8 percent, with strong emphasis on the manufacturing sector. Manufacturing has long been recognized as an essential driver of economic development for most countries, as it has an important economic and employment multiplier effect. The manufacturing sector will have to play an important role to take Indian economy to a high growth rate trajectory and achieve the planned objectives. Micro Small and Medium Enterprises play an essential role in the overall industrial economy of the country and account for over 45% of India's manufacturing output².

Despite strong potential, India's manufacturing performance has not been encouraging. The share of manufacturing in India's GDP has stagnated at around 16 percent³, compared to more than 30 percent (and growing) in some of the other Asian countries. India's manufacturing sector has been facing challenges, such as low value addition, low productivity, and less-than-desirable up scaling. However, world-class production units that compete in the international market are also present in India.

The major constraints in the growth and competitiveness of India's manufacturing sector are:

- ▶ access to finance (especially for MSMEs)
- ▶ access to technology and skilled manpower
- ▶ access to markets (domestic & export)
- ▶ infrastructure deficiencies

These constraints impact the competitiveness of MSMEs operating in both upstream and downstream manufacturing industries.

Upstream industries, such as the tooling industry, which consists of developing and manufacturing of dies, moulds, casts, as well as testing and prototyping, serves as an interface between product design and product manufacturing. The right tools help increase throughputs, reduce material waste, improve product quality, time to market and thus improve competitiveness. The importance of the tooling industry increases with accelerating technological developments, product sophistication/ innovation/ customization and reducing time to market. Tooling is a specialized but local industry (more than 60 percent of tools in the world are locally produced and consumed - including in India)

¹ <http://unstats.un.org/unsd/snaama/dnltransfer.asp?fID=2>

² <http://www.dnb.co.in/Nashik2013/PDF/MSMEsInIndia.pdf>

³ The Manufacturing plan - Strategies for accelerating growth of manufacturing in India in the 12th Five Year Plan and beyond, Planning Commission

dominated by MSMEs (more than 80% of firms in India, Europe, US and Japan). Like other countries, the private tooling industry in India has grown hand in hand with the manufacturing industry. The turnover of the Indian tooling industry is approximately INR 13,000 crores, with more than a thousand firms employing over 120,000 workers (TAGMA 2011). The constraints to the growth and competitiveness of the Indian tooling industry mirror the ones affecting manufacturing as a whole, as articulated above. The scarcity of skilled workers and problems related to their retention, as well as the lack of access to a high-quality design and prototyping facility has hurt growth.

In downstream industries such as automotive, electronics, fragrance and flavours, glass, leather, toys etc., there is shortage of skilled labour and limited access to advanced technologies. These industries include large numbers of MSMEs, often working as part of supplier networks of larger enterprises and subject to increased international competition.

1.1.1 Demographic overview and challenges

While India stands to benefit from an immense demographic dividend, with the largest youth population in the world (around 66 percent of the total population is under the age of 35), it has an overall employment rate of 4.7 percent (under usual principal status approach) and an overall labour force participation rate of 50.9 percent⁴. For the country to gain from this demographic dividend, skilling and up-skilling its youth are key priorities for the Government of India (GoI).

India has a labour force of about 470 million, of which less than 10 percent have received skills training, either through formal or informal means⁵. About 13 million young people enter the labour force annually. Despite the huge expansion of skills training provision during the 11th Five-year plan, the country's skills development system requires massive up scaling. In its 11th and 12th Five-year plans, India recognized that skill development is critical to achieve faster, sustainable and inclusive growth on one hand, and to providing decent employment opportunities to the growing young population, on the other. According to the National Skill Development Policy published in March 2009, India has set a target of skilling 500 million people by 2022⁶. This program will play a bigger role in the country's plan by setting a target of skilling 150 lakh people within the next 6 years.

Global experience shows that a workforce with higher schooling and skill levels leads to higher productivity and personal income. A 2011 study showed that students who attended three-year vocational training courses at ITIs earned 25 percent more than two-year course students, who earned 14 percent more than did one-year course students⁷. These results were also observed in a 2007 study showing that the returns on vocational training in India have been found to be 8 percent,

⁴ Report on the Third-Annual employment & unemployment survey (2012 - 2013) of the Ministry of Labor, Government of India.

⁵ 11th and 12th Five Year Plan

⁶ <http://labour.nic.in/upload/uploadfiles/files/Policies/NationalSkillDevelopmentPolicyMar09.pdf>

⁷ Vocational Training in the Private Sector (Goyal 2011)

almost equivalent to the 8.4 percent related to an additional year of education. The same study showed that, increased educational attainment by one year is associated with 5.8 percent higher firm-level productivity in India⁸.

1.1.2 Country's manufacturing objectives

Development of Indian manufacturing sector calls for deepening and recalibrating of economic reforms that would strengthen the sector and make it grow faster and become an engine of inclusive growth. To realize the potential of the manufacturing sector, Government of India has announced National Manufacturing Policy in 2011 with the objective of enhancing the share of manufacturing in GDP to 25% within a decade and creating 100 million jobs. It also seeks to empower rural youth by imparting necessary skill sets to make them employable. Sustainable development is integral to the spirit of the policy and technological value addition in manufacturing has received special focus.

The National Manufacturing Policy has six objectives:

- ▶ Increase manufacturing sector growth to 12-14% over the medium term to make it the engine of growth for the economy. The 2 to 4 % differential over the medium term growth rate of the overall economy will enable manufacturing to contribute at least 25% of the National GDP by 2022.
- ▶ Increase the rate of job creation in manufacturing to create 100 million additional jobs by 2022.
- ▶ Creation of appropriate skill sets among the rural migrant and urban poor to make growth inclusive.
- ▶ Increase domestic value addition and technological depth in manufacturing.
- ▶ Enhance global competitiveness of Indian manufacturing through appropriate policy support.
- ▶ Ensure sustainability of growth, particularly with regard to the environment including energy efficiency, optimal utilization of natural resources and restoration of damaged/ degraded eco-systems.

1.1.3 Recommendations of XII plan Working group & Parliamentary Standing Committee

At present, the Office of Development Commissioner [O/o DC (MSME)], Ministry of Micro, Small and Medium Enterprises, operates 10 TRs and 8 TDCs (both hereinafter called as TCs) spread across the country. The TCs have been providing technical and vocational training programmes to more than 1,00,000 trainees annually including AICTE and NCVT approved certification. They also provide

⁸ The Knowledge Economy and Education and Training in South Asia (World Bank 2007)

design and manufacturing support to entrepreneurs alongside technical consultancies. The TCs primary focus is to improve access to advanced technologies & provide technical advisory support to entrepreneurs and workers, as well as opportunities for technical skill development to the youth at varying levels.

Considering the performance of existing TCs, the Department related Parliamentary Standing Committee on Industry, in its 235th report submitted to Rajya Sabha on 4 May 2012 have recommended as follows:

- i) "The committee is impressed with the performance of the TRs established by the MSME Ministry. These enable the youth to improve their skills and get employment opportunities. The success of such TRs inspires confidence that establishment of more such institutions will equip the young people with necessary ability useful in the expanding market and manufacturing sector".
- ii) "The Committee strongly recommends that more money must be allocated for establishment of TRs across the country. It is understood that MSME Ministry is also approaching the concerned organizations within Government to get loan from International Financial Institutions. If Planning Commission and Finance Ministry cannot allocate more funds for this purpose, the necessary permission to MSME Ministry to get access to borrowings from international banks may be given without delay. However, it is strongly recommended that we must use our own resources for this cause, which is good for the youth of our country and MSME sector".

The evaluation of existing ten TCs was undertaken under GIZ-MSME Umbrella Programme during 2011. The experts have appreciated the performance of the existing TCs and have recommended expansion of skill development activities and introduction of newer technologies in the TCs.

During the budget speech of 2013-14, following announcement was made;

Para 75: "TRs and TDCs set up by the Ministry of MSME have done well in extending technology and design support to small businesses. I propose to provide with World Bank assistance, a sum of Rs 2,200 crore during the 12th Five Year Plan period to set up 15 additional Centres".

In pursuance of (i) the announcement made in the Budget (2013-14), (ii) the recommendations of the Department Related Parliamentary Standing Committee on Industry in its 235th Report submitted to Parliament (Rajya Sabha) on 4 May 2012, and (iii) the recommendations of the experts after evaluating the performance of existing TCs, it was proposed to implement "Technology Centre Systems Programme (TCSP)" at an estimated project cost of INR2,200 crore including World Bank

assistance of USD 200 million by setting up 15 new TCs and to modernize / upgrade existing TCs by introducing latest machinery / technologies.

1.1.4 Technology Centres System Program

The Technology Centres Systems Program, a national program, seeks to enhance the technological and skill base of MSMEs in selected manufacturing industries, via upgraded and new TCs (currently called TRs and TDCs). The TCs will have as their mission to improve the competitiveness of MSMEs across India – with a strong emphasis on low income states.

This will be achieved by providing an integrated suite of services to MSMEs on a fee basis, ranging from providing them access to technology, access to skills and access to business advisory services. TCSP will reinforce the technical capability of the TCs as well as their performance, by further increasing the participation of the private sector in key decisions at both the national and local levels.

The TCs will support industry clusters across manufacturing value chains, both upstream (tooling industry) and downstream (key industries exposed to global competition close to the technology frontier, such as the automotive and electronics sectors, as well as industries evolving through indigenous innovations, such as fragrance and flavour, glass, leather, toys etc.).

TCSP's Program Development Objective has been defined to enhance the competitiveness of MSMEs by improving their access to technology and business advisory services as well as skilled workers through systems of financially sustainable TCs. The program seeks to establish 15 new TCs and upgrade capabilities of select existing TCs and develop linkages between MSMEs, Indian and international research institutes and leading manufacturers. This would include upgradation in technology, land and building infrastructure and other associated infrastructure of the TC. The program will connect leading practices contributing to advance technology, knowledge, skilling and innovation which can be transferred to MSMEs served by each TC.

The competitiveness of MSMEs is impacted by various factors such as entrepreneurial drive of the leader, market and customer dynamics, their access to technology, finance & business advisory and availability of skill manpower. The TCs will shape the outcomes of the program by providing MSMEs access to technology, business advisory and skilled manpower. So it would be possible to measure the success of this program by measuring the offtake of these paid services of the TCs by MSMEs. Therefore, the key indicators that will be measured are;

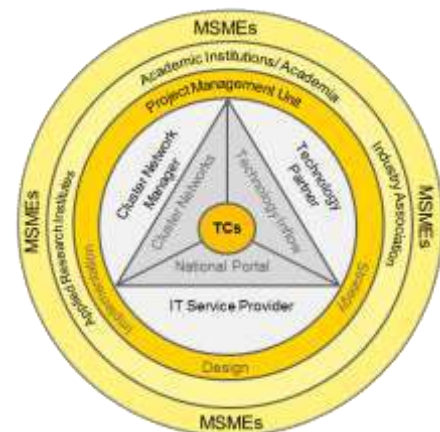
- ▶ Number of enterprises paid for services rendered including placement services
- ▶ Number of long term trainees employed by industry, including MSMEs, within six months after being trained at TCs
- ▶ TCs' gross profit before depreciation (not including land)

- ▶ Access to Technology
 - Revenue of TCs from access to technology activities (production support and consultancy)
 - Capacity utilization of TCs machines
 - Number of technology strategies/roadmaps developed by TPs and endorsed by Industry Associations and IC
- ▶ Access to Skilled Workers
 - Number of trainees trained (direct program beneficiary)
 - external trainers trained
 - with newly developed contents
 - female
 - from low income states
 - from disadvantaged section of society (SC/ST)
 - Number of skills development contents (e.g. curricula, standards, certification schemes) developed and adopted by industry associations, and/or certifying agencies
- ▶ Access to Business Advisory
 - Number of needs assessment and related business plans developed by CNMs and endorsed by Industry Associations
 - Value of TCs' businesses generated with support of Cluster Network Managers

In addition, intermediate result indicators are designed to monitor critical progress towards achievement of the PDO with primary emphasis on market-tested outputs of the TCs supported by Technology Partner and Cluster Network Manager. Examples of such indicators include capacity utilization of machines, number of trainees trained, access to services by MSMEs, number of technology strategies / roadmaps developed by TPs and endorsed by industry associations and value of TCs' businesses generated with support of CNMs.

This program will create an ecosystem to help MSMEs become more competitive by acquiring improved technology and employing better skilled workers. This will be done directly through the services provided to them by the TCs, as well as indirectly through the linkages with larger firms (e.g. as part of the supplier network of an OEM), which will provide access to the services of the TCs under the condition that it benefits their suppliers. The TCs will contribute by providing inputs to MSMEs on manufacturing technology & business advisory and by improving the skills of workers/ skill seekers for better employment opportunities. The program will therefore benefit the Indian MSMEs, students and workers and help establish systems of TCs in the country wherein each

Figure 1: TCSP eco-system



centre will gain from the specialisation and experience of the others and improve the competitiveness of MSMEs.

1.1.5 Key TCSP stakeholders

TCSP has multiple stakeholders who will need to work together to achieve the objective of enhancing the competitiveness of MSMEs by improving their access to technology and business advisory services as well as skilled workers through systems of financially sustainable TCs. The key players who will participate in the program include:

▶ MSME Units - Beneficiaries

MSME units will be the prime beneficiaries of the program and the overall objective of the program centres around providing them with access to modern technology, access to business advisory services and access to skilled workforce.

▶ Skill seekers

Workers, job and skill seekers will also gain from this program with access to short term and long term training/skill development courses that will help job seekers to improve their career prospects and finding livelihood.

▶ Office of Development Commissioner, Ministry of MSME (DC-MoMSME)

The program would be designed and implemented under the aegis of the O/o Development Commissioner MSME, Government of India. O/O DCMSME has the mandate to support MSMEs and TCSP will serve this towards this purpose.

▶ Technology Centres

The TCs will serve MSMEs with integrated suite of services on a fee basis, ranging from providing them access to technology, access to skills and access to business advisory services. The program will focus to upgrade selected existing TCs and development of 15 new TCs that support or will support industry clusters across manufacturing value chains, both upstream (tooling industry) and downstream (key industries exposed to global competition close to technology frontier, such as automotive electronics, as well as industries evolving through indigenous innovations, such as fragrances and flavours, footwear, glassware, toys etc.).

▶ Collaborations with Industry associations, academia, applied research institutes and others

Strategic collaborations between TCs and various other organizations will be critical to foster research and development, business incubation and strengthen the TCs with regard to manufacturing services, business advisory and training capabilities. These include:

- Regional / sectorial industry associations representing MSMEs
- Regional / national level engineering/ academic / vocational training institutions

- Applied research institutes
- Local regional colleges
- Autonomous institutes such as IISc, CSIR
- Academia

Leading practices from around the world for similar program suggest and underscore the importance of establishing such linkages. In the Indian context, there are many research oriented projects and concepts that can provide competitive advantage to Indian industry once the early state research emanating from applied research institutes and academia can be validated and implemented at the TC through such collaborations. The TCs will provide a unique environment of bringing the country's leading academics, engineering and industry professionals together to develop and demonstrate new technologies on an industrial scale. This will allow the clients of TCs to develop new manufacturing processes in a safe, neutral setting, reducing the associated financial risks.

► **Program Management Unit (PMU)**

Role of PMU is to assist the O/o DC MSME in designing and implementing this program. This includes developing framework for identifying sites/sectors for the new TCs, developing detailed project report, support in procurement of services and EPC contracts; developing and implementing environment and social safeguards, monitoring and evaluation, manage the roll out of the national portal, deployment of subject matter expertise and overall program management for TCSP over 6 years. EY LLP has been selected as the PMU for the TCSP by the O/o DC MSME via competitive bidding as per World Bank guidelines.

► **Technology Partner (TP)**

Role of TP is to help enhance the supply side of the TC by augmenting the technologies at the TCs, assist in their capacity building with respect to the identified technologies and clusters and provide greater support to the services being offered to the MSMEs by the TCs. These services include being exposed to the potential impact of new and relevant technologies, learning how to use new technologies/equipment, providing access to cutting-edge equipment, developing and testing new products, consultancy, training and deploying efficient techniques and practices that improve the competitiveness of the MSMEs being served.

► **Cluster Network Manager (CNM)**

CNMs for each System (or sub System) of TCs will specialize on specific geographic cluster(s)/ industry(s). The CNM will build capacity of the TC to enhance economic development cooperation amongst key stakeholders to improve the competitiveness of the cluster. This will include strengthening market linkages of the TCs with the MSMEs in the cluster it serves, trade and industry associations, academia, educational institutions, applied research institutions, service providers, other government support institutions, workers and skill seekers.

The CNM would seek to increase competitiveness of supply chains of large firms by enhancing quality, reliability and productivity of MSME suppliers by offering services of the TC, thus also helping in meeting revenue targets of the TC. The CNM will enhance the competitiveness of the cluster business environment by establishing a network of service providers which will address the needs of the MSMEs not served by the TC e.g. access to a network of financial services. The CNM will also facilitate closer cooperation between the TC and MSMEs with key innovation stakeholders such as applied research institutes, autonomous institutions such as IISc, CSIR, academia, skill seekers, and students etc. to enhance product and process innovation. TC's capacity will be further enhanced through closer cooperation amongst skills development and labour market stakeholders to increase the number of workers/ trainees from TCs finding long term employment to improve their livelihood.

► **National Portal Service Provider (NPSP)**

Role of NPSP is to design, develop, set-up, operate and maintain the IT platform for MSMEs. The IT platform will act as a common platform for services that will be required by an MSME from the start of their business, to successful operations and closure e.g. access to regulatory services for entrepreneurs, assistance for financing, access to list of suppliers etc. The platform intends to extend the reach of the program to its remote beneficiaries well beyond the TCs' physical location through access to e-learning solutions, B2B service and product market place, e-recruitment, assistance for financial services and e-governance services (forum to address grievances, automation of customer facing operations of the O/o DC MSME) on paid basis.

► **Construction Management Consultant**

The Construction Management Consultant (CMC) shall be responsible for design, supervision of work and final closure of construction works for the TC. CMC will prepare concept plans and subproject appraisal reports, carry out contract planning and detailed engineering designs, prepare schedules of quantities and specifications. It will support the PMU in preparation of procurement packages, bid documents, invitation, receipt and evaluation of bids etc. CMC will supervise the construction, manage the contract, monitor construction activities and will certify contractor's progress claims, carry out quality control, testing, and prepare progress and monitoring reports, and certify bills.

1.1.6 RFD of TCSP

TCSP's objective is to enhance the competitiveness of MSMEs by improving their access to technology, business advisory services as well as skilled workers through systems of financially sustainable TCs. For monitoring the program outcomes, RFD has been defined; which contains the results indicators at the PDO level and intermediate outcome level together with the baselines and targets over the life of the program. Intermediate results indicators are designed to monitor critical progress toward achievement of the PDO with primary emphasis on market-tested outputs of the TCs and other stakeholders of the TCSP (viz. TPs, CNMs and ITP service provider).

Active participation of General Manager of TCs will be essential for steering the operationalization of TCSP in line with the envisioned mandate. The key success parameters of the General Manager include:

- ▶ Revenue earned by respective TC from,
 - Production
 - Training
 - Consultancy and others
 - Business given to private tool rooms
 - Production/training/consultancy with the help of CNM (territory/sectors to be identified Jointly by CNM and TCs in advance)
- ▶ Recovery ratio--Revenue/ recurring expenditure (cash) in percentage
- ▶ Profit before depreciation
- ▶ Profit after depreciation
- ▶ No. of trainees trained in Long term & Short term training programme
- ▶ No. of courses identified which are suitable for women employment & courses designed and started (CNM to assist the identification of courses and TP to design)
- ▶ No. of units assisted , out of which how many are MSMEs
- ▶ Present technical papers showing successes delivered and how it has aided industry
- ▶ Technical incubation centre to start and the long term trainees to be encouraged to register for starting enterprises

The table below depicts the snapshot of result indicators which form a part of the RFD.

Table 1: Result indicators of the RFD

Program development objective indicators		 Number of enterprises paid for services rendered including placement services
		 Number of long term trainees employed by industry, including MSMEs, six months after graduating from the TCs
		 TCs' gross profit before depreciation (not including land)
Intermediary Results		
Component 1- Technical assistance to the existing and new TCs	Access to Technology	 TCs revenue from access to technology activities (production support and consultancy)
		 Capacity utilization of machines in TCs
		 No. of technology strategies/roadmaps developed by TPs and endorsed by industry associations and IC
	Access to Skilled workforce	 Number of trainees trained (direct program beneficiary)
		 Number of skills development contents (e.g. curricula, standards, certifications) developed and adopted by industry associations, and/or certifying agencies
		 Number of needs assessment and business plans developed by CNMs and endorsed by Industry Assocs.
		 Value of TCs' businesses generated with support of Cluster Network Managers
		 Number of users of IT Platform
Component 2-Investments to upgrade existing and develop new TCs		 Number of new TCs built
Component 3-Technical assistance to MoMSME		Establishment of PMU for program implementation and capacity building of MoMSME

The program aims to have direct and indirect industrial and economic outcomes to the country, such as enhanced manufacturing competitiveness, improvement in the overall employment rate and increased GDP growth.

1.2 Overview of existing MSME TCs

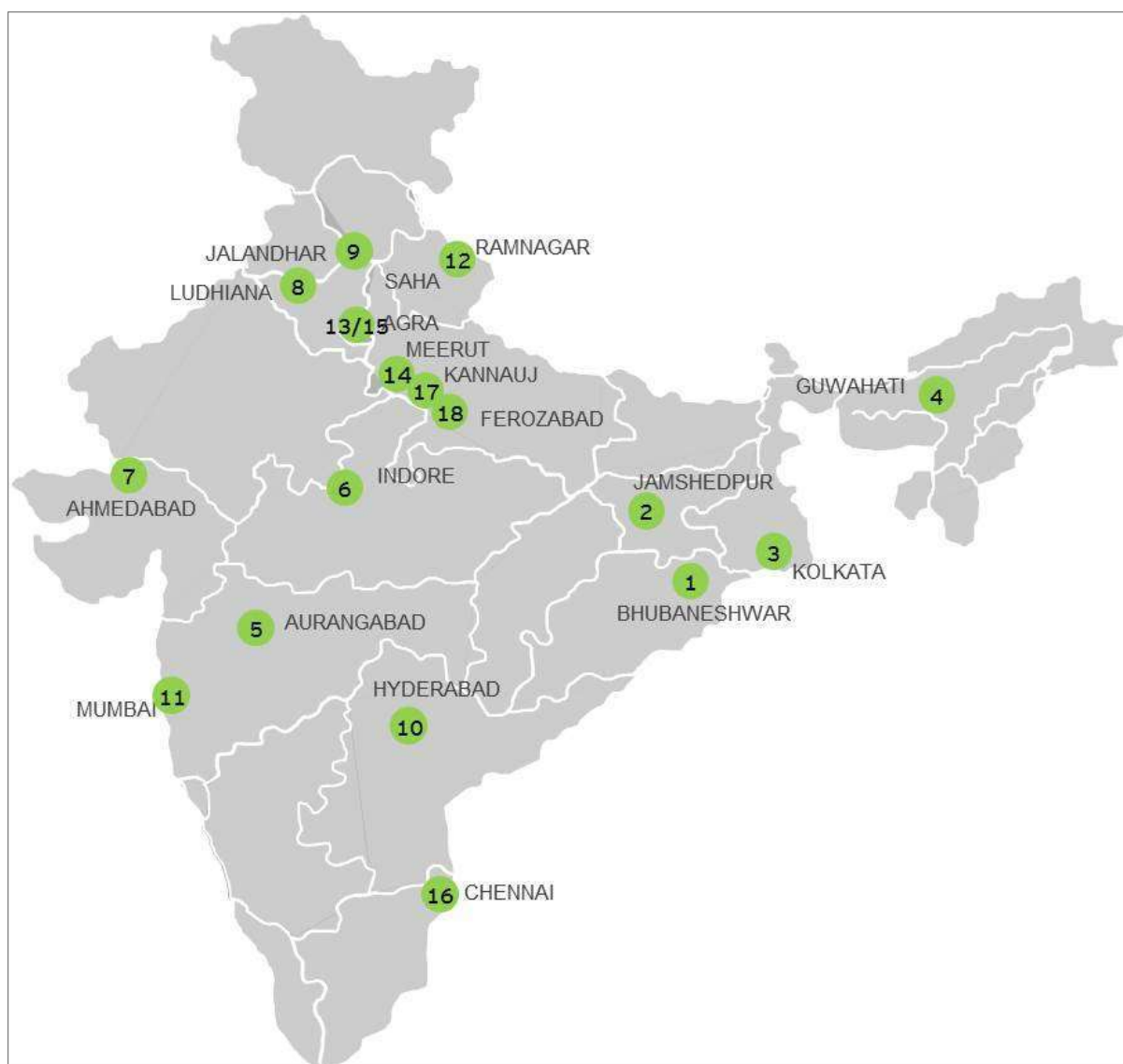
Out of the currently operational 18 Technology Centres (TCs) & Tool Rooms (TRs), 10 are for the tooling industry and 8 are for other industries such as ESDM (electronics system design and manufacturing), glass, footwear, and fragrance and flavour and sports. Half of these eighteen TCs are located in low income states (Uttar Pradesh, Madhya Pradesh, Odisha, Jharkhand and Assam). The TCs are self-sufficient institutions that provide design support, training, manufacturing, testing & calibration and consulting services to MSMEs and other enterprises. They have created a niche in the market in various fields such as hand tools, plastics, automotive, testing & calibration etc. The list of the existing TCs & TRs along with their specializations is given below:

Table 2: Existing TCs & TRs with focus sectors

SN	Name	Focus Sector
1	Central Tool Room & Training Centre (CTTC), Bhubaneswar (Odisha)	General engineering (Precision components)
2	Indo Danish Tool Room (IDTR), Jamshedpur (Jharkhand)	General engineering (Auto components)
3	Central Tool Room & Training Centre (CTTC), Kolkata (West Bengal)	General engineering
4	Tool Room & Training Centre (TRTC), Guwahati (Assam)	General engineering (Training in tool making)
5	Indo German Tool Room (IGTR), Aurangabad (Maharashtra)	General engineering (Auto components)
6	Indo German Tool Room (IGTR), Indore (Madhya Pradesh)	General engineering (Auto & Pharma)
7	Indo German Tool Room (IGTR), Ahmedabad (Gujarat)	General engineering (Auto & Plastic tools)
8	Central Tool Room (CTR), Ludhiana (Punjab)	General engineering
9	Central Institute of Hand Tools (CIHT), Jalandhar (Punjab)	General engineering (Hand tools)
10	Central Institute of Tool Design (CITD), Hyderabad, (Andhra Pradesh)	General engineering & ESDM
11	Institute for Design of Electrical Measuring Instruments (IDEMI), Mumbai, (Maharashtra)	ESDM and tool making
12	Electronics Service & Training Centre (ESTC), Ramnagar (Uttarakhand)	ESDM

SN	Name	Focus Sector
13	Process and Product Development Centre (PPDC), Agra (Uttar Pradesh)	Foundry and forging
14	Process cum Product Development Centre (PPDC), Meerut (Uttar Pradesh)	Sports goods
15	Central Footwear Training Institute (CFTI), Agra (Uttar Pradesh)	Leather & footwear
16	Central Footwear Training Institute (CFTI), Chennai (Tamil Nadu)	Leather & footwear
17	Fragrance and Flavour Development Centre (FFDC), Kannauj (Uttar Pradesh)	Fragrance & flavours
18	Centre for Development of Glass Industries (CDGI), Firozabad (Uttar Pradesh)	Glassware

Figure 2: Location of existing TRs & TCs



Several of these were set up through support from German and Danish Government under bilateral agreements as well as with the UNIDO. These TCs are largely self-sustaining entities that provide technical and vocational training programs to more than 1,00,000 trainees annually. Some of these include training programs certified by the AICTE and NCVT. They also provide design and manufacturing support to entrepreneurs alongside technical consultancies.

The existing TC's, were set up between 1967 and 1999, with primary focus on improving access to technologies and providing technical advisory support for entrepreneurs in the given industry cluster they serve. These TCs also serve workers and youth by offering opportunities for hands-on technical training and skill development in varied specialisations with a view to improve employability and livelihood opportunities.

The key services offered by the TCs include:

► **Design & manufacturing**

- Product Development
- Design & Manufacturing of tools, dies, moulds, precision tools
- Process Development & Improvement

▶ **Skill development**

- Conduct long & short term training programs in the areas of CAD, CAM, CNC, automation, RPT, mechatronics, glass design, shoe design, aromatherapy etc.
- Offers customised programs for industries

The education level of the participating students ranges from school drop outs to 10th/12th/ITI/diploma/degree holders

▶ **Consultancy**

- Process and Product Improvement
- Automation solutions
- Quality Systems support
- Turnkey assignments
- Course curriculum developments

Over the last few years, financial performance of the TCs has markedly improved. Most of them have experienced strong revenue growth (mostly due to training activities) and have achieved financial sustainability (before depreciation and land costs and few TCs even after depreciation). Based on the recent reports and financial analysis, following are some of the key observations:

- ▶ **High profitability in recent years:** There has been an improvement in recovery ratio of these TCs, thus allowing them to progress towards their self-sustainability mandate. Majority of them have become profitable in the last three years.
- ▶ **Skew towards training:** Training and skill developed services have been a key revenue sources for the TCs. The scope of manufacturing needs to be up-scaled to achieve a balance in operations and revenues from each TC. Ideally, revenues should be balanced between the two main sources of income for the TCs. Only IGTR Aurangabad is found to be closely balanced. CITD Hyderabad and CTTC Kolkata, although profitable, need to perhaps enhance their production activities.
- ▶ **Focus of production activities is more towards job work or component production:** It was found that the utilisation of machines in the production area was focused on component production and facilities for designing, die casting or tooling were not being fully utilized. CTTC Bhubaneswar and IDTR Jamshedpur focus on component production while CTR

Ludhiana on job work and IGTR Indore and CTTC Kolkata on jigs and fixtures. Only IGTR Aurangabad and CITD Hyderabad were found to focus on specialization in production, including designing, such as die casting and sheet metal or press tooling.

- ▶ **Training capacity is well utilized:** As reflected in the sources of revenue generation, the scale of training activities has been growing. All TCs initially reviewed, demonstrated an increase in training numbers from 2011-12 to 2012-13. The highest increase was observed at IGTR Ahmedabad. Although this is a positive trend, the staffs at these TCs need to focus on production and maintain a balance between these two activities, while also up scaling other activities like consultancy and product testing. The centres should also seek avenues for taking advantage of government sponsored schemes and subsequently train more technicians in welding, machining and in automation.

There is a need to replicate the TCs at more places along with technological up gradation, improved training facilities and innovation in the business models etc. This will increase their capacities to train and strengthen the workforce supply. By improving the competitiveness of these facilities, the MSME TCs can be better utilized and expected to produce a bigger footprint in the Indian manufacturing sector.

1.3 Evaluation study of TCs and recommendations of the experts

A study of selected MoMSME TRs in India on '*Strategic Assessment and Recommendations*' was submitted under the '*Micro, Small and Medium Enterprises Umbrella Programme*'. The purpose of the study was to make comparison of the TRs with international TRs programmes. It is to be noted that these TRs have now been renamed as TCs. An integrated set of ten recommendations have been made to increase the impact of the TR programme - reducing constraints to manufacturing MSME growth which are as follows:

- ▶ **Scale up training to meet market demand** - TCs should train more people. The gap in the supply of advanced manufacturing skills will systematically reduce.
- ▶ **Support private tooling sector to mature to excellence** - Besides 10 government TRs, hundreds of private TRs contribute to increased manufacturing MSME competitiveness by providing more complex tools at lower prices.
- ▶ **Engage in strategic partnerships** - Partnerships with large manufacturers can help realise large scale opportunities for manufacturing MSME. TCs can benefit from large scale and long lasting demand for services and increased revenue.
- ▶ **Re-organise "business model" of government TRs**- the TCs should function as autonomous business units with increased powers and accountability, increase job enrichment and control over own wellbeing. These teams are likely to become more motivated, innovative, leaner and more responsive to customers.

- ▶ **Map out the TRs role in the local innovation system** - TCs can benefit from integration with the local innovation system. Increased opportunity will result from increased stakeholder awareness and support.
- ▶ **Move away from hierarchy to network governance** - TCs will benefit from more autonomy which enables them to respond better to opportunities.
- ▶ **Establish a strategic framework** - TCs should utilise a coherent strategic framework which clearly articulates programme goals, sound economic development principles and good practices. Revised KPIs should promote sound strategy that result in greater, sustained development impact.
- ▶ **Establish a strategic facilitation capacity** - TCs should learn faster to achieve greater development impact. TCs should be at an international level of competitiveness.

Apart from above, several studies have been undertaken by O/o DC MSME in recent years to analyse the technology capabilities and governance framework established at the existing TCs. The key findings from these studies are summarized as follows:

- ▶ **Technology**
 - There is a possibility of improving the overall machine performance by suitable investments in large size milling machines and grinding machines to remove the bottleneck
 - Rationalization and standardization of all manufacturing processes
 - Reduction of in-machine set-up times using zero-point clamping systems and pallets
- ▶ **Organization**
 - Definition of requirements for improving planning and control of the order fulfilment process by developing an electronic planning and control system.
- ▶ **Training**
 - Development of a link between manufacturing competencies and course offerings through the introduction of course offerings that address organizational capabilities and component manufacturing,
 - Establishment of modular course structure for advanced training of industry professionals.

All of the above recommendations are valuable not only for the improvement of the existing TCs but also it serves as an important input for conceptualizing and planning for the new TCs.

2. DPR objective and approach

2.1 Objective

An ESDM focused Technology Centre in Bengaluru has been proposed with the underlying fact and review of the catchment area (Bengaluru-Kolar-Hassan-Chitradurga-Tumakuru-Krishnagiri-Coimbatore) which has some of the leading ESDM units. Further a number of transformational industrial projects are proposed and the TC can facilitate and support the MSME units coming up across this region. The TC at Bengaluru will play an important role in enhancing the competitiveness of the MSME Units in the area. TC will provide support service to entrepreneurs and MSMEs from the initial stages of product concept to prototyping, low volume production and incubation for a period of 2 years. The TC will focus on improving access to technology, providing skill up-gradation and offering advocacy support to the MSMEs with high growth potential. The long term vision is to ensure competitiveness of the MSMEs in the eco-system by strengthening their linkages to the mainstream ESDM manufacturing sector in the region.

The objective of this DPR is to evaluate feasibility of proposed MoMSME TC at Bengaluru. This includes assessment of the market need in the region, technology and skillset requirement, amount of investment required, construction needed, its layout and subsequent requirements for implementation of the green field TC at Bengaluru. This DPR has been prepared in consultation with relevant stakeholders including O/o DC-MSME, Government of Karnataka, MSME-DI, Department of Industries, key players, industry associations in Karnataka such as CLIK, ELCINA, IESA, Government Institutes and ancillary units in the region. This DPR would facilitate the implementation plan of proposed TC at Bengaluru.

2.2 Approach

To start with, a comprehensive secondary research was carried out to understand the technological requirements of the sector and in particular of the Bengaluru catchment area. To validate the facts, the team performed a detailed primary research, which included meetings with various key stakeholders including O/o DC-MSME, ESDM units in the catchment and others as explained below.

Discussions with various stakeholders were carried out to develop better understanding of the requirements and expectations from the proposed TC. Leading players were met in this region to discuss and understand the various insights with respect to the tooling & other technological requirements during the preparation of the DPR. Telephonic discussions with some of the key ESDM component manufacturers and suppliers in the Bengaluru region were carried out. The objective of this primary research was to understand their business requirements, issues, challenges, and future requirements to develop a deeper understanding of the requirements that can be served by the TCSP in future.

Based on the outcomes and the results of the discussions, market opportunity assessment was undertaken to understand the technology demand in ESDM sector across segments across the various stages of manufacturing.

Way forward: Post completion of the DPR for the proposed TC at Bengaluru under TCSP, the on-boarding of 3 main partners would be very much required to achieve the envisaged outcome in the defined time frame.

- ▶ Construction Management Consultant - For the development of the new facility
- ▶ Manufacturing Technology Partner - Procurement of machines and adoption of new technologies
- ▶ Cluster Network Manager - Marketing the centre and development of cluster with the right mix of products and services

3. Framework for selection of industry/ clusters/ systems/ location for new TCs

3.1 Location selection framework

With the objective of establishing 15 new TC's to support industry clusters, there was a need to prioritize and identify high potential growth industries based upon certain selected parameters. Hence, one of the most challenging and critical aspect of the TCSP was selection of the Industry/Clusters/Systems/Locations. This required careful consideration of parameters and consultation with the stakeholders. Preliminary meetings with the O/o DC-MSME were held to discuss the concept and approach. Subsequently three distinct approaches were finalised to identify the locations:

a) **Manufacturing Competitiveness approach:** Key idea for this approach was to identify location for TC at a place where it can create the most impact on improving the manufacturing competitiveness. The steps involved were:

- ▶ Listing major manufacturing industries creating value across country
- ▶ Identifying the clusters which can be catalyst to the manufacturing competitiveness for respective industry

One key limitation of this approach is that it will select the clusters which are already established and are among the most competitive across the country, will get shortlisted. A TC at such location will further improve the competitiveness of this location.

b) **Inclusive Growth approach:** Approach is based on the assumption that that state which has higher Net State Domestic Product has better growth and hence the states with lower per capita state domestic product should be supported. A TC in such states would become catalyst to improve the manufacturing growth in the state. Following steps were followed:

- ▶ Identification of bottom 15 Low Income states on the basis of per capita Net State Domestic Product⁹
- ▶ Identification of major manufacturing Industries in the State
- ▶ Identification of the major clusters for the identified major industries in the state

One of the key drawback of this approach is that clusters identified will not be the most competitive for the industry in the country. It is possible that by investing in a TC at such a location might improve the competitiveness of that cluster but may not make this TC a world class centre.

⁹ 2011-12 Current prices

c) **Alignment of Major Economic Projects:** As a TC will create value for many years¹⁰ and there are some mega projects in progress which will get completed in 10-15 years. This approach aims to incorporate the possible future growth areas on the basis of these mega projects. Considering that such economic growth is based on future development these areas may not get covered in above two approaches. The steps included are:

- ▶ Identification of major Economic projects & timelines (which have been ratified by the Government)
- ▶ Listing the States & Industries getting impacted
- ▶ Identifying the emerging clusters for the top industries

Above three approaches resulted in the first list of many locations. It was important to create a common framework to choose the most appropriate location. In this context “systems approach” was applied. Systems approach takes in to account the presence of entire ecosystem for a TC in the catchment area¹¹ and **Location Attractiveness Index** was created.

A Technology Centre will perform better in achieving its objectives if it is established at a location with better LA Index.

Construct of LA Index:

$$\text{LA Index Score} = \text{Catchment Score} * \text{Presence of TC Score}$$

Catchment Score = $f \times (\text{MSME Unit Score} * \text{ITI/PT Score} * \text{Presence of Major Firms Score} * \text{Presence of Leading Technical Institute Score})$

Presence of TC Score = Presence of state/private technology center in the catchment area

Following data prints were captured and analysed:

- ▶ Number of MSMEs, Number of ITIs /Polytechnics, Number of Major Firms, Leading Technology Institutes for R&D
- ▶ Existence of TCs in the Catchment area (inclusive of DC-MSME, State Government , and Private Tool Rooms)

MSME Units: This reflects the concentration of MSME and it is envisaged that larger the number of units more opportunity for TC to impact the competitiveness.

Number of ITIs/Polytechnics: This reflects the availability of population seeking skill development courses. It has also been observed that students from ITI and polytechnic form a large group of students seeking vocational training at TCs due to lack of such facilities at their respective institutes.

¹⁰ Existing Technology Centers are more than 25 year old.

¹¹ Catchment Area = District of the location and all neighbouring districts (transcending state boundaries) it is assumed that maximum value creation will be in the immediate surroundings of the Technology Center.

Number of Major Firms: It has been observed that often larger firms take the initiatives to go for technology upgrades and performance improvements. This leads to cascading effect and firm's suppliers, competitors follow up these initiatives in order to stay competitive. If a TC has larger number of such major firms in the vicinity it will have more opportunity to do technology collaborations and thus impact the entire ecosystem.

Leading Technology Institutes: Each TC can play a vital role to establish an Industry- Academia partnership. It has been found that while there are researched ideas available at the academia but they have difficulty in commercializing same. On the other hand the industries are looking for the fresh ideas to improve upon their competitiveness in the market. Unfortunately this linkage does not happen as industry has need of ideas where the proof of concept is ready and unfortunately academia does not goes beyond research. TC can play a role of bridging this gap and create the platform to link industry and academia.

