DRAFT TERMS OF REFERENCE FOR TECHNOLOGY PARTNER FOR PRECISION MANUFACTURING AND GENERAL ENGINEERING SECTOR

1. Background

1.1. Country & sector context

India is one of the world's largest and most dynamic emerging markets with vast economic potential. The objective of the Government of India's, 12th Five-Year Plan (FY2013–17) is to return to Gross Domestic Product (GDP) growth rates in excess of 8 percent, with a strong emphasis placed 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 in taking the Indian economy to a high growth rate trajectory and achieving the planned objectives.

Despite a strong potential, India's manufacturing performance has not been encouraging. The share of manufacturing in India's GDP has stagnated at around 16 percent[1], compared to more than 30 percent (and growing) in some of the other Asian countries. India's manufacturing sector has had to face other challenges, such as low value addition, low productivity, and less-than-desirable up scaling. However, there also exist world-class production units that compete in the international market, as observed in the automotive sector.

To realize this potential, the Government of India has set the objective of enhancing the share of manufacturing in India's