State/Private TC: TC can play a vital role in mentoring and improving the performance of the state government or private sector TCs (tool rooms). If there are such opportunities in the vicinity of the MoMSME TC it can further increase the reach of TC to improve the competitiveness of MSMEs.

The weightages assigned to each parameter were as below:

100				Catchment Area Parameters				Major Firms		Tech Inst.		Presence of state/pvt TR	
				30		20		20		10		20	
State	Industry	Location	Net Score	Units	Unit Score	ITI/IPT	ITI/IPT Score	Number	Score	Number	Score	TC of State Govt/ Pvt Tool Room	TC-State Govt/ Pvt Score

In order to further refine the list of locations arrived using the above approach, following additional criteria for shortlisting the industries were incorporated:

- ▶ **Prior experience:** These are the sectors where O/o DC-MSME has experience of operating TCs, such as General Engineering, Automotive, Electronics/ESDM, Leather & Footwear, Glassware, Sports Goods, and Fragrance & Flavours
- ▶ **Concentration of MSME's:** These are sectors where O/o DC-MSME has limited prior experience of operating TCs, however there exist a large number of MSMEs in these

industries. Such as Food processing, Textiles (including Handlooms & Handicrafts), Pharmaceuticals, Wood/Paper/Pulp, and Rubber & Plastics.

- ▶ **Emerging Sectors:** These are upcoming sectors that may be at the forming stage, but will become major sectors in the near future, such as Bio-technology, Nano -technology, etc.

The sector in which DC-MSME has prior experience have been taken on priority. These sectors are: auto components, ESDM, general engineering, fragrance & flavour, leather & footwear, glass. Later the scope can be expanded to include other sectors pertaining to ministries other than MoMSME, if needed. Such sectors include food processing, pharmaceutical, packaging etc. where presence of MSMEs is considerable.

The list of locations arrived through the above was further refined and finalised with respect to the following additional considerations;

During these discussions additional considerations emerged:

- ▶ **State Classification:** The states were classified into two categories as unserved states and served states. All states of the country were distributed between Un-served states where O/o DC-MSME did not have an operating TC and served states where an operating MoMSME TC existed.
- ▶ At first unserved states were considered for the new TC in order to spread the coverage of MoMSME TC which would help in supporting more MSMEs across the country. With the approval of locations for the unserved states, served states would also be considered for the technologies for which existing TC cannot support.
- ▶ On the basis of MSMEs concentration in prior experience sectors, leading clusters were identified in each unserved state. This resulted in identifying the industry wise potential locations in each of these states.
- ▶ Some of the unserved states took proactive approach and have allocated or identified land for the purpose of TC. These locations were mapped to the locations identified in the step above. Accordingly technology focus was selected for these locations.

3.2 Selection of Bengaluru location for setting up of new TC

As per the location selection framework and subsequent approval in the 4th PSC meeting held on 15th May 14, Bengaluru was selected as the location for setting up of new ESDM TC. Bengaluru region has been found suitable from multiple perspectives:

- ▶ Catchment area Bengaluru Kolar-Hassan-Chitradurga-Tumakuru-Krishnagiri-Coimbatore) has some of the leading ESDM players. Bengaluru and its catchment area has several major ESDM OEMs and over 4936 MSMEs in the ESDM sector. A TC at Bengaluru will help improve the manufacturing competitiveness
 - Major OEMs include - Wipro, Infosys, Centum Electronics, Philips, etc.
- ▶ Mega industrial projects in vicinity
 - The Karnataka government is taking several measures to boost the ESDM industry in the State. Incentives are being provided to the ESDM industry, which is expected to increase the number of units in this sector.
 - Several industrial zones are being allocated for the industry. This includes proposed greenfield and brownfield clusters in Bengaluru, Chittoor, Vellore, and Mysuru.
 - The Electronics Hardware Manufacturing policy of 2011 has identified three corridors to set up electronics hardware manufacturing hubs – Bengaluru-Tumakuru corridor which will concentrate on semiconductors, Hubli-Dharwad corridor which will focus on automotive electronics, and Mysore-Nanjangud corridor which will cater to medical electronics.
 - GMR Krishnagiri Special Investment Region (GKSIR) is a 2800 acre Greenfield City being developed by the GMR Group. It is being developed as a joint venture with the Government of the state of Tamil Nadu. GKSIR is located on the Bengaluru-Chennai Industrial Corridor. The zone is being developed in phases, and is being positioned as a high-end development for new technology and high value segments from Electronics, Automotive, Defence, and Aerospace Manufacturing to Nano Technology, Solar Manufacturing, and Light Engineering.
- ▶ Good connectivity and access from other locations
 - Bengaluru is extremely well connected, being located on the NH-4 (Mumbai-Pune-Bengaluru-Chennai), NH-7 (Varanasi-Nagpur-Hyderabad-Bengaluru-Madurai), and NH209 (Bengaluru-Dindigul (Tamil Nadu)). It is also located on SH-17 (Bengaluru - Ramanagara-Mandya-Mysuru), SH-39 (Bengaluru - Hesarghatta), SH-84 B (Bengaluru-Ramanathapura-Jaloor), SH-87 (Bengaluru-Anekal), and SH-104 (Bengaluru-Kannur-Nandi), making it a strategic location for industries.

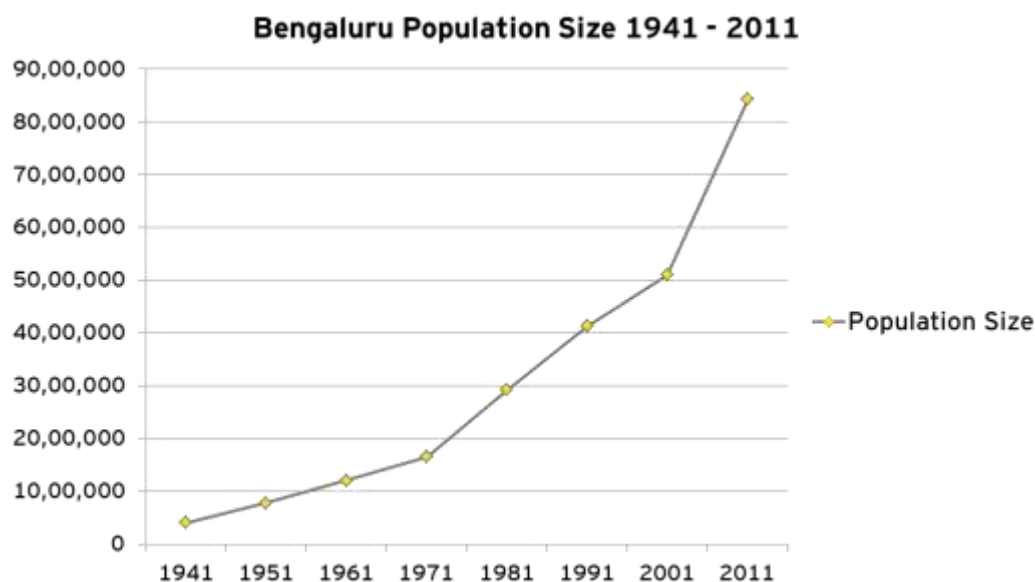
4. Location brief

4.1 Demographic profile of the district

Population growth: The total population of the Bengaluru district is approximately 96 lakhs (census 2011). The growth of population in the Bengaluru district was 47% during the years 2001-11. Out of the total population in 2011, 52% (approximately 50 lakh people) are men and 48% (approximately 46 lakh people) are women. The density has increased from 2,985 people per square kilometres in year 2001 to 4,381 in year 2011.

The World Economic Forum has identified Bengaluru as an Innovation Cluster. In the past 20 years, many private sector and multinational companies have set up base in Bengaluru to take advantage of the vast talent pool available in the city, including Infosys and Wipro. The clustering of IT, biotech, aerospace, defence and electronics-related industries in Bengaluru and the large public sector enterprises have attracted people from all over the country, leading to an exponential growth in the population. However, the growth of the population has not been commensurate with the development of infrastructure, which has drastically lagged behind. To address this issue, the state government has initiated several infrastructure projects, including the Metro Rail and signal-free elevated expressways to ease the city traffic which currently has more than 4 million vehicles; and over 1000 vehicles being added on a daily basis to Bengaluru's roads.¹²

The graph depicts the growth of population over the decades of Bengaluru district.



¹² http://export.gov/india/eg_in_053803.asp

Rural-urban population composition: Bengaluru district has an urban population of around 91% (87 lakh) and a rural population of around 9% (8.7 lakh people) as per census 2011. In the urban area, males constitute around 52% (46 lakh people) of the population and women constitute for around 48% (41 lakh people) of the population. In the rural area, males constitute around 53% (4.6 lakh people) of the population and women constitute 47% (4.1 lakh people) of the population.

Sex Ratio: The sex ratio at the district level is 916 females per 1000 males (year 2011).

Literacy Rate: The literacy rate of Bengaluru district is around 87.67%. Among male and female this rate is 91.01% and 84.01% respectively. At the district level, the number of literates has increased by 4.71% from year 2001 to 2011. The male and female literates increased by 3.09% and 6.53% respectively during this period¹³.

¹³ Census 2011

4.2 Regional overview

Bengaluru is the Capital city of Karnataka, and India's leading IT exporter. It is located on the Deccan Plateau in the South Eastern part of Karnataka, at 12° 39' to 13° 18' North latitude, and 77° 22' to 77° 52' East longitude. Bengaluru district borders with Kolar and Chikkaballapur in the northeast, Tumakuru in the northwest, Mandya and Ramanagara in the southeast, and Mysore and Tamil Nadu in the south. The Bengaluru Urban District is divided into 4 taluks - Bengaluru North, Bengaluru South (Rajarajeshwari Nagar), Bengaluru East (Krishnarajapura) and Anekal.

Bengaluru possesses world class infrastructure in housing, education & research. It is well connected by road, rail, and air. Several national and state highways run through Bengaluru, connecting it to major cities within India. There are 18 railway stations with 148.32 km of rail network in district. Bengaluru is also connected by rail to most cities in Karnataka, as well as other states. Mangalore and Chennai are the closest ports at a distance of 242 Km and 315 Km respectively. Bengaluru Airport is fourth busiest airport in India¹⁴.

Figure 3: Location map



¹⁴ GIM Bengaluru Urban District Profile 2012

Table 3: Bengaluru District snapshot¹⁵

Section	Quantity/Value
Area	
Total geographical area	2196 Sq. km
Administration	
Tehsil	4
Villages	699
Land use pattern	
Total area	2,17,410 Hectares
Total irrigated area	63,800 Hectares
Population (census 2011)	
Total population	95,88,910
Men	50,25,498
Women	45,63,412
Literacy	
Total literate	87.67%
Men	91.01%
Women	84.01%
Industries	
Registered MSME units	4,349
Employed persons	48,576

¹⁵ <http://dcmsme.gov.in/dips/Bangalore%20Urban%20District.pdf>

Table 4: Status of power, water, wind and rainfall in the region

Aspect	Status	Significance for TC
Water availability	▶ Bangalore Water Supply and Sewerage Board (BWSSB) is responsible for water supply ▶ Majority of the water for Bengaluru is sourced from the Cauvery River¹⁶ ▶ Ground water is largely sourced from open wells. Open wells as well as bore wells can both yield between 70 to 90 meters of water per day.¹⁷	▶ Ensures availability of water ▶ Industry which requires water throughout the year may have to construct pondage at their cost and meet the water requirement during the lean period.¹⁸
Electricity availability	▶ Bengaluru's electricity is provided by Bangalore Electricity Supply Company (BESCOM) ▶ Karnataka has an installed generation capacity of about 14,159 MW, of which about 6,158 MW is from thermal power generation, 3,600 MW from hydel power, 3,571 MW from renewable energy sources and 500 MW from other sources¹⁹	▶ Power back up (generators) to be designed keeping emergency and essential services / equipment in mind, since power failures do occur (as per conversations with existing companies)
Wind flow	▶ The high wind speed averages 17 kmph during the westerly winds in the month of July and a minimum of 8-9 kmph during the months of April and October. ▶ Humidity is 65% ▶ Bengaluru is located 3000 ft. above sea level	▶ Should maximize natural ventilation

¹⁶ <http://bwssb.org/faq/>¹⁷ <http://ces.iisc.ernet.in/energy/wetlands/sarea.html>¹⁸ [http://karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202014-19%20\(English\).pdf](http://karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202014-19%20(English).pdf)¹⁹ [http://karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202014-19%20\(English\).pdf](http://karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202014-19%20(English).pdf)

Aspect	Status	Significance for TC
Rainfall	▶ Average annual rainfall: 859 mm ▶ Primary rainy season: June - September (South-West Monsoon) ▶ Secondary rainy season: November - December (North-East Monsoon)	▶ Should estimate capacity of rainwater harvesting
Temperature	▶ Bengaluru has a moderate climate, recording high temperatures during April with daily mean temperatures of 33.4°C, and low temperatures in December, with daily mean temperatures of 25.7°C ▶ Maximum temperature of 33°C, and minimum of 14°C	▶ For estimation of capacity of AC to be installed for adequate cooling, and designing of building

The proposed Technology Centre is to be set up at the Aerospace Park and SEZ at Devanahalli, in the Bengaluru District. The town is located about 40 km to the north-east of Bengaluru. Bengaluru Aerospace Park (BAP) is being developed as a world-class aerospace hub, spread over 984 acres, and also containing a 252 acre Special Economic Zone.

The aerospace park is located adjacent to the Bengaluru International Airport (BIAL), and accessible by key national highways - NH-7, NH-4, and NH-207. A direct link from BAP to BIAL is planned. A High Speed Rail Link (HSRL) is proposed between Bengaluru City and BAP / BIAL.

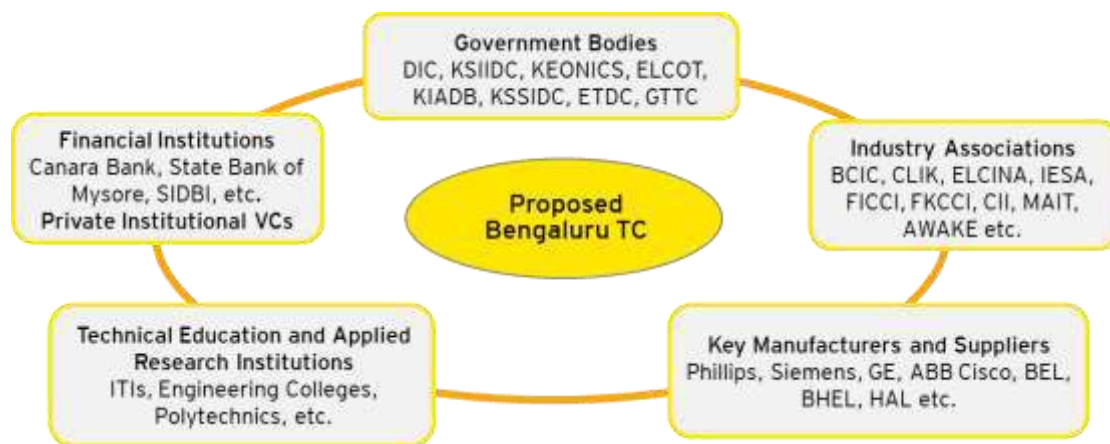
Infrastructure in terms of roads, underground cabling, power lines, water lines, and effluent discharge lines for treated effluents will be provided. An International Convention Centre is proposed on 30 acres of land near BAP.

4.3 Regional stakeholders

Regional Industry associations, leading manufacturers, training institutes, applied research institutes, academia, thought leaders and above all MSMEs would play an important role in providing the guidance on key aspects including (but not limited to) designing capabilities, technological requirements, skillset requirement and cluster development.

Key stakeholders for the Bengaluru TC would include: Government bodies, industry body associations, manufacturers and suppliers (e.g; OEMs, tier 1 and MSMEs etc.), financial institutions, technical and vocational training institutes, applied research institutes etc. in the catchment area. Bengaluru and its catchment area include: Kolar, Hassan, Chitradurga, Tumakuru, Krishnagiri, and Coimbatore. The following figure depicts the stakeholders of the Bengaluru TC:

Figure 4: Stakeholders of Bengaluru TC



4.3.1 Government Bodies

► Department of Industries and Commerce (DIC)

The Department of Industries and Commerce acts as a catalyst for the overall development of the industrial sector through effective discharge of developmental and facilitation roles. With a view to promote investment and trade, the Department formulates and implements the Policies of the State, Identification of Sectoral Advantages of the State and Human resource development for sustainable and growth-oriented industrialization has been a crucial role of the Department. Facilitating the take-off of infrastructure projects that boost the industrial growth has also been the Department's forte. The Department helps enhance the competitiveness of domestic industry through modernization, technology upgradation and adoption of best practices. It also provides a forum for entrepreneurs and industrialists through their associations to represent their needs to the Government, which translates into Policies of the State.

Some of the crucial infrastructure projects facilitated by the Department in Karnataka include Growth Centres across the State, Export Promotion Industrial Parks, International Technology Park Ltd., Electronic city, Food and Agro-technology parks, Agro Export zones, Special Economic Zones, Bengaluru International Airport, etc.

The Department is able to reach out to the small businesses as well as Industrial Houses by a great degree of decentralization within the organizational structure. The Department functions through the Districts Industries Centres, various Boards Corporations and Special purpose vehicles. The implementation of Policies of the Government is done through various schemes and the implementation of these schemes is decentralized for faster delivery of services.

► **Karnataka State Industrial & Infrastructure Development Corporation Limited (KSIIDC)**

KSIIDC has been an important arm of the state in bringing industrial boom in various sectors; KSIIDC has assisted 135 start-up ventures through equity participation to the extent of Rs. 118.28 crores spread across the State. KSIIDC has also extended financial assistance in the form of debt to core sector industries like Steel, Cement, Mining and Textiles and modern sector industries like Information Technology, Aviation, Tele-communication and other infrastructure projects to the extent of around Rs. 2223 crores.

The objectives of the Karnataka State Industrial Infrastructure Development Corporation are:

- To act as catalyst for promoting industrial growth in the State, especially in the medium and large sector by:
 - Identifying industrial opportunities
 - Providing guidance and advice to prospective entrepreneurs
 - Providing necessary financial assistance and other related services to realise these opportunities.
- To act as the designated agency of the Government to:
 - Plan and formulate proposals for industrial infrastructure development projects after assessing the need in different sectors/areas
 - Monitor the specified mega projects during implementation as the nodal agency.

► **Karnataka State Electronics Development Corporation Limited (KEONICS)**

KEONICS was incorporated as with the objective of promoting the development of electronic industry in the State and to create infrastructure for the rapid growth of electronic industries. It was envisaged to function both as manufacturer and as a facilitator as well as catalyst for

the development of electronic industries and accordingly classified as development enterprise.

The present activities of Karnataka State Electronics Development Corporation Limited are broadly categorized as under:

- **Training Services:** KEONICS has network of 230 training centres throughout Karnataka, for computer training and IT Enabled services. All the training centres are well equipped with latest Hardware and Software. Training programmers are also being conducted to staff of various Government Departments and organizations in addition to other candidates.
- **Infrastructure Facility Services:** KOENICS has set up Electronics City, which is a major hub of electronics and IT activities. With a view to encourage growth of Information Technology.
- **Marketing Services:** KEONICS is supplying EPABX systems to various Defence head Quarters. It has also undertaken projects of telecommunication networks by using Optical Fiber Cables and underground cables and is also marketing computer hardware, software and electronic equipment to various Government organizations. It has also provided e-tendering solution 'Tender Wizard' to more than 30 Government organizations. In these projects Karnataka State Electronics Development Corporation Limited has partnered with companies like M/s Tata Telecom, Pair Cables, Simoco, HP, CMS, Antares, etc.
- **Consultancy Services:** Karnataka State Electronics Development Corporation Limited has developed in house competence in offering consultancy on project implementation to various Government Departments in the areas of Networking, Web creation and Software Development and Computerization plans. It has acquired these skills through re-orientation training programmes as system integrators, certified engineers and software developers.

▶ **Electronics Corporation of Tamil Nadu Limited (ELCOT)**

ELCOT is a Government of Tamil Nadu undertaking, with the objective to promote, establish, and run State Public Sector Enterprises for electronic items; manage, supervise, finance, advise, assist, aid or collaborate with any association, firm, company, enterprise, undertaking, institution or scheme for the advancement and development of all branches of electronics and of industries and business concerns based on or relating to electronics. ELCOT also provides support to Government Bodies, Organizations, Boards, etc. in the area of IT / ITES related initiatives and e-Governance.

▶ **Karnataka Industrial Areas Development Board (KIADB)**

KIADB is a wholly owned infrastructure agency of Government of Karnataka. This Board functions as per statutory provisions, rules and regulations enacted there under. The Board comprises of senior government officers in their ex-officio capacities. The Board of members meet regularly to take decisions and monitor the functions.

Aims and Objectives:

- Promote rapid and orderly development of industries in the state
- Assist in implementation of policies of Government within the purview of KIAD Act
- Facilitate in establishing infrastructure projects
- Function on “No Profit - No Loss” basis

Functions:

- Acquire land and form industrial areas in the state
- Provide basic infrastructure in the industrial areas
- Acquire land for Single Unit Complexes
- Acquire land for Government agencies for their schemes and infrastructure projects

► **Karnataka State Small Industries Development Corporation (KSSIDC)**

KSSIDC renders services to the small scale sector in the State. The corporation started with the following as its key service areas:

- Establishment and Management of Industrial Estates
- Procurement and distribution of raw materials
- Assistance towards marketing
- Dissemination of information by participating in the internal and international exhibitions.
- Supply of machinery under Hire Purchase Scheme.
- Providing Guidance to SSI Entrepreneurs.
- Providing Technical Library facilities.

► **Electronics Test and Development Centre (ETDC), Bengaluru**

ETDC has been set up in Bengaluru under Standardisation Testing and Quality Certification Directorate (STQC). ETDC is engaged in providing accredited calibration and testing facilities. It serves industries located in South India with an aim of upgrading the overall quality of electronics products manufactured in India. The High precision Calibration Centre (HPCC), the test laboratory for solar panels and products, and the EMI / EMC test centre are important facilities at this centre.

- The testing services cover electronics and electrical systems testing, including equipment system testing, environment testing, safety testing, electromagnetic interference (EMI) / electromagnetic compatibility (EMC) testing, and solar PV testing.

- Calibration services offered include electro-technical calibration, non-electrical calibration, high precision calibration (non-electrical parameters), and high precision calibration (electro-technical parameters).

▶ **Government Tool Room and Training Centre (GTTC)**

GTTC is an Indo-Danish Project, and was established in 1972 to provide skilled manpower and technical services to the existing and emerging industries. The key objectives of GTTC include:

- Offering hands on long-term, short-term and need based training programmes
- Design and manufacturing of press tools, dies for metals and plastics, jigs and fixtures, etc.
- Manufacturing of Critical and precision Components for Aeronautical and Defence sectors, etc.

GTTC provides training courses in tool and die making, precision manufacturing, electronics and communication engineering, and mechatronics.

4.3.2 Industry Body Associations

▶ **Bangalore Chambers of Industry and Commerce (BCIC)**

BCIC is the Apex Chamber of Commerce representing large and medium industries in the State of Karnataka. The Chamber represents 95% of the capital investment and 90% of labour employed in the State of Karnataka. The chamber presently has a membership of 600 companies representing various sectors of industry. BCIC plays an active and important role in promoting trade and investment in the Karnataka and has a domestic and international network with the Chambers of Commerce across the globe.

▶ **Electronics City Industries' Association (ELCIA)**

ELCIA was formed by the industries located in the Electronics City in 1992, with the help of KEONICS. Electronics City is one of India's largest electronic industrial parks, spread over 332 acres. The Objective of the Association is to protect and promote the interests of the industries by sharing technology and information as well as to provide a forum for addressing common problems confronting the industries. Several large electronics and IT companies are located here.

▶ **India Electronics and Semiconductor Association (IESA)**

IESA is a trade body representing the Indian ESDM industry. IESA is committed towards building global awareness for the Indian ESDM industry and supporting its growth through focused initiatives in developing the ecosystem. This is through publishing credible data,

networking events and alliances with other international associations. IESA works closely with the Government as a knowledge partner on the sector, both at the centre and at the state level.

The primary objective of IESA is to act as a catalyst for the growth of the ESDM industry in India.

Objectives include:

- Create global awareness for the Indian semiconductor and electronic systems industry outside of the generic 'IT' umbrella
- Create a win-win interaction among semiconductor and electronics product and services companies, government, academia, venture capitalists and industry bodies
- Create an enabling ecosystem that catalyzes industry growth and leadership
- Enhance operational efficiency
- Foster active collaboration between industry and universities to further expand the available world class semiconductor talent pool
- Identify investment opportunities
- Drive technology vision for the semiconductor and electronic systems industry
- Promote trade and industry

► **Federation of Karnataka Chambers of Commerce and Industry (FKCCI)**

FKCCI (erstwhile Mysore Chamber of Commerce) was founded in 1916. It seeks to promote the national interest by way of both public and private sector led economic growth, and has played a catalytic role in policy making at the State and Central level. FKCCI's mission is to promote the cause of Trade and Industries in Karnataka, give necessary guidance to members, and help frame policies and deliberate on matters of regulation and taxation. The membership at FKCCI stands at 3000 direct members and more than 250,000 indirect members drawn from all sectors of Trade, Commerce and Industry across Karnataka, including 26 District Chambers of Commerce and 135 Trade Industry Associations. The Federation is a member of national bodies like FICCI, ASSOCHAM and also the International Chamber of Commerce. FKCCI has launched a dedicated research wing, set up to provide comprehensive research information to the industry on various aspects of conducting business in the State.

► **Federation of Indian chamber of Commerce and Industry (FICCI)**

Established in 1927, FICCI is the largest and oldest apex business organization in India. It is a representative body for India's business and industry. FICCI is involved in influencing policy, and provides a platform for networking and consensus building within and across sectors. FICCI represents several sectors, including Electronics Hardware Manufacturing. It has been

involved in developing and promoting Government Tax and Policy development, R&D, innovation, marketing, and cluster development.

► **Confederation of Indian Industry (CII)**

CII works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII's primary goal is to develop Indian industry and to ensure that government and society as a whole, understanding both the needs of industry and its contribution to the nation's well-being. Their role includes:

- To identify and strengthen industry's role in the economic development of the country
- To act as a catalyst in bringing about the growth and development of Indian Industry
- To reinforce industry's commitment to society
- To provide up-to-date information and data to industry and government
- To create awareness and support industry's efforts on quality, environment, energy management, and consumer protection
- To identify and address the special needs of the small sector to make it more competitive
- To promote cooperation with counterpart organisations
- To work towards the globalisation of Indian industry and integration into the world economy

► **Consortium of Electronic Industries of Karnataka (CLIK)**

CLIK was founded as a Regional Trade Organization located in Bengaluru.

- CLIK's objective is to promote a vibrant electronic industry in Karnataka. It achieves its objectives by organizing need based seminars, exhibitions, trade delegations, policy advocacy, etc.
- CLIK has established a CLIK Calibration and Test Centre, IPR Cell etc. to support its members. The organization conducts CLIKTRONIKA, its flagship international event every 2 years.

► **Peenya Industries Association**

The Peenya Industries association was founded with the objective of safeguarding the interest of industrial units in Peenya Complex. Over the years the Association transformed itself from a welfare organisation into a facilitator for the promotion and growth of small-scale industries. The Association has attained the status of being recognised by both the Central and State Governments in the formulation of industrial policies.

- The Association organises Growth Programmes, Vendor Development Programmes, ISO Certification Programmes, Refresher Courses, Training Programmes, Seminars and symposiums and Workshops, Interactive Meetings on various Technical, Commercial and Management topics of interest to the members. The Association also renders community services.
- It is represented in the various committees of the Government Departments like Industries and Commerce, RBI, Central Excise & Customs, Commercial Taxes, etc.

► **Manufacturers' Association for Information Technology (MAIT)**

MAIT represents Hardware, Training, R&D & Hardware Design and other associated service segments of the Indian IT Industry. MAIT's charter is to develop a globally competitive Indian IT Industry, promote the usage of IT in India, strengthen the role of IT in national economic development, promote business through international alliances, promote quality consciousness in the IT Industry and transform the Indian IT Industry into a World Scale Industry leading to a World Class Usage and thus a World Size Market.

MAIT contributed in formation of the ICT policies of both the States and the Central Government, including the 12th Five Year Plan for IT. MAIT was also a part of the Task Force set up by the Ministry of Communications & IT, Government of India in the past to suggest measures to stimulate the growth of IT, ITeS and Electronics Hardware Manufacturing Industry in the country. MAIT has played a role in formulating the e-Waste Rules 2011 as well the e-Waste Implementation Guidelines.

Key thrust areas:

- Enabling a policy framework of IT manufacturing ecosystem
- Attracting investments in IT/electronics manufacturing
- Simplification of procedures for domestic and external transactions
- Increasing IT penetration/usage in India.
- Rationalization of local levies and taxes on IT products to make them affordable.
- Promoting Green IT management
- Promoting sustainability & environmentally sound management of e-Waste
- Promoting IP among all the stakeholders
- Promoting international relations
- Demand Creation
- Promoting SME sector
- Promoting design, innovation and new product development.
- Promoting development of local language IT applications/products/solutions.
- Promoting usage of genuine IT products, components and consumables.

► **Association of Women Entrepreneurs of Karnataka (AWAKE)**

AWAKE is a not-for-profit, Non-Governmental Organization (NGO) based in Bengaluru. AWAKE strives to promote entrepreneurship among women as a means to achieve self-reliance and socio-economic independence.

Awake has the following functions:

- Provides support and guidance to aspiring women from rural, urban, national and international arenas to be successful entrepreneurs, irrespective of their age, academic, social, economic background.
- Services to women Self Help Groups (SHGs), NGOs and other development agencies engaged in Income Generation Activities and Entrepreneurship Development.
- Entrepreneurship development involving awareness programs, business counseling, trainings, skill development, mentoring, business incubation, information sharing and networking, marketing assistance, credit referral and policy advocacy.
- The organization comprises of women entrepreneurs from various sectors as its members. Members of AWAKE contribute their time and expertise to support women entrepreneurs, based on the approach '*Entrepreneur guiding Entrepreneur*'.
- Strong support network with Government, non-government, corporate, developmental agencies, funding and finance agencies, working with them to provide the expertise in entrepreneurship development for both rural and urban women.
- Collaborates as a resource organization in institutional competence building, training, policy making and enabling technology transfers for state, national and international agencies.

AWAKE fosters an entrepreneurial culture in women such that their contribution to the global economy is recognized.

4.3.3 Leading Manufacturers

► **OEMs and Tier 1 players**

The Bengaluru region houses some of the largest industries in the electronics sector, specifically in Electronics City. Key players in the region include; Philips, Siemens, General Electric, ABB, Cisco Systems, Bharat Electronics Limited, Hindustan Aeronautics Limited, Centum Electronics, Honeywell, ISRO, etc. The proposed Bengaluru TC would develop capabilities in manufacturing of electronics required to support these enterprises. It would also play an important role in the supply of skilled manpower.

► **MSME Units**

Bengaluru and its catchment area includes Kolar, Hassan, Chitradurga, Tumakuru, Krishnagiri and Coimbatore. Together, the catchment area comprises approximately 58,258 MSME units. Of these, about 3,833 are in the EDSM sector²⁰.

4.3.4 Financial Institutions

Major financial institutions across the region are as follows;

District name	Financial institutions
Bengaluru	Canara Bank, UCO Bank, SBI, Nationalised banks, SIDBI
Kolar	Canara Bank (lead bank), Nationalised banks (eg. Bank of India)
Hassan	Canara Bank (lead bank), Vijaya Bank, Nationalised banks (eg. Bank of India)
Chitradurga	Canara Bank (lead bank), State Bank of Mysore, Vijaya Bank
Tumakuru	State Bank of Mysore (lead bank), Canara Bank
Krishnagiri	Indian Bank, Nationalised banks
Coimbatore	Canara Bank, Nationalised Banks

In addition to this, there are other sources of funding such as venture capitalists. These include the Indian Angel Network and the Anand Rathi group, among others.

4.3.5 Technical Education and Vocational Training Institutes

► Technical Education

Karnataka has a total of 195 engineering colleges, 291 polytechnics²¹, and 1112 Industrial Training Institutes / Centres (ITI / ITCs)²². The table below illustrates the number of ITIs (government and private) in the catchment area, as well as their intake capacity in the catchment area falling in Karnataka.

Number of ITIs / ITCs and their Intake Capacity in the Catchment Area (Karnataka Regions)²³

	Number of ITI / ITCs	Intake Capacity (approx.)
Bengaluru	74	9612
Kolar	24	3514
Hassan	64	7355
Chitradurga	56	4820
Tumakuru	59	5573
Total	277	30874

²⁰DC MSME

²¹ <http://dte.kar.nic.in/>

²² http://www.iddkarnataka.gov.in/docs/75_Vocational_Training_in_Karnataka.pdf

²³ <http://emptrg.kar.nic.in/private-itis-index.htm>

Prominent technical educational institutes in the catchment area are detailed in the table below (not comprehensive):

District	Prominent Technical Educational Institutes ²⁴
Bengaluru	RV College of Engineering PES University MS Ramaiah Institute of Technology International Institute of Information Technology BMS College of Engineering Sri Sairam College of Engineering Nitte Meenakshi Institute of Technology Bangalore Institute of Technology MVJ College of Engineering University Visvesvaraya College of Engineering The Oxford College of Engineering Sir M Visvesvaraya Institute of Technology Nettur Technical Training Foundation Indian Institute of Science (IISC)
Kolar	C Byregowda Institute of Technology Dr T Thimmaiah Institute of Technology Golden Valley Institute of Technology
Hassan	Malnad College of Engineering Government Engineering College Rajeev Institute of Technology Bahubali College of Engineering
Chitradurga	SJM Institute of Technology
Tumakuru	Channabasaveshwara Institute of Technology H.M.S Institute of Technology Kalpataru Institute of Technology Siddanganga Institute of Technology Sri Siddhartha Institute of Technology Sridevi Institute of Engineering And Technology
Krishnagiri	Government Polytechnic College Government College of Engineering Adhiyamaan College of Engineering Hosur Institute of Technology and Science P.S.V. College of Engineering and Technology Sri Venkateshwara Institute of Engineering
Coimbatore	PSG College of Technology Sri Krishna College of Engineering and Technology JCT College of Engineering and Technology CMS College of Engineering and Technology Coimbatore Institute of Technology Hindustan College of Engineering and Technology Karunya Institute of Technology and Sciences Government College of Technology

► Vocational Training:

Karnataka has taken an active stance on promoting vocational training in the state.

²⁴ Desktop research - multiple sources

The Karnataka government's Directorate of Employment and Training proposes to:

- Ensure steady flow of skilled manpower to industries
- Equip the youth with practical skills which enable them to seek employment or self-employment
- Raise the quality and quantity of industrial production by systematic training of workers

The Karnataka Vocational Training and Skill Development Corporation (KVTSDC) was set up with the objective of imparting skills and employment to 10 lakh persons in the succeeding five years from inception. The following are some of the main objectives of the Corporation:

- To design, develop and implement various skill-training programs based on the emerging trades.
- To impart training in multi skills, considering the demand of industries.
- To assist, implement and strengthen SCVT (Skill Council for Vocational Training)
- To implement various employment generating training programs sponsored by Govt., public sector, Enterprises, Corporations, Boards, Local Bodies and Associates etc.
- To assist, organize, co-ordinate, regulate and provide employment of Indian skilled personnel and others for overseas employment

The Karnataka Skill Council for Vocational Training deals with matters related to vocational training in the state. The SCVT has approved electrical and electronics clusters in the state for vocational training in these trades. The vocational programs in these clusters include photography and videography, intercom and mobile phone service, repair and maintenance of photocopiers, printers and scanners, computer hardware mechanic, UPS inverter and power supply, bio medical technician, acoustics and sound systems, electrical motor rewinding technician, servicing of electrical home appliances, power generator technician, electrical wiring technician and solar power equipment technician²⁵.

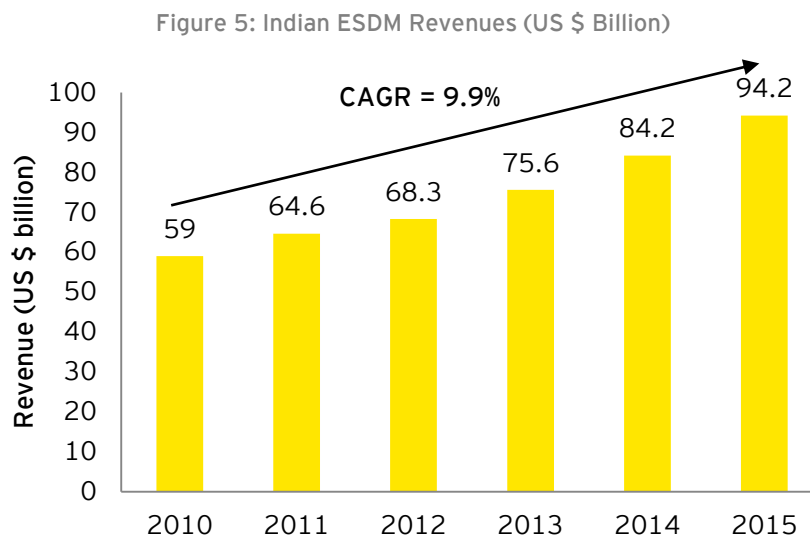
²⁵ <http://emptrg.kar.nic.in/SCVT%20Approved%20trades.pdf>

5. Opportunity and need assessment

5.1 India scenario

ESDM is one of the fastest growing manufacturing industries in the India. Despite accounting for only about 3.5% of the global electronics market, the Indian ESDM industry is being globally recognized for its consumption potential. A CAGR of 9.9% is estimated for ESDM in India, from USD 59 billion in 2010 to an estimated USD 94 billion in 2015. However, most of the demand is at present being fulfilled by imports. By the end of 2015 only 6.7% of this is expected to be made by local domestic companies.²⁶

The below charts depict Indian's ESDM sector growth in the recent past:



The Indian ESDM industry can be categorised into five key segments:

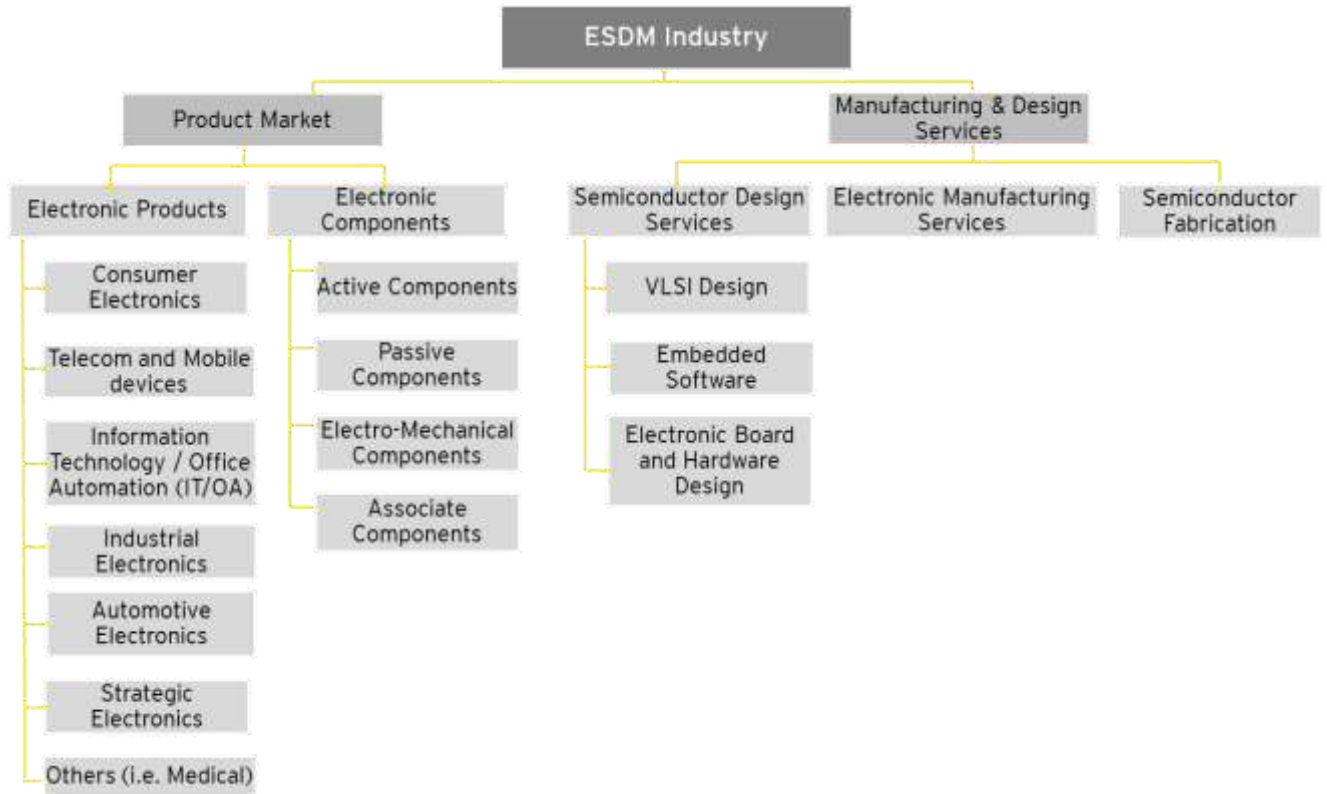
1. **Electronic Products** - These constitute the total market for electronic products (produced locally or imported) for domestic consumption as well as export of electronic products manufactured in a country
2. **Electronic Components** - This includes all local manufacturing of electronic components
3. **Semiconductor Design Services** - These include revenue from semiconductor design-related activities of local players and captives of semiconductor MNCs operating in a country. It includes revenues from embedded software, very large scale integration (VLSI) and hardware/board design
4. **Electronics Manufacturing Services (EMS)** - Includes revenue from all EMS services rendered in the country

²⁶ Indian ESDM Market 2011 - 2015, ISA - Frost Sullivan Report

5. **Semiconductor fabrication** - This will include revenue generated by foundries through fabrication of semiconductors.

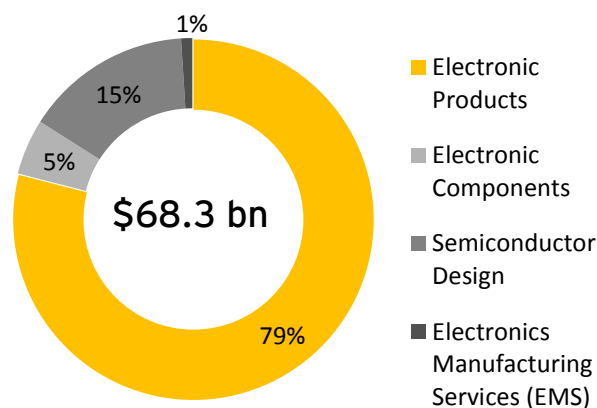
The diagram below depicts the breakdown of these key ESDM Segments:

Figure 6: ESDM Sector Overview



Additionally, the following chart shows the breakup of the Indian ESDM market in value terms in the year 2012.

Figure 7: Indian ESDM market value 2012 (by categories)²⁷

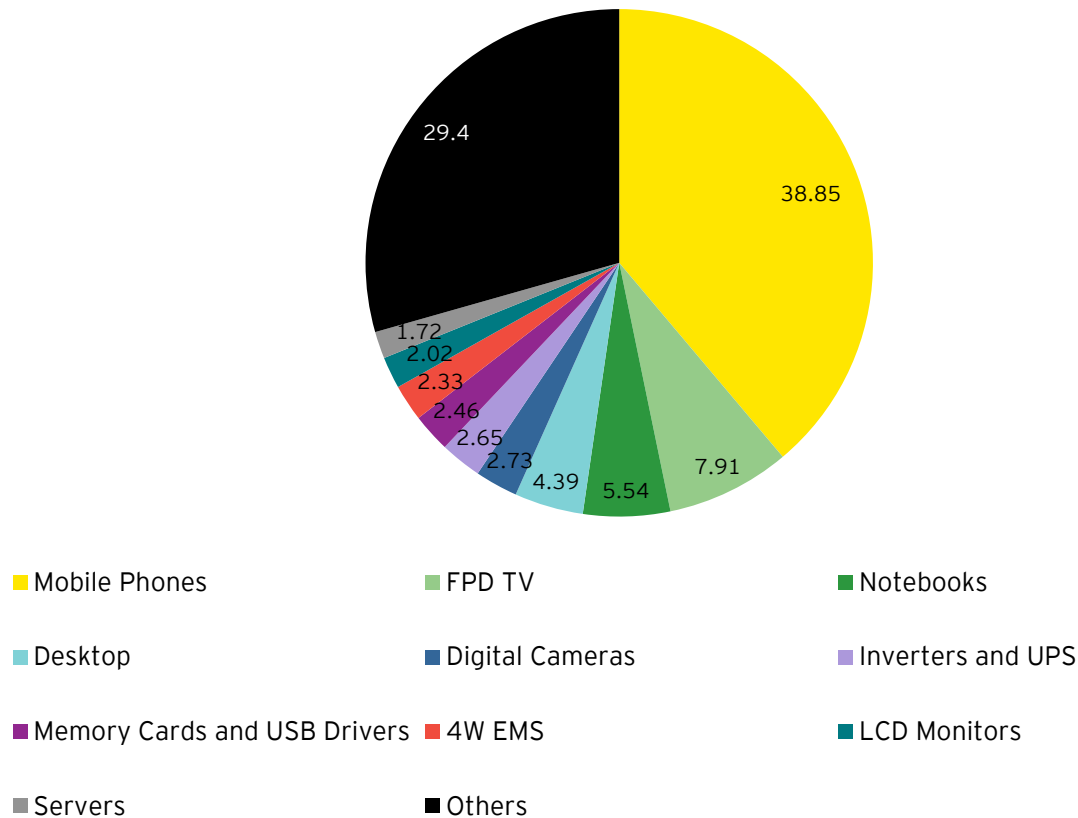


²⁷ IESA-FS Indian ESDM Market 2014: <http://www.iesaonline.org/downloads/IESA-F&S-Indian-ESDM-Market-2014-Executive-Summary.pdf>

Note: Semiconductor fabrication is a relatively new area in India and no revenue from the same was reported in 2012.

Analysing the application segment, it was observed that the top 20 products accounts for 80 percent of the overall electronics total market in terms of value in 2012. The following chart depicts the top 10 products by Total Market Revenue share in the Indian Electronics Manufacturing Sector:

Figure 8: Indian Electronics Market share (in %): Top 10 Products by Total Market Value (2012)²⁸



Changing global landscapes in electronics design and manufacturing capabilities as well as cost structures are forcing global companies to look for other options. Companies from around the world such as Samsung, Philips, General Electric (GE), etc. are looking to build local capabilities in India as well as other low cost destinations, not just to serve the domestic market but also to cater to overseas markets. The different value chain segments within the ESDM industry are at varying stages of development. Similarly, various electronics applications markets such as telecom electronics, automotive electronics, consumer electronics and industrial electronics, are at different stages of ecosystem development.

²⁸ IESA-FS Indian ESDM Market 2014: <http://www.iesaonline.org/downloads/IESA-F&S-Indian-ESDM-Market-2014-Executive-Summary.pdf>

The Government of India has taken measures to boost investments in the electronics hardware manufacturing sector, as well as to promote MSMEs in the ESDM sector. Various schemes have been announced to facilitate this:

- ▶ DeitY has announced a scheme to promote MSMEs in the ESDM sector, which aims to provide financial support to MSMEs to promote manufacturing, to bring quality into Indian manufacturing, and also to promote exports. The support under the scheme will be in the form of reimbursements to the manufacturers, domestic industry, and exporters in the electronics sector. The scheme will provide grant in aid for the following activities²⁹:
 - Reimbursement of expenses relating to compliance of electronic goods with “Indian Standards”.
 - Reimbursement of expenses for testing and certification required for export.
 - Development of electronics manufacturing clusters.
- ▶ The Government of India has announced the Modified Special Incentive Package Scheme (M-SIPS) that:
 - provides up to 25% of the capital investment in SEZ areas
 - 20% in non-SEZ areas as financial incentive to the ESDM Sector³⁰
- ▶ India is attempting to join the select countries which have capabilities to manufacture state-of-the-art semiconductor chips in the world. Recently, Government of India has approved two semiconductor wafer fabrication facilities (FABs) to be set up. Two consortia of investors and technology providers have responded to the Government of India’s expression of interest to set up FABs in India. These two consortia are:
 - M/s Jaypee Associates along with M/s IBM,USA and M/s Towerjazz, Israel. The proposed location is Greater Noida about 50 Kms from New Delhi.
 - M/s HSMC along with M/s ST Microelectronics, Geneva and M/s Silterra, Malaysia. The proposed location is Prantij, near Gandhinagar, Gujarat.

5.1.1 Primary research

As a part of preparing the DPR, discussions with some electronics manufacturers, industry associations, and other stakeholders in the Bengaluru district were carried out. The objective of the primary research was to understand the business requirements, issues, challenges, and future requirements³¹ of the ESDM industry to develop a deeper appreciation of the requirements that the

²⁹ http://deity.gov.in/sites/upload_files/dit/files/Notification2.pdf

³⁰ Karnataka ESDM Policy 2013

³¹ Key questions asked during telephonic discussions in Annexure

Technology Centre Systems Program of the O/o DC MSME can serve. The research also included the support requirements of players with respect to designing, training, manufacturing and consultancy.

Discussions were held with members of CLIK, ELCIA, IESA, Commerce and Industries Department, JWG for ESDM, MoMSME and other industry experts. Key inferences drawn from the primary research focused on four main areas, as follows:

Design and Development:

- ▶ It was recommended that facilities for designing and prototyping for the electronics sector should be included. It was suggested that the TC should procure prototyping equipment to support MSMEs and start-ups.
- ▶ PCB Layout Designing and embedded system development assistance is required
- ▶ IP Creation and Innovation within the ESDM sector should be supported
- ▶ Platform should have Venture Capital scrutiny and rigour apart from the regular product development support

Consultancy:

- ▶ It was recommended that the TC should provide consulting services for product design at the time of inception, fault finding and designing of body / enclosures for products / components

Production:

- ▶ A requirement for testing and calibration facilities was expressed Medical electronics, industrial electronics, auto-electronics, telecommunications, avionics, sensor technology, and packaging of electronics are the key areas which were recommended for the TC to focus on
- ▶ Testing requirements (performance, environmental, etc.) are common across all subsectors of the ESDM industry, and the TC should cater to all sub-sectors within the ESDM sector
- ▶ A clean room should be established for product manufacturing
- ▶ High-end equipment is already available at existing CFCs / testing centres (Bureau Veritas, Electronics Test and Development Centre, Centres at Indian Institute of Science (IISc) etc.) in Bengaluru, and should not be replicated in the MSME TC. Low-end equipment which is required frequently for testing / prototyping could be included
- ▶ It was suggested that the TC should provide diagnostic services in addition to testing
- ▶ A common facility centre was recommended
- ▶ Idea of a Manufacturing Incubation Centre should be explored

Training:

- ▶ Skilled manpower trained in testing and calibration for the electronics sector in Bengaluru is a key requirement
- ▶ A skilling centre is required for supporting MSMEs and large scale enterprises

5.2 Market opportunity

Bengaluru has become an IT, electronics and aerospace hub. Karnataka proposes to emerge as the leading contributor to India's ESDM sector by accounting for at least 10% of the total ESDM Market by 2020, and Bengaluru will be at the centre of this development. Bengaluru is the fastest growing major metropolis in the country with an economic growth rate of over 10%, and contributing GDP of \$83 billion.³² Bengaluru is the principal administrative, cultural, commercial and industrial centre of Karnataka. The city is called by many names, including India's knowledge hub, Silicon Valley, Aerospace and machine tools hub of India, and the Garden city of India. Many reputed corporate companies like Wipro and Infosys and several public undertakings like Indian Space Research Organisation and Hindustan Aeronautics Limited are headquartered in the city.

- ▶ Bengaluru is spread over 2196 square kilometres, and comprises 14 industrial estates³³.
- ▶ Electronics City is located in Bengaluru, which hosts several large electronics manufacturers.

Bengaluru is well connected, being located on the NH-4 (Mumbai-Pune-Bengaluru-Chennai), NH-7 (Varanasi-Nagpur-Hyderabad-Bengaluru-Madurai), and NH209 (Bengaluru-Dindigul (Tamil Nadu)). It is also located on SH-17 (Bengaluru - Ramanagara-Mandya-Mysuru), SH-39 (Bengaluru - Hesarghatta), SH-84 B (Bengaluru-Ramanathapura-Jaloor), SH-87 (Bengaluru-Anekal), and SH-104 (Bengaluru-Kannur-Nandi), making it a strategic location for industries.

Along with its connectivity, Bengaluru's competitive advantage lies in:

- Infrastructure in Bengaluru is more developed in comparison to other districts of Karnataka
- Availability of labour and proximity to Electronics City (an ESDM, IT and aerospace hub), where several electronics and aerospace companies are located. Bengaluru has some of the best aerospace and electronics industries and also is the home to advanced research and development institutions like HAL, NAL, etc.
- The Karnataka government's proposal to undertake brownfield expansion of ESDM cluster at Electronic City near Bengaluru has received the approval from the Union government
- Bengaluru is the country's fourth largest fast moving consumer goods (FMCG) market³⁴
- Bengaluru is one of the pioneers in the concept of industrial clusters with established Industrial clusters like Whitefield, Electronics City, Peenya (largest industrial cluster in Asia) etc.
- Availability of basic amenities such as piped water supply, schools, transportation, hospitals, telecom networks, banks etc.
- Bengaluru has around 85 semiconductor design firms (as of 2008), making it one of the major global clusters in chip design. Moreover, Bengaluru is the largest hub of semiconductor design

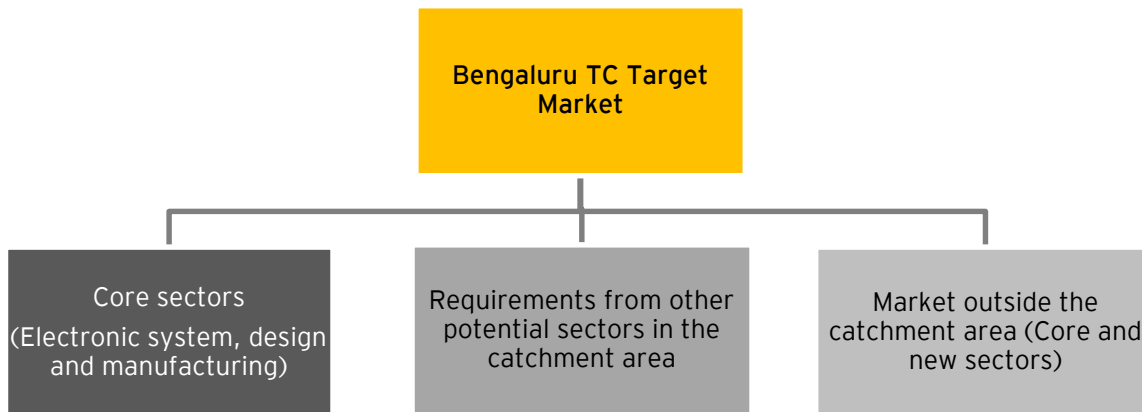
³² <http://dcmsme.gov.in/dips/Bangalore%20Urban%20District.pdf>

³³ DC msme

³⁴ http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Emerging%20Growth%20Market%E2%80%A6Bangalore_New%20Delhi_India_2-20-2015.pdf

companies, outside the Bay Area, California with nearly 70 per cent of the country's chip designers based here accounting for 80 per cent of the sector's revenues from India.³⁵

- Bengaluru has over 3100 start-ups, and is the 4th largest start-up hub in the world³⁶
- As per the Budget 2014 - 2015, the Union government has given its in-principle approval for setting up of the first ESDM cluster development in Electronics City, Bengaluru.
- Proposed Mumbai-Bengaluru Industrial Corridor is a proposed economic corridor. The Indian government has aimed to generate an investment of over 300,000 crores from this corridor, and expect to create 2.5 million jobs. This corridor is expected to pass through different cities, including Pune, Satara, Kolhapur, Belgaum, Dharwad, Devangere, Haveri, Chitradurga, and Tumakuru³⁷.
- Proposed Bengaluru-Chennai Industrial Corridor will connect Chennai-Bengaluru-Chitradurga through the cities of Sriperumbudur, Ponnapanthangal, Ranipet, Chittoor, Bangarupalem, Palamaner, Bangarpet, and Hoskote. There has also been discussion of extending this corridor to Mangalore.



5.2.1 Market in core sectors in the catchment

Bengaluru and its catchment area include Kolar, Hassan, Chitradurga, Tumakuru, Krishnagiri and Coimbatore. Together, the catchment area comprises approximately 98,365³⁸ MSME units. Of these, about 4,936 are in the EDSM sector.

³⁵ http://www.iesaonline.org/downloads/ISA_UKTI_protect.pdf

³⁶ Economic Survey 2014-15

³⁷ <http://www.ficci-indiace-businessforum.com/pdf/Invest%20India.pdf>

³⁸ DC MSME

Bengaluru and its Catchment Area



The MSME sector is a vibrant and vital sector of Karnataka's economy in terms of employment generation and share of production. There were nearly 4.81 lakh registered MSMEs in Karnataka as on 31st March, 2014, providing employment to over 28 lakh persons with a total investment of around 18,635 crore.³⁹ The Karnataka State government has developed schemes which provide incentives to MSMEs as well as to the ESDM sector. This combination of incentives is expected to provide a thrust to ESDM MSMEs in the State, and make Karnataka an attractive destination for entrepreneurs in this sector to establish enterprises.

Karnataka's ESDM policy sets targets for the State. In order to achieve these targets, numerous incentives are being provided to the ESDM industry. The following targets are set for **Karnataka ESDM policy**⁴⁰:

- Emerge as the leading contributor to India's ESDM sector by accounting for at least 10% of the USD \$400 billion by 2020
- Generate over 20% of the country's total ESDM exports target of USD \$80 billion in 2020
- Develop core competencies in specific ESDM verticals such as telecom, defence electronics, avionics and energy
- Make Karnataka the country's preferred destination for investments in ESDM, and
- Generate at least 240,000 new jobs, 25% of India's PhDs and 5000 patent filings in ESDM sector in Karnataka by 2020
- Increase the value-addition that is done in Karnataka

³⁹ [http://karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202014-19%20\(English\).pdf](http://karnatakaindustry.gov.in/documents/Karnataka%20Industrial%20Policy%202014-19%20(English).pdf)

⁴⁰ <http://www.bangaloreitbt.in/docs/2013/3/ESDM-Policy-ENGLISH.pdf>

Table 5: MSME Units in Focus Sector in the Catchment Area

District	Total MSME Units	MSME units in Focus Sector
Bengaluru	4349	1955
Kolar	8408	568
Hassan	10682	472
Chitradurga	11015	450
Tumakuru	23804	388
Krishnagiri	8583	199
Coimbatore	31524	915
Total	98,365	4,936

Key highlights of the catchment area have been presented in the table below:

District & No. of MSMEs ⁴¹	District Profile	Units in General ESDM	Key highlights
Bengaluru (4349)	▶ 4th largest technological hub in the world and largest in Asia ▶ Several large MNCs in the ESDM sector have established branches here ▶ 15 Industrial Areas, 15 Industrial Estates, and 15 SEZs ▶ Government Tool Room and Training Centre (GT&TC) was established with assistance of Dutch Government at Industrial Estate Rajajinagar. It is serving industry by way of precision tooling and providing in well trained craftsmen the area of tool and die making	▶ 1955 units in the ESDM sector	▶ Multi-storied complexes at Electronic City industrial estate and Bommasandra ▶ Multi-storied complexes in Peenya Industrial Estate
Kolar (8,408)	▶ 5 Industrial areas and 5 industrial estates in the District ▶ Government has acquired 600 acres of land for the establishment of an Industrial Township at Naraspura	▶ 568 MSMEs in the ESDM sector	▶ Mahindra Aerospace has a manufacturing facility in Kolar ▶ Suvarna Karnataka Development Corridor envisages the creation of an IT/BT zone, among others

⁴¹ DCMSME District Industrial profiles

	▶ Suvarna Karnataka Development Corridor to pass through Kolar		
Hassan (10,682)	▶ 9 industrial areas in the district ▶ Direct connectivity to Mangalore port, making it an emerging export destination ▶ District has 400 acre Industrial Growth Centre with fully developed road linkages and completely loaded infrastructure with dedicated power and water supply	▶ 472 MSMEs in the ESDM sector	▶ Presence of a dedicated SEZ with a total investment of INR 686 crore for Electronic Hardware - IT/ ITES provides a conducive environment for export oriented units in the district
Chitradurga (11,015)	▶ 3 Industrial Estates and 1 industrial Area in the District	▶ 450 MSMEs in the ESDM sector	▶ Indian Institute of Sciences is coming up with second campus in Chitradurga spread over 2000 acres of land
Tumakuru (23,804)	▶ 7 industrial areas and 8 industrial estates	▶ 388 MSMEs in the ESDM sector	▶ Proposed smart city in Tumakuru (Karnataka is set to receive Rs. 70 crore in the initial disbursement period to develop Tumakuru as a smart city) ▶ Electronic Hardware Manufacturing Hubs proposed to be set up on the Bengaluru-Tumakuru Corridor

Krishnagiri (8583)	▶ Several industrial houses in Hosur, including Tatas, TVS group, etc. ▶ SIPCOT and SIDCO industrial estates present	▶ 188 MSMEs in the ESDM sector	▶ SIDCO electronic industrial estate ▶ ELCOT Electronic Hardware SEZ ▶ GMR Special Investment region planned over 4300 acres. The cluster is being developed under M-SIPS as an EMC, with the aim of creating a complete electronic ecosystem. Dedicates space provided for electronics, automotive, aerospace, nano technology
Coimbatore (31524)	▶ Key industries include textile and IT ▶ One of the major manufacturers of automotive components in India, with manufacturers including Maruti Udyog and Tata Motors	▶ 915 MSMEs in the ESDM sector	▶ Second largest software producer in Tamil Nadu ▶ Several planned IT / ITES parks around the city ▶ ELCINA EMC planned in ADD Industrial park under EMC scheme ▶ Electronics product cluster present for automobile dash board instruments, UPS Stabilisers, Timers and Controllers, process and switch controllers, and PCBs.

While the Technology Centre will provide services for MSMEs across the ESDM sector, it will focus on certain key subsectors as detailed below:

- Medical Electronics:** The medical electronics market in India was valued at US \$6.5 billion in 2013 and is likely to grow at a compound annual growth rate of 16 percent to reach US \$11.7 billion by 2017⁴². Factors for the growth of medical electronics in India include higher disposable income, increased spending on healthcare, and increase in non-communicable diseases in India, and growing awareness among the middle class to focus on early detection and disease prevention. These factors have led to an increased emphasis on providing access to affordable and preventive healthcare. The government's initiatives towards boosting medical electronics in the country are visible in the form of tax and duty exemptions to boost local manufacturing of medical electronics. Medical Electronics are not covered under ITA1. Recently, the Government of India has allowed 100% foreign direct investment for the manufacturing of medical devices in the country. This is expected to provide a boost to the

⁴² <http://www.frost.com/prod/servlet/press-release.pag?docid=289401907>

industry. The Government is also expected to release a national Medical Devices Policy. According to the draft policy which has been released, several fiscal and non-fiscal incentives are proposed for greenfield and brownfield units. Currently, there are very few large players in the medical electronics sector who are manufacturing smaller medical devices such as blood pressure machines, etc. This provides an opportunity for MSMEs to enter the sector. The current regulatory regime poses a challenge for this sector, as it does not provide a separate regulatory status in India for medical electronics. Further, the healthcare spend in India is lower than most other economies, and there is a low rate of adoption of medical electronics in small towns, cities, and rural areas. Medical Electronics players in Karnataka include Philips, Wipro, GE, etc.

- b. **Industrial Electronics:** The Indian industrial electronic sector is now a matured industry sector in the country as far as various application segments are concerned. There has been an increased demand for automation and process control in process-based industries. The demand for automation and process control equipment is mainly from process-based industries including the power generation, chemical, medical, pharmaceutical, fertilizer, and petrochemical sectors. Going forward, the demand for industrial electronics is expected to be driven by its applications in areas such as artificial intelligence, robotics, decision analytics, smart image processing and nanotechnology. State of the art and reliable supervisory control and data acquisition (SCADA), programmable logic controller (PLC)/Data Acquisition systems are being applied across various sections of the process industry. Latest AC drive systems from smaller to very high power levels also find application in large engineering industries like steel plants and metal industries. World class digital UPS systems are being manufactured in the country to cater to the need of the emerging digital economy. However, it appears there is insufficient manufacturing base in the country for the whole range of the latest test and measuring instruments which are invariably produced from outside. A good number of Indian companies in the control and instrumentation sector are able to acquire orders for export through international competitive bidding. Key players in industrial electronics include Centum Electronics, Mitsubishi Electric India, and Texas Instruments.
- c. **Avionics:** Avionics include military systems such as radar, sonar and electronic warfare systems; satellite-based communication and navigation systems; surveillance systems and other defence systems. This sector is being driven by factors such as increased budgetary outlay for armed forces, replacement of old defence equipment, emergence of networks centric warfare that depends on electronics, and growth of aerospace market. Further, under the Indian Defence Offset Policy, offset obligations require Defence contractors to source the equivalent of 30 per cent of the foreign exchange value of the contract from Indian

suppliers. Currently, the offset obligation is rarely met through any investment in the electronics sector. However, DeitY had formulated a proposal wherein it has been broadly envisaged that in case of procurement of electronic items, 10-15 per cent of the procurement price (i.e. a total of US\$ 1 - 2.25 billion) should be earmarked for electronics products/components that go into manufacture of that item. It is also proposed that in case domestic electronic products for the purpose are not available, the supplier must undertake to invest in manufacturing in India to meet the offset obligations. Challenges for this sector include high investment and long gestation period for start-ups, as well as very strict standards with need to be complied with. With the presence of HAL, NAL, AIRBUS, BOEING, ISRO, HCL, UTC Aerospace, Goodrich Corporation etc. and with a good ecosystem the State is emerging as the favoured global destination in Aerospace Sector.

5.2.2 Market in other potential sectors in catchment

The region has potential to tap the demand from other growth sectors in and across the neighbouring districts states within upcoming sectors in manufacturing and service particularly in the areas of IT, Biotechnology, Automotive, Textiles and Garments.

- ▶ **Automotive:** Karnataka has become a manufacturing hub for auto majors like Volvo, Toyota Kirloskar, TVS Suzuki, Telco, L&T Komatsu, BEML as well as auto component companies like BOSCH, Delphi, Denso, Siemens, Escorts and Rane. The presence of the automotive industry provides an opportunity for the technology centre, as the cost of electronic content in cars is currently 20-25%. It is expected that the cost of electronic content in cars will go up to 35 % by 2017, and further up to 50 % in 2030. Several automobile manufacturing zones exist in the state, providing an opportunity for the TC due to an increased demand for automotive electronics.
- ▶ **Biotechnology and Pharmaceuticals:** Karnataka is also the Biotech Capital of India and home to nearly 60% India's biotech units. Some of the key players such as Biocon, Glaxo Smith Kline Pharmaceuticals Ltd., Jubilant Life Sciences Ltd. and Astra Zeneca India have established their key centres in the State. Bengaluru is a biotechnology hub, with one of the largest bioscience clusters. The highest number of biotechnology start-ups anywhere in the country is based out of Bengaluru, and these are growing at the rate of 30 per cent year on year. Several Biotechnology parks are proposed in and around Bengaluru, including Nutri / Nutraceutical Park and Phytopharmaceutical Park at Mysuru, Marine Biotech Park at Mangalore, and Agri-Biotech Park at Dharwad. Incentives are provided to biotechnology firms under the state's Biotechnology Policy, which is also providing impetus to the sector.
- ▶ **Solar:** Karnataka proposes to set up the world's largest solar park, with a capacity of 2,000 MW. This will come up on 10,000 acres of land in Tumakuru District. In addition to this,

Convault Energy plans to setup 1000 MW of solar plants in the State. Tata Power Solar has also commissioned a 10 MW solar power plant in Chitradurga. Several other solar projects are proposed or have been initiated in the State. The State has also implemented a Solar Policy, in order to increase power generation through solar energy. This is expected to increase solar PV manufacturing.

In addition to the ESDM Industry, districts in the catchment have the following key industries:

- (a) **Bengaluru⁴³**: Key industries include IT & BT Capital, Engineering, Automobile, Auto Components, Aerospace, Knowledge Based Industries, Agri and Food Processing, Electronics and Telecommunication, Apparel, Tourism, R&D and Cement. Suvarna Karnataka Development Corridor has proposed a Pharmaceutical and Bio-Tech zone covering Bengaluru Urban District.
- (b) **Kolar⁴⁴**: The Suvarna Karnataka Development Corridor passing through Kolar envisages the creation of an Apparel Zone, IT/BT Zone, Automobile Zone. Other key industries in Kolar are agriculture and food processing, auto and aerospace, and textiles. District comprises of a dedicated auto cluster which provides a vibrant ecosystem for the growth of the sector. Narasapura is the emerging Auto hub within the state. Mahindra Aerospace has a manufacturing facility in Kolar district.
- (c) **Hassan**: The district has an Industrial growth centre, Agri export zone and SEZ which would fuel accelerated growth of general and agro processing units. Hassan has a vibrant Agriculture base which makes it ideal for Food Processing and Agro based industries. The key industries include agriculture and food processing, textile and handloom industries, pharmaceuticals, and electrical / electronics
- (d) **Chitradurga**: The district is emerging as one of the strong contenders for the Steel and Cement Industries. The key industries include energy, textile and handloom industries, food processing, and cement.
- (e) **Tumakuru**: Key industries include Food Processing, IT and BT, and Textiles and Handlooms
- (f) **Krishnagiri**: State Industrial Promotion Corporation of Tamil Nadu (SIPCOT) has developed an industrial complex in Hosur over an area of 1370 acres. Besides electronics, key industries in the district include automobile, chemical, iron and steel. Information Tehcnology has scope for investment in the area due to its close proximity to Bengaluru.

⁴³ GIM Bengaluru Urban DIC

⁴⁴ GIM Kolar DIC

(g) **Coimbatore:** Textiles is one of the key industries in Coimbatore. In addition to this, Hosur is the second largest software producer in Tamil Nadu, after Chennai. TIDEL park for IT has been launched, and several other IT parks are planned around the city. Manufacturing industries are also prevalent in Coimbatore, with industries such as Tata Consultancy, Robert Bosch GmbH, KGISL and CSS Corp Pvt. Ltd. Several small scale engineering companies, including the motor and pump industry and wet-grinder industry.

5.2.3 Market outside catchment area

Going forward, in addition to the MSMEs in existing sector (ESDM), Bengaluru TC can also focus on MSMEs in the ESDM sector outside the catchment area. Typical opportunities for TCs outside the catchment are sourced from existing and proposed industrial zones in this area.

There is growing impetus to the ESDM Industry in India. Several State Governments have come out with their own policies to facilitate, promote and develop Electronics design and manufacturing sector. The states that have come out with Industrial Promotion/ Electronics Hardware/ ESDM Policy are Andhra Pradesh, Gujarat, Madhya Pradesh, West Bengal, Maharashtra, Karnataka and Uttar Pradesh.

This impetus from the government clubbed with the steady growth rate of the sector in India has led to a large number of electronic clusters/hubs emerging in India. The map below indicates the location of some of these key clusters.



Figure 9: Electronic clusters in India

Some of the key clusters which the Bengaluru TC can cater to include:

State	Location
Andhra Pradesh	Hyderabad, Ranga Reddy
Tamil Nadu	Chennai, Coimbatore, Krishnagiri
Karnataka	Nellore, Vishakhapatnam
Kerala	Ernakulam

A new TC is to be established in Puducherry, which will also cater to the same market. These TCs can work in synergy with each other in order to cater to the market in the area.

5.3 Opportunities associated with other mega projects planned in Bengaluru and it's catchment area

- ▶ Samsung has signed up with the Department of Technical Education (DTE) and the Ministry of Micro, Small and Medium Enterprises (MSME) to set up Samsung Technical Schools across Industrial Training Institutes (ITI) and Tool Rooms in India. Complementing the regular syllabus ongoing at these institutes, Samsung's Technical Schools run the Advanced Repair and Industrial Skills Enhancement (ARISE) training program, designed to impart hands-on, trade specified training to these students. Additionally, soft skills courses for smoother consumer interaction through theory as well as hands-on practical knowledge are also provided. Students also benefit from on the job training at Samsung manufacturing facilities and authorized service centers. There is a massive potential for a Samsung Technical School in Bengaluru, as the Samsung R&D Institute is headquartered here.
- ▶ India's first semiconductor characterization lab is has recently been inaugurated in Bengaluru. The project has been jointly developed by the Karnataka government, STPI and IESA, with Tessolve as the vendor.⁴⁵ SMART Lab will play an important role in providing an ecosystem that will provide impetus to semiconductor, product and system design companies.
- ▶ The Electronics Hardware Manufacturing policy of 2011 has identified three corridors to set up electronics hardware manufacturing hubs – Bengaluru-Tumakuru corridor which will concentrate on semiconductors, Hubli-Dharwad corridor which will focus on automotive electronics, and Mysore-Nanjangud corridor which will cater to medical electronics.
- ▶ The Karnataka government's proposal to undertake brownfield expansion of ESDM cluster at Electronic City near Bengaluru has received the approval from the Union government
- ▶ The Government has acquired 600 acres of land for the establishment of an Industrial Township at Narasapura. Narasapura is an emerging auto hub, and thus would require electronic components for automobiles.
- ▶ CII has drawn up a roadmap for the industrial development of Mysuru and recommended the adoption of a cluster approach to promote Mysuru as Karnataka's next IT & ITes and ESDM hub.
- ▶ The Karnataka ESDM policy proposes to support the development of seven ESDM Manufacturing Clusters in the State by 2020.

⁴⁵ <http://www.tessolve.com/stpi-smart-lab>

- ▶ Proposed ELCINA - Sri Electronics Manufacturing Cluster to come up in Chittoor.
- ▶ ESDM cluster ELCINA - Raaga Mayuri Electronics Park has been approved in the Anantapur district in Andhra Pradesh.
- ▶ GMR Krishnagiri Special Investment Region (GKSIR) is a 2800 acre Greenfield City being developed by the GMR Group, an Indian Infrastructure major. It is being developed as a joint venture with the Government of the state of Tamil Nadu. GKSIR is located on the Bengaluru-Chennai Industrial Corridor. The zone is being developed in phases, and is being positioned as a high-end development for new technology and high value segments from Electronics, Automotive, Defence, and Aerospace Manufacturing to Nano Technology, Solar Manufacturing, and Light Engineering.
- ▶ Brownfield electronics manufacturing cluster initiative has been approved in Vellore.
- ▶ The Government proposes to set up a 'Mobile Hand Set Manufacturing Cum Assembly Hub' in the IT Investment Region, proposed to be developed in Bengaluru.⁴⁶

These mega projects will provide significant opportunities in key sectors for the proposed TC in the long run.

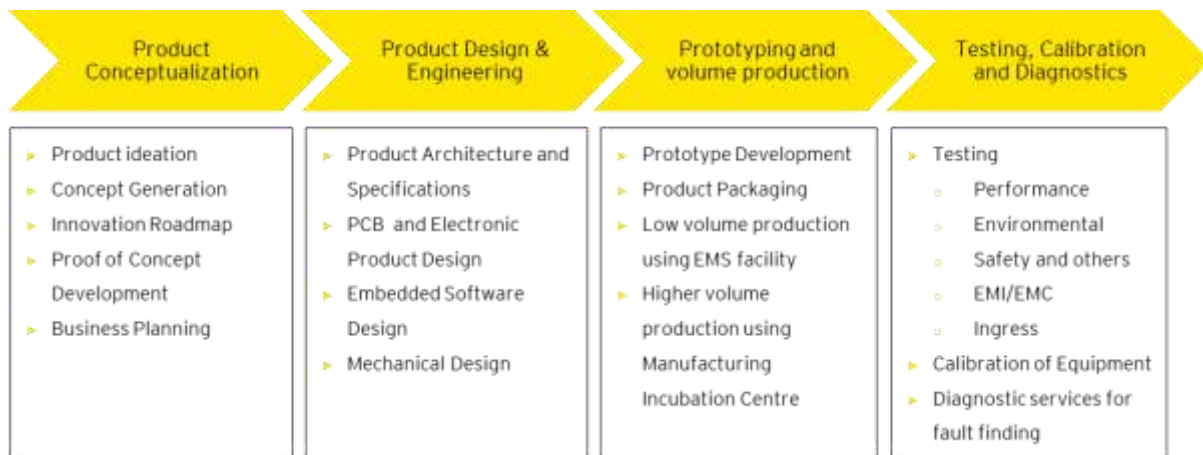
⁴⁶ Karnataka Electronics Hardware Policy 2011

[illegible]

6. Focus area for Proposed TC

As discussed in the previous section, Bengaluru has become a major electronics and IT hub in India and contributes to a large portion of the ESDM market size in India. As per the Karnataka ESDM Policy 2013, Karnataka proposes to account for at least 10% of the total market for ESDM in India (i.e. US\$ 40 billion) by 2020, and Bengaluru will be at the centre of this development. Within the ESDM sector, the Joint Working Group (ESDM) had identified 14 key sub-sectors that can be supported by the TCs focused on the ESDM sector. The key services such as electronic design, electronic assembly, testing, calibration etc. required to manufacture electronic product remain the same across the various sub-sectors. Therefore the greenfield TC in Bengaluru is proposed to provide services across the value chain for ESDM sector for all sub-sectors, with a key areas for specialization such as Medical Electronics, Industrial Electronics, and Avionics, etc.

Figure 10: Service Areas across the ESDM Value Chain



Therefore, based discussions with O/o DC-MSME and industry associations in Bengaluru and domain experts, a ESDM TC with a focus on areas such as medical electronics, industrial electronics, and avionics, etc. is proposed at Bengaluru in the state of Karnataka. It is important to note that O/o DC-MSME has three other TCs focussed on the ESDM sector across India. Therefore, Bengaluru TC is planned in such a way that it complements the existing investment and overall improves the capability of ESDM focussed MSMEs in India.

The Bengaluru TC is planned to provide support to entrepreneurs from the point of concept creation to development of prototype and low volume production. The diagram below provides a snapshot of the services that will be provided by the TC:

Figure 11: Proposed Services to be provided by Bengaluru TC

Innovation and Design Centre	Prototyping, Testing and Calibration Centre	Manufacturing Incubation Centre	Training Centre
Concept Creation support	Prototyping	Shell Infrastructure	Electronic Product Eng./ Embedded System
Product Design Centre	Electronic Assembly	Business Facilities Centre	PCB Assembly
Patent Registration and Harnessing	Electronic Testing	Machinery and Equipment on rent	Hardware Repair and Maintenance
Entrepreneurship Club	Electronic Calibration		Computer Software
Consultancy Services			

The key services of the TC are divided into four independent profit centres:

- Innovation and Design Centre - This will provide support for concept creation, product design, patent registration and harvesting along with related consultancy services for entrepreneurs, MSMEs and other large players in the ESDM sector
- Prototyping, Testing and Calibration Centre - This will provide facilities for additive manufacturing, electronic assembly, testing and calibration for electronic products
- Manufacturing Incubation Centre - This facility will provide shell infrastructure, business facility centre and machinery and equipment for entrepreneurs/MSMEs to rent for a period of 2 years
- Training Centre- The TC will provide a number of long, medium and short term courses on embedded system design, PCB Design and Assembly, hardware maintenance and repair and computer hardware and software

Details of each of these centres in provided in the following sub-sections:

6.1 Innovation and Design Centre

The innovation and design centre will provide consultation support to entrepreneurs, MSME in the ESDM sector on various areas such as concept creation, product design, patent registration and

harvesting, process design and development, lean manufacturing, cost engineering etc. The key services to be provided by the centre have been further divided into the following:

6.1.1 Concept Creation Support

Generating a successful product requires product ideation, testing of an idea in the market, confirming if the idea would work in practice, checking the patent landscape, defining a roadmap, developing a proof of concept etc. The TC would provide the following services to support this:

- ▶ Product ideation - Generate & shape ideas in a structured way, identify opportunities, develop and test concepts, develop processes that foster creativity & improves the quality
- ▶ Innovation roadmap - Set-up, design and implement robust, future-proof innovation roadmaps covering everything from business strategy to project initiation that can be translated into sound product architectures and platforms that form the basis of current and future range with support of Manufacturing Technology Partner
- ▶ Proof of concepts - Developing schematics, CAD designs, hands-on lab support, feasibility judgments, and early feedback on manufacturability
- ▶ Business Plan - planning product and services, support for market research, marketing plan, financial assessment etc.
- ▶ Legal advisory - Support from legal and financial experts for assistance/ advisory regarding firm incorporation, tax compliance etc.
- ▶ Assistance for secure financial assistance - Support for seeking financial assistance through banks, government schemes (of central and state government) to support entrepreneurs/MSMEs and facilitating angel/venture capitalist funding
- ▶ Market Linkages - Assist entrepreneurs in creation of market linkages with OEMs, suppliers, research institutes and labs through support of the Cluster Network Manager

The TC will have a dedicated team of coaches and mentors who will provide the above mentioned consultancy services to entrepreneurs and MSMEs who sign up for this service. It is suggested that a team of at least 4 dedicated professionals with prior experience of providing similar services be hired to provide these services. The 4 professionals include an innovation coach, a finance guide and two consultants for support and institutional memory. In addition, the TC would hire the expertise of the required resources e.g. sectorial experts, legal guide etc. to increase their in-house capability in specific domains as per the market demand.

6.1.2 Product Design Centre

The TC will provide product design related services for electronics products including

- ▶ Product architecture and specifications
- ▶ Electronic Design - Electronic System Design including circuit, PCB, FPGA, analog and digital components, Power/Transformer etc.
- ▶ Mechanical Design - Mechanical components, packaging & housing

This will require the need to procure the following software and equipment:

Table 6: Product Design Centre: Software and Equipment

S.No.	Design Type	Equipment/Software
1.	Electronic Design	1. PCB and Electronic Design Software such as OrCAD, PADS, Eagle etc. 2. DSP/ ARM/ Microcontroller/ FPGA/ CPLD Development Board + Software
2.	Mechanical Design	1. CAD Software like CATIA, UG etc.

The design centre would require a dedicated manager support by two senior design engineers for electronics and one senior design engineer for mechanical design.

6.1.3 Patent Registration and Harnessing

The TC will provide support for a broad range of Intellectual Property matters including patent search, drafting, filing and prosecution. These services require inputs from a large number of experts such as patent attorneys, registered patent agents and technologist. The TC will utilize the services of the Cluster Network Manager to create an ecosystem of such expertise whose services can be utilized by MSMEs as per their requirements at subsidized costs.

In addition the TC will have a dedicated IPR guide who will assist MSMEs for filing patents as well as harnessing existing patent information to accelerate innovation. Patents contain large amounts of technical, business, and policy-related information that can help entrepreneurs to generate ideas and drive innovation. In addition, it can be useful for MSMEs and entrepreneurs to identify expired or abandoned patents in relevant areas to check if they can be utilized by them for their products. The specific objectives of this facility will be as follows:

- i. Provide facility for searching/mapping of patents, electronic designs etc.
- ii. Provide basic information to file application for grant of patent, GI, electronic design etc.

- iii. Facilitate successful transfer and commercialization of technologies
- iv. Facilitate collaboration with potential clients for exploring possibilities for technology tie-ups and upscaling needs
- v. Provide information on best IPR practices
- vi. To provide guidance in filing applications with national/international agencies and execution of other documents concerning to licensing technology transfer agreements, etc.
- vii. To advise beneficiaries on legal remedies available on issues such as infringement, duplication of patent/ industrial designs, etc.

The facility should work in close association with the National Patent Offices/ Regional Patent Offices and other National/ International Agencies administering implementation of IPR related matters.

6.1.4 Entrepreneur Club

This facility at the TC would be tasked to attract potential entrepreneurs in the ESDM sector. Entrepreneurs would be encouraged to submit technology centric business ideas to the TC which would be assessed by an Appraisal Committee with help of the industry and selected entrepreneurs would be asked to join the Entrepreneur Club. Joining the club would provide entrepreneurs with the following:

- a) All services of the TC including concept creation support, product design, intellectual property services, consultancy services, prototyping, assembly testing, calibration, access to Manufacturing Incubation Centre would be provided at a subsidized rate.
- b) The TC would facilitate access of entrepreneur club members to service providers who can help in creation of start-up. e.g. Chartered accountants , Banks, Intellectual property office, etc.
- c) The TC would organize workshops and group discussions for entrepreneurs with key experts to help and guide members with their ideas

6.1.5 Consultancy services

MSMEs in every sector are plagued with bottlenecks and inefficiencies that compromise their competitiveness and presence in the market. Handholding is required to enable MSMEs to develop competencies in the areas of product & process development, operation improvement, streamlining and standardisation of processes through adoption of international norms, new technologies and capacity enhancement. Quality and technical relevance of products need to be maintained by

supporting innovation for product development, component manufacturing, precision engineering, process automation and adherence to quality norms.

Therefore, the Bengaluru TC would have a dedicated professional wing to assist MSMEs by providing consultancy services in the field of electronic product design, manufacturing processes and innovations for improved quality and productivity. The support of Technology Partner will be taken wherever required. Consultancy will be provided in the following areas:

Table 7: Proposed Consultancy Services

S.No.	Area
1	Product Road mapping and Architecture
2	Electronic Product Design and Engineering
3	Process Design and Engineering
4	Value Engineering/ Cost Competitiveness
5	Development Productivity and Lean Manufacturing
6	Financial Services (Project Financial , Business Plans for funds, Book Keeping, etc)
7	End User Driven innovation and Open innovation
8	Certifications and accreditations for medical electronics (Electronic Testing and Calibration)
9	Environment Health and Safety Standards for ESDM Units
10	Market Development Support to find the vendors, customers and other enablers

To start with, the staff of the innovation and design centre will provide consultancy services as well. In addition, the TC would hire the required resources to increase the in-house capability. Illustrative phasing of the areas/domains where the TC can provide consulting services has been suggested below. This has been designed keeping in mind the resource planning and future revenue projections as well. The table below represents the projected revenue estimates for 10 years, keeping in mind the impetus on the consulting services for the proposed TC. Refer to table in section 14.1.1 for the projected revenue from consulting.

6.2 Prototyping, Testing and Calibration Centre

This facility will provide MSMEs and entrepreneurs with support to develop prototypes for their electronic items, test and calibrate them and also produce pilot orders using this facility before embarking upon the regular manufacturing. To provide these services this centre would have the following facilities:

- a) Prototyping facility - with 3-D additive machines to produce mechanical components to be used in developing an electronic product
- b) Electronic Assembly facility - basic electronic assembly facility with PCB assembly workstations and technicians for assembling prototypes and low volume production for pilot orders required by entrepreneurs
- c) Testing facility - full-fledged electronic testing facility to provide environmental, safety, EMI/EMC, ingress and performance testing for electronic items
- d) Calibration facility - secondary level electronic calibration facility for calibration of all electronic items along with electronic and physical sensors and meters used in electronic products

The sections below provide details of the machinery and equipment planned in each of these facilities.

6.2.1 Electronic prototyping facility

This facility will be used for developing prototypes for all plastic body, casing and smaller components for electronic products. This facility will not be used for mass production. The TC will provide prototyping and additive manufacturing machines for polymers and plastics and will be staffed with a dedicated senior technician supported by the design team.

The following machines have been identified for the electronic prototyping facility at the proposed TC. The list will be further validated by technology partner for finalisation and to initiate procurement. The budgetary cost of these machines is approximately estimated at around INR 300 lakhs.

Table 8: Electronic Prototyping Facility: Machinery

SN	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
1.	3D Polymer Additive Manufacturing Machine	1	300	300

SN	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
	Total		300	300

In the first phase only a polymer additive machine has been planned for the facility. A metal additive machine may also be required at the facility but the feasibility for the same will be assessed by the Technology Partner at a later stage. In the meantime the Metal 3-D printing facilities along with the mechanical tool room facilities at other private/government Tool Room in Bengaluru or MSME TCs in other cities will be utilized for manufacturing metal components as when required by MSMEs.

6.2.2 Electronic Assembly Facility

As part of the first phase, a 20 workstation electronic assembly unit has been planned at the TC, to provide basic manual electronic assembly services for assembling prototypes and low volume production for pilot orders required by entrepreneurs. This facility will not support high volume production. It will be housed in a 500 square feet 10,000 grade clean room. Details of the same are provided in the infrastructure section. This facility will be staffed with one dedicated manager, one senior engineer and two senior technicians. In addition to the above, trainees being trained in electronic product assembly will also support the above manpower.

The following machines have been identified for the electronic prototyping facility at the proposed TC. The list will be further validated by technology partner for finalisation and to initiate procurement. The budgetary cost of these machines is approximately estimated at around INR 500 lakhs.

Table 9: Electronic Assembly Facility: Machinery

SN	Machine
1.	Pre Forming Machine
2.	PCB Assembly Jig
3.	PCB Storage Rack
4.	Component Storage Bins
5.	Tool kit consisting of (Soldering iron, De soldering pump, Wire cutter, Wire cutter/stripper, Automatic wire stripper, Different types of Screw drivers , Pliers, Tweezers, IC Slip extractor etc.)
6.	Soldering Station
7.	Temperature Controlled Soldering Station
8.	De soldering Station.
9.	SMD Rework/Repair Station
10.	Wave Soldering Machine

SN	Machine
11.	SMT Pick & Place Machine
12.	LCR Meter
13.	Digital Multimeter

In addition, the facility would also need to provision for items for antistatic assembly such as antistatic mat, antistatic bags , antistatic component storage bin, wrist strap , static charge meter, antistatic PCB storage rack, antistatic tools etc.

This facility in the TC does not include machinery and equipment for PCB manufacturing as this is a low value addition service and a large number of PCB manufacturers e.g. AT&S India, CIPSA-TEC India, Micropack, DMS Technologies etc. are available in Bengaluru to whom this service will be outsourced.

6.2.3 Electronic Testing Facility

The testing facility at the TC will provide environmental, safety, EMI/EMC, ingress and performance testing for electronic products. While most of the equipment included in this facility can be utilized for testing of all electronic items (eg. Medical, Industrial, Mobile, IT Industry, Consumer Electronics, etc.)

The following machines have been identified for the electronic testing facility at the proposed TC. The list will be further validated by technology partner for finalisation and to initiate procurement. The budgetary cost of these machines is approximately estimated at around INR 3,726.3 lakhs.

Table 10: Electronic Testing Facility: Machinery

SN	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
	Basic Requirement			
1.	Voltage Stabilizer/ CVT	3	1.5	4.5
2.	Three phase regulated variable power source	1	20	20
3.	Single Phase regulated variable power source	1	10	10
4.	Split AC	15	0.5	7.5
5.	Dehumidifier	5	0.5	2.5
6.	Purchase of New IEC/IS/UL/ISO/EN and other standards, etc.	1	10	10
	Safety Testing			
7.	Temperature Recorder	1	15	15
8.	Winding resistance meter	1	10	10
9.	Digital storage Oscilloscope	1	10	10
10.	High voltage probe	1	5	5
11.	Electronic load	1	15	15
12.	Digital multimeter	3	0.6	1.8

SN	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
13.	(Handheld/desktop)			0
14.	Digital clamp on meter	2	0.5	1
15.	Electrical Safety Tester	1	30	30
16.	Impulse generator	2	20	40
17.	Defibrillator Proof test set	1	8	8
18.	Radiation meter	1	5	5
19.	Gas detector	1	5	5
	Environmental Testing			
20.	Environmental chamber	1	100	100
21.	Thermal Shock Chamber	1	175	175
22.	Vibration Test system	1	100	100
23.	Salt spray chamber	1	50	50
24.	Bump/ Shock Test system	1	100	100
25.	Vibration plus Environmental Chamber	1	150	150
26.	Altitude Test Chamber	1	100	100
	Fire Safety Test Equipment			
27.	Horizontal and Vertical Flame Chamber	1	50	50
28.	Heat deflection temperature test set	1	60	60
29.	Needle flame test chamber	1	10	10
30.	Tracking test apparatus	1	10	10
31.	Glow wire Test apparatus	1	10	10
	Ingress Protection Test			
32.	Test Probe IEC 61032 - 1 set	1	8	8
33.	Digital force Gauge	2	1	2
34.	Dust Chamber	1	10	10
35.	Ingress of water test system- 1 set	1	200	200
	Other Tests			
36.	Microscope	1	3	3
37.	Digital LCR meter	1	10	10
38.	Endurance test set for switches	1	10	10
39.	Test apparatus for devices forming a part of the MAINS plug	1	10	10
40.	Cord anchorage test set	1	10	10
41.	Weights	1	5	5
42.	Creepage Gauges	1	1	1
43.	Ball pressure test apparatus	1	2	2
44.	Oven	1	5	5
45.	Digital power analyser	1	20	20
46.	Tumbling Barrel	1	10	10
47.	Digital pressure gauge	1	5	5
48.	Flexing test apparatus	1	10	10
49.	Free fall test apparatus	1	10	10
50.	Coated PCB test apparatus	1	10	10
51.	Isolation transformer	1	5	5
52.	UV meter	1	10	10

SN	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
53.	Sound level Analyzer	1	25	25
54.	Microwave radiation meter	1	5	5
55.	XRy radiation meter	1	5	5
56.	Illuminance meter/ Luxmeter	1	2	2
57.	Gas pressure gauge	1	1	1
58.	Digital Nano volt/ micro ohmmeter	1	20	20
59.	Thermostat endurance test set	1	5	5
60.	Temperature limiter endurance test set	1	5	5
61.	AC DC current source	1	5	5
	EMI/EMC Test Equipment			
62.	ESD Simulator	1	15	15
63.	Anechoic Chamber,	1	850	850
64.	Radiated susceptibility and Radiated Emission test system	1		
65.	RF Shielded chamber	1	50	50
66.	Electrical fast transient/burst simulator	1	40	40
67.	Surge Simulator	1	85	85
68.	Conducted RF immunity simulator	1	40	40
69.	Power frequency magnetic field test system	1	30	30
70.	Pulse magnetic field test system	1		
71.	Harmonics/Flicker Measurement test System	1	60	60
72.	Line Impedance stabilizing network	1	12	12
	Specialized Equipment for Performance Testing of Medical Electronics, Industrial Electronics, etc.		1000	1000
Total		96		3726.3

Provision for RoHS testing has not been included at the TC facility as part of Phase 1. A full-fledged RoHS testing lab is available at TUV Rheinland, Bengaluru and therefore MSMEs approaching the TC will be referred to the TUV Rheinland lab during the initial stages. The Technology Partner will be asked to assess the required of the same at the TC at a later stage.

6.2.4 Electronic Calibration Facility

The TC will provide a secondary level electronic calibration facility for calibration of all basic electronic products and physical/electronic sensors used in electronic items. The following machines have been identified for the electronic calibration facility at the proposed TC. The list will be further validated by technology partner for finalisation and to initiate procurement. The budgetary cost of these machines is approximately estimated at around INR 662 lakhs.

Table 11: Electronic Calibration Facility: Machinery

S N	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
	Electro-Technical Calibration			
1.	Multifunction Calibrator	2	50	100
2.	6 and Half DMM	3	5	15
3.	4 and half DMM	2	1	2
4.	Decade Mega Ohm Box	1	20	20
5.	Decade Resistance Box	1	15	15
6.	Process Calibrator	1	10	10
7.	LCR Bridge	1	15	15
8.	Standard Resistors	1	10	10
9.	Sound Level Calibrator	1	10	10
10.	Sound Level Meter	1	5	5
11.	Tachometer Calibrator	1	10	10
12.	Stroboscope	1	5	5
13.	Tachometer	1	2	2
14.	Frequency Counter	1	20	20
15.	Time-Interval meter	1	5	5
16.	Energymeter test System (3 position)	1	70	70
17.	HV Divider	1	25	25
18.	Decade Capacitance Box	1	15	15
19.	Decade Inductor Box	1	15	15
20.	AC/DC Current source	1	15	15
21.	CT Analyzer	1	10	10
22.	CT/PT Calibration System	1	100	100
	Infrastructure			
23.	Constant Voltage Transformer	1	2	2
24.	Split Air Conditioners	10	0.5	5
	Thermal Calibration			
25.	Thermo-couple calibration furnace (300 to 1100 degree temperature)	1	15	15
26.	Low Temperature Bath (-80 to ambient degree temperature)	1	10	10
27.	Dry block Calibrator (ambient to 600 degree temperature)	1	10	10
28.	Temperature Indicator	1	5	5
29.	Temperature Indicator with compensation	1	5	5
30.	Standard Platinum Resistance Temperature (PRT) Detector	1	5	5
31.	Standard Thermocouple (Type S) without compensation	1	5	5
32.	Laboratory Temperature Indicator	1	1	1
33.	Humidity Measurement Probe	1	10	10
	Mass and Volume Lab			
34.	Standard Weights (E1 Class)	1	20	20
35.	Standard Weights (E2 Class)	1	20	20
36.	Standard Weights (F1 Class)	1	10	10
37.	Semi-micro balance (upto 200 gms)	1	10	10

S N	Machine	No.	Unit Cost (INR Lakhs)	Total Cost (INR Lakhs)
38.	Precision Balance (upto 6.1 Kg)	1	15	15
39.	Pipette Calibration System	1	10	10
	Pressure Calibration Lab (Tertiary)			
40.	Hydraulic Pressure comparitor (0-1000 bar)	1	10	10
41.	Pneumatic Pressure Pump (1-20 bar)	1		
42.	Digital Pressure Indicator (-1 bar to 20 bar)	1		
43.	Digital Pressure Indicator (0 to 70 bar)	1		
44.	Digital Pressure Indicator (0 to 700 bar)	1		
Total		44		662

Under TCSP, IEDMI Mumbai is planned to become a primary calibration centre, therefore any MSMEs requiring calibration services of precision greater than the one planned at the Bengaluru TC will be referred IEDMI Mumbai

6.3 Manufacturing Incubation Centre

One of the key bottle necks for any entrepreneur is finding support for setting up and running a manufacturing unit in the first 2-3 years of inception. The pressure of finding space to set up a manufacturing unit and obtaining all necessary registration and clearances itself is a big challenge for MSMEs. It has often been observed that entrepreneurs suffer due to complex processes for setting up of plants and non-transparent decision making by various agencies. In addition, it is also observed that MSMEs, in a race to survive, ignore focus on quality and EHS practices and this becomes a hurdle which precludes them from being part of global value-chains.

The Manufacturing Incubation Centre proposed at the Bengaluru TC will the basic shell infrastructure with area ranging from 200-400 square-feet and world class manufacturing plant and machinery on rental basis for a 2 year period. This MIC is expected to fuel the growth of enterprise which has successfully crossed the stage of pilot order and ready to execute larger orders. The MIC would comprise of the following facilities:

- Shell infrastructure for setting up an EMS facility with space between 200-400 square feet
- Support Business facilities like office space, conference rooms, reception area etc.
- IT Support services like internet, video conferencing, Wifi etc.
- Electricity and power connection with sub-meters

- e) Registrations and Clearances for setting of a manufacturing unit such as environmental clearances, fire safety, license for running a factory, registration for commercial establishment etc.

No common plant and machinery has been planned for the first phase of the TC. The Technology Partner will assess the required common equipment than can be purchased by the TC and offered to MSMEs on rent. This will also be driven by the need of the entrepreneurs and will become a part of the incubation centre. In the meantime, the entrepreneurs can utilize the common facilities already available at the TC.

The Manufacturing Incubation Centre would not only provide space but also help in connecting with suppliers and skilled workers. One of the key points this MIC aims to achieve is to ensure focus on quality control from the get-go. Members of the MIC would be encouraged to start work in a setup concentrated on following environment, protocols and ethics from day one. It is therefore expected that when these enterprises come out of the MIC they could be examples of world class manufacturing practices.

The Manufacturing Incubation Centre should also leverage existing Central and State Government policies to explore options for providing tax incentives to players using the Manufacturing Incubation Centre e.g. service tax exemption offered by selected Technology Incubators supported by National Science and Technology Entrepreneurship Development Board under the Department of Science and Technology, Government of India.

6.4 Training Centre

The TC at Bengaluru will provide professional training in various courses with focus on the ESDM sector. The TC will be able to produce highly skilled technical workforce, with greater career prospects in the ESDM sector. The duration of courses will be both short and long term, ranging from 1 month to 12 months in various areas:

- a) Electronic Design and Manufacturing - Embedded Systems, PCB Design and Manufacturing, Electronic Assembly
- b) Electronic Repair and Maintenance
- c) Computer Hardware and software

The batch size, number of batches per annum and respective fees has been decided on the basis of capacity of existing TCs and NCVT norms. The TC will start training activity from the first year of its operation across all specialisations. The total capacity intake is expected to be approximately 9,500

trainees over 5 years and reach a capacity of 2,900 by the fifth year. The detail of courses in various specialisations is given below:

No .	Trade	Course name	Duration (months)	Part Time/Full Time	Batch size	No. of Batch / year	Capacity Intake
1	Electronic Design and Manufacturing	Advanced course in Embedded Technology	6	FT	40	2	80
		Basic course in Embedded Technology	3	FT	40	4	160
		Electronic/PCB Design and Manufacturing	6	FT	40	2	80
		PLC Based Automation Techniques	3	FT	20	2	40
		Microcontroller Programming Skills	3	FT	20	2	40
		Microprocessor Programming	3	FT	20	4	80
		SCADA	1	FT	20	4	80
		Computer Aided PCB Design and Manufacturing	12	PT	40	4	160
		PCB Assembly	6	PT	40	4	160
2	Hardware Repair and Maintenance	Computer Hardware, Maintenance, Installation, Networking and Multimedia	2	FT	20	4	80
		Mobile/HDD Repair and Maintenance	2	FT	40	4	160
		Refrigerator Repair and Maintenance	3	FT	20	4	80
		Electronic Mechanic	12	PT	20	2	40
		Electrician Trade Practices	12	PT	20	2	40
		Auto Electrician	6	PT	20	2	40
		Electronic and Instrumentation Technician	12	PT	20	2	40
		SMD Work and rework and electronic repair	1	FT	20	4	80
		Small Transformer and Stabilizer Manufacturing and Repair	1	FT	20	4	80

No .	Trade	Course name	Duration (months)	Part Time/Full Time	Batch size	No. of Batch / year	Capacity Intake
		Repair and Maintenance of Telecom Equipment	1	FT	20	4	80
3	Computer Hardware and Software	Advance course in Computer Software	6	FT	30	2	60
		Advanced Course in Computer Hardware	6	FT	30	2	60
		Advanced Computer Networking	2	FT	30	4	120
		Diploma in Information Security Management	4	FT	30	3	90
		Diploma in Software Programming	3	FT	30	4	120
		Diploma in Oracle PL, SQL and DBA	4	FT	30	3	90
		Diploma in Software Testing	3	FT	30	4	120
		Core Java and Java Programming	2	FT	30	4	120
		Visual Basics	2	FT	30	4	120
		C	2	FT	30	4	120
		C++	2	FT	30	4	120
		Computer Fundamentals	2	FT	30	4	120
Total							2860

No	Trade	Course name	Fee/ student (INR)	Capacity Intake	Minimum Qualification	Classrooms		Laboratories		Workshops	
						#	Area	#	Area	#	Area
1	Electronics Design and Manufacturing	Advanced course in Embedded Technology	1,00,000	80	Degree/Diploma in Engineering/ITI in relevant field	1	75				
		Basic course in Embedded Technology	30,000	160	Degree/Diploma in Engineering/ITI in relevant field	1	75				
		Electronic/PCB Design and Manufacturing	30,000	80	Degree/Diploma in Engineering/ITI in relevant field	1	75	1	54		
		PLC Based Automation Techniques	20,000	40	Degree/Diploma in Engineering/ITI in relevant field	1	75	1	54		
		Microcontroller Programming Skills	12,000	40	Degree/Diploma in Engineering/ITI in relevant field			1	54		
		Microprocessor Programming	10,000	80	Engineering/Polytechnic Students			1	54		
		SCADA	6,000	80	Engineering/Polytechnic Students			1	54		
		Computer Aided PCB Design and Manufacturing	20,000	160	High School					1	108

No	Trade	Course name	Fee/ student (INR)	Capacity Intake	Minimum Qualification	Classrooms		Laboratories		Workshops	
						#	Area	#	Area	#	Area
		PCB Assembly	10,000	160	8th Pass						
2	Hardware Repair and Maintenance	Computer Hardware, Maintenance, Installation, Networking and Multimedia	8,000	80	ITI/Intermediate (Science)	1	75	1	54		
		Mobile/HDD Repair and Maintenance	12,000	160	ITI/Intermediate (Science)						
		Refrigerator Repair and Maintenance	6,000	80	8th Pass	1	75	1	54		
		Electronic Mechanic	12,000	40	High School	1	75	1	54		
		Electrician Trade Practices	12,000	40	High School	1	75				
		Auto Electrician	7,000	40	8th pass						
		Electronic and Instrumentation Technician	12,000	40	ITI/Intermediate (Science)						
		SMD Work and rework and electronic repair	5,000	80	Engineering/Polytechnic Students			1	54		
		Small Transformer and Stabilizer Manufacturing and Repair	5,000	80	Engineering/Polytechnic Students						
		Repair and Maintenance of Telecom Equipment	5,000	80	Engineering/Polytechnic Students			1	54		

No	Trade	Course name	Fee/ student (INR)	Capacity Intake	Minimum Qualification	Classrooms		Laboratories		Workshops	
						#	Area	#	Area	#	Area
3	Computer Hardware and Software	Advance course in Computer Software	30,000	60	Degree/Diploma in IT/CS	1	75	1	54		
		Advanced course in Computer Hardware	30,000	60	Degree/Diploma in IT/CS	1	75	1	54		
		Advanced Computer Networking	7,500	120	Degree/Diploma in IT/CS	1	75				
		Diploma in Information Security Management	40,000	90	Degree/Diploma in IT/CS						
		Diploma in Software Programming	25,000	120	Degree/Diploma in IT/CS						
		Diploma in Oracle PL, SQL and DBA	30,000	90	Degree/Diploma in IT/CS						
		Diploma in Software Testing	18,000	120	Degree/Diploma in IT/CS						
		Core Java and Java Programming	5,000	120	High School						
		Visual Basics	5,000	120	High School						
		C	5,000	120	Engineering/Polytechnic Students						
		C++	5,000	120	Engineering/Polytechnic Students						

No	Trade	Course name	Fee/ student (INR)	Capacity Intake	Minimum Qualification	Classrooms		Laboratories		Workshops	
						#	Area	#	Area	#	Area
		Computer Fundamentals	5,000	120	8th Pass						
		Total		2860		11	825	12	648	1	108

The TC will have adequate installed capacity of infrastructure like equipment, software, tool kits, computers etc. required to provide training to the proposed student capacity under various specialisations. The estimated cost of these machines is approximately INR 930 lakhs. The following table provides the details of the same;

Table 12: Training Lab Infrastructure

S.No.	Training Labs	Nos	Value (lakhs)	Total
1	PCB Assembly Setup (40 person)	40	2	80
2	Clean Room Facility	1	100	100
3	FPGA Kits + Software	25	4	100
4	8052 Kits + Software	25	4	100
5	PIC Kits + Software	25	4	100
6	PLC Kits + Software	25	4	100
7	Electronic Repair and Maintenance Kits	100	0.5	50
8	PCB Design Software - 40 users Education license	40	1	40
9	Computers	300	0.5	150
			Sub-Total	820
10	Furniture for labs	12	3	36
11	Classroom Furniture @ 60 seats	11	3	33
			Sub-Total	69
12	Transformer @2000KVA			25
13	DG Set @ 500KVA			40
14	UPS			25
			Sub-Total	90
15	Misc, Unforeseen & Contingency			54
			Total	1,133

6.5 Industry collaborations and associations

The objective of this section to understand the potential areas of collaboration and association the new TC at Bengaluru can form and further support MSMEs. The key stakeholders have been identified in section 4.3.

Figure 12: Potential areas for collaboration or association with key stakeholders

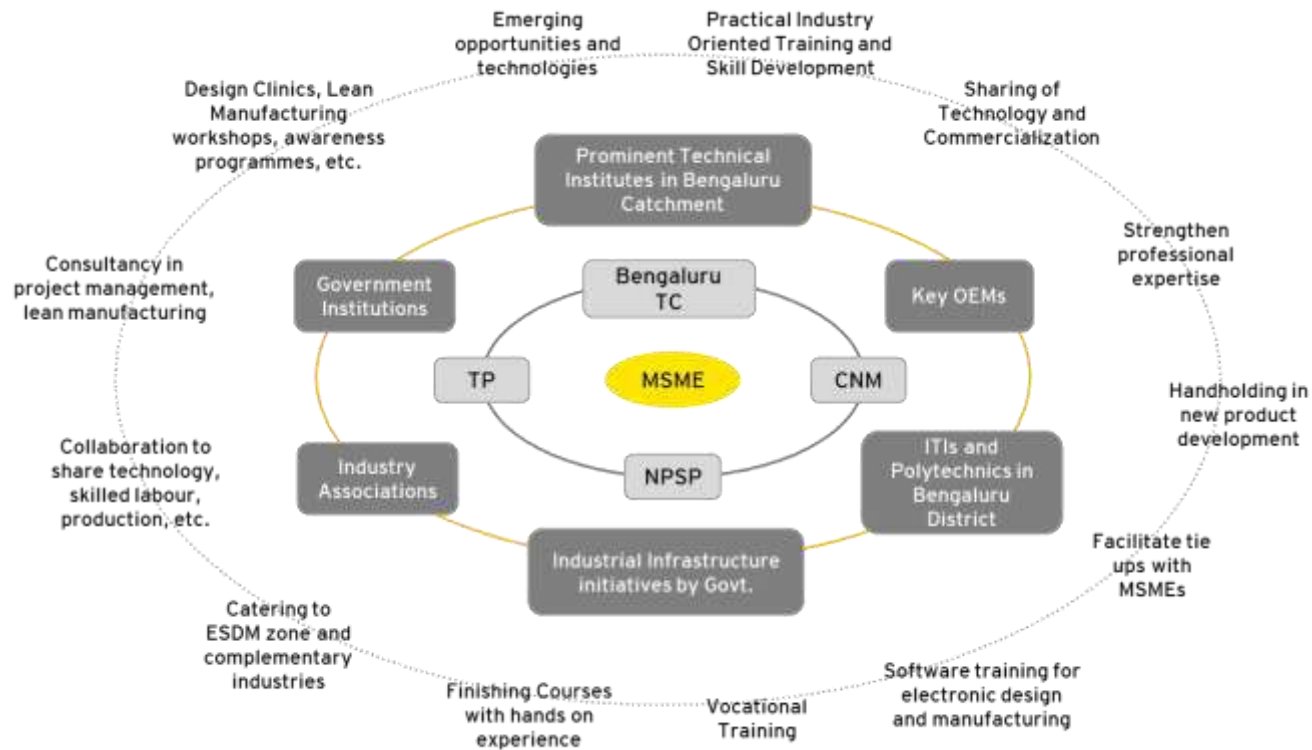


Table 13: Potential Areas for Industry Collaborations and Associations

SN	Stakeholder type	Potential areas of Collaborations and association for Bengaluru TC ⁴⁷
1	Prominent technical institutes in Bengaluru catchment	▶ The Bengaluru TC can collaborate with technical institutes and centres of excellence, with the objective to strengthen its professional expertise and skilled manpower in the field ESDM. ▶ Further, emerging opportunities and technologies can be jointly met with respect to the global technology trends.
		▶ TC can tie up with these prominent institutes for student exchange programmes to provide better practical industry oriented training and skill development. ▶ TC can become partner for commercialisation of the research by these institutes in ESDM and help in technology sharing among MSMEs through CNM. ▶ To form technology collaboration with these institutes for technology innovation through TP.
2	Key OEM's	TC can, ▶ Provide handholding in new product development. ▶ Facilitate tie ups with MSMEs for production outsourcing etc. ▶ Support suppliers to meet OEM requirements. ▶ Provide tailor made training programmes to the OEMs.
3	ITI and Polytechnics in Bengaluru district	▶ The Bengaluru TC can tie up with the ITI /Polytechnics/ engineering colleges in the district to provide training to the students for the development of various skill sets like; ▶ Software training to its students for electronic design and production. ▶ During summer vacation, the TC can conduct vocational training programmes for students.

⁴⁷ The TC will take support from Technology Partner and Cluster Network Manager in mentioned areas wherever required

SN	Stakeholder type	Potential areas of Collaborations and association for Bengaluru TC ⁴⁷
		▶ TC can further conduct finishing courses for students post completion of their diploma/ITIs. Finishing courses provide for sufficient hands on experience, which helps students develop expertise and increase the employability of the students. ▶ TC can help in development of similar finishing courses to train students in the premises of these institutes.
4	Industrial infrastructure Initiatives by Government	▶ Existing infrastructure of the ESDM zone and industrial zone can be leveraged by new TCs by catering to the industry. ▶ TC can further collaborate with these zones/ clusters above to share technology, produce, skilled labor etc. ▶ TP can guide them in different high-end technologies for manufacturing and other process. ▶ These clusters will have easy access to market. CNM can collaborate with them in future for different initiatives.
5	Industry associations	▶ TC can conduct various initiatives with industry associations and MSME members ▶ During these workshops, TC can educate about the details of different promotional policies and schemes of DC, MSME, Govt. of India for benefit and sustainable growth of MSMEs. ▶ TC can also provide consultancy services in the areas of project management, lean manufacturing etc. to these associations and MSME members.

6.6 Technology collaboration

The proposed TC at Bengaluru should venture into multiple new areas and to facilitate technology transfer and improve market linkages, role of TP and a CNM has been planned under TCSP.

- ▶ The TP will help identify and define globally competitive technological capabilities required in the cluster and assist proposed TC in building this capability through planning and handholding

over a period of five years. The Technology Partner (TP) is required to enhance the capability and service offerings of TCs such that they transform to become models of manufacturing excellence for MSME. They need to become a trusted partner for MSMEs to learn how to attain manufacturing excellence and attain associated excellence in skills development. The services of the TCs include being exposed to the potential impact of new and relevant technologies, trainings on use of technologies/equipment, providing access to cutting-edge equipment, developing and testing new products and patenting. The key objectives of the TP include:

- In conjunction with all stakeholders of the TCSP identify and define the globally competitive technological capability required by TCs, assist in their execution and provide handholding during their roll out.
- Supporting the up gradation of the existing TCs and establishment of new TCs for the manufacturing sector
- Augment services being offered by the TCs with respect to identified technologies and clusters with respect to training, production assistance (including optimization of equipment utilization) and technical advisory, resulting in increase in revenues of TCs focused at the manufacturing sector
- Support TCs to increase productivity and competitiveness of general engineering (specially automotive and precision engineering) focused MSMEs by
 - Exposing them to existing and expected future technologies
 - Develop skills of the workers and students in the identified technologies and clusters
 - Offering advice/recommendations to MSMEs (clients) who directly or indirectly supply to large auto OEMs or automotive and automotive component manufacturers.

All investment decisions (technological & other) and work prioritization in TCs must be intrinsically connected with the market place and efficiently translate market needs to products and services that (satisfy these needs), & will be enabled by technology and enriched by global knowledge & expertise of the various stakeholders including the TP, empowered by global networks and people.

- ▶ The CNM will be appointed for a period of five years to facilitate cluster and market development to realise improved competitiveness. The CNM will work closely with the MSME clusters to understand their needs and requirements and get OEMs/ buyers involved in the program. The CNM will strengthen market linkages of TC with the MSMEs in the cluster it serves, trade and industry associations, academia, educational institutions, applied research institutions, service

providers, other government support institutions, workers and skill seekers. Existing research institutions which could be potential collaborators for specific technologies are - CMRI, SAMEER, NML, IISc etc. The CNM would work towards the following key objectives:

- Increase of business opportunity for MSMEs through new market linkages.
- Increase competitiveness of supply chains of large firms by enhancing the quality, reliability and productivity of MSME suppliers.
- Increase the number of MSMEs utilizing the services of TCs resulting in increase in revenues of TCs
- Enhance competitiveness of the cluster business environment:
 - Increase access by MSMEs to a network of business development services (BDS) which address needs not in the domain of TC expertise
 - Increase access by MSMEs to network of financial service providers
 - Increase awareness of opportunities in the public sector to contribute to a more competitive business environment.
- Establish closer cooperation of key innovation stakeholders to enhance product and process innovation. This would include linking the research agendas of applied research and education institutes/organizations to industry and market requirements and promoting joint research and development projects.
- Facilitate closer cooperation amongst skills development and labor market stakeholders to increase the number of workers/ trainees from TCs finding long term employment to improve their livelihood.
- Establish a business model which ensures financial self-sustainability of the CNM as before the end of the TCSP funding window.

All investment decisions (technological and other) and work prioritization in TCs must be intrinsically connected with the market place and efficiently translate market needs to products and services that (satisfy these needs), and will be enabled by technology and enriched by global knowledge and expertise of the various stakeholders including the CNM, empowered by global networks and people.

[illegible]

7. Social and environmental safeguards

7.1 Socio-economic profile

- ▶ **Composition of workforce:** Majority of the population in Bengaluru district is engaged in the secondary and tertiary sectors. The tertiary sector employs the largest proportion of people, being the largest contributor to the district's economy. The primary sector employs a minor proportion of people.
- ▶ **Sector Composition:** Bengaluru district contributes about 34% of Karnataka's GDP. The district's GDDP (gross district domestic product) was Rs. 1,55,24,765 crores at current prices in 2011-2012, and per capita GDDP was Rs. 2,09,959 at current prices in 2011-2012. Karnataka's GSDP (gross state domestic product) in the same time period was Rs. 4,58,894.37 crores, and per capita GSDP was Rs. 76764 at current prices⁴⁸.

Primary sector: This sector accounts for 1.65% of the GDDP, contributing Rs. 1809.27 crores in 2011-2012, with major contribution from agriculture, forestry & logging, fishing, mining and quarrying⁴⁹.

- Total geographical area of the district is 219600 Hectares, and the net area sown is 50371 Hectares⁵⁰.
- Paddy and Ragi are the major crops grown in the district along with other subsidiary crops such as Maize, Cereals and Groundnut.

Secondary sector: This sector accounts for 31.53% of GDDP, contributing Rs. 48951.40 crores in 2011-2012, with major contribution from manufacturing activities⁵¹.

- As of 2012, Bengaluru had 14 industrial areas. The district has 375 Large and Medium industries, and 6346 factories. Bengaluru district has 4,349 MSMEs
- The MSMEs have a capital investment of approximately Rs. 579 crores, and providing employment to 48,576 persons.
- The types of MSME industries registered include electrical machinery and transport equipment, engineering units, cotton textile, ready-made garments and embroidery, chemical / chemical based industry, rubber, plastic and petro based industry, paper and paper products, and metal based (steel fab).

⁴⁸ Directorate of Economics and Statistics, Karnataka

⁴⁹ Directorate of Economics and Statistics, Karnataka

⁵⁰ http://raitamitra.kar.nic.in/imp_agri_stat.html

⁵¹ Directorate of Economics and Statistics, Karnataka; Bengaluru Urban Brief Industrial Profile (Ministry of MSME)

- Several MNCs have electronic manufacturing facilities in and around Bengaluru, and the government of Karnataka is taking several incentives to boost electronics manufacturing in the area.
- Industries in Bengaluru export IT/ IT related Products, Software, Readymade Garments, Agarbattis, Gems & Jewellery, Machine Tools, Light engineering and Electronic Goods.

Tertiary sector: This sector accounts for 67.3% of GDDP, contributing Rs. 104486.98 crores in 2011-2012. The important areas in the service industry are; IT / ITES, trade, hotels, restaurants, transportation, and retail⁵².

- Bengaluru is nicknamed the *Silicon Valley of India*. The name signifies the status of Bengaluru as a hub for IT companies
 - The district has a large concentration of firms specializing in Research and Development and software production
 - Several MNCs have Research and Development centres for the ESDM sector in Bengaluru
- **Education:** Bengaluru's literacy rate is 87.67%, significantly higher than that of the rest of the state. At the Intermediate college level, courses are available in the area of science, arts and commerce. The following table gives information regarding the number of educational institutions present in Bengaluru district;

Educational Institutions in the District (2010 - 2011)⁵³

Education	Number
Primary schools	1030
Middle Schools	3099
Secondary / senior secondary schools	2031
Colleges	545
Technical Institutes	Medical: 26 Engineering: 73

- **Health:** Bengaluru Urban district was ranked 1st in Karnataka in terms of HDI in the year 2006. The following table gives an overview of health infrastructure in the district during 2010-11:

Health Infrastructure in Bengaluru District⁵⁴

⁵² Directorate of Economics and Statistics, Karnataka; Bengaluru Urban Brief Industrial Profile (Ministry of MSME)

⁵³ Source: Brief industrial profile of Bengaluru district, Ministry of MSME.

⁵⁴ Source: Brief industrial profile of Bengaluru district, Ministry of MSME.

SN	Type	Numbers
1.	Allopathic hospitals	9
2.	Beds per allopathic hospitals	1790
3.	Ayurvedic hospitals	6
4.	Beds per ayurvedic hospitals	396
5.	Community health centres	3
6.	Primary health Centres	75
7.	Sub health centres	15
8.	Private hospitals	195

- **Tribal Population:** As per the census 2011, 6.95% of the population of Karnataka is scheduled tribe. District wise distribution of tribal population shows that concentration is found mainly in districts like Raichur District. Mandya district has the lowest tribal population. Bengaluru Urban district had a scheduled tribe population of 1.3% as per the 2001 census.

7.2 Social and environmental screening

Environmental and social screening enables the envisaged risks to be addressed at the very beginning of designing and conceptualizing the implementation of the expansion or the green-field development. The two main objectives of environmental and social screening are to:

- ▶ Enhance the environmental and social sustainability of a proposed project. This aspect of screening focuses on the environmental and social benefits of a project.
- ▶ Identify and manage environmental and social risks that could be associated with a proposed project. This aspect of screening focuses on the possible environmental and social costs of an intervention and may point to the need for environmental and social review and management.

7.2.1 Social screening

As per World Bank guidelines TCSP has a two-tier approach⁵⁵ to Social Screening Process (SSP) as defined by World Bank which is as follows;

- ▶ **No Social Screening Process (NSSP)** is applicable if,
 - Expansion/modernization of an existing TC takes place within its existing complex/campus and/or within an established and operational sites such industrial estates, industrial parks, export promotion zones etc.
 - New TC is to be established within established and operational sites such as industrial estates, industrial parks, export promotion zones etc.
- ▶ **Full Social Screening Process (FSSP)** is applicable if a new TC is to be established on land acquired from private title holders and/or on Government land under different tenure systems provided by the Government to establish a new Centre
- ▶ **Indigenous People's Social Screening Process (IPSSP)** will be undertaken
 - If a new TC is to be established in an area with high indigenous population comprising tribal populace and
 - If the area is covered by Govt. Policies and Plans such as Tribal Sub Plans and Panchayati Raj Extension to Scheduled Areas

Further, Resettlement Policy Framework (RPF) applies to all components of Technology Centre Systems Program that requires acquisition of private land and transfer of Government/public land and that are likely to have adverse social impact including involuntary resettlement.

⁵⁵ As per TCSP Environmental management framework - Draft (9 December 2013), MoMSME

Bengaluru TC;

- ▶ The identified site for the proposed TC at Bengaluru;
 - Land has been transferred by Government of Karnataka to O/o DC-MSME for the development of the TC by O/o DC-MSME.
 - Clearances received from the department for being free from any kind of encumbrances and squatter settlements. Further during site visit by PMU consultants the same has been verified.
- ▶ The allocated site for the proposed new TC at Bengaluru is in the Aerospace Industrial park. So, FSSP would not be applicable as *'the land for the establishment of the TC is not acquired from any private title holders and/or on Government land under different tenure systems'*.
- ▶ Hence, in this case NSSP will be applicable since the new TC is to be established within an established and operational site of the Aerospace Industrial Park,

Also, the proposed location of the TC is not established in an area with high indigenous population comprising tribal populace and the area is not even covered by any Govt. Policies and Plans such as Tribal Sub Plans and Panchayati Raj Extension to Scheduled Areas. Hence, this rules out the undertaking of IPSSP.

The responsibilities related to social management will ultimately reside with the respective TC. The PMU will facilitate, support the implementation of the Social Management Plans and prepare a six-monthly report on all aspects of Resettlement Policy Framework and Process.

7.2.2 Environmental screening

TCs are like mini industries; hence planning, development and management of the TCs involve several critical environmental, health and safety obligations. Good environment practices and processes are required to be an integral part of any expansion or development of any green-field TC. The foremost and most essential stage of environment management is to conduct an environmental screening that highlights appropriate level and type of Environmental aspects and their likely associated environmental impact. The screening process aims to quickly identify those projects in which no potential environmental and social issues exist, so that only those with potential environmental and social implications will undergo a more detailed screening process. As a consequence, the outcome

of the screening process will be a categorization of the project into one or more of the following categories:

- ▶ **Category 1:** No further action is needed, either because no significant environmental impact and risks were identified, or because sufficient environmental review has already been conducted and environmental management recommendations have been incorporated into the project;
- ▶ **Category 2:** Environmental sustainability elements need to be integrated into project design because there are possible environmental and social benefits, impact, and/or risks associated with the project (or a project component) but these are limited in nature, predominantly indirect or very long-term and so extremely difficult or impossible to directly identify and assess.
- ▶ **Category 3:** Further environmental and social review and management is needed because potential environmental and social impact or risks are associated with the project (or a project component) and it is possible to identify these with a reasonable degree of certainty. In some cases, determining the significance of these impact or risks will require environmental and social assessment which, in turn, will lead to the identification of specific environmental and social management measures that need to be incorporated into the project.

The methodology for screening includes desk study, site visit and study of available literature.

- ▶ **Desk study** involves collection and review of the secondary data available in the public domain. This may involve the seismic activity of the area where new TC is proposed, soil type, land use pattern, etc. This will enable one to decide the methodology and level of Environment assessment and distributing the responsibility amongst the team members.
- ▶ **Site visit/s** is/are conducted to collect first hand data/information about the new site. This enables a cross check of the secondary data available during the desk review and assessing the likely environmental aspects and health and safety hazards. Also, this involves interaction with different stakeholder in the region to gauge any possibility of conflict related to TC.

During the study phase the team conducted a site visit. Based on this, the checklist used to conduct environment screening at the selected site is given below:

Table 14: Checklist for environmental screening

SN	Issues	Yes/No	Remarks
1	Will the expansion or new TC affect the land use pattern?	No	The land allotted for the TC is in a designated Aerospace park. The same is already an industrial zone and has been earmarked for MSME. Therefore, setting up of the TC will not lead to any effect on the land use pattern.

SN	Issues	Yes/No	Remarks
2	Will the development include significant land disturbance or site clearance?	Yes	Yes, the land allocated for the TC has a lot of mango and coconut trees. The development of the TC shall lead to relocation (if possible) or cutting of certain trees on the land. Care should be exercised while developing the layout of the TC so as to minimize the number of trees to be cut. Moreover, during discussion it was told that coconut trees on the land are dead and do not bear fruit while mango trees are producing fruit. Therefore, design should be such that the no. of mango trees to be cut should be minimal. Efforts shall be made to replant trees, wherever possible, and compensatory afforestation shall be done in accordance with the State legislation, in case trees are cut.
3	Will the project involve acquisition of land from private players?	No	The land has been allocated to MSME by the Government. Therefore, does not involve acquisition of land from private players.
4	The selected site is defined as industrial / commercial / residential?	Yes	Industrial zone
5	Is there any protected area or biodiversity sensitive area in the vicinity which is likely to be affected by the operations of the TC?	Yes	There is no biodiversity sensitive or protected area in the vicinity which is likely to be affected by the operations of the TC. However, it was told that there are snakes found in and around the site which will be relocated before the start of the operations.
6	Is there any archaeological or cultural/heritage structure in the vicinity of the site?	No	There is no archaeological or cultural/heritage structure in the vicinity of the site.
7	Is there any group of indigenous people in and around the selected site?	No	There are no indigenous people in and around the selected site
8	Will the construction activity affect the surrounding around the TC?	No	The allocated land has open road on one of its side and vacant land on all the other three sides. As such construction and operation of the TC is not envisaged to have any impact of the surrounding area.
9	What is the source of water available at the site (Ground	No	During discussions it was told that water shall be supplied by the Karnataka Industrial Areas

SN	Issues	Yes/No	Remarks
	water, surface water, municipal supply, etc.)? Is the water requirement envisaged to put additional pressure on the water sources?		Development Board (KIADB) responsible for development of the park. Moreover, since the operations of the TC are not expected to be water intensive and therefore, they shall not put additional pressure on the existing water sources.
10	Will the project lead to increased air emissions in the region?	Yes	The TC is envisaged to have insignificant dust emissions during the construction period. Care may be exercised to minimize dust emissions and its impact, if any, on the adjoining industry. Also, during the operation phase appropriate measures shall be undertaken to minimize air emission in case D.G set is used for electricity backup.
11	Will the project lead to increase in noise levels in the area?	Yes	Increase in noise level is not envisaged in the area due to TC. However, care like acoustic enclosures for D.G set, in case installed, construction only in day time, etc. may be practiced.
12	Will the TC involve use of chemicals and/or solvents?	No	The envisaged TC will only use diesel (in case D.G set is installed). However, in case any chemicals are used appropriate measures shall be undertaken to manage and store the chemicals.
13	Will the project involve handling, storage and disposal of hazardous waste? If yes, what are the different types of waste envisaged from the TC?	No	The envisaged TC will not use chemicals. However, in case, chemicals and any other hazardous materials are used measures shall be undertaken to manage the associated waste.
14	Is the project located in the area of seismic faults? In case yes, in which seismic does the location lie?	No	The TC location falls in the Seismic zone - II (Least active). Therefore, there is no danger from seismic activity.
15	Is there any record of natural calamity in the area in the past? If yes, what is the probability of the same affecting the operations of TC in the future?	Yes	Yes, Bengaluru has had a history of heavy rainfall and Floods. Though the operations of the TC are not envisaged to be threatened due to floods, adequate measures may be adopted looking at the rainfall pattern in the area.

Apart from this, in case of an expansion of the further data/information may be collected so as to identify the existing issues and plan appropriate measures to address the same in the brown-field development.

- ▶ Also, publicly available literature review on the issues in the envisaged industrial sectors should be kept in mind. This may further help in a robust screening of the possible EHS impact of upcoming TC and may provide opportunity to MSME to have measures in place to mitigate the same.

After the initial screening, **Detailed Site Assessment** for the proposed TC may be conducted using the environmental assessment checklist so as to understand the existing issues and the environment feasibility with respect to the proposed development.

7.3 Gender equity and social inclusion strategy

Gender, Equity and Social Inclusion Plan (GESIP) is an important aspect of the social management framework. TCSP also aims to create more choices for young people entering labour force (including women and those who belong to vulnerable sections of society) in terms of providing opportunities for hands-on-technical skills development at varying levels and types through TCs. This is in accordance with Government of India's focus on inclusive growth focusing on poverty reduction and group equality and also with World Bank's Country Partnership Strategy with emphasis on engagement, transformation and inclusion.

GESIP will be formulated for the proposed Bengaluru TC, during its operational phase which would not only be an outcome of the participatory process but also be rooted in the national and state policies for gender and social inclusion. Areas to be considered while preparing GESIP will also be in line with the RFD of the programme and would comprise the following (but not limited to):

- ▶ Criteria for admission into vocational education and training for skills development
- ▶ Increased opportunities for employment to women trainees
- ▶ Timings of training
- ▶ Ease of Location of TC
- ▶ User friendly campus infrastructure esp. for differently abled sections
- ▶ No. of women rest rooms
- ▶ Training Aids and infrastructure
- ▶ Any other component

The PMU will prepare and monitor the strategy to help with the preparation and implementation of a GESIP with particular emphasis on inclusion of young women as well as those who belong to weaker and underprivileged sections of society. For example, those who belong to SC/STs, backward castes, minorities and those who are differently abled. Good practices coming out of the GESIP will be documented and replicated/scaled up further in new TCs.

GESIP Strategy roadmap (Suggestive)

- ▶ Develop a module/ guidance notes for preparing TC specific GESIPs covering the following aspects:
 - Gender gaps
 - Importance of gender
 - Identification of gender specific issues and constraints that hinder the implementation of GESIP (human capital, access to information, access to finance, institutional factors, socio-cultural norms, structural factors, political/ legal)
 - Use of gender-disaggregated data to analyse the business environment
 - Identify communication channels to reach intended program beneficiaries
 - Useful links and tools
 - Case studies/ best practices
 - Core questions and indicators
- ▶ Capacity building of TC focal points identified to work on GESIP. Analysis of existing pool of potential trainees and their eligibility in terms of gender and social inclusion and in terms of eligibility criteria as set out in national and State policies
- ▶ Hand holding support for planning and implementing GESIP
- ▶ Setting up institutional arrangements at TC level for transparent and accountable implementation and monitoring of GESIP based, among others, on specific and measurable indicators. Develop reporting and monitoring formats to assess progress every 6 months
- ▶ Organize and facilitate monthly meetings (for 6 months) for GESIP coordinators to identify issues and best practices and synthesize learning's' within and across sectors

7.4 Sample monitoring and reporting template

The monitoring of environmental parameters would be undertaken on quarterly basis. The responsibility of the same would lie with the concerned TC and a copy of the consolidated performance will be sent to the O/o DC MSME for their records and recommendations. The suggestive template for monitoring and reporting for the same to be adopted by the TC's is given below. Further, during operation and maintenance of the TC, a number of potential EHS impact may be expected based on the kind of activities undertaken. These possible aspects are delineated in the EHS section of this DPR.

Table 15: Sample monitoring and reporting template

SN	Parameter	Frequency of monitoring and reporting
1	Water consumption	Quarterly
2	Water Cess Report	Quarterly
3	Energy consumption	Quarterly
4	Waste generation and disposal - Municipal Solid Waste - Hazardous waste - Non-hazardous waste - Other categories	Quarterly
5	Safety records Near Misses First Aid cases	Quarterly
6	Training No of students and other trained	Quarterly
7	Air pollution and Noise pollution	6-monthly
8	Internal audit report	Quarterly
9	Update of legal register	6-monthly

Clearances Required and Respective Authorities



8. Clearances required and respective authorities

The proposed TC at Bengaluru is one of the Greenfield projects proposed under TCSP. This would include development of physical infrastructure including facilities like production, training, administration, hostel, canteen, utilities etc. keeping in view the long-term sustainability. The same would require clearances at different levels during construction such as approval of layout plan, environmental clearance, electricity and water supply connection, health and safety clearance and other associated clearances. Obtaining these clearances would be crucial for timely completion of the project and therefore needs to be planned well in advance. The following table gives indicative details of the various clearances along with the respective approving authorities and the tentative time required. However, considering that land has already been allotted, some of these regulations may not be applicable.

Table 16: Clearances required and respective authorities - Illustrative

SN	Required clearance/ approvals ⁵⁶	Department /agency
1.	Registration under VAT Act	Commercial Taxes Department
2.	Registration under CST Act	Commercial Taxes Department
3.	Tax Clearance Certificate	Commercial Taxes Department
4.	Land conversion - Conversion of land use	Town and Country Planning Department
5.	Land Allotment	KIADB
6.	Allotment of plots in Industrial Areas	KIADB
7.	Issue of NOC to the authority concerned regarding conversion of land use	Town and Country Planning Department
8.	Environmental Clearance and consent to establish from State Pollution Control Board (SPCB)	Karnataka State Pollution Control Board
9.	Consent to operate under the Air Act and Water Act from SPCB. Also, under the hazardous Act, if hazardous materials are being handled and disposed from the facility	Karnataka State Pollution Control Board
10.	Electricity Connection	BESCOM
11.	Water connection	Karnataka Urban Water Supply and Drainage Board
12.	NOC from Fire Department	Karnataka Fire and Emergency Services

⁵⁶ Ebiz Karnataka

SN	Required clearance/ approvals ⁵⁶	Department /agency
13.	Approval of place and for permission to construct building under the Factories Act	Labour and Employment Department - Department of Factories, Boilers, Industrial Safety and Health
14.	Approval of factory layout plan under factories Act, 1948	Labour and Employment Department - Department of Factories, Boilers, Industrial Safety and Health
15.	License for running the factory	Labour and Employment Department
16.	Registration of shops and commercial establishments	Labour and Employment Department - Labour Department
17.	Stability Certificate	Town and Country Planning Department
18.	Permission to establishments having more than 50 labours under Industrial Employment	Labour and Employment Department - Labour Department
19.	Safety certificate for Lift	Karnataka State Electrical Inspectorate
20.	Permission to extract ground water, if applicable	Central Ground Water Authority
21.	Society registration	Indian societies registration act 1960

9. Manpower and human resource development

The success of an institute or an organization majorly depends upon the skill set and experienced human resource available with them. Hence, it's planning, recruitment and development is one of the most important aspects while designing a new Technology Centre. As a part of the study we have analysed organizational structures of some of the existing Technology Centres to understand the major functional areas, number and level of employees, contractual staff and other related aspects. In continuation, we have also discussed the same with O/o DC-MSME and some of the heads/GMs of the existing TRs.

As per the existing structure, there are following functional areas/streams in a TR:

- ▶ Production
- ▶ Design
- ▶ Training
- ▶ Consultancy and Marketing
- ▶ Administration and Accounting

The level of employee heading a particular Functional area/stream/department varies in some of the TCs. In an Indo German TR Administration and Accounting is head by a Manager while in Indo Danish TCs this is being headed by a Senior Manager. Sanctioned employee strength in these existing TCs typically varies from 110-120.

9.1 Proposed organisation structure

While analysing the existing organizational structures and designing the new one, we have taken some considerations into account which have been discussed and validated with the O/o DC-MSME. Some of the key considerations are as below:

- ▶ As per the decision taken in the Empowered Finance Committee, the total sanctioned strength for any new TC would be 60 in contrary to the existing ones which have total sanctioned strength of 110-120.
- ▶ In the proposed organizational structure for Bengaluru TC, the main revenue streams are Production (which includes Assemble, Testing, and Calibration), Innovation, Design and Consultancy, and Training. These departments will be headed by Senior Managers who would directly report to GM/DGM.
- ▶ Contrary to the existing structures and target of sanctioned employee strength of not more than 60, we have proposed only 7 levels as compared to the existing structures which have 9 levels in the hierarchy. Below these levels, the resources will be hired as contractual employees on need basis.

- ▶ In the proposed structure for Bengaluru TC, a separate vertical for the Manufacturing Incubation Centre (MIC) has been proposed.
- ▶ In the existing structure consultancy and marketing department were clubbed into one, but in the proposed structure for Bengaluru TC it has been proposed to have marketing as a separate department and consultancy be clubbed with the design and innovation department.
- ▶ The other three departments namely, Marketing, Administration and Accounting, and MIC are proposed to be headed by Manager level position and they will directly report to GM/DGM. This has been done as the administration and accounts department is lean and a manager level employee would be able to manage the same. Also, as stated above, the total sanctioned strength cannot exceed 60.
- ▶ It is proposed that training in the Bengaluru TC will be focused solely on Electronics
- ▶ Based on our discussions with the O/o DC-MSME and heads of the existing MSME TCs, there was a need for dedicated manager for the short term trainings. In the structure for Bengaluru TC, we have proposed separate managers for long term and short term trainings. Keeping in mind the scale and the number of trainees in the short term courses, the manager short term would mainly be responsible for administration, planning, quality control, issue of certificate to trainees, fee collection and others. The managers would be additionally responsible for placement of students which will include industry interaction, managing training and placement, delivering presentations etc.

As highlighted above, the proposed Technology Centre at Bengaluru will be divided into six functional areas/departments. These are:

- ▶ Production (Assembly, Testing, and Calibration)
- ▶ Training (Electronics)
- ▶ Design, Consultancy and Innovation
- ▶ Manufacturing Incubation Centre (MIC)
- ▶ Marketing
- ▶ Admin and Accounting

It is recommended that the GM and the DGM divide these six areas/departments between them, depending on competency, work-load and previous experience. Overall GM would be responsible for the management and financial health of the TC.

The chart consists of 5 levels in addition to the General Manager (GM) and the Deputy General Manager (DGM).

- ▶ The third level consists of Senior Managers as the departmental heads of innovation, design and consulting, production and training. They will report directly to either the GM or the DGM, depending upon the division of departments within them.

- ▶ The fourth level will consist of Managers who will be supporting Senior Managers in their respective domains. But for marketing, admin and accounting, and MIC department, as explained above manager will head this department and directly reporting to GM or DGM.
- ▶ The fifth level consists of senior engineers (Sr. Engg.) and Sr. Officers. Level six consists of engineers (Engg.) and offices.
- ▶ The final level consists of senior technicians with requisite operational level expertise.

The responsibilities of each position and qualifications required to fulfil roles are covered in the following section. Hence, the recommended final organisational structure for the proposed TC is based on experience from established MSME technology centres, discussions with O/o DC-MSME and heads of some of the existing TCs, expert opinion and knowledge and experience with organisational planning.

Based on the considerations stated above, the organisational chart provided below demonstrates the target organizational structure to be achieved in 5 years (by 2020-21) from inception. Though, we have provided the figures till 2025-26 since we are estimating the revenue and expenditures for next 10 years.

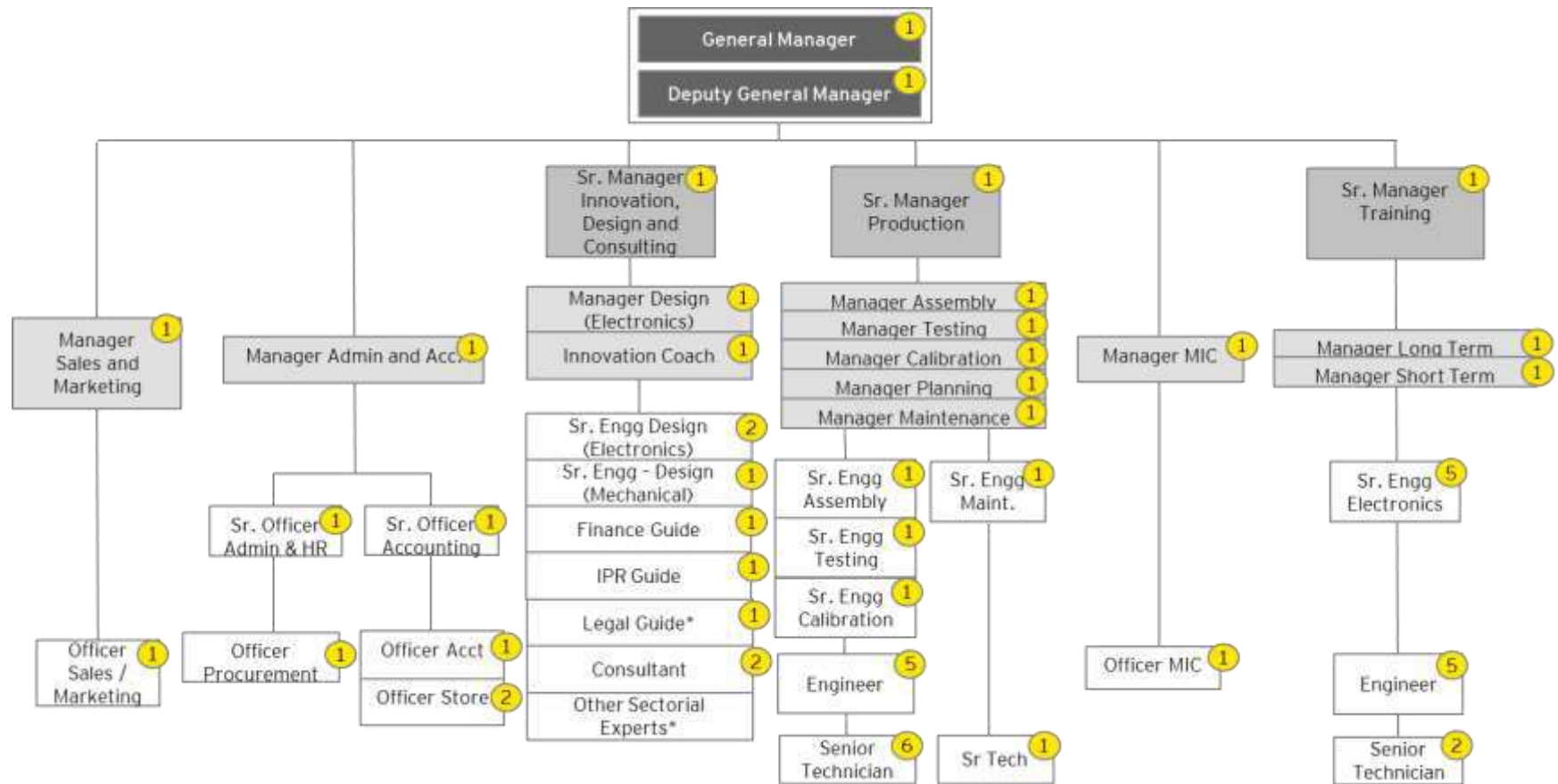
Table 17: Sanctioned strength of key resources

S. No.	Designation	Proposed Sanctioned Strength
1.	General Manager	1
2.	Deputy General Manager	1
Department		
3.	Marketing	2
4.	Administration and accounting	7
5.	Innovation, Design and consultancy	10
6.	Production	22
7.	MIC	2
8.	Training	15
Total		60⁵⁷

In addition to the above sanctioned strength, we have recommended additional employees as contractual employees.

⁵⁷ The details and basis of number of employees is provided in the next section

Figure 13: Proposed organisation structure



*Hired on a contractual basis as per need requirement

In addition to the above sanctioned strength, we have recommended additional employees as contractual employees. Based on the requirement, we have estimated around 59 contractual employees (45 in training, 12 in production, and 2 in consulting) by end of FY 2026. The figure for number of contractual employees have been arrived at by taking various factors into account namely - existing employees in training and production, the number of courses vis-à-vis the number of trainees, trainee to teacher ratio, projected revenue numbers over the years, number of shifts in production vis-à-vis the utilization and others.

While considering the ratio for trainee to teacher, we have used the following assumptions after discussion with existing GMs and O/o DC-MSME.

- Trainee to teacher ratio for theory classes - 60:1; with theory classes conducted for 20% of time
- Trainee to teacher ratio for practical classes - 20:1; with practical classes conducted for 80% of time

After calculating the weighted average of the above ratios we got the overall trainee to teacher ratio of 28:1. Post discussions, we have considered trainee to teacher ratio of 25:1 for calculating the number of employees in the training department (regular and contractual faculty) keeping in mind the employees who will be on leave at any given point of time.

9.2 Phase wise induction of human resources

As discussed in the above sections, the proposed TC will be have 60 employees as sanctioned strength and the target structure will be achieved within 5 years from 2016-17. Therefore due care have been taken during the study to phase the recruitment of employees. On the same lines, initially some positions have been proposed to be vacant when establishing the organisational structure of the TC. This has been proposed keeping in mind the time it will take to be fully operational. Vacant positions will also create incentives for high performers to obtain higher positions when the time comes for fulfilling these.

The phase wise estimated staffing over next few years as part of human resource planning has been done through the identification and analysis of the various types of activities and skill sets required for smooth and efficient functioning of the proposed TC. Multiple rounds of discussions with industry experts, World Bank, O/o DC-MSME and heads of some of the existing MSME TCs have been undertaken to arrive at the requirement of human resources needed to meet the business objectives in the short and long term of the proposed TC.

The following provides the details of recruitment in various phases over next few years. This phasing is suggestive and can be modified based on the need and revenue generating capabilities of the TC

during operations. Some of the considerations which have been taken into account while recommending the phasing of employees are as below:

► **Year 2016-17: 2 staff members**

- GM will be involved in project implementation and work out the strategy for marketing, training, production and consultancy with the help of CNM and TP. GM will also monitor the progress of construction and procurement of machines etc. GM will also be responsible for planning of recruitment of required manpower.
- Manager - Administration & Accounts will be responsible to get statutory registrations like sales tax and PF, opening of TC's bank account, getting power and water connection etc. Manager will also support GM in recruitment of people in the coming years.

► **Year 2017-18: 21 staff-members**

- Three senior managers (Innovation, Design and Consulting; Production; and Training) will be recruited to further recruit staff in respective departments. These would also be responsible for orientation and training of respective staff members.
- The first long term training programme will commence this year and one senior engineer, one engineer and one senior technician will be recruited for installation of machines and conducting theory and practical training
- By second half of this year, production and design staff will be recruited. The respective senior managers would be responsible for orientation and training of these staff members. These staff will undergo training for a period of 3-6 months to make them fully trained before start of the operations of the proposed TC
- An innovation coach and senior design engineer will also be recruited, in order to commence consultancy operations
- Manager - maintenance and senior technicians will be recruited to install and commission machines for production and training. They will also be responsible for installing the power supply system
- Manager MIC will be recruited in order to set up manufacturing infrastructure and provide for plug-and-play facilities
- Stores and accounts officers will be recruited to maintain statutory records and support the operations

► **Year 2018-19: 41 staff- member**

- Production will commence during this phase and hence more engineers and senior engineers will be recruited. The number of staff has been decided based on estimated number of machines commissioned during this phase and number of shifts in production
- This year some short term training courses will commence along with the starting of the second year of the long term course.

- Officer sales will be recruited to support manager marketing for preparation of detailed marketing plan of the TC. The staff would be engaged in various marketing activities for wider reach of the proposed TC across the region. This would be crucial for promotion of the TC and would help departments increase their revenue
- Officer MIC will be recruited in order to facilitate rental of space, and providing linkages with suppliers and skilled workers.
- The Innovation, Design and Consultancy department has been planned to commence its commercial services during this year and hence managers, consultants, and senior engineers will be recruited to meet the requirement.

► **Year 2019-20: 50 staff members**

The proposed TC would be fully operational by this period with activities in production, training, innovation, design and consultancy, MIC, etc. Additional staff will be recruited for smooth undertaking of the gradual increase in the activities across all the departments.

It is recommended to leave the position of the DGM vacant initially. The position of the DGM can be filled by a high performing senior manager within design and consulting, production or training depending upon the requirement, skill set and experience.

Rest of the positions will be filled gradually as TC activity escalates and the manpower requirements increase. The tables below summarise the phasing of the organisational completion within each area; Administration and Accounting, Innovation, Design and Consulting, Production, MIC, Training and Sales and Marketing, in addition to the positions of the GM and DGM. The numbers represent the numbers of employees within the specific position at a given point in time. The timeline spans from 2016 to 2027.

Table 18: Summary of phase wise induction of resources

Year	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
Full time employees											
Total	2	21	41	50	55	60	60	60	60	60	60
Sub-Contractors											
Total	0	3	13	21	21	31	34	44	49	54	59

The tables below depict the hiring of number resources in every department every year starting from 2016-17 to 2026-27. In the year 2020-21, the TC is recommended to hire the complete sanctioned strength of 60 employees.

Table 19: Department wise induction of fulltime resources - Illustrative

Year	16-17	17-18	18-19	19-20	20-21	25-26	26-27
General Manager							
General Manager	1	1	1	1	1	1	1
Total	1	1	1	1	1	1	1
Deputy General Manager							
Deputy GM	0	0	0	0	0	1	1
Total	0	0	0	0	1	1	1
Sales and Marketing							
Manager Sales and Marketing	0	1	1	1	1	1	1
Officer Sales and Marketing	0	0	1	1	1	1	1
Total	0	1	2	2	2	2	2
Administration and Accounting							
Manager Admin. and Accounting	1	1	1	1	1	1	1
Sr. Officer Admin and HR	0	0	0	0	0	1	1
Sr. Officer Accounting	0	0	0	0	0	1	1
Officer Procurement	0	0	1	1	1	1	1
Officer Accounting	0	1	1	1	1	1	1
Officer Store	0	1	1	2	2	2	2
Total	1	3	4	5	5	7	7
Innovation, Design and Consulting							
Senior manager	0	1	1	1	1	1	1
Manager Design (Electronics)	0	0	1	1	1	1	1
Innovation Coach	0	1	1	1	1	1	1
Sr. Engg. Design (Electronics)	0	1	1	1	2	2	2

Year	16-17	17-18	18-19	19-20	20-21	25-26	26-27
Sr. Engg. Design (Mechanical)	0	0	1	1	1	1	1
Finance Guide	0	0	1	1	1	1	1
IPR Guide	0	0	1	1	1	1	1
Consultant	0	0	1	1	2	2	2
Total	0	3	8	8	10	10	10
Production							
Senior Manager Production	0	1	1	1	1	1	1
Manager Assembly	0	0	1	1	1	1	1
Manager Testing	0	0	1	1	1	1	1
Manager Calibration	0	0	1	1	1	1	1
Manager Planning	0	1	1	1	1	1	1
Manager Maintenance	0	1	1	1	1	1	1
Sr Engg. Assembly	0	0	0	1	1	1	1
Sr Engg. Testing	0	0	0	1	1	1	1
Sr Engg. Calibration	0	0	0	1	1	1	1
Sr. Engg. Maintenance	0	1	1	1	1	1	1
Engineer	0	2	3	4	5	5	5
Senior Technician	0	1	2	2	4	6	6
Senior Technician Maintenance	0	1	1	1	1	1	1
Total	0	8	13	17	20	22	22
Manufacturing Incubation Centre							
Manager MIC	0	1	1	1	1	1	1
Officer MIC	0	0	1	1	1	1	1
Total	0	1	2	2	2	2	2
Training							

Year	16-17	17-18	18-19	19-20	20-21	25-26	26-27
Senior Manager	0	1	1	1	1	1	1
Manager Long Term	0	0	1	1	1	1	1
Manager Short Term	0	0	1	1	1	1	1
Sr. Engg.	0	1	3	5	5	5	5
Engg.	0	1	3	5	5	5	5
Senior Technician	0	1	2	2	2	2	2
Total	0	4	11	15	15	15	15

9.3 Roles and responsibilities

Below is summary of the suggestive roles and responsibilities (including the minimum qualification levels) of the individual employees which can be referred to while recruiting.

Table 20: Roles and responsibilities of proposed positions

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
General Manager	B.Tech (CS / Electrical / Electronics) with MBA or M.Tech	15 Years with 8 years in similar role	▶ Electronics Manufacturing / Design / Testing and Calibration / Training. ▶ Experience in Project Implementation will be preferred ▶ Networking skills with industrial associations, key players, etc.	▶ Over all responsible for the administration and financial health of the TC ▶ Key responsibility areas include (but not limited to); Marketing, Administration, HR, Accounts, Production, Design & consultancy etc. ▶ Responsibility for achieving the target KPIs set by the Governing Council
Deputy General Manager	B.Tech (CS / Electrical / Electronics) with MBA or M.Tech	12 Years with 5 years in similar role	▶ Electronics Manufacturing / Design / Testing and Calibration / Training. ▶ Experience in Project Implementation will be preferred	▶ Head of Production, Innovation and Design, Consultancy and Training
Manager- Sales & Marketing	M. Tech. in CS / Electrical / Electronic	10 years with 5 years in similar role	▶ Marketing of TC product range ▶ Supporting Sr. Managers of respective departments to acquire orders	▶ Plan and evaluate marketing activities towards all stakeholders ▶ Stakeholder analysis ▶ Sales according to targets

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Follow up with prospective and existing customers	
Sales Officer	MBA or Equivalent	3 years	▶ Experience of invoicing and sales accounting ▶ Payment collection from customers ▶ Should be familiar with Computerised accounting procedures	▶ Execute marketing and sales activities ▶ Sales invoicing, taxes etc.
Manager - Admin. and Accounting	CA/ICWA or MBA with bachelor's degree in Commerce/ Accounting / Finance	8 Years with 3 years in similar role	▶ Experience in the area of Administration, HR and Accounting ▶ The Manager must also have basic knowledge of government laws, regulations and state specific compliances ▶ Familiarity with ERP/accounting softwares	Head of Accounts, Administration and HR: ▶ General housekeeping of TC ▶ Bookkeeping, accounting and finance including financial analysis ▶ TC security ▶ Payroll ▶ Procurement management and store keeping
Sr. Officer - Admin. & HR	MBA or Equivalent	5 Years	▶ Experience in the area of HR and Administration ▶ Familiarity with Industrial laws and compliances	▶ Housekeeping of TC ▶ Security systems operation ▶ Transport System and management ▶ Payroll
Sr. Officer - Accounting	Bachelor's degree in commerce/Accounting / Finance	5 Years	▶ Experience in accounting and Tax ▶ Should be familiar with latest accounting software	▶ Bookkeeping and accounting ▶ Financial analysis

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
	with M.Com. or MBA			
Officer - Accounting	M. Com. or MBA or Equivalent in Accounting	3 Years	▶ Experience in accounting and Tax. ▶ Should be familiar with latest accounting software	▶ Bookkeeping and accounting ▶ Handling of Cash, Banking etc.
Officer Store	Diploma in CS / Electrical / Electronic or Equivalent	3 Years	▶ Experience in Store keeping, including inventory management ▶ Experience in Computer systems / software for store keeping operation	▶ Managing store ▶ Issue of consumable and non-consumable stores and keeping records
Officer Procurement	M. Com. or MBA or Equivalent	3 Years	▶ Experience in Procurement processes ▶ Knowledge of Govt. Procurement rules and processes will be desirable	▶ Procurement ▶ Vendor Development
Senior manager - Innovation, Design & Consultancy	M.Tech in CS / Electrical /Electronic engineering	10 Years with 5 years in similar role	▶ Proficiency in Electronics design ▶ Practical Experience in use of software for electronics design like OrCAD, PADS, CAD Soft Eagle, etc. ▶ Knowledge of Quality systems ▶ Experience in technical consultancy will be preferred ▶ Experience with ESDM Start ups ▶ Providing Consultancy Services	Responsible for supporting MSMEs and entrepreneurs w.r.t: ▶ Concept creation support, including product ideation, innovation roadmap, development of proof of concepts, business planning, and market linkages ▶ Product architecture and design ▶ Consulting Services in areas such as process design, value engineering, lean manufacturing, EHS, etc.

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
				In charge of entrepreneur club and patent registration and harnessing centre
Manager- Design (Electronics)	B. Tech in Electronic engineering.	8 years with 3 years in a similar role	▶ Experience in product modelling, design ▶ Proficiency in Electronics design ▶ Practical Experience in use of software for PCB and electronics design ▶ Experience of manufacturing and assembly of electronics ▶ Knowledge of Quality systems ▶ Experience in technical consultancy will be preferred	▶ Designing electronics and components ▶ Product development ▶ Prototyping
Manager - Design (Mechanical)	B. Tech in Mechanical engineering	8 years with 3 years in a similar role	▶ Experience in product modelling, design, tool design ▶ Proficiency in one of the areas in Tool Design, either Sheet metal press tool or Plastic mould ▶ Practical Experience in use of CAD/CAM/CAE in product and tool design ▶ Knowledge of Tool trial ▶ Knowledge of Quality systems ▶ Experience in technical consultancy will be preferred	▶ Designing tools, moulds and die casting ▶ Product development ▶ Quality systems ▶ Value engineering ▶ Tool try outs and proving ▶ Consultancy to MSMEs: Deliver functional consulting on assigned areas to ensure MSMEs are able to successfully use the solutions

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
Innovation Coach	B. Tech in CS / Electrical /Electronic engineering	8 years with 3 years in a similar role	▶ Proficiency in Electronics design ▶ Practical Experience in use of software for electronics design like OrCAD, PADS, CAD Soft Eagle, etc. ▶ Experience in product ideation and innovation ▶ Knowledge of Quality systems ▶ Experience in business planning ▶ Experience with ESDM Start ups ▶ Providing Consultancy Services	Providing consultancy services in the following fields: ▶ Product ideation, development and testing of concepts ▶ Setting up innovation roadmap including business strategy, product architecture ▶ Proof of concepts including developing schematics, lab support, feasibility judgements ▶ Business planning ▶ Market Linkages
Sr. Engineer- Design (Electronics)	B. Tech in CS / Electrical / Electronic engineering	5 Years	▶ Experience with designing electronic components / electronics ▶ Knowledge of high software in electronic design such as OrCAD, PADS, CAD Soft Eagle, etc. ▶ Experience of consultancy in the areas of product and component development, quality systems and value engineering	▶ Designing electronics and electronic components ▶ Product and prototype development ▶ Quality systems ▶ Value engineering ▶ Consultancy to MSME
Finance Guide	B. Sc. / Diploma in Finance or equivalent	5 Years	▶ Experience in financial assessment ▶ Experience in financial consultancy and business plan creation	▶ Consultancy services for financial assessment and feasibility, business planning

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
IPR Guide	LLB / PGDM in IPR or equivalent	5 Years	▶ Experience in patent creation and harnessing	▶ Consultancy services for patent creation and harnessing
Consultant	B. Tech in CS / Electrical / Electronic engineering	5 Years	▶ Proficiency in Electronics design ▶ Practical Experience in use of software for electronics design like OrCAD, PADS, CAD Soft Eagle, etc. ▶ Experience in product ideation and innovation ▶ Prototyping experience ▶ Knowledge of Quality systems ▶ Experience in business planning ▶ Experience with ESDM Start ups ▶ Providing Consultancy Services	▶ Assistance and consultancy in concept creation, product and process development, quality and reliability, sustainability, prototyping
Sr. Manager Production	M. Tech. in CS / Electrical / Electronic Engineering	10 Years with 5 years in similar role	▶ Experience with manufacturing and assembly, testing and calibration, and at least 3 years of leadership experience ▶ The Sr. Manager should also have hands on experience with programming software for electronics production	▶ Responsible for assembly, testing, and calibration centres ▶ Quality assurance of services ▶ Overall responsible for machine maintenance and upkeep ▶ Ensuring on-time deliveries ▶ Deliver budgeted quantities as per required quality standards

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Experience to debug, analyse problems, root causes & take corrective improvement actions	▶ Manpower deployment and controlling manpower costs as per target
Manager- Assembly	B. Tech CS / Electrical / Electronic Engineering	8 Years with 3 years in a similar role	▶ Experience with electronic product and PCB assembly (SMT and through hole / manual and automated) ▶ Hands on experience with PCB design software ▶ Experience of de-bugging, analysing problems, root cause and taking corrective improvement actions when PCB is not functional as per specifications ▶ Should have good knowledge of quality inspection	▶ Product and PCB assembly centre ▶ Responsible for timely delivery of products ▶ Overall responsible for machine maintenance and upkeep ▶ Ensuring on-time deliveries
Manager- Testing	B. Tech in CS / Electrical / Electronic Engineering	8 Years with 3 years in a similar role	▶ Experience with using testing equipment and software ▶ Safety testing and fire safety testing ▶ Environmental testing and Ingress testing ▶ EMI / EMC ▶ RoHS Testing	▶ Supervise testing department staff. Planning, organizing, and monitoring testing assignments and ensuring work expectations for scope, schedule, cost and responsiveness. ▶ Interface with engineering for technical resolutions for tolerance failure's ▶ Increase through-put of testing department

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
				▶ Overall responsible for machine maintenance and upkeep
Manager- Calibration	B. Tech in CS / Electrical / Electronic Engineering	8 Years with 3 years in a similar role	▶ Experience in conducting calibration of basic electronic / physical sensors and meters used in electronic items ▶ Electro-Technical Calibration ▶ Thermal Calibration ▶ Mass and Volume Lab ▶ Pressure Calibration	▶ Supervise calibration department staff. Planning, organizing, and monitoring calibration assignments and ensuring work expectations for scope, schedule, cost and responsiveness. ▶ Interface with engineering for technical resolutions for tolerance failure's ▶ Increase through-put of calibration department ▶ Overall responsible for machine maintenance and upkeep
Manager- Planning	B. Tech in CS / Electrical / Electronic Engineering	8 Years with 3 years in a similar role	▶ Experience in electronics assembly, testing, and calibration ▶ Experience in programming, knowledge of programming software	▶ Preparation of stage wise / machine wise scheduling in co-ordination with head of production team ▶ Production Planning and Control, and further despatching of jobs ▶ Estimate & manage to get component requirements

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
				▶ Responsible from issue of raw components to despatch of final product to customers including routing
Manager- Maintenance	B. Tech in Mechanical/ Electrical/ Electronics Engineering	8 Years with 3 years in a similar role	▶ Knowledge of Installation and commissioning of machines and equipment ▶ Practical experience in preventive and repair maintenance of machines and equipment ▶ Practical experience of maintaining utility equipment like sub-station, UPS, water treatment plant, DG set etc.	▶ Head of Machinery maintenance including preventive maintenance, repair etc. of machines and equipment ▶ Responsible for Power supply, energy conservation water system in the campus
Senior Engineer- Assembly	B. Tech in Electronics Engineering	5 Years	▶ Prior experience with electronic assembly	▶ Electronic product and PCB assembly (SMT and through hole / manual and automated) ▶ Running PCB design software ▶ De-bugging, analysing problems, root cause and taking corrective improvement actions when PCB is not functional as per specifications ▶ Quality inspection

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
Senior Engineer - Testing	B. Tech in Electronics Engineering	5 years	▶ Prior experience with electronic testing	▶ Safety testing and fire safety testing ▶ Environmental testing and Ingress testing ▶ EMI / EMC ▶ RoHS Testing
Senior Engineer - Calibration	B. Tech in Electronics Engineering	5 years	▶ Prior experience with electronic calibration	▶ Conducting calibration of basic electronic / physical sensors and meters used in electronic items ▶ Electro-Technical Calibration ▶ Thermal Calibration ▶ Mass and Volume Lab ▶ Pressure Calibration
Senior Engineer - Maintenance	B. Tech in Electronics Engineering	5 years	▶ Experience in Maintenance of machines and equipment (electronics or mechanical) ▶ Experience in machine programming and operation (electronics)	▶ Machine maintenance including preventive maintenance, repair, etc. of machines and equipment ▶ Responsible for power supply, energy conservation water system in the campus
Engineer	Diploma in Electronics	3 years	▶ Knowledge and experience in electronics assembly / testing / calibration / prototyping ▶ Machine programming and operation (electronics)	▶ Machine programming and operation for testing / calibration / prototyping ▶ Assembly of electronics

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
Senior Technician (Assembly / Testing / Calibration / Prototyping)	Diploma / ITI in respective areas	3 years as Sr. Technician	▶ Knowledge and experience electronics and component manufacturing ▶ Electronics assembly ▶ Testing and calibration ▶ Prototyping ▶ Knowledge of machine programming and operation for testing / calibration / prototyping	▶ Machine programming and operation for testing / calibration / prototyping ▶ Assembly of electronics
Senior Technician - Maintenance	Diploma/ ITI in respective areas	1 year after Diploma or 5 Years after ITI in respective areas	▶ Experience in Maintenance of machines and equipment (electronics) / ▶ Experience in machine programming and operation ▶ Experience in electronics assembly, testing and calibration	▶ Maintenance of machines and equipment ▶ Machine programming and operation (electronics)
Manager - MIC	M. Com. Or MBA or Equivalent	8 Years	▶ Experience in management, administration, and marketing in the ESDM sector ▶ Familiarity with regulations and compliances	▶ Helping members of Incubation centre in getting orders and execution of the same
Officer - MIC	M. Com. or MBA or Equivalent	3 Years	▶ Experience in the area of Administration and Marketing	▶ Administration and Promotion

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Familiarity with Industrial laws and compliances ▶ Prior experience of marketing and promoting in the ESDM sector	
Senior Manager- Training	M. Tech. in Electronics engineering	10 Years with 5 years in a similar role	▶ Experience with electronics manufacturing and training in the field of ESDM ▶ Experience with designing curriculum and preparing lecture plans and course material for long term and short term training	▶ Overall responsible for planning and executing training activities ▶ Overall responsible for designing curriculum and preparing lecture plans and course material ▶ Responsible for Quality and Certification in training
Manager Training- Long Term	B. Tech. in Electronics Engineering	8 years with 3 years in a similar role	▶ Experience with electronics manufacturing and training in ESDM ▶ Experience with designing of curriculum and preparing lecture plans and development of course material for long term and short term training	▶ Planning and implementing of training activities in designing, manufacturing, assembly, testing ▶ Focus on long term training courses ▶ Evaluation of training activities and identify improvements ▶ Curriculum design ▶ Lecture plans and course material
Manager Training - Short Term	B. Tech. in Electronics Engineering	8 years with 3 years in a similar role	▶ Experience with electronics manufacturing and training in ESDM	▶ Planning and implementing of training activities in designing, manufacturing, assembly, testing

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Experience with designing of curriculum and preparing lecture plans and development of course material for short term training	▶ Focus on short term training courses ▶ Evaluation of training activities and identify improvements ▶ Curriculum design ▶ Lecture plans and course material
Senior Engineer- Electronics (Training)	B. Tech. Electronics Engineering	5 Year	▶ Experience with electronics and component manufacturing and training in ESDM ▶ Experience with designing curriculum and preparing lecture plans and development of course material for long term and short term training ▶ Knowledge of software for electronic design and manufacturing	▶ Undertake training courses in electronics and component manufacturing
Engineer- Training	Diploma in Electronics	3 Years	▶ Experience in electronics manufacturing and training in ESDM	▶ Undertake training courses ▶ Demonstrate practical skills to trainees ▶ Deliver theory lectures
Senior Technician - Training	Diploma / ITI in respective areas	1 year after Diploma or 5 years after ITI in respective areas	▶ Experience in Maintenance of machines and equipment (electronics) ▶ Experience in machine programming and operation (electronics)	▶ Machine programming and operation for equipment used in trainings

Profile/ Designation	Minimum Qualification	Minimum Experience	Other Skill set/ requirements	Key Responsibilities
			▶ Experience in electronics assembly, testing and calibration	

9.4 Governance structure

9.4.1 Selection of the Governance Model for the new TCs

All the existing 18 TCs have been set up under the Societies Registration Act, 1860. The management of affairs mainly rest with the Governing Council constituted by MoMSME, Government of India with the Additional Secretary and Development Commissioner of Ministry of Micro, Small and Medium scale Enterprises (DC-MSME) acting as the President of the Society and Chairman of the Governing Council (GC).

This arrangement has proved effective as most TCs have supported local MSMEs well and have performed financially. Each TC has a separate society and has very decentralised authority and governance structure. DC, MSME being chairman and other two members Director -Tool Room and representative of IF-wing of MoMSME are common members in all 18 GCs.

During the study and preparation phase of this DPR, we analysed different governance models for the new TCs. Under Indian law, there are three legal forms that exist for non-profit organisations. Mainly two forms are relevant for the purpose of the TCSP Program.

- ▶ Society as per society Registration Act, 1860
- ▶ Section 25 companies as per Companies Act, 1956

The two forms mentioned above have distinguishing features as per their respective acts.

Table 21: Comparison of Society Registration Act and Companies Act

Features	Registered Society	No-for-profit Company u/s 25
Setting up and running cost	Nominal	Comparatively more than the society & trust
Formation	Simple	Takes 2-3 months, required to comply with provisions of Companies Act
Jurisdiction	Registrar of society	Registrar of companies
Meetings	Annual Meeting As per Law. Governing Body meeting as per the rules of Society.	Quite Extensive as per the provision of Company Law
Governance	Vests with governing body as per the rules framed by them. Law specifies no rules & regulation	Vests with Board of directors & management committee. Specific provisions for quorum, adoption, ratification and compliance

Features	Registered Society	No-for-profit Company u/s 25
Membership transfer	Impossible	Free or control as per desire
Statutory Regulations	Limited	Exhaustive
Transparency	Transparent (As society act is not so exhaustive requiring statutory compliance for each and every step of business operation)	Fully Transparent (The Companies Law is quite exhaustive requires specific compliance in each activity of business operation)
Perception commercial lenders	Less comfortable	More comfortable
Interest of commercial lenders	Less secured, as Act doesn't provide any rules regarding how the interest of lenders can be settled in the case of bankruptcy	More secured, as exhaustive provisions in companies act about how the interest of lenders can be secured by distributing the assets of the company in case of liquidation
Accountability	More (Can be established, if the rules, regulation and by-laws of the Society are framed in manner to fix accountabilities)	More, (As per the statutory regulations)
Financial Management & Disclosures	Best practices can be adopted through framing regulations. However, Act doesn't provide anything specific on this	Exhaustive provisions in Companies Act providing for financial management and disclosure policies
Modification of Objects	Easy Legal Procedure	Complicated legal procedure
Penalties	Lesser	Higher
External audits	Subject to lesser audit requirement. As Act doesn't provide for various kind of audits of the Society. However, generally the society provide for audit regulations and compliance to audit observations as part of their bye-laws and rules and regulations	Greater degree of control through Auditing framework as per companies Act. E.g. Statutory Audit, tax audit, cost audit etc.
Basic Document	Memorandum of Association Articles of Association with rules & regulations	Memorandum of Association Articles of Association

The Table above outlines difference in the two prominent governance structures. Generally, Companies are construed as more reliable legal entity in the commercial world or to attract private participants because the transparency inherits from the statute itself under which it is incorporated.

However, a society may also bring forward discipline by framing rules and regulations of the society through the governing body. This fact together with the minimal cost of setting up and running and simplicity in its formation makes the society a popular model in the case where purpose is not to finance the cost of the project but optimise the cost and delays.

The existing 18 TCs formed as per society model have made it proven model because of the following facts:

- ▶ Very clear cut authority flow and ownership by other GC members and GMs (as permanent member secretary). It instils competition among individual TCs to excel.
- ▶ The Incentive schemes work better in small groups (individual TCs). It also allowed better performing and surplus generating TCs to retain surplus fund and deploy them best suited to them.
- ▶ Rules and regulation framed by the societies fix the accountability of various authorities in organisation.
- ▶ Delegation of financial power has been developed which fix the authority of each of the officer in management body.
- ▶ Well established system for procurement is being followed as per GoI guidelines and GFR, 2005
- ▶ Matters have been identified on which decision can be taken only by the Governing Body.
- ▶ Annual accounts are audited by the statutory auditors well in time and audit report is placed and adopted by the Governing Body in its annual meeting
- ▶ Compliance to audit observations are strictly complied with and observed by the O/o DC-MSME

Overall the present system is working well and at this stage raising fund is not the sole purpose, it is recommended to continue with the societies for proposed Bengaluru TC with following few minor modifications

- ▶ Governing council can make provision for more membership from OEMs
- ▶ Provision of membership from state technical University who controls most private Engineering colleges
- ▶ One more sector expert in the GC
- ▶ GC usually meets once in six months only and it is suggested to have one executive committee or advisory committee consisting of local MSME/Cluster association members,

sector experts and other stakeholders who can meet quarterly and can advise TCs and can also be delegated with powers higher than GMs

9.4.2 Composition of the Governing Council

As mentioned above, the proposed TC will be set up under the Societies Registration Act, 1860. The management of affairs primarily rest with the Governing Council constituted by MoMSME, Government of India with the Additional Secretary and Development Commissioner, Ministry of Micro, Small and Medium Enterprises (DC-MSME) acting as the President of the Society and Chairman of the Governing Council of each TC.

The Governing Council of TC will comprise four types of members as explained below:

Table 22: Governing Council of Bengaluru TC

Representation in the Governing Council	Suggestive recommendations
(i) Ex-officio members	
Representative from Government of India ▶ Development Commissioner, Ministry of MSME as Chairman, ▶ Industrial Advisor or Director of TR or Program Coordinator, ▶ Director DI-MSME of the respective States, ▶ Representative from Integrated Finance Wing of the Ministry of MSME. Representative from State Government ▶ Official from concerned industry department, ▶ Official from concerned department of technical education/training.	▶ Secretary, Industries ▶ Commissioner/Director, Technical Education & Training
(ii) Institutional members	
▶ Representative of state level industrial promotion body ▶ Representative of association of small scale industries ▶ Representative of the local chambers of commerce and industries/ Industry Promotion Institution/NSIC.	▶ KSIIDC, KEONICS ▶ Karnataka Small Scale Industries Association (Kassia) ▶ Bangalore Chambers of Industry and Commerce (BCIC)
(iii) Professional and other members	

Representation in the Governing Council	Suggestive recommendations
▶ One expert representing the fields of finance & accounts/ law/management, ▶ One representative of small scale electronics producers, ▶ One representative of OEM, ▶ One representative of major ESDM manufacturer in the region ▶ Representative of Technical University of the state which governs engineering colleges	▶ To be nominated by O/o DC-MSME ▶ To be decided by O/o DC-MSME
(iv) MD/Executive Director/GM/PD of the Society	
On his appointment, the Executive Director or General Manager of the Society shall automatically become ex-officio member of the Governing Council during the tenure of his office, as <i>Member Secretary</i> .	

▶ Role of the governing council

The Governing Council will discharge such duties and responsibilities, exercise such powers and undertake and carry out such activities as considers essential with a view to attain the aims and objectives as per the Memorandum of Association of the Society, with particular reference to the following;

- To prepare and execute plans and programmes for the establishment of the TC based on the plan of operation and to carry on its administration and management after such establishment.
- To prepare, consider and approve the policies and strategies of the Society and to reconsider and amend the said policies and strategies whenever appropriate.
- To receive grants and contributions and to have custody of the funds of the society.
- To prepare, consider and approve the budget estimates of the society every year.
- To prepare and maintain accounts and other relevant records and annual statement of accounts including the balance sheet of the society.
- To open, conduct and prescribe courses of study, training and research in ESDM (design and manufacturing) and subjects.
- To fix and receive such fees and other charges from persons undergoing training as may be necessary.
- To prescribe rules and regulation for the admission of candidates to the various courses of training.
- To lay down standards of proficiency to be demonstrated before the award of diplomas, certificates and other distinctions to the trainees.

- To institute and award scholarships, prizes and medals.
- To provide for and supervise the residence, health, discipline and the well-being of the trainees in the Society.
- To create subject to the provisions of Rule 68 supra technical, training, research, administrative, ministerial and other posts under the Society and to make appointments thereto on such terms and conditions as deemed appropriate.
- To co-operate with any other organisation in the matters of education, training, management and allied subjects.
- To enter into arrangements for and on behalf of the society.
- To sue and defend all legal proceedings on behalf of the Society.
- To appoint committee or committees for the disposal of any business of the Society or for advice in any matter pertaining to the Society.
- To delegate to such extent it may deem necessary any of its power to any officer or committee of the Governing Council.
- To consider and pass such resolution on the Annual Report, the annual accounts and the financial estimates of the Society as it thinks fit.
- To make, inform, adopt, amend, vary or rescind from time to time rules and by-laws for the regulation of and for any purpose connected with the management and administration of affairs of the Society and for the furtherance of its aims and objectives.
- To make, adopt, amend, vary or rescind from time to time rules and by-laws for
 - For the conduct of the business of the Governing Council and the committee(s) to be appointed by it,
 - For delegation of its powers,
 - For fixing quorum.
- To sell, lease, mortgage or exchange and otherwise transfer all or any portion of the properties of the Society.
- To establish a provident fund for the benefit of the employees of the Society.
- To perform such additional functions and to carry out such duties as may from time to time be assigned to it by the Society.
- To establish procedure in respect of services and technical advice to be rendered to the industry by the Society and the levy and collection of charges for the same.
- To delegate its powers as may be deemed fit and appropriate but not the powers for:
 - Altering, extending or abridging the purposes of the TC within the meaning of the Societies Registration Act, 1860.
 - Amalgamating the TC either wholly or partially with any other TC having similar aims and objectives.
 - Altering, extending or abridging the Rules and Regulations of the TC within the meaning of the Societies Registration Act, 1860.

- Shifting the existing location or altering the capacity of the TC.
- Making capital investment exceeding the approved budget.
- Borrowing money except for working capital exceeding the approved budget.
- Transferring by way of mortgage, pledge, hypothecation or otherwise any assets, moveable or immovable, except as security for working capital.
- Appointing bankers and auditors.
- Generally anything extraordinary and of major importance.

► **Roles and responsibilities of the member secretary (GM/PD/MD)**

- Plan, direct, co-ordinate, organize and supervise day-to-day work of the society.
- Implement policies, strategies and such programs of the society and attend to all statutory requirements imposed thereon.
- Prescribe the functions, duties and responsibilities for all officers and staff of the society, give them appropriate instructions and exercise such supervision and disciplinary control as may be necessary.

► **Roles and responsibilities of the O/o DC-MSME in management of the TCs**

- Support DC-MSME in executing the responsibilities as the Chairman of the Governing Council of all TCs.
- Support in implementation of strategic projects and policies from the central to the TC levels.
- Act as the nodal point of coordination between the TCs and the DC-MSME.

10. Marketing plan of Bengaluru TC

The marketing of Bengaluru TC would require specific actions in order to engage with potential customers and clients in the catchment area. A series of activities is therefore required to be planned for effective marketing of Bengaluru TC to promote its business, product or services. The broad suggestive framework for marketing of Bengaluru TC would include the following;

Figure 14: Suggestive framework for marketing of TC



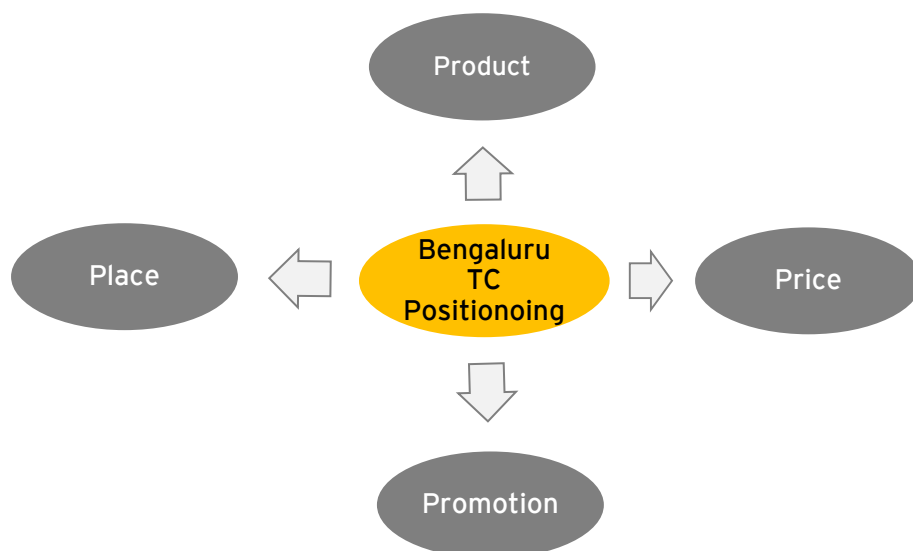
In line with the above suggestive framework, a detailed Go to Market plan of the proposed TC will be prepared subsequently by the Cluster Network Manager (CNM) along with the GM and marketing team of the TC. The role of CNM for marketing would be very crucial and will act as an additional arm of the marketing wing of the proposed TC. It will further strengthen its market linkages with the MSMEs in the cluster it serves. CNM will also market the TC within the trade and industry associations, academia, educational institutions, applied research institutions, service providers, other government support institutions, workers and skill seekers.

As part of the marketing initiative, CNM would work closely with MSME clusters in the region to understand their needs and requirements and involve OEMs/ tier 1 players in the region. Based on the observations, the marketing strategy of the TC would be customized targeting various focus groups including technical and training institutes. Further, the CNM would be part of the consolidation of the results and recommendations of the diagnostic into a strategic plan for cluster development. The CNM would also represent the TC in various industry oriented outreach programmes and workshops. This would help in two ways; promoting the TC and understanding industry perspective and future areas of focus. The same will help to identify key areas of focus for the TC and align the future marketing strategies accordingly.

Hence, the CNM would promote the TCs in among the newly developed partnerships for mutual benefit around identified programmes / initiatives.

The plan should clearly position the proposed TC's marketing mix with respect to its four Ps - product, price, place and promotion. The suggestive points which needs to be taken care while designing the Go To Market Plan for the Bengaluru TC has been highlighted below:

Figure 15: Positioning of marketing mix for proposed TC



Product

An ESDM TC with a focus on areas such as Medical Electronics, Industrial Electronics, Avionics, etc. is proposed to be developed at Bengaluru based on the existing ESDM ecosystem in Karnataka, the ecosystem for entrepreneurship in Bengaluru, and government impetus for this sector in the State. The product and service offering of the proposed TC therefore has been carefully derived keeping in view the existing gaps to address specific requirements of this sector. Further the shortlisted specialisations and respective courses to be offered by the proposed TC have been done keeping in view the shortage in the availability of required skill sets in the labour force across the industry.

The existing ESDM focussed MSME TCs majorly focus on tool room requirements for the ESDM industry, PCB design and manufacturing, and design, testing and repairs. There is a need for a unit for electronics assembly, as well as for end-to-end consultancy services for entrepreneurs, including concept creation, product ideation, and creation of prototypes. As a differentiator and keeping the market needs in mind, we have proposed an ESDM TC in Bengaluru with a focus on segments such as medical electronics, industrial electronics, avionics, etc. We have also proposed an electronics assembly unit, testing and calibration services, and an innovation centre for budding entrepreneurs. The centre would encourage final year trainees to start their own

ventures by providing necessary support like finance, machining, availing benefits of Government schemes etc. for a period of 3 years.

The summary is provided below:

The key offerings of the proposed TC will be ESDM focused assistance like; design and consultancy, creation of prototypes, electronics assembly, testing and calibration, training for skill development with respect to various specialisations. Focus areas would include:

- Innovation, design, and consultancy services: This includes concept creation, product ideation, business plan creation, and manufacturing prototypes, as well as consultancy services in the field of product design.
- Electronics Assembly, Testing and Calibration services.
- Long and short term training programmes in software for electronic design and manufacturing, etc.
- Incubation support to the trainees/budding entrepreneurs for their start-up ventures

Price

As per the study and discussions with GMs of some of the existing TCs, the proposed TC should adopt the cost plus pricing approach for its products and services during its initial years of operation and thus ensuring operating profit for sustainability. Most of the existing MSME TCs follow the cost plus pricing approach only for all of their products and services

As a differentiator from the existing MSME TCs, it is proposed that once the TC will strengthen its brand and credibility in the market it should gradually move towards market-based pricing with defined margin levels (margin based costing). Then, the TC will have to work towards optimisation of its processes and operations to sustain its margins in the competitive environment.

The above mentioned pricing models are suggestive and will depend on the detailed analysis while preparing the Go To Market Plan with the support of the CNM

Promotion

Promotion of TCs products and services is one of the most important components of the Go To Market Plan for a new set-up. Hence, below are some of the suggestive points which might be considered while making the final Go To Market Plan for the proposed Bengaluru TC.

► Increasing visibility to external audience

- Encourage and execute early communication and promotion of activities by TC which are relevant to key external audiences including industry, media, technical media etc.
- Producing a steady, reliable stream of quality outbound communications that highlights;
 - Research innovations and technology evaluations coming from the TC and its partnerships.

- Special events and conferences hosted or supported by TC.
- Working with industry partners to identify projects for joint publicity.
- Develop Facebook/ LinkedIn/ Twitter/ YouTube presence to connect to students.
- Ensure current marketing message is being maintained with all social media platforms administered by these TC.
- ▶ **Engaging internal stakeholders**
 - Conduct media and website training on a regular basis for all interested faculty and staff.
 - Leverage active partnerships with the industry and community, inviting departmental and staff participation.
 - Ensure department faculty and staff are informed of the progress of the TC with respect to each goal.
- ▶ **Other Activities**
 - **Website:** Develop a website showcasing all highlights of the TC.
 - **TC fast facts:** Fast fact can be a two-page information sheets describing the highlights of TC. It can be made available online and increase the visibility to external audiences.
 - **TC online email newsletters:** Preparation and delivery of high-quality email newsletters from TC to industrial units, associations and other partners with the latest research announcements, news and more of engaging and interesting information to these external audiences.
 - **High quality print promotions:** High quality print promotions coordinated by TC communications, which maintains the Bengaluru TC as a brand to be utilised in outreach efforts.
 - **Industry tie-ups:** Partner with Industries and other technical education institutes to increase the visibility of TC. Explore opportunities to participate in publications and other co-branding opportunities with these partners from time to time.
 - **Maintain consistent social media presence:** Ensuring consistent, exciting messaging is posted on active social media platforms including the TCs Facebook page, Twitter account, YouTube channel and others. Promote the presence of TC on these platforms to students, alumni and supporters while acting as a social media hub for internal departments
 - **Roadshows** to promote the TC and engage industry players

Place

Bengaluru is an ESDM hub, with several large players as well as MSMEs. An ecosystem for ESDM is already in place, with MSMEs across the value chain located around the region. Bengaluru is a key location for foreign investments in the ESDM sector. All these location advantages will be leveraged while preparing the detailed marketing plan to establish the proposed TC as one of the prominent TCs catering to the ESDM Sector.

As a part of developing the go to market plan GM would work with the CNM, during the final stages of the construction, to prepare a detailed marketing plan keeping in view the focus areas of the TC. This team, with support from CNM, would be responsible to conduct the suggestive activities as mentioned in the promotion component and lead the marketing initiative for the TC.

In view of the above broad framework the following would be undertaken for marketing of the TC during its inception to start with. It is proposed to keep aside an initial one time marketing budget for completing most of the below mentioned activities through third party vendors:

Table 23: Suggestive marketing activities, ownership and timeline

Phases	Activity	Ownership	Timeline
Preparation of promotional materials	- Designing brochure of TC (through outsourcing) - Short video film of TC infrastructure and facilities available (through outsourcing- post completion of the infrastructure/construction) - Development of TC website (through outsourcing)	Marketing team, GM and CNM	Construction and Post construction phase
Pre marketing activities	- Preparing list of industrial association bodies in the Bengaluru catchment, district and state. - Preparing list of industries in consultation with DIC. - Shortlisting of perspective players' with respect to product range and process. - Design a brief questionnaire. - Preparing list of engineering colleges, ITIs, polytechnics, in the catchment area.	CNM and GM	Construction phase
Targeting the manufacturing units	- Send the brochure along with cover letter and short questionnaire to the shortlisted industries. - Seek time from large industries and industry body associations to give presentation on the capability statement of Bengaluru TC with respect to Assembly, testing and calibration, design and consultancy services, etc. - Send representatives to get the filled questionnaire or fill the questionnaire circulated earlier.	GM, Manager Marketing, CNM and TP	During installation and commissioning of machines for manufacturing

Phases	Activity	Ownership	Timeline
	- Analyse the questionnaires received with respect to production, consultancy, training requirements of industries. - Meeting the key industrial units identified in the analysis to further understand their needs with respect to Assembly, testing and calibration, design and consultancy services, etc. - Organise as well as participate in industry oriented outreach programmes/ seminars/ workshops/ boot camps etc.		
Targeting OEMS	OEMs are important because they involve many industries including MSMEs in the manufacturing of a product. The TC will plan for targeting the same through the following; - Take appointment and meet the OEMs in the region to understand their specific needs with respect to support required in the ESDM sector and training of employees etc. - Presentation on the capability statement of Bengaluru TC with respect to Assembly, testing and calibration, design and consultancy services, etc. - Get their vendor details and understand their portfolio of product requirement at various levels - Plan to Increase product portfolio to cater to the OEMs and their vendors	GM, Manager Marketing, CNM and TP	During installation and commissioning
Targeting technical and vocational training institutes and high schools	- Meet the principle/ HoD of the institutes and present on the capability statement of Bengaluru TC with respect to training infrastructure, faculty, real time learning with on job learning etc. - Seeking permission and presenting the same to final and pre final year students - Getting permission to display the brochure of TC on the notice board of these institutes.	Marketing team (GM) and CNM	During installation and commissioning of machines for training

Phases	Activity	Ownership	Timeline
	Organise as well as participate in industry oriented outreach programmes/ seminars/ workshops/ boot camps etc.		

11. Quality system

The new TC would further aim to obtain various process certificates to enhance its competitiveness. These include:

Table 24: Indicative certifications of quality systems

Name of certification	Area	Details
ISO 9001	Quality Management System (QMS)	▶ This would help to monitor, control, and improve quality of the TC ▶ It is a series of standards that define, establish, and maintain a quality assurance system for manufacturing and service industries ▶ ISO 9001 deals with the requirements that organizations wishing to meet the standard must fulfil
ISO 14000	Environmental Management System (EMS)	▶ Will help to address various aspects of environmental management of the TC ▶ It provides practical tools to identify and control environmental impact and constantly improve their environmental performance ▶ EMS will equip the TC with procedures appropriate to ensure that TC operations do not lead to any significant environment impact.
ISO 29990	Learning services for non-formal education and training	▶ For quality professional practice, performance and enhance transparency ▶ Allows for comparison on a worldwide basis of learning services, and management standards in the field of non-formal learning
ISO 50001	Energy management systems	▶ Gives requirement for energy management systems ▶ Establishes framework for industrial plants; commercial, institutional and government facilities and entire organisations to manage energy usage
OHSAS 18001	Occupational Health and Safety standard	▶ Is an internationally-applied British Standard for occupational health and safety management systems ▶ It provides for the elements of an effective safety management system which can be integrated with other management systems and help organizations achieve better occupational health and safety performance

Name of certification	Area	Details
		▶ It helps the organization to assess the potential hazards and their associated risks due the operations
ISO / IEC 17025	General requirements for the competence of testing and calibration laboratories	▶ Main ISO standard used by testing and calibration laboratories. In most major countries, ISO/IEC 17025 is the standard for which most labs must hold accreditation in order to be deemed technically competent.
IPC-A-610	Acceptability of Electronic Assemblies	▶ Used worldwide by original equipment manufacturers and EMS companies.

▶ The TC will essentially adopt the 5S technique for process improvement to clean and organise its workspace to improve the workflow. Further trainees will be trained and exposed to 5S process improvement technique. This would require the TC to do the following;

- **Sort:** To de-clutter the workspace and prioritise tools and materials used frequently, the TC will sort everything in the work area so that unnecessary items (tools, parts, equipment, storage bins, etc.) can be removed and either discarded or stored elsewhere.
- **Straighten:** This will involve creating storage solutions that would facilitate orderly work flow of everything in the TC by placing more frequently used items for quick and easy access.
- **Shine:** This will require efforts in the initial phase involving painting and installing better lighting to make the workspace clean and tidy. Further during ongoing activities at the TC, the work space and equipment will be cleaned and restored to their proper place at the end of each shift. Basic preventative maintenance tasks like tightening, oiling, restocking will also be part of this. The workstation would then be ready for the next user (or the next day) and the order created in the first two steps will be preserved.
- **Standardize:** The objective of the same would be to make everyone in the TC familiar about the current steps in order to follow and establish expectations. TC would conduct training, create documented procedures, work instructions, use visual guides, checklists, and/or photos for easy understanding of any changes made. Standardised ways will increase efficiency and be user friendly for TC employees and others.

- **Sustain:** Sustaining the processes would be important to ensure that focus doesn't drift away from 5S. TC would adopt strategies like daily meetings, mini-audit and ongoing continuous improvement efforts to sustain the 5s.

Infrastructure and Facilities



12. Infrastructure and facilities

The infrastructure of the proposed TC at Bengaluru has been developed based on the requirements, recommended norms, capacity data of the existing TCs capacity, discussions with key stakeholders and the experience of the team in providing professional advice on similar projects. The team has studied the applicable AICTE/ NCVT norms for development of infrastructure facilities for engineering and technology institutes and detailing out the infrastructure provisions for the proposed TC in view of the same. Leading practises from international training institutes have also been considered. The TC will be built on area of around 10 acres and the layout will have following blocks with required infrastructure:

- ▶ **Electronics Block:** This block will house the Prototyping, Testing and Calibration Centre and highest priority has been given to the allocation of space for installation of machines for product prototyping, assembling, and testing and calibration activities. Depending on the space required by the machines, the area for these activities should be demarcated which would also include other facilities like toilets, washrooms and change rooms, adequate space for their mobility, clean drinking water in their vicinity etc. In addition to the other facilities this block will house a 500 square feet ISO Class 7 (Class 10,000) Cleanroom for assembly of PCB and product assembly. Details on the Cleanroom classification, requirements and cleaning and maintenance procedures are provided at the end of this section.
- ▶ **Training Block:** This area will have classrooms, labs, conference hall, faculty rooms and facilities for training / seminars/ workshops etc.
- ▶ **Administrative Block:** This block will have GM and DGMs Office and secretariat. It will also house office and desk space of all management, professional staff, administrative and support staff, library and other amenities such as conference room with video conferencing facility, meeting rooms etc. This block will also house the Innovation and Design Centre which will consist of office for the innovation and design teams and conference rooms for client interactions.
- ▶ **Manufacturing Incubation Block:** This block will consist of around 20 demarcated rooms of 200-400 square feet for house EMS facilities for 40 entrepreneurs. In addition the block will include office facilities, conference room with video conferencing facility, meeting rooms, reception area etc. for common use of the entrepreneurs.
- ▶ **Utilities Block:** The utilities block comprises of areas that will house main electrical meter, VCBs, HT panel, distribution panel and power back up DG plant. The utilities block will also house water pumps, purification plant and chilling plant, water treatment plant, etc. The open

areas around the building will also have some utilities provision such as rain water harvesting pits and panels for the operation of external lighting. Utility will also include sewage treatment plant at an appropriate location.

- ▶ **Hostel and staff accommodation:** The hostel blocks will comprise of accommodation for the students (separate for males and females). A few staff quarters (for driver, security officer, wardens - boys and girls hostel, maintenance -mechanical and electrical, electrician, store keeper etc.) will also be constructed to house some of the emergency staff or on need basis.
- ▶ **Open Areas:** The open areas comprise of drive way, rain water harvesting pit and landscaped areas including the facade and main entry of the TC. The size of the open area will depend on the design strategy adopted by the CMC.
- ▶ **Others:** This will include canteen, parking, security room etc.
- ▶ **Basic amenities:** Apart from the above facilities the campus will have basic amenities with provision for;
 - Drinking water
 - Toilets
 - Dining room as a hygienic area and place away from the work environment for rest breaks and the consumption of food
 - Change rooms to enable employees to change (e.g. uniforms or dirty work clothing) with privacy and security. Such facility helps to reduces employee exposure to and potential spread of contaminating substances used in work processes
 - Personal storage for the secure and clean storage of personal belongings or clothing, lockable where necessary
 - Immediate availability of doctors, health supervisors and ambulance and sufficient first aid kits
 - Fire safety with smoke alarms to protect people against death and injury from fires. Providing fire safety awareness to employees and conduct fire drill from time to time
 - Fire assembly area in case of fire or natural calamity
 - Dustbins with proper colour coding in green for organic, yellow for glass, white for paper, grey for metal, blue for plastic, red for hazardous products

Table 25: Details of proposed infrastructure

Details	Nos.	Total Area (Sq. mt.)
Production Block		3,712
Electronic Assembly Unit/ Clean Room	2	216
Testing Labs	10	540

Details	Nos.	Total Area (Sq. mt.)
Calibration labs	3	162
Production Office (Cabins, Documentation & others)		250
Innovation and Design Centre		250
Entrance Lobby		55
EMI / EMC ROOM + compressor		219
Server room/electrical room/ahu room		246
Circulation and Stairs		1054
Future Expansion		610
Toilet		110
Training Block		4,226
Sn. Manager/HoD Room	1	52
Training Office		
Manager Room	1	24
Reception & Counselling		95
Faculty Room		196
Library with efacility	1	152
Multi-purpose hall for examination/drawing/reading room	1	210
Classrooms	11	825
Labs	12	720
Electronic Assembly Workshop	1	120
Placement Cell, VC, Tool Store, Electrical Panel, House Keeping, Circulation		180
Toilet		1652
Admin Block		1038
GM Office & Sect		63
DGM Office		40
Purchase Officer cabin		55
Accounts cabin		
HR & Admin		
Marketing		40
Reception Area		94
Record Room		38
IT Dept/Server Room		52
Manager Admin Cabin		44

Details	Nos.	Total Area (Sq. mt.)
Pantry		20
Store		35
Ups, Electrical, Fire Control room		32
Record room		35
IT department		25
Server room		25
Circulation. Lobby, staircases		400
Toilet Block		40
Conference Rooms		839
Conference Hall 1 (for 30 people)	1	196
Conference Hall 2 (for 150 people)	1	540
Toilet		36
Lunch Area		67
Others		1,978
Canteen (incl. toilets, kitchen, store, common facility etc.)		1395
Utilities Room - DG Set, Transformer, UPS		373
Security Room (incl toilet)		180
Bank Counter		30
Staff Quarters/ Guest House	10	580
Manufacturing Incubation Block		903
EMS/Production Units + Office Space	19	760
Conference Rooms, Reception Area, Common Utilities Room	2	108
Toilet		35
Total		13,276

- **Hostel and staff accommodation:** The hostel block will comprise of accommodation for students enrolled under fulltime courses along with the hostel warden. Based on calculations, it has been estimated that around 800 trainees will be in fulltime courses at any given point of time. Further, on the basis of study conducted and discussions with heads of some of the existing MSME TCs, the provisioning of hostel facility has been done for approximately 20% of the above mentioned capacity. Therefore, it is proposed to develop the hostel capacity for around 200 trainees and out of which 25% (around 50) will be reserved for female trainees. The hostel building has been planned to be G + 3 structures with provision for further vertical expansion depending on future requirements. Part of the ground floor of the hostel building will be reserved for use as hostel office, other common facilities etc. The space on rest of the floors will be developed as rooms for accommodation of students. The details of proposed

hostel infrastructure have been given in the following table. Also there will be a provision for executive hostel which will accommodate visiting faculties, guests etc. Additionally, eight emergency staff quarters will also be constructed to house some of the key management officials as per requirement. Initially the staff quarters block will be a G+1 structure with a provision of further expanding it vertically depending on future requirements.

Table 26: Details of proposed infrastructure for hostel

Hostel	Category	Floors	Trainees per Room	Number of trainees	Area per trainees (sq. mt.)	Total Area (sq. mt.)
Hostel No.1	Boys	G+3	4	145	8	1,160
Hostel No.2	Girls	G+3	4	55	10	550
Hostel No.3	Executive	G+3	1	32	10	320
Total				210		2,030

Note: All viable options will be studied to decide on the design of the proposed block for hostel and staff quarters. The number of floors for these facility buildings and all other associated details can be further finalised with the appointment of CMC for development of the campus for TC.

As per the details of proposed infrastructure given in above two tables, the construction of the Bengaluru TC will include development of 15,306 (13,276 + 2,030) square metre of built up area in total. Per square metre cost of construction has been estimated to be INR 31,800. Further, the tentative cost for development of underground water tank, rain water harvesting system, storm water drainage network, water treatment plant, sewage treatment plant, street lighting, development of internal roads, landscaping and grey water treatment plant for entire campus has been estimated to be around INR 450 lakhs. Further discussion has already been carried out with officials of RIICO for development of boundary wall which is estimated to cost around INR 180 lakhs. The detail for development of campus infrastructures is as follows;

Table 27: Cost for development of campus infrastructures

SN	Hostel	Cost (in INR lakh)
1.	Cost of development of build-up area @ 31,800 per sq. mt. for 13,276 sq. mt.	4,867.30
2.	Underground water tank, rain water harvesting system, storm water drainage network, water treatment plant, sewage treatment plant, street lighting, development of internal roads, landscaping and grey water treatment plant and boundary wall	630

3.	Total	5,497.30
4.	Contingency @ 5%	274.87
5.	Grand total	5,772.17

Further provisioning towards establishment of other associated infrastructure will be done for the planned capacity and is listed in the following table;

Table 28: Details of other infrastructure

SN	Other Infrastructure	Nos.	Unit Cost (INR lakhs)	Total Cost (INR lakhs)
1	Office & Storage Furniture	0.5	60	30
2	Hostel Furniture	0.25	210	52.5
3	Canteen and Hostel Dining hall furniture	0.6	20	12
4	Kitchen equipment	20	2	40
5	Other Office equipment, IT infra etc	1	50	50
6	Laptop	0.6	20	12
7	Desktop	0.5	50	25
8	Photocopier cum printer	2	8	16
9	Vehicle	12.5	2	25
10	Preliminary and Pre-operative expenses	258		258
11	Others (Misc & Unforeseen)	50	1	50
Total				570.50

Above all, the development of campus infrastructure will be done keeping the following guidelines in mind;

► **Campus Layout/ Plan:** Campus layout is crucial for successful performance of the TC. At least 30% green area will be maintained and landscaping will be done to improve aesthetics of the surrounding while maintaining habitats conducive to natural fauna. Also, efforts will be made to conserve existing vegetation and other rich biodiversity in the premises as well as vicinity. Apart from this, there will be the following considerations while planning the campus layout:

- **Site drainage:** Existing drainage pattern of the available site will be studied and the drainage system required for the TC will be constructed in line with the drainage pattern. Storm water drain will be constructed separately so as avoid mixing of the fresh and the waste water.
- **Heat island effect:** Site will be planned properly to mitigate the heat island effect (Thermal gradient difference between developed and undeveloped areas) by following measures:
 - At least 40% of the non-roof impervious surfaces on the site (including parking lots and walkways) will be shaded

- Pavements and walkways should be painted in light colour (solar reflectance index > 0.5)
 - **Boundary:** The campus will be provided with boundary wall in all the directions to avoid encroachment, theft and safety.
 - Trees will be planted in large numbers to provide natural shade in the open areas. This helps to reduce the temperature on campus in comparison to the vicinity
 - Efforts will be made to utilize natural light to the maximum possible extent and provision should be made for natural ventilation
 - Green building codes may be adopted while designing the building layout so as to ensure following environmental safeguards;
 - Renewable energy in terms of solar water heater, solar panels, solar street light may be used
 - LED/CFL lights will be used within the premises to reduce the energy consumption
 - Provisioning of water treatment and recycling facility to reduce water consumption
 - Water harvesting arrangement to recharge the ground water and/or reduce dependency on ground water
 - Provisioning of waste management including practices to minimize waste generation, etc.
 - Criteria mentioned in the National building code will be followed so as to ensure that all the safety precaution like escape routes/emergency exits, setting of machinery providing appropriate working space, etc. is maintained
 - Hazardous material like asbestos sheets should be avoided in any part of the structure
 - Substitutes to natural resources will be encouraged in appropriate ratio so as to decrease natural resource consumption while maintaining the required strength (example: Fly ash may be used in small percentage instead of cement for construction, composite material may be used construction of doors instead of wood, etc.
 - Provision of toilets for both men and women will be made in appropriate number so as to ensure comfortable and hygienic working conditions
 - Energy efficient products like 5 star rated air conditioner, refrigerator, energy efficient motors, etc. will be used in the TC's
- **Detailed building plan preparation:** The building design is crucial for sustainable performance of the TCs. A number of factors including energy efficiency, materials of construction, natural light and ventilation, insulating, etc. must be kept in mind in order to maintain eco-friendly operations. Also, adherence to aspects related to safety like, resistant to earthquakes, proper evacuations, etc. will ensure successful operations of the TC.

- **Construction management:** Construction at the site involves a number of activities. These activities may lead to certain EHS impact on the existing natural settings and therefore, appropriate mitigation measures will be required to be put in place so as to minimize or avoid this impact. A snapshot of the issues with the basic principles to be kept in mind during construction is given in the EHS section of this DPR.

ISO 7 (Class 10,000) Clean Room requirements, cleaning and maintenance procedures

A cleanroom is a controlled environment, typically used in manufacturing processes and scientific research facilities. A cleanroom is designed to control contamination by monitoring airborne and surface particles, liquid levels, and static electricity. More accurately, a cleanroom has a controlled level of contamination that is specified by the number of particles per cubic meter at a specified particle size. The following table indicates the maximum allowed particles in a ISO 7 or Class 10,000 (as per US FED STD 209E) clean room

US FED STD 209E Class	ISO Equivalent	maximum particles/ft ³				
		≥0.1 µm	≥0.2 µm	≥0.3 µm	≥0.5 µm	≥5 µm
10.000	ISO 7	350,000	75,000	30,000	10,000	70

Contamination can be caused by a number of environmental factors such as people, activities (such as movement), outside contaminants, HVAC systems and more. Therefore contamination control needs to be achieved by using the proper high-efficiency particulate air (HEPA) filtration system, installation of air shower at entry (may not be required for an ISO 7 air shower), furniture, procedures, garments, cleaning tools, wipes and more. In addition, to maintain an anti-static clean room for electronic assembly, provision for antistatic mats on the floor and working benches, Antistatic bags, antistatic component storage bin, wrist strap, static charge meter, antistatic storage rack, antistatic tools etc. needs to be made.

Some of the common do's and don't's for the clean room include:

- Only authorized personnel will be allowed inside the cleanroom.
- All personnel entering the clean room should use a face mask, hair cover, gown, antistatic wrist bands and anti-static slipper.
- Before entering the anti-static areas personnel must use the static charge meter to ensure they are safe to enter the area.
- Wooden/mechanical pen/pencils, perfumes, colognes, watches, jewellery, cassette players, phones, beepers, combs, cardboard or non-cleanroom approved papers are not allowed inside a clean room
- The clean room workstations, floor and ceiling must be cleaned regularly using specialized equipment only

- | |
|--|
| <p>f) The clean room should be tested on annual basis to ensure that the air quality within the clean room is being managed.</p> |
|--|

13. Expenditure pattern

13.1 Capital expenditure

Total capital expenditure to the tune of around INR 12,952 lakhs is envisaged for the setting up of new TC at Bengaluru. Summary of the Capital Expenditure is provided as below:

Table 29: Capital expenditure

Capex	Cost (INR Lakhs)
Plant and Machinery (including contingency)	6,581
Infrastructure (including contingency)	6,371
Total Capex including contingency	12,952

In addition to the above mentioned capital expenditure, pre-operative expenses to the tune of INR 258 lakhs will be incurred towards consultancy fees, obtaining clearances and approvals.

13.1.1 Plant and machinery

Total expenditure on machines to the tune of around INR 6,686 lakhs is envisaged for the setting up of new TC at Bengaluru.

Table 30: Plant & Machinery

Capex	INR Lakhs
Production Machinery and equipment	5,288
Training machines and equipment	979
Contingency @ 5% of capex	313
Total Capex including contingency	6,581

Figures may not match due to rounding

The capital cost estimate for the proposed modernisation project has been prepared jointly by O/o DC-MSME and EY team based on inputs from the following:

- ▶ Discussions at existing technology centres such as IDEMI Mumbai and ESTC Ramnagar
- ▶ Market opportunity assessment by EY team
- ▶ Validation of technology needs by detailed discussions with EMS players such as Indics Electronics, Quantum Aeon, etc.
- ▶ Site visits and discussions with local industry and industry associations such as CLIK, IESA, Commerce and Industries Department, Peenya Industrial Association.
- ▶ Inputs from Office of DC MSME

13.1.2 Land & building cost

Bengaluru has around 20 acres of land available for setting up of the facility of the TC.

Table 31: Land & building cost

SN	Building & Other Infrastructure	Cost (in INR lakh)
1	Cost of development of build-up area @ 31,800 per sq. mt. for 13,276 sq. mt.	4,867
2	Underground water tank, rain water harvesting system, storm water drainage network, water treatment plant, sewage treatment plant, street lighting, development of internal roads, landscaping and grey water treatment plant and boundary wall	630
3	Other Infrastructure (furniture, office, kitchen equipment, office equipment, desktops, vehicle, etc.)	570
4	Total	6,067
5	Contingency @ 5%	303
Grand total		6,370

13.2 Operating expenditure

The operating expenditure for the TC has been classified into variable operating expenditure and fixed operating expenditure.

13.2.1 Variable operating expenditure

Variable operating expenditure has two key heads. Expenditure under each head has been identified for the key income streams:

- a) **Raw materials and Consumables**
 - ▶ Raw materials for electronic assembly
 - ▶ Raw materials for 3-D prototyping
- b) **Utilities (electricity and water)**

Table 32: variable cost assumptions

Assumptions for Variable operating cost	Unit	Norms
Raw material and consumables		
RM for Electronic Assembly	% of Assembly revenue	10.0%
RM for 3-D Polymer Additive Machine	% of 3-D printing revenue	10.0%
Utilities		
Electricity and Water	% of total revenue	4.0%

13.2.2 Fixed Operating expenditure

Fixed operating expenditure has four key heads. Expenditure under each head has been identified for the key income streams:

- c) **Salary and wages/ establishment expenses**

The salary expenses include salary for employees of proposed TC at Bengaluru. There will be 60 employees on regular contract and ~ 59 will be on temporary contract/honorarium visiting.

d) Repairs and maintenance (R&M)

Cost of repair and maintenance has been calculated for

▶ **Plant and machinery installed**

R&M for plant and machinery has been taken as a percentage of plant cost in an operating year.

▶ **Buildings**

R&M for building has been taken as a percentage of building cost in an operating year

e) Calibration Charges

All the testing and calibration equipment will need to be calibrated on a regular basis.

Calibration charges has been taken as a percentage of plant and machinery cost for the testing and calibration equipment.

f) Training expenses

Training expenses primarily comprise of expenses incurred for external faculty visiting to the TC from time to time as part of Short term and Long term trainings. These expenses typically include faculty fees, hotel and transportation.

g) Other production and administration expenses

These include expenditure on heads like transportation/entry tax/ freight, Vehicle expenses, Printing and stationery, traveling and conveyance, audit, consultancy, advertisement, publicity, marketing, telephone, internet, bank charges, miscellaneous expenses. Expenditure under each head has been identified for the key income streams- Finished goods and Training

h) Insurance of new plant and machinery

Insurance expense for new plant and machinery includes the insurance cost for the new machinery to be installed. The same has been calculated as a percentage of the gross block of new machines.

i) Marketing Expenses

Marketing expenses have been taken as fixed values for first year and second year onward

Table 33: Fixed Operating Cost assumptions

Assumptions for Fixed Operating Cost	Unit	Norms
--------------------------------------	------	-------

Salaries & Wages	Detailed assumptions given in a separate table	
R&M (Plant & Mach)	% of Plant	3.5%
R&M (Building) per year	% of Building	2.0%
Calibration Charges (take as 10% of P&M cost after every 5 years)	% of P&M cost for testing and calibration equipment	2.0%
Training Expenses	% of training revenue	10%
Other Prod. & Admin. Exps	% of overall revenue	8%
Insurance cost (New P&M)	% of P&M	0.5%
Marketing expenses (1st year)	Rs. Lakhs p.a	50
Marketing expenses (2 year onward)	Rs. Lakhs p.a	25

► **Manpower and Salary Cost**

Manpower numbers have been designed in line with the expansion plan of the TC and ramp up of the production, training and consultancy.

Manpower salary numbers are in line with the salary structure of existing TCs

Table 34: Manpower and salary assumptions

		Monthly Comp (Rs. / month)	2016- 17	2017- 18	2018- 19	2019- 20	2020- 21	2021- 22	2022- 23	2023- 24	2024- 25	2025- 26	2026- 27
Top Management													
	GM	1,53,861	1	1	1	1	1	1	1	1	1	1	1
	DGM	1,29,327						1	1	1	1	1	1
Sub Total			1	1	1	1	1	2	2	2	2	2	2
Management and Support staff													
Sales and marketing	Manager Marketing	82,777		1	1	1	1	1	1	1	1	1	1
	Officer Sales	35,744			1	1	1	1	1	1	1	1	1
Administrat ion and accounting	Manager Admin. and Accounting	69,204	1	1	1	1	1	1	1	1	1	1	1
	Sr. Officer Admin and HR	62,371						1	1	1	1	1	1
	Sr. Officer Accounting	62,371						1	1	1	1	1	1
	Officer Procurement	35,744			1	1	1	1	1	1	1	1	1

		Monthly Comp (Rs. / month)	2016- 17	2017- 18	2018- 19	2019- 20	2020- 21	2021- 22	2022- 23	2023- 24	2024- 25	2025- 26	2026- 27
	Officer Accounting	35,744		1	1	1	1	1	1	1	1	1	1
	Officer Store	35,744		1	1	2	2	2	2	2	2	2	2
Innovation, Design and consultancy	Senior manager	86,857		1	1	1	1	1	1	1	1	1	1
	Manager Design (Electronics)	82,777			1	1	1	1	1	1	1	1	1
	Innovation Coach	82,777		1	1	1	1	1	1	1	1	1	1
	Sr. Engg. Design (Electronics)	64,806		1	1	1	2	2	2	2	2	2	2
	Sr. Engg Design (Mechanical)	64,806			1	1	1	1	1	1	1	1	1
	Finance Guide	64,806			1	1	1	1	1	1	1	1	1
	IPR Guide	64,806			1	1	1	1	1	1	1	1	1
	Consultant	64,806			1	1	2	2	2	2	2	2	2
Production	Senior Manager Production	86,857		1	1	1	1	1	1	1	1	1	1
	Manager Assembly	82,777			1	1	1	1	1	1	1	1	1
	Manager Testing	82,777			1	1	1	1	1	1	1	1	1

		Monthly Comp (Rs. / month)	2016- 17	2017- 18	2018- 19	2019- 20	2020- 21	2021- 22	2022- 23	2023- 24	2024- 25	2025- 26	2026- 27
	Manager Calibration	82,777			1	1	1	1	1	1	1	1	1
	Manager Planning	82,777		1	1	1	1	1	1	1	1	1	1
	Manager Maintenance	82,777		1	1	1	1	1	1	1	1	1	1
	Sr Engg. Assembly	64,806				1	1	1	1	1	1	1	1
	Sr. Engg. Testing	64,806				1	1	1	1	1	1	1	1
	Sr. Engg Calibration	64,806				1	1	1	1	1	1	1	1
	Sr. Engg. Maintenance	64,806		1	1	1	1	1	1	1	1	1	1
	Engineer	34,240		2	3	4	5	5	5	5	5	5	5
	Senior Technician	29,512		1	2	2	4	6	6	6	6	6	6
	Senior Technician Maintenance	29,512		1	1	1	1	1	1	1	1	1	1
Manufacturing Incubation Centre	Manager MIC	82,777		1	1	1	1	1	1	1	1	1	1
	Officer MIC	35,744			1	1	1	1	1	1	1	1	1
Training	Senior Manager	86,857		1	1	1	1	1	1	1	1	1	1
	Manager Long Term	82,777			1	1	1	1	1	1	1	1	1

		Monthly Comp (Rs. / month)	2016- 17	2017- 18	2018- 19	2019- 20	2020- 21	2021- 22	2022- 23	2023- 24	2024- 25	2025- 26	2026- 27
	Manager Short Term	82,777			1	1	1	1	1	1	1	1	1
	Sr. Engg.	64,806		1	3	5	5	5	5	5	5	5	5
	Engg.	34,240		1	3	5	5	5	5	5	5	5	5
	Senior Technician	29,512		1	2	2	2	2	2	2	2	2	2
Sub Total			1	20	40	49	54	58	58	58	58	58	58
Total (Managem ent and Support Staff)			2	21	41	50	55	60	60	60	60	60	60

Number of Employees on Contract													
	Training	15,000		3	8	10	10	20	20	30	35	40	45
	Contractual Employees (Production)	10,000			4	10	10	10	12	12	12	12	12
	Contractual Employees (Consulting incl. legal)	2,00,000			1	1	1	1	2	2	2	2	2

	Monthly Comp (Rs. / month)	2016- 17	2017- 18	2018- 19	2019- 20	2020- 21	2021- 22	2022- 23	2023- 24	2024- 25	2025- 26	2026- 27
Sub Total		0	3	13	21	21	31	34	44	49	54	59

14. Financial analysis

14.1 Key assumptions

Project construction and commencement of operations

The project construction is expected to start in the financial year 2016-2017. It is assumed that, the construction period and installation of machines shall be completed in 15 months. Full-scale operations will commence at the end of the construction period of 15 months. The infrastructure development will coincide with the arrival of machines to be able to start the operations as planned.

Table 35: Key assumptions

Start of Project	1-Sep-16
Construction period (Months)	15
Commencement of operation, date	1-Dec-17
Number of years, useful life of machines and equipment (as per depreciation rules)	10
Maximum days of operation in a year	300

14.1.1 Income assumptions

► Production

Table 36: Production Assumptions

Equipment	Estimated Machine Rate/Hour	Shift	Hours
Electronic Testing			
Safety Testing			
Temperature Recorder	150	2	16
Winding resistance meter	100	2	16
Digital storage Oscilloscope	100	2	16
High voltage probe	50	2	16
Electronic load	150	2	16
Digital multimeter	18	2	16
(Handheld/desktop)	0	2	16
Digital clamp on meter	10	2	16
Electrical Safety Tester	300	2	16
Impulse generator	400	2	16
Defibrillator Proof test set	80	2	16
Radiation meter	50	2	16

Equipment	Estimated Machine Rate/Hour	Shift	Hours
Gas detector	50	2	16
Environmental Testing			
Environmental chamber	1,000	2	16
Thermal Shock Chamber	1,750	2	16
Vibration Test system	1,000	2	16
Salt spray chamber	500	2	16
Bump/ Shock Test system	1,000	2	16
Vibration plus Environmental Chamber	1,500	2	16
Altitude Test Chamber	1,000	2	16
Fire Safety Test Equipment			
Horizontal and Vertical Flame Chamber	500	2	16
Heat deflection temperature test set	600	2	16
Needle flame test chamber	100	2	16
Tracking test apparatus	100	2	16
Glow wire Test apparatus	100	2	16
Ingress Protection Test			
Test Probe IEC 61032 - 1 set	80	2	16
Digital force Gauge	20	2	16
Dust Chamber	100	2	16
Ingress of water test system- 1 set	2,000	2	16
Other Tests	0	2	16
Microscope	30	2	16
Digital LCR meter	100	2	16
Endurance test set for switches	100	2	16
Test apparatus for devices forming a part of the MAINS plug	100	2	16
Cord anchorage test set	100	2	16
Weights	50	2	16
Creepage Gauges	10	2	16
Ball pressure test apparatus	20	2	16
Oven	50	2	16
Digital power analyzer	200	2	16
Tumbling Barrel	100	2	16
Digital pressure gauge	50	2	16
Flexing test apparatus	100	2	16
Free fall test apparatus	100	2	16
Coated PCB test apparatus	100	2	16
Isolation transformer	50	2	16
UV meter	100	2	16
Sound level Analyzer	250	2	16
Microwave radiation meter	50	2	16
XRay radiation meter	50	2	16
Illuminance meter/ Luxmeter	20	2	16

Equipment	Estimated Machine Rate/Hour	Shift	Hours
Gas pressure gauge	10	2	16
Digital Nano volt/ micro ohmmeter	200	2	16
Thermostat endurance test set	50	2	16
Temperature limiter endurance test set	50	2	16
AC DC current source	50	2	16
EMI/EMC Test Equipment			
ESD Simulator	150	2	16
Anechoic Chamber,	8,500	2	16
Radiated susceptibility and Radiated Emission test system	0	2	16
RF Shielded chamber	500	2	16
Electrical fast transient/burst simulator	400	2	16
Surge Simulator	850	2	16
Conducted RF immunity simulator	400	2	16
Power frequency magnetic field test system	300	2	16
Pulse magnetic field test system	0	2	16
Harmonics/Flicker Measurement test System	600	2	16
Line Impedance stabilizing network	120	2	16
Specialized Equipment for Performance Testing of Medical Electronics, Industrial Electronics, etc.	10,000	2	16
Electronic Calibration			
Electro-Technical Calibration			
Multifunction Calibrator	1,000	2	16
6 and Half DMM	150	2	16
4 and half DMM	20	2	16
Decade Mega Ohm Box	200	2	16
Decade Resistance Box	150	2	16
Process Calibrator	100	2	16
LCR Bridge	150	2	16
Standard Resistors	100	2	16
Sound Level Calibrator	100	2	16
Sound Level Meter	50	2	16
Tachometer Calibrator	100	2	16
Stroboscope	50	2	16
Tachometer	20	2	16
Frequency Counter	200	2	16
Time-Interval meter	50	2	16
Energymeter test System (3 position)	700	2	16
HV Divider	250	2	16
Decade Capacitance Box	150	2	16
Decade Inductor Box	150	2	16
AC/DC Current source	150	2	16
CT Analyzer	100	2	16
CT/PT Calibration System	1,000	2	16

Equipment	Estimated Machine Rate/Hour	Shift	Hours
Thermal Calibration			
Thermo-couple calibration furnace (300 to 1100 degree temperature)	150	2	16
Low Temperature Bath (-80 to ambient degree temperature)	100	2	16
Dry block Calibrator (ambient to 600 degree temperature)	100	2	16
Temperature Indicator	50	2	16
Temperature Indicator with compensation	50	2	16
Standard Platinum Resistance Temperature (PRT) Detector	50	2	16
Standard Thermocouple (Type S) without compensation	50	2	16
Laboratory Temperature Indicator	10	2	16
Humidity Measurement Probe	100	2	16
Mass and Volume Lab			
Standard Weights (E1 Class)	200	2	16
Standard Weights (E2 Class)	200	2	16
Standard Weights (F1 Class)	100	2	16
Semi-micro balance (up to 200 gms)	100	2	16
Precision Balance (up to 6.1 Kg)	150	2	16
Pipette Calibration System	100	2	16
Pressure Calibration Lab (Tertiary)			
Hydraulic Pressure comparator (0-1000 bar)	100	2	16
Pneumatic Pressure Pump (1-20 bar)	0	2	16
Digital Pressure Indicator (-1 bar to 20 bar)	0	2	16
Digital Pressure Indicator (0 to 70 bar)	0	2	16
Digital Pressure Indicator (0 to 700 bar)	0	2	16
Electronic Assembly Unit			
20 person Electronic Assembly Unit with Class 10,000 Clean Room	5,000	2	16
Prototyping Unit			
3D Polymer Additive Manufacturing Machine	3,000	2	16

Machine utilisation	
1 st year of production	10%
2 nd year of production	20%
3 rd year of production	30%
4 th year of production	40%
5 th year of production	55%
6 th year of production	70%

Post the 6th year, the machine utilization has been kept constant at 70%, and a year-on-year increase 5% is assumed in

the production revenue owing to price inflation.

► Training revenue assumptions

Table 37: Training Revenue Assumptions

No.	Trade	Course name	Duration (months)	Fee/ student (INR)	Batch size	No. of Batch/ year
1	Electronic Design and Manufacturing	Advanced course in Embedded Technology	6	1,00,000	40	2
		Basic course in Embedded Technology	3	30,000	40	4
		Electronic/PCB Design and Manufacturing	6	30,000	40	2
		PLC Based Automation Techniques	3	20,000	20	2
		Microcontroller Programming Skills	3	12,000	20	2
		Microprocessor Programming	3	10,000	20	4
		SCADA	1	6,000	20	4
		Computer Aided PCB Design and Manufacturing	12	20,000	40	4
		PCB Assembly	6	10,000	40	4
2	Hardware Repair and Maintenance	Computer Hardware, Maintenance, Installation, Networking and Multimedia	2	8,000	20	4
		Mobile/HDD Repair and Maintenance	2	12,000	40	4
		Refrigerator Repair and Maintenance	3	6,000	20	4
		Electronic Mechanic	12	12,000	20	2
		Electrician Trade Practices	12	12,000	20	2
		Auto Electrician	6	7,000	20	2
		Electronic and Instrumentation Technician	12	12,000	20	2
		SMD Work and rework and electronic repair	1	5,000	20	4
		Small Transformer and Stabilizer Manufacturing and Repair	1	5,000	20	4
		Repair and Maintenance of Telecom Equipment	1	5,000	20	4
3	Computer Hardware and Software	Advance course in Computer Software	6	30,000	30	2
		Advanced Course in Computer Hardware	6	30,000	30	2
		Advanced Computer Networking	2	7,500	30	4
		Diploma in Information Security Management	4	40,000	30	3
		Diploma in Software Programming	3	25,000	30	4

No.	Trade	Course name	Duration (months)	Fee/ student (INR)	Batch size	No. of Batch/ year
		Diploma in Oracle PL, SQL and DBA	4	30,000	30	3
		Diploma in Software Testing	3	18,000	30	4
		Core Java and Java Programming	2	5,000	30	4
		Visual Basics	2	5,000	30	4
		C	2	5,000	30	4
		C++	2	5,000	30	4
		Computer Fundamentals	2	5,000	30	4

► **Consultancy revenue assumptions**

Revenue from consultancy is expected to start in 1st year of operation i.e. 2017-18 when the TC is fully operational and all infrastructures are in place. The below mentioned estimates are on a conservative side and are purely based on the expert judgement and prevailing market rates.

Table 38: Consultancy Revenue Assumptions

Projected Consultancy Revenue												INR Lakhs
S.N	Consulting Areas	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Product Road mapping and Architecture	0	3	3.9	5.1	7.1	10.6	11.7	12.9	14.2	15.6	17.1
2	Concept Creation Support	0	15	19.5	25.4	35.5	53.2	58.6	64.4	70.9	77.9	85.7
3	Electronic and PCB Design	0	57.6	74.9	97.3	136.3	204.4	224.9	247.4	272.1	299.3	329.2
4	Process Design and Engineering	0	3	3.9	5.1	7.1	10.6	11.7	12.9	14.2	15.6	17.1
5	Value Engineering/ Cost Competitiveness	0	6	7.8	10.1	14.2	21.3	23.4	25.8	28.3	31.2	34.3
6	Development Productivity and Lean Manufacturing	0	3	3.9	5.1	7.1	10.6	11.7	12.9	14.2	15.6	17.1
7	Financial Services (Project Financial , Business Plans for funds, Book Keeping, etc)	0	9	11.7	15.2	21.3	31.9	35.1	38.6	42.5	46.8	51.4
8	End User Driven innovation and Open innovation	0	9	11.7	15.2	21.3	31.9	35.1	38.6	42.5	46.8	51.4
9	Certifications and accreditations for electronics	0	3	3.9	5.1	7.1	10.6	11.7	12.9	14.2	15.6	17.1
10	Environment Health and Safety Standards for ESDM Units	0	3	3.9	5.1	7.1	10.6	11.7	12.9	14.2	15.6	17.1
11	Market Development Support to find the vendors, customers and other enablers	0	6	7.8	10.1	14.2	21.3	23.4	25.8	28.3	31.2	34.3
Total		0	118	153	199	278	417	459	505	556	611	672

14.1.2 Project cost and financing

The project construction will be undertaken in a phased manner. In the initial phase, construction of infrastructure for basic training courses is planned along with procurement of basic machines.

Table 39: Project cost and financing

Project cost and phasing		INR lakhs
Particulars	2015-16	2016-17
Project Cost	1,593	11,359
Total	12,952	

The Greenfield TC project will be funded by a grant from Government of India which would be sourced through World Bank loan and equity funding from MoMSME.

14.1.3 Other Financial Assumptions

Terminal value assumptions:	
Discount rate	9.25%
Growth rate in perpetuity	5.0%
Cost of equity	9.25%

Working Capital Assumptions		
Margin Money	%	100%
Cash in Hand	Days	60
Accounts Receivables	Days	90
Suppliers Credit (A/P)	Days	30
Finished goods Storage	Days	30
Inventories (RM, Consumables)		
Finished goods	Days	90
Jobwork	Days	90
Training	Days	90

Inflation (Salary etc)	10%
------------------------	-----

Depreciation Rates		
Asset Class		WDV
Tangible Assets		
	Plant and machinery	13.91%
	Buildings	10.00%
	Vehicles	15.00%
	Furniture & fixture	10.00%
	IT hardware & software	60.00%

14.2 Working capital and cash flow statement

Overall net working capital requirement for the TC is expected to grow from about INR 122 lakhs in 2017-18 to INR 909 lakhs by year 2025-26.

Figure 16: Net working capital requirement

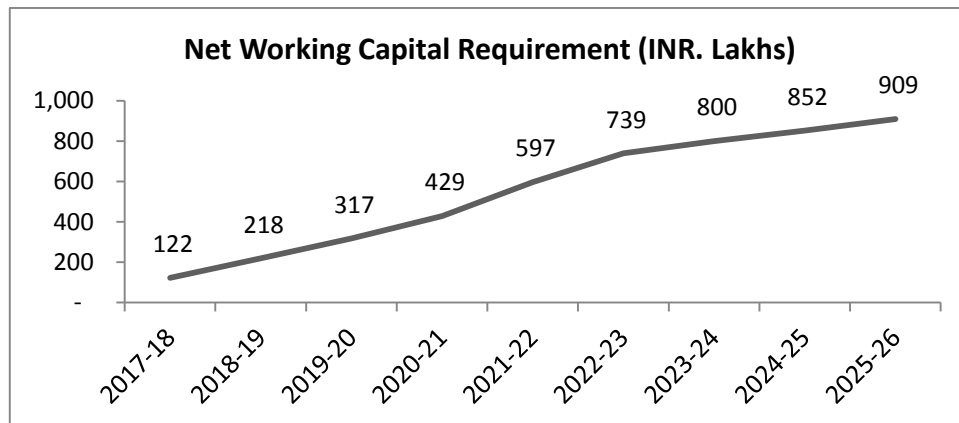


Figure 17: Cash flow closing balance

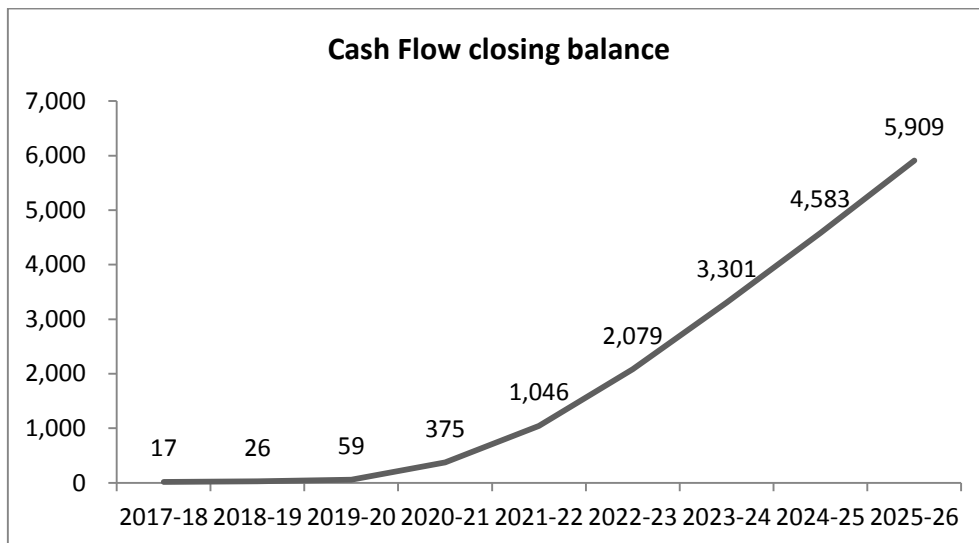


Table 40: Working Capital Schedule

Working Capital Schedule (in Rs. Lakh)											
Year	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Raw Material Storages											
Electronic Assembly and Prototyping	-	0.72	1.44	2.16	2.88	3.96	5.04	5.29	5.56	5.83	6.13
Accounts Receivables	-	121.92	217.28	315.95	426.69	594.50	735.68	796.16	848.65	905.03	965.62
Gross Working Capital Requirement	-	123	219	318	430	598	741	801	854	911	972
Suppliers Credit	-	0.24	0.48	0.72	0.96	1.32	1.68	1.76	1.85	1.94	2.04
Net Working Capital Requirement	-	122	218	317	429	597	739	800	852	909	970

Table 41: Cash flow statement

Cash Flow (in Rs. Lakh)											
Years	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Income post Depn and interest	-27	-339	-1,889	-1,433	-1,020	-589	-57	385	585	717	838
Add: Depreciation		159	1,485	1,308	1,153	1,016	896	791	698	617	545
Inflow from Grant / Capital Fund	1,593	11,359									
Capital to balance -ve cash flows, if any	50	250	450	230							
Total Cash Inflow	1,616	11,429	46	105	132	427	839	1,175	1,283	1,334	1,383
Investment in Assets	1,593	11,359									
Net Change in WC			122	96	99	111	169	142	61	53	57
Total Cash Outflow	1,593	11,359	122	96	99	111	169	142	61	53	57
Opening Balance		23	93	17	26	59	375	1,046	2,079	3,301	4,583
Surplus/Deficit	23	70	-76	9	33	316	671	1,033	1,222	1,281	1,327
Closing Balance	23	93	17	26	59	375	1,046	2,079	3,301	4,583	5,909

14.3 Income & expenditure statement

The income to the proposed centre from training will start accruing from year 2017-18 with completion of phase 1 (basic training infrastructure and procurement of basic machines) and start of basic courses. Initially an income of INR 95 lakhs is expected in year 2017-18. Once the overall construction is complete, the TC revenue is expected to grow from INR 596 lakhs in 2018-19 to INR 3,713 lakhs by year 2026-27.

Income and Expenditure (Rs. Lakhs)												
	Construction period		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Income												
Training Income		95	190	332	427	475	522	575	632	664	697	732
Prototyping, Assembly ,Testing and Calibration			241	492	738	984	1,353	1,723	1,809	1,899	1,994	2,094
Consultancy Income		-	118	153	199	278	417	459	505	556	611	672
Manufacturing Incubation Centre			48	79	116	160	211	271	340	374	412	453
Total Income	0	95	596	1,057	1,480	1,897	2,504	3,027	3,286	3,492	3,713	3,950
Expenditure												
Variable Operating expenditure												
Raw materials and Consumables												
Electronic Assembly			2	5	7	10	13	17	18	19	19	20
3-D Prototyping			1	3	4	6	8	10	11	11	12	12
Utilities (Electricity & water)			24	42	59	76	100	121	131	140	149	158

Income and Expenditure (Rs. Lakhs)												
	Construction period		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total Variable Operating expenditure			26	47	66	85	113	138	149	158	168	178
Fixed Operating Expenditure												
Salary & Wages/ Establishment expenses	27	208	447	581	685	749	863	978	1,092	1,219	1,360	1,496
Repairs and Maintenance												
P&M			182	182	182	182	182	182	182	182	182	182
Buildings			115	115	115	115	115	115	115	115	115	115
Calibration charges for Testing and Calibration Equipment			88	88	88	88	88	88	88	88	88	88
Training Expenses		9	19	33	43	47	52	57	63	66	70	73
Other Prod. & Admin. Exps		8	48	85	118	152	200	242	263	279	297	316
Marketing expenses		50	50	25	25	25	25	25	25	25	25	25
Insurance of new machines			26	26	26	26	26	26	26	26	26	26
Fixed Operating Expenditure	27	275	974	1,135	1,282	1,384	1,551	1,714	1,854	2,000	2,162	2,321
Total Expenditure	27	275	1,000	1,182	1,348	1,470	1,665	1,851	2,003	2,158	2,330	2,499
Income (Gross Margin)	(27)	(180)	(404)	(125)	132	427	839	1,175	1,283	1,334	1,383	1,451
Depreciation	0	93	1485	1308	1153	1016	896	791	698	617	545	482
Income post Depn and interest	-27	-273	-1889	-1433	-1020	-589	-57	385	585	717	838	969

Note: Figures may not match due to rounding

14.4 Balance sheet

Table 42: Balance sheet

Balance Sheet (INR Lakhs)												
Years	Construction Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Liabilities												
Capital fund	1,593	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952
Capital for -ve cashflows	50	300	750	980	980	980	980	980	980	980	980	980
Reserves & Surplus	(27)	(366)	(2,255)	(3,689)	(4,709)	(5,298)	(5,355)	(4,971)	(4,386)	(3,668)	(2,830)	(1,861)
Total	1,616	12,886	11,446	10,243	9,223	8,634	8,577	8,961	9,546	10,263	11,102	12,071
Assets												
Fixed Assets												
Gross Block	1,593	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952	12,952
Less: Depreciation	-	159	1,645	2,953	4,105	5,122	6,018	6,809	7,507	8,124	8,669	9,150
Net Block	1,593	12,793	11,307	9,999	8,846	7,830	6,934	6,143	5,445	4,828	4,283	3,801
Current Assets												
Cash	23	93	17	26	59	375	1,046	2,079	3,301	4,583	5,909	7,300
Current Assets	-	-	122	218	317	429	597	739	800	852	909	970
Total												

Note: Figures may not match due to rounding

During the operational period of the Bengaluru TC, the TC may utilise the accumulated depreciation towards upkeep, maintenance of existing machines or purchase of new machines to offset any impact of change in technology.

14.5 Profitability

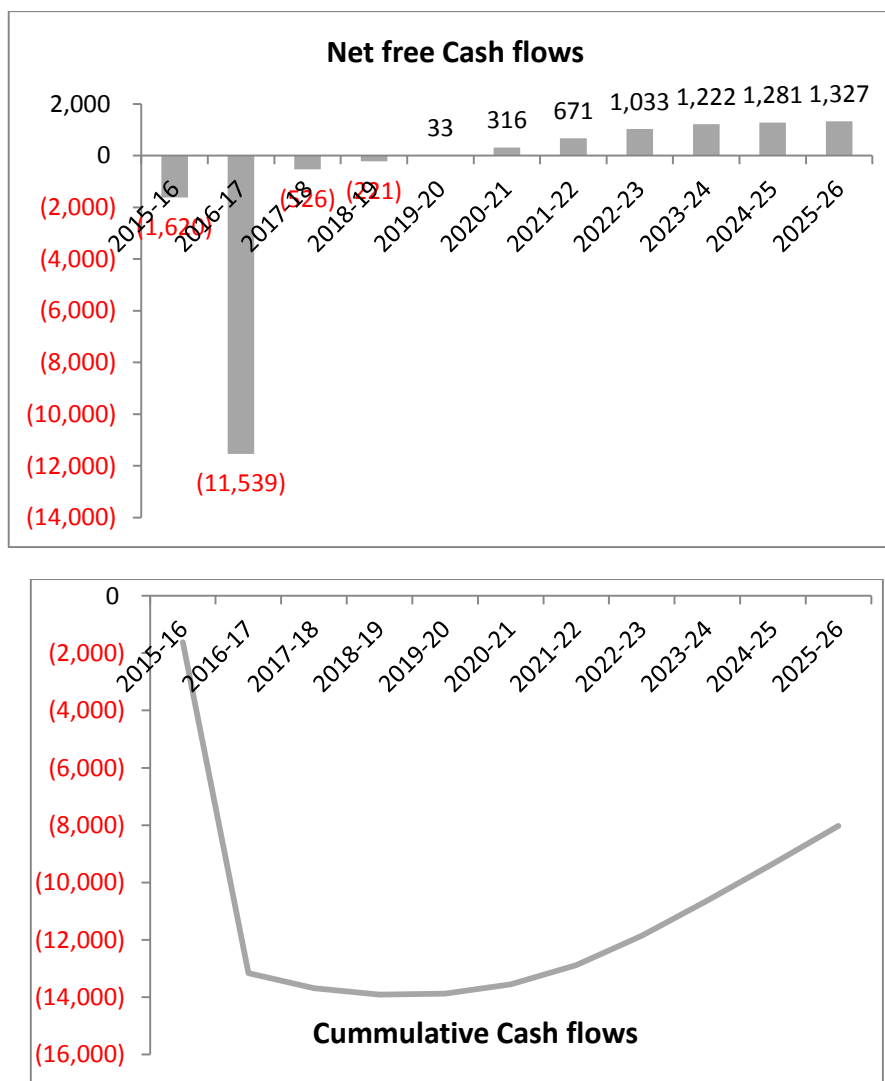
Overall project profitability has been estimated considering phased investment in plant & machinery and infrastructure. The full-fledged operations are expected to start from the year 2017-18. The project IRR for a period of 12 years till 2026-27 is 15.3%.

Table 43: Profitability with investment plant & machinery

Project IRR	12.2%
Payback period	>11 years

The project is expected to generate positive net free cash flows starting year 2019-20. The TC is also projected to generate a positive operating expense from the 4th year of operations. However equity of about INR 980 lakhs will have to be infused in first four years to balance the negative cash flows.

Figure 18: Net free Cash flows and Cumulative Cash flows



14.6 Sensitivity analysis

Sensitivity analysis of Project IRR has been carried out with respect to the key project parameters.

- ▶ Project cost
- ▶ Construction period
- ▶ Revenue from Training
- ▶ Revenue from Finished Goods
- ▶ Revenue from Job work
- ▶ Revenue from Consultancy

The project IRR is most sensitive to changes in Production, testing and calibration, followed by changes in project cost, training revenue, and consultancy revenue.

Prototyping, Testing and Calibration form majority of revenue for the TC followed by production and consultancy. 5 percent increase/decrease in training revenue increases / decreases the project IRR by about 0.85%.

5 percent increase/decrease in project cost decreases/ increases the project IRR by about 0.5%

5 percent increase/decrease in training revenue increases / decreases the project IRR by about 0.28%.

5 percent increase/decrease in consulting revenue increases / decreases the project IRR by about 0.25%.

Sensitivity of IRR to

		Construction period 15.00
Increase in Project cost	-5%	12.7%
	0%	12.2%
	5%	11.6%
	10%	11.1%

		Construction period 15.00
Increase in Training revenue	-7.5%	11.7%
	-5%	11.9%
	0%	12.2%
	5%	12.4%
	10%	12.7%

		Construction period 15.00	
Increase in Consultancy revenue	-10%		11.6%
	-5%		11.9%
	0%		12.2%
	5%		12.4%
	10%		12.7%

		Construction period 15.00	
Increase in PTC revenue	-10%		10.4%
	-5%		11.3%
	0%		12.2%
	5%		13.0%
	10%		13.7%

15. Environment, health and safety

Effective management of environmental, health, and safety (EHS) issues entails the inclusion of EHS considerations at various levels during project implementation. An assessment has been done of the proposed operations of the TC and their EHS impacts are highlighted below:

15.1 Planning and design

The TC is location in an industrial zone developed by the Karnataka Industrial Areas Development Board (KIADB). The land has been allocated to MSME by the Government and does not involve acquisition of land from private players. There is no archaeological or cultural/heritage structure in the vicinity of the site. Also, there is no biodiversity sensitive or protected area in the vicinity which is likely to be affected by the operations of the tool room. However, there are some snakes found in and around the site which will be relocated (if they are on the site) before the start of the operations. Professional help shall be undertaken for this task.

15.2 Construction phase

During the construction phase a lot of EHS issues arise, which if not appropriately addressed can have significant impact on the environment and lead to significant health impacts. Some of the envisaged impacts along with proposed mitigation measures are given below for the TC:

Table 44: Activities and anticipated EHS issues during construction phase

Activity	Associated impact	Mitigation measures
Clearing of land (before initiating the construction work, clearing of the mango and coconut trees shall be carried out)	Loss of green cover	▶ Planning of the TC should be done in such a way so as to minimize the number of trees required to be cut at the site.
Excavation, drilling and levelling for the construction of foundation and base of building and roads	Air pollution	▶ Water sprinkling at regular intervals during excavation and drilling activities should be practiced to avoid generation of dust. ▶ The excavated soil should not be stored in the direction of the wind. Also, the pile of excavated soil should be covered to avoid dust. ▶ Construction machinery should be properly maintained to minimize exhaust emissions.
	Loss of Top soil	▶ Effort should be made to use the overburden, especially top soil, within premises for landscaping.

Activity	Associated impact	Mitigation measures
		▶ During levelling, gradation across the land (If any) would be reduced to the extent possible.
	Noise pollution	▶ Noise prone activities should be planned during day time and shall be avoided, to the extent possible, during night time.
	Occupational health hazards	▶ Adequate personal protective equipment like safety helmets, face masks, safety shoes, safety goggles etc. should be provided for the safety of workers. ▶ The excavated area should be provided with a visible boundary (Usually created using a tape and sticks) to ensure safety at site. ▶ Training should be imparted to workers on occupational safety and technical aspects of job undertaken by them.
	Disposal of debris and other wastes	▶ The waste and debris should be disposed of at an identified place preferably wasteland and appropriate approval should be taken for the same from land owner or revenue authorities. ▶ The disposal site would be at least 1000 meters away from the areas including notified forest land, water bodies and productive lands.
Establishing labour camp (The labour camps at the project site will be temporary in nature)	Health Risks	▶ Contractor should provide garbage bins to all workers' accommodation for dumping wastes regularly in a hygienic manner in the area; ▶ Awareness program shall be undertaken for the construction workers to make them aware about diseases including AIDS; ▶ Adequate drinking water facilities should be provided in the temporary sheds of the construction workers; ▶ First aid box would be provided at every construction campsite and under the charge of a qualified person to provide first aid. Availability of such person should be ensured at all time. The first aid box would contain the following in case of less than 50 workers at the site;

Activity	Associated impact	Mitigation measures
		i) Twelve small sterilized dressings. ii) Six medium size sterilized dressings. iii) Six large size sterilized dressings. iv) Six large size sterilized burn dressings. v) Six (1/2 oz.) packets sterilized cotton wool. vi) One (2 oz.) bottle containing a 2 per cent alcoholic solution of iodine. vii) One (2 oz.) bottle containing sal-volatile having the dose and mode of administration indicated on the label. viii) One roll of adhesive plaster. ix) One snake-bite lancet. x) One (1 oz) bottle of potassium permanganate crystals. xi) One pair of scissors. xii) One copy of the first-aid leaflet approved by the Chief Inspector of Factories.
	Water pollution and/or land contamination	▶ Provision of separate mobile toilet facilities for men and women should be made. The effluent from the toilets should be disposed in soak pits;
Movement of vehicles (Vehicle movement shall prevail at the site to transfer the material and workers at site. Apart from this, third party vehicles delivering the material and equipment shall also be there.)	Air pollution	▶ All the vehicles entering the site should be asked to have updated PUC (Pollution under control) certificate; ▶ Trucks/dumpers will be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil; ▶ Maintenance of vehicles will be carried out regularly; ▶ Sprinkling of water will be practiced at the site.
	Water contamination and / or Soil contamination	▶ Proper maintenance of vehicle will be carried out to avoid any leakage of oil or grease.
	Safety risks	▶ Vehicle speed will be restricted to 15km/hour at site;

Activity	Associated impact	Mitigation measures
		▶ Necessary safety trainings will be provided to the drivers.
Use of D.G set (D.G sets shall be used at site to provide electricity to labour camps and construction activity)	Air pollution	▶ D.G should be optimally used with proper orientation and adequate stack height. ▶ Proper maintenance of the DG should be carried out on regular basis.
	Noise pollution	▶ Acoustic enclosures should be provided with the D.G sets to minimize the noise levels.
Storage of diesel	Soil contamination	▶ A covered area should be defined for storage of HSD with concrete flooring
	Safety risks	▶ The diesel storage area should not be in proximity of the labour camps. ▶ Inflammable substance should not be allowed at the project site.
Handling of waste (During construction phase there may be generation of both hazardous and non-hazardous waste which needs to be carefully handled to ensure environment safeguard)	Land contamination and Water contamination	▶ Waste will be stored at designated place after segregation on the basis of category (hazardous and non-hazardous); ▶ Hazardous waste should be disposed of to the authorized vendors only; ▶ A waste management plan should be chalked out to properly dispose the debris generated from the site.
	Safety risks	▶ Adequate PPE's should be identified and provided to the workers at site.
Installation and operation of concrete mix plants and batching plants (In case, these are installed on temporary basis at the project site)	Noise pollution	▶ Noise shielding will be used where practicable and fixed noise sources will be acoustically treated for example with silencers, acoustic louvers and enclosures. ▶ Provision of make shift noise barriers near high noise generating equipment will be made to minimize horizontal propagation of noise in case of residential area in the vicinity.
Construction labour management	Child labour and forced labour	▶ Provision of clause in contractor's agreement will be made that bans child labour and forced labour at project site.

Activity	Associated impact	Mitigation measures
		▶ Adequate procedures to avoid or prevent hiring/entry of child labour at the project site will be undertaken; ▶ Random check will be undertaken at the site.
	Health and safety risks for children of workers	▶ Temporary crèche facility will be provided in case of migrant labourers children residing in the camps to ensure safety.
	Loss of green cover	▶ Fuel will be made available to construction workers for food preparation; ▶ Construction workers will be warned not to cut and use the trees available on the project site as fuel wood. Random checks will also be done to ensure same.

15.3 Operation and maintenance

The operations at TC shall majorly involve assembly of PCB units and testing and calibration of the electronic equipment apart from imparting training. Some potential EHS issues that may be related to these activities are as follows:

15.3.1 Operation of the TC

a) Assembly of PCBs

Table 45: Potential hazards during assembly of PCBs

Activity	Associated impact	Mitigation measures
Handling of raw material	Cut injury	▶ Gloves should be provided to workers handling the raw material
Soldering	Health hazard	▶ Lead free soldering paste shall be used in the process; ▶ Appropriate fume extracting equipment shall be installed in the TC where soldering operations are undertaken; ▶ Appropriate gloves shall be provided to the operators.
Use of solvents for cleaning	Land contamination	▶ Solvents should be kept in small quantities at the workstation

Activity	Associated impact	Mitigation measures
	Air pollution	▶ Fumes extraction shall be installed in the TC where solvents will be used
	Contact with eye	▶ Eye wash shall be installed in the TC so as to enable eye wash in case of contact with solvent ▶ Eye goggles may be provided to employees and trainees in case there is a risk of splashing of solvent.
	Skin reaction with solvent	▶ Appropriate gloves must be provided to the operators and trainees handling the solvent
Disposal of rejected PCBs	Land contamination / water pollution	▶ All the electronic waste including rejected PCBs shall be collected and stored in an appropriate place and disposed to an authorised e-waste recycler and appropriate records shall be maintained for the same
Use of UPS	Land contamination due to leakage of battery	▶ Dry batteries shall be used in the UPS room
Use of D.G sets	Noise pollution	▶ D.G sets with acoustic enclosures shall be purchased to avoid noise pollution
	Land contamination	▶ Diesel should be poured in D.G set using funnel to avoid land contamination due to spillage. Also, concrete flooring shall be provided under and near the D.G set
	Air pollution	▶ Chimney with appropriate height shall be provided to minimize air pollution and ensure compliance with the legislation
	Water contamination due to leakage and/or spill over	▶ All the waste shall be stored under a shed so as to avoid contamination and washing away of waste in nearby water stream or ground water in case of rain
Generation of domestic effluent	Land contamination	▶ Sewage treatment plant will be installed in the TC to treat the domestic effluent released from the hostel and the toilets in the TC.
Canteen operations	Fire incident	▶ Fire extinguishers should be provided in the canteen; ▶ Cylinders should be regularly checked for leakage; ▶ Hose pipes should be regularly replaced to avoid any incident of leakage
	Land contamination to due food waste	▶ Efforts should be made to reduce food waste;

Activity	Associated impact	Mitigation measures
		▶ Option of converting food waste into compost shall be explored.

b) Testing and calibration activities:

During the testing and calibration e-waste will be generated that should be disposed to an authorised e-waste recycler. Rotation policy shall be adopted for employees who are engaged on the testing process to mitigate/minimise fatigue and ergonomic issues.

If radioactive testing is being used for the components following precautions shall be taken to ensure that there is not radioactive pollution and the employees and trainees in the TC are not exposed to the same:

- ▶ Only authorised personal should be allowed to operate the machine;
- ▶ Proper protective suite should be worn while operating the machine;
- ▶ In no circumstance the check door should be opened while the machine is operating;
- ▶ Training shall be imparted to all the employees and trainees on the measures to be adopted in case of a radioactive leakage or incident

15.3.2 Maintenance of the TC

Table 46: Potential hazards during O & M phase

Potential impact	Recommendation for mitigation
Deterioration of the structure over the period of time	▶ A structural stability certificate would be taken from a chartered engineer every 5 years. ▶ Approvals would be taken for any change in the layout of the TC from the factory inspector. ▶ Regular maintenance and repair work shall be undertaken throughout the TC over the period of time.
Fire risk	▶ Fire extinguishers shall be placed throughout the TC prone to fire incident; ▶ Fire extinguishers will be checked for pressure on annual basis; ▶ Electrical wiring in the premises would be regularly checked and repair should be undertaken wherever required.

The protection of public health, safety and general welfare will also be ensured through adherence to the building codes since these are related to the construction and occupancy of buildings and structures.

15.4 Basic requirements for EHS management

The following section outlines the details of the essential measures to be undertaken for sound EHS management within the TC;

- ▶ Storm water management
- ▶ Fire risk management,
- ▶ Rain water harvesting, if practical,
- ▶ Sewage treatment,
- ▶ Ventilation system.
- ▶ Monitoring of EHS performance

15.4.1 Storm Water Management

Storm water includes any surface runoff and flows resulting from precipitation, drainage or other sources. Typically, storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding streambeds and banks. In order to reduce the need for storm water treatment, the following principles would be applied:

- Storm water would be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge
- Surface runoff from process areas or potential sources of contamination would be prevented
- Where this approach is not practical, runoff from process and storage areas would be segregated from potentially less contaminated runoff
- Runoff from areas without potential sources of contamination would be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate would be reduced (e.g. by using vegetated swales and retention ponds)
- Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority would be given to manage and treat the first flush of storm water runoff where the majority of potential contaminants tend to be present;
- When water quality criteria allows, storm water would be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
- Oil water separators and grease traps would be installed and maintained as appropriate at refuelling facilities, workshops, parking areas, fuel storage and containment areas.

- Sludge from storm water catchments or collection and treatment systems will contain elevated levels of pollutants and would be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety , and conservation and long term sustainability of water and land resources.

15.4.2 Fire risk management

a) Fire alarm system

- ▶ Automatic Fire alarm system will be provided in all buildings of the campus excluding student hostels and emergency staff quarters.
- ▶ The system will have appropriate provisioning of smoke detectors and beam detectors with respect to the sensitivity and probability of fire.
- ▶ Fire alarm panels will be provided at appropriate locations with easy and convenient accessibility for manual activation of alarm in case failure of automatic system.
- ▶ A control panel will be provided at control station with a repeater panel in security cabin to activate, deactivate and reset the fire alarm system.
- ▶ The instrumentation, panels, sensors and equipment used will be of certified make confirming to relevant standards.
- ▶ Smoke detectors and beam detectors will be installed above and below false ceiling as applicable.

b) Firefighting system - overview

- ▶ **Mapping of potential fire risk shall be done across TC and** fire extinguishers (CO2 and powder based) should be placed in relevant areas;
- ▶ Maintenance of fire extinguishers shall be undertaken on annual basis.

15.4.3 Rain water harvesting

- ▶ The campus will be divided in to 4 or 5 areas and the storm water from the roof top of each building in each area will be collected in the specified area.
- ▶ The storm water outlets on building roofs will be checked for adequacy with respect to size considering maximum rainfall intensity in past 100 years.
- ▶ Additional outlets will be provided to the building roof, in case the existing outlets are found to be insufficient.
- ▶ The outlets will be provided with vertical down take pipes, which will be connected to the existing underground storm water lines through nearby chambers.

- ▶ Suitable locations for ground water recharge pit will be identified in each area as mentioned above.
- ▶ Considering geology, ground water tables, applicable rules and regulations and available space, ground water recharge pits with bore holes and pipes will be designed with adequate capacity.
- ▶ The ground water recharge pits will be connected to the storm water line through nearest chamber to fetch storm water (collected on roof) to the pit.
- ▶ Overflow will be provided to the ground water recharge pit at suitable level, to take off excess water back to the storm water network and discharge off.
- ▶ The ground water recharge pits will be protected with fence around to prevent ingress of people, animals etc.
- ▶ Suitable provision will be made to cut off and on the flow to the ground water recharge pits.

15.4.4 Sewage treatment plant

- ▶ Sewage Treatment plant with integral effluent treatment will be provided for primary and secondary treatment;
- ▶ The treated effluent will be used for gardening and/or recycled for use in toilets to the extent possible.

15.4.5 Ventilation system

a) Internal buildings

- ▶ The TC premises will have provision for sufficient ventilation. This will be done keeping in view the amount of space in the TC, number of people expected to occupy the space, type and amount of machines/equipment, and overall size of the space. The designing will be done keeping in view proper distribution of air for ventilation throughout all occupied spaces across the TC.
- ▶ Natural ventilation - The premises will have adequate openings, such as doors, windows and/or vent opening to clean environment. Roof vents would be placed wherever applicable to reduce the reliance on air conditioning systems
- ▶ Air input, smoke exhaust will also be installed and maintained for proper ventilation.

b) **Manufacturing/ Production area:** The production area will be provided with central air conditioning.

c) **UPS room**

- ▶ Appropriately designed ventilation system will be provided to the UPS room.
- ▶ The ventilation system will mainly comprise of air conditioning units providing cold air at lower temperature and exhaust system taking out hot air coming out of the UPS.
- ▶ The system will be designed to maintain adequate temperature around the UPS equipment as per manufacturer's requirements/ specifications.

15.4.6 Monitoring

EHS monitoring programs would be undertaken to verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant EHS aspects, and the implementation of prevention and control strategies. The monitoring program would include;

- ▶ EHS inspection/Audits
- ▶ Calibration of the equipment
- ▶ Surveillance of the working environment
- ▶ Surveillance of workers health

[illegible]

16. Key risks and mitigation

The key risks associated with implementation of the project along with possible mitigation measures are summarized in this section. It must be noted that risks universe is dynamic and is likely to change periodically. It is recommended that frequent analysis is carried out and mitigation plans are drawn. Below are risks that may impact this project;

Table 47: Risk & mitigation

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
Project Planning	Risk of inadequate planning of time, effort and resources required to complete the project	▶ Adequate time and cost buffer to be kept to deal with contingencies. ▶ Appointment of CMC for detail design and project management during construction of the TC	✓	✓	✓
Approvals and Clearances	Risk of delay in clearances from local authorities like ▶ Plan Sanction - Town Planning Authority/ Local Body ▶ Commencement Certificate - Town Planning Authority/ Local Body ▶ Fire NOC - Provisional and Occupancy - Local Fire Authority	▶ Appointment of PMC firm. ▶ Timely application of approvals for relevant authorities by CMC ▶ Monitoring of status of Approvals.		✓	

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	▶ Plinth Checking Certificate - Town Planning Authority/ Local Body ▶ Building Completion Certificate - Town Planning Authority/ Local Body ▶ Consent to Establish and Operate - Pollution Control Board ▶ MAP Approval and Factory License - Directorate of Industrial Health and Safety ▶ Labour License - Labour Commissioner ▶ Fuel Storage - Chief Controller of Explosives ▶ Tools, Tackles, Pressure Vessels, Hoists - Competent Engineer ▶ Electrical Systems - Electrical Inspector				
Environmental risk	Loss of top soil	▶ Top soil excavated from the site should be carefully handled. It should be collected separately and stored as a heap which is appropriately covered. The heap should not be put in the direction of wind to avoid dust generation	✓		✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
		▶ Maximum effort should be made to utilize the top soil for landscaping within the site			
	Air pollution due to digging and levelling activities	▶ Water sprinkling shall be practiced ▶ Construction machinery shall be properly maintained to minimize exhaust emissions of CO, SPM and Hydrocarbons ▶ These activities shall be avoided in very high wind and cover should be provided for loose construction material	✓		✓
	Water contamination and health risks associated with setting labour camp for construction	▶ Toilet shall be earmarked for both men and women contractual workers ▶ Adequate drinking facilities shall be provided at the construction site; ▶ Temporary crèche facility may be provided in case of migrant labourers children residing in the camps to ensure safety	✓		✓
	Land and water contamination due to waste generated at site	▶ Waste shall be stored at designated place after segregation on the basis of category (hazardous and non-hazardous) ▶ Hazardous waste shall be disposed of to the authorized vendors only	✓		✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	Air pollution due to use of D.G set.	▶ D.G set to be optimally used with proper orientation and adequate stack height ▶ Stack monitoring carried out on regular basis ▶ Proper maintenance of the DG Set should be carried out on regular basis ▶ Acoustic enclosures are to be provided with the D.G sets to minimize the noise levels			
Construction	Delay in construction due to cost overrun, management of building contractors.	▶ Appoint a PMC for a design and build contract for managing construction. ▶ Strict timeline will be made and agreed with PMC. ▶ Regular M&E, Built in mechanism for penalty for delays and incentive for timely completion, ensuring timely payment based on milestones.	✓	✓	
Deviation in project scope	Change in project scope ▶ initiated by MoMSME, ▶ Machinery supplier constraints ▶ Product discontinuation	▶ Clear buy in on project plan and execution planning. ▶ Identification of Machinery suppliers based on the top current suppliers and technology available.	✓	✓	✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
Maintaining World Class Construction quality	Construction quality may not be up to the mark.	▶ Appointment of third party Government quality assurance agency.			
On-boarding of Key players	Delay in on boarding of key project stakeholders - Technology Partner - Construction Network Manager - Construction Management Consultant Quality Assurance	▶ Clearly defined scope and incentives for stakeholders. ▶ Timely contracts with the project stakeholders.		✓	✓
Procurement of machinery	Delay in procurement of machines and goods due to high Lead time and time taken for clearances	▶ Machines and equipment chosen should be standard and popular models available in market. Early release of order confirmation and advance if any. ▶ Appointment of efficient and pre-approved Clearing & Handling Agency (CHA) to ensure timely clearances and transportation of machines.		✓	
	Variation in Equipment required and finally procured. Too stringent specs may lead to high price and low competition, loose specs may lead to low price but low quality	▶ Neutral specifications to be drafted based on thorough research on TC requirements and current models available.	✓	✓	

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
Trained resource availability	Availability of trained manpower for operation of new machines	▶ Machine specific training programmes to be conducted for training of key personnel and knowledge sharing.			✓
Market	▶ Change in product mix ▶ Change in customer mix ▶ Change in technology ▶ Change in product pricing ▶ Competition from Govt./Public tool rooms ▶ Lack of cluster development in the target region	▶ Expansion of product base. ▶ Increase in customer base. ▶ Develop a backup plan for retiring of obsolete machines.			
Policy	Change in Government Policy/ Schemes for ▶ Training ▶ key sectors E.g. Change in Government space programme, increase in imports may affect orders from major clients	▶ Increase existing customer base. ▶ Diversify into new sectors.	✓		✓
Taxation	Change in service tax policy on training may adversely affect training revenue	▶ Institute should keep abreast with policy changes and the same should be considered while designing the course and fee structure.			
Human resource	▶ Labour availability	▶ Planning for holidays and lean periods.	✓		✓

Key broad area	Risk	Mitigation	Impact on		
			Cost	Time	Resources
	▶ Retention of key employees (Flight of key talented people can make it difficult to achieve centre's growth plans)	▶ Good incentive scheme and career development plans.			
Management risk	Lack of capable management to run the TC	▶ Leadership training. ▶ Succession planning.			✓
Maintenance risk/ spares - Availability of spares & services	Delay in availability of spares and service support at a reasonable cost	▶ Procure models that are likely to continue for at least next 5 yrs. to ensure better availability of spares and services.	✓		
Performance of key stakeholders	Poor performance of Outsourced agencies like TP, CNM and PMC	▶ Establishment of KPIs ▶ Periodic review of performance. Suitable penalty clauses to be added in the ToRs.			✓
Weather	Delay in construction due to monsoon season	▶ Planning for lean periods and periods of low construction activity.	✓	✓	

17. Conclusion

The TC at Bengaluru is proposed to be an ESDM focused TC with an emphasis on segments such as medical electronics, industrial electronics, avionics, etc. Assembly, prototyping, testing, and calibration of electronics; Consultancy services for product design and development, manufacturing, and innovations in process and productivity; Manufacturing incubation services; and training would be the prominent activities to be undertaken by the TC. This also includes support to MSME clusters in technology and engineering solutions, for improvement of their quality systems and productivity, and for patent registration and harnessing. The TC will make a concerted effort in reaching out to MSMEs for these works

TC will contribute towards skilling youth to make them employable in industry by designing courses relevant to them. The focus areas for the proposed TC are in line with objectives of the program. This will be further complemented by the proposed innovative ideas for the TC like;

- ▶ The new TC will take steps to form consortium with MSMEs including TRs to jointly cater to the focus sectors. Once formed, the TC would further formalise and institutionalise the consortium. The TC should provide handholding/ support and special machining & testing facility to members of this consortium and prepare a road map for the next 3-5 years to ensure that these MSME can develop the required expertise and become more competitive
- ▶ Manufacturing Incubation Centre: A MIC is proposed at the Bengaluru TC with the basic shell infrastructure and world class manufacturing plant and machinery on rental basis for a 2 year period (as part of Phase 2). This MIC is expected to fuel the growth of enterprises which have successfully crossed the stage of pilot order and are ready to execute larger orders. The MIC would provide shell infrastructure, support business facilities, provide IT support, provide electricity and power connection, and assist with registration and clearances for setting up a manufacturing unit. In addition to this, the MIC would help entrepreneurs to connect with suppliers and skilled workers.
- ▶ The TC will form an Entrepreneur Club. By joining this club, entrepreneurs would receive all services of the TC including concept creation support, product design, intellectual property services, consultancy services, prototyping, assembly testing, calibration, access to Manufacturing Incubation Centre at a subsidized rate. The TC would facilitate access of entrepreneur club members to service providers who can help in creation of start-up. e.g. Chartered accountants, Banks, Intellectual property office, etc. The TC would organize workshops and group discussions for entrepreneurs with key experts to help and guide members with their ideas

All these initiatives of the TC would not only strengthen the expertise of MSMEs in manufacturing but also help to develop a sustainable ecosystem for MSMEs in the region in the long run. On the same

line, even investments have been proposed keeping the focus area and adherence to EHS guidelines in mind.

Above all, TCSP program will enable TC to showcase the best practices not only in the adoption of new technologies and skilling the youth but also managing all the associated environmental and social aspects.

Annexure



18. Annexure

18.1 List of MSMEs / other manufacturers / associations contacted in primary survey

SN	Name of the Unit	Region	State	Contact
1.	Hitech Magnetics & Electronics Pvt. Ltd.	Bengaluru	Karnataka	Ms. Uma Reddy
2.	Vegashakti Consultants	Bengaluru	Karnataka	Dr. Madhusudan V Atre
3.	Ignitarium Technology Solutions Pvt Ltd	Bengaluru	Karnataka	Mr. Ramesh Shanmugham
4.	Cirel Systems Pvt Ltd	Bengaluru	Karnataka	Mr. Sumeer Mathur
5.	Connovate Technology Pvt Ltd	Bengaluru	Karnataka	Mr. Bahubali Shete
6.	iWave Systems Technologies Pvt Ltd	Bengaluru	Karnataka	Mr. Mohamed Saliya
7.	Terminus Circuits	Bengaluru	Karnataka	Mr. Sankara Reddy
8.	Aptina India Pvt Ltd	Bengaluru	Karnataka	Mr. Sudershan Vuruputoor
9.	Consortium of Electronic Industries of Karnataka	Bengaluru	Karnataka	Ms. Uma Reddy Mr. Mohan Das
10.	Electronics Cities Industries Association (ELCIA)	Bengaluru	Karnataka	Mr. Nagraj
11.	JWG for ESDM, MoMSME	Bengaluru	Karnataka	Mr. Sanjeev Keskar
12.	eMERG Association	Bengaluru	Karnataka	Dr. Rajalakshmi R
13.	Peenya Industrial Association	Bengaluru	Karnataka	Mr. Venkatesh D. T.
14.	Commerce and Industries Department, Government of Karnataka	Bengaluru	Karnataka	Mr. Gurunath S. Kulkarni
15.	Indics Electronics Company	Bengaluru	Karnataka	Mr. Vivek Khanna
16.	Indian Electronics and Semiconductor Association	Bengaluru	Karnataka	Mr. MN Vidyashankar
17.	Quantu Aeon	Bengaluru	Karnataka	Mr. Balaji

18.2 Key questions asked primary survey

ESDM: Market Need Assessment Survey

Organization Name			CEO/MD/Owner name	
Person Filling form			Location:	
Email ID			Phone Numbers	
Range of Turnover	Less than 25 Cr	25 -50 Cr	50-150 Crore	Above 150 Cr
Number of Employee	Less than 25	25 - 100	100-250	Above 250
% of Employee (Tech Skill wise)	Unskilled []	Skilled (ITI+)[]	Graduate[]	P.G. []

1. Which segment of Electronic industry your firm belongs to?

- | | | | |
|---|----------------------|---|----------------------|
| (a) Consumer Electronics | <input type="text"/> | (b) Medical Electronics | <input type="text"/> |
| (c) Semiconductor design service | <input type="text"/> | (d) Electromechanical Electronics | <input type="text"/> |
| (e) Embedded systems | <input type="text"/> | (f) Strategic (Defence & Aero) Electronics | <input type="text"/> |
| (g) Industrial Electronics | <input type="text"/> | (h) Power Electronics | <input type="text"/> |
| (i) Automotive Electronics | <input type="text"/> | (j) Light Emitting Diodes | <input type="text"/> |
| (k) Renewable (Solar/Wind) Electronics | <input type="text"/> | (l) Electronics Components (PCB, etc.) | <input type="text"/> |
| (m) Telecom Electronics | <input type="text"/> | (n) Electronics Manufacturing Systems | <input type="text"/> |
| (o) Other Please specify..... | | | |

2. Please tick the activity (s) of your firm:

(a)	Raw Material Supplier	
(b)	Basic Component Manufacturing	
(c)	Component Assembly	
(d)	System / Subsystem Assembly	
(d)	Electronics Manufacturing Design Services	
(e)	Semi-Conductor design services	
(f)	Electronics Component / Product Sourcing	
(g)	Testing, Calibration, and Quality Assurance	
(h)	Packaging	
(i)	Warehousing & Logistics	
(j)	Any other	

3. Please list top three types of products from your firm. If required please expand the list.

- | | |
|----|----|
| 1. | 4. |
| 2. | 5. |
| 3. | 6. |

4. If diversification is planned in your firm, what will be the new products produced/services?

- | | |
|----|----|
| 1. | 4. |
| 2. | 5. |
| 3. | 6. |

5. If expansion is planned by your firm which will the capabilities/resources required additionally?

- 1.
- 2.
- 3.

6. Which are major raw materials for your firm? If needed extra space please use additional pages.

S.N.	Raw Material	Imported (%)

7. Manpower requirement of your firm :

S. No	Option	Area 1	Area 2	Area 3
(a)	Skilled Workers			
(b)	Engineers & Technicians			
(c)	Managerial			
(d)	Unskilled/Others			

Area e.g. Assembly, Testing, Soldering, printing, etc.

7. What are the top three manufacturing process trends in your sector?

- 1.
- 2.
- 3.

8. Which are the top three requirements of your firm with respect to improvement in Manufacturing Technology that will improve firm's competitiveness? If needed extra space please use additional pages.

- 1.
- 2.
- 3.

9. Which are the top requirements your organization needs with respect to common facilities?

S.N.	Focus	Requirement 1	Requirement 2
(a)	Common Hi-Tech Production Machinery		
(b)	Research & Development Centre		
(c)	Testing Labs		
(d)	Integrated Logistic system		
(e)	Training Centre		
(f)	E-waste management		
(g)	Any other (Please suggest)		

If required please provide additional details in the last page.

10. What are the top skill gaps or areas of skill upgrade you have identified in the workforce that is holding you from being more competitive in the market?

1. Un-skilled workers
2. Skilled Workers
3. Engineers & Technicians
4. Managerial

11. Name three requirements you would like access to that will help in improving Quality of your output?

- 1.
- 2.
- 3.

12. What are the top three challenges you face in catering to the needs of international customers?

- 1.
- 2.
- 3.

13. What are the top three areas of improvement for you suppliers that will help the quality of your output?

- 1.
- 2.
- 3.

14. What are the top three priorities you need assistance in the product development to grow your market?

- 1.

2.

3.

15. Please list name of technical institutes from where you have been taking technical support / guidance?

1.

2.

3.

16. Please list the sources from where you have been hiring the work force?

1.

2.

3.

17. Please list the industry association / chambers you are part of and for which purpose?

1.

2.

3.

18. Please list the conferences / workshops / seminars where your firm is regular participant?

1.

2.

3.

19. Please suggest ideas or actions which can expand the ESDM sector rapidly?

1.

2.

3.

20. In which of the areas have you taken the support of MSME Technology Centre (Please tick all services used)?

1. Testing

2. Production Support

3. Skill Development

4. Process improvement

5. Product / Tool Development

6. Technical / Business Consultancy

21. How would you like to rate the overall services offered by centre?

Very Bad

2. Bad

3. Average

4. Good

5. Excellent

22. Suggest at least three areas of improvement for MSME Technology Centre? Use additional pages if needed.

1.

2.

3.

18.3 AICTE norms for engineering and technology institutes

a) Land requirement for technical institutions

Other than Rural Places			Rural Areas		
UG Programs	Diploma	Standalone PG Programs	UG Programs	Diploma	Standalone PG Programs
2.5	1.5	2.5	10	5	10

Land area requirements in acres

- ▶ Land Area Requirements:
 - Land area shall cover hostel facilities, if any
 - Land shall be in one continuous piece
 - Considering hilly nature of land in North Eastern States, land may be made available in 3 pieces which are not away from each other by more than 1 Km
- ▶ Number of students generally allowed per acre land available when FSI = 1 is 300.
- ▶ Built up Area Requirements
 - The Institution area is divided in, Instructional area (INA, carpet area in sq. m.), Administrative area (ADA, carpet area in sq. m.), Amenities area (AMA, carpet area in sq. m.)
 - Circulation area (CIA) is equal to 0.25 (INA+ADA+AMA).
 - Total built up area in sq. m. is equal to (INA+ADA+AMA) + (CIA)

► Instructional area (carpet area in sqm)

	Number of Divisions (UG class of 60)	Duration of course (in yrs)	Class Rooms (C)	Tutorial Rooms(D) PG class rooms (H)	Laboratory	Research Laboratory	Work Shop	Additional WS/Labs for Category X courses	Computer centre	Drawing Hall	Library and Reading Room	Seminar Halls
Carpet area in sqm per room			66	33	66	66	200	200	150	132	400	132
Engineering/ Technology (Degree Institute)												
Number of rooms required for new institution	A	4	C=A	D=C/4	10	-	1	-	1	1	1	1
Total number of rooms (UG)	A	4	$C=A \times 4$	D=C/4	10/Course*	-	1	2/Course (Max 4)	1	1	1	1/Course
Total number	F	2	-	H=Fx2	1/Specialization	1/Specialization	1	2/Course (Max 4)	1	1	1	1/Course

	Number of Division s (UG class of 60)	Duratio n of course (in yrs)	Class Room s (C)	Tutorial Rooms(D) PG class rooms (H)	Laboratory	Research Laboratory	Work Shop	Addition al WS/Labs for Category X courses	Compute r centre	Drawin g Hall	Library and Readin g Room	Seminar Halls
of rooms (PG)												
Where, - Category X of courses: Mechanical, Production, Civil, Electrical, Chemical, Textile, Marine, Aeronautical and allied courses of each. - Classrooms, Tutorial rooms and Laboratories required for 2nd, 3rd and 4th year may be added progressively to achieve total number as stated. - Additional Library (Reading room) area of 50 sq m / per 60 student (UG+PG) intake beyond 420. - UG laboratories if shared for PG courses shall be upgraded to meet requirements of PG curriculum - Progressive requirement, 2nd year onwards shall be calculated as 3+3+2 labs/course - Additional 5 Labs/Course when number of divisions are more than 2/course. - Round off fraction in calculation to the next integer.												
Engineering/ Technology (Diploma and Post Diploma Institute)												
Carpet area in sqm per room				66	33	66	200	200	150	132	400	132
Number of rooms required for new		A	Y	C=A	D=C/4	06	1	-	1	1	1	-

	Number of Division s (UG class of 60)	Duration of course (in yrs)	Class Room s (C)	Tutorial Rooms(D) PG class rooms (H)	Laboratory	Research Laboratory	Work Shop	Additional WS/Labs for Category X courses	Computer centre	Drawing Hall	Library and Reading Room	Seminar Halls
institution												
Total number of rooms	A	Y	C=A $\times$ Y	D=C/4	06/Course*	1	2/Course (Max 4)	1	1	1	1	1
Where; - Category X of courses: Mechanical, Production, Civil, Electrical, Chemical, Textile, Marine, Aeronautical and allied courses of each. - Classrooms, Tutorial rooms and Laboratories required for 2nd, 3rd and 4th year may be added progressively to achieve total number as stated. - Additional Library (Reading room) area of 50 sq m / per 60 student (UG+PG) intake beyond 420. - Progressive requirement, 2nd year onwards shall be calculated as 2+2 labs / course - Round off fraction in calculation to the next integer.												

b) Duration and Entry Level Qualifications for the Technical Program (Engineering and Technology Programs/ Degrees)

SN	Diploma/ Degree	Duration	Eligibility
1	Under graduate degree program (full time)	4 years	- Passed 10+2 examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry / Biotechnology / Biology - Obtained at least 50% marks (45% in case of candidate belonging to reserved category) in the

			above subjects taken together
2	Diploma Programs (full time)	3 / 4 years	▶ Passed 10 std. / SSC examination Obtained at least 35% marks at the qualifying examination
3	Post diploma programs	1.5 years/ 2 years	▶ Passed Diploma examination ▶ Obtained at least 50% marks (45% in case of candidate belonging to reserved category) at the qualifying examination.

c) Norms for Intake & Number of Courses / Divisions in the Technical Campus

Diploma/ Degree	Intake per division	Maximum Number of UG/PG courses and/ or divisions allowed in the new division (single shift working)	
		Divisions	Intake
Diploma/ Post diploma level	60	5	300
Undergraduate level	60	5	300
Post graduate degree and post graduate diploma level	18	6	108

New technical campus in Engineering and technology shall necessarily opt for courses from the following:

- ▶ Applied Electronics & Instrumentation
- ▶ Chemical Engineering/Technology
- ▶ Civil Engineering/Technology, Construction Engineering Computer Science, Computer Science and Engineering, Computer Science & Information Technology
- ▶ Computer Technology Electrical Engineering or Electrical & Electronics Engineering
- ▶ Electronics and Communication Engineering

- ▶ Information Technology
- ▶ Instrumentation and Control Engineering
- ▶ Mechanical Engineering
- ▶ Production Engineering

d) **Norms for Essential and Desired requirements for Technical Campus (Marked as essential need to be made available at the time of the Expert committee visit)**

SN	Details of requirement	Provisioning
1.	Language Laboratory The Language Laboratory is used for language tutorials. These are attended by students who voluntarily opt for Remedial English classes. Lessons and exercises are recorded on a weekly basis so that the students are exposed to a variety of listening and speaking drills.	Essential
2.	Potable Water supply and outlets for drinking water at strategic locations	Essential
3.	Electric Supply	Essential
4.	Backup Electric Supply	As required
5.	Sewage Disposal	Essential
6.	Telephone and FAX	Essential
7.	First Aid facility	. Essential
8.	Vehicle Parking	Essential
9.	Institution web site	Essential
10.	Barrier Free Built Environment for disabled and elderly persons including availability of specially designed toilets for ladies and gents separately	Essential
11.	Safety provisions including fire and other calamities	Essential

SN	Details of requirement	Provisioning
12.	General Insurance provided for assets against fire, burglary and other calamities	Essential
13.	All weather approach road	Essential
14.	General Notice Board and Departmental Notice Boards	Essential
15.	Medical and Counselling Facilities	Essential
16.	Public announcement system at strategic locations for general announcements/paging and announcements in emergency.	Desired
17.	Enterprise Resource Planning (ERP) Software for Student-Institution-Parent interaction	Desired
18.	Transport	Desired
19.	Post, Banking Facility / ATM	Desired
20.	CCTV Security System	Desired
21.	LCD (or similar) projectors in classrooms	Desired
22.	Group Insurance to be provided for the employees	Desired
23.	Insurance for students	Desired
24.	Staff Quarters	Desired

e) Norms for Faculty requirements and Cadre Ratio for Technical campus

► Diploma

Diploma	Faculty: Student ratio	Principal/ Director	Head of the Department	Lecturer	Total
		A	B	C	D
Diploma/ Post diploma	1:20	1	1 per department	S/20	A+B+C

S = Sum of number of students as per Approved Student Strength at all years

► Degree

Degree	Faculty: Student ratio	Principal/ Director	Professor	Associate professor	Assistant professor	Total
		A	B	C	D	A+B+C+D
Undergraduate	1:15	1	$(S/15 \times R) - 1$	$(S/15 \times R) \times 2$	$(S/15 \times R) \times 6$	$S/15$
Postgraduate	1:12	-	$(S/12 \times R)$	$(S/12 \times R)$	$(S/12 \times R)$	$S/12$

Note:

For undergraduate: S = Sum of number of students as per Approved Student Strength at all years, $R = (1+2+6)$

For Postgraduate: S = Sum of number of students as per Approved Student Strength at all years * $R = (1+2)$, $^{\#}R = (1+2+6)$

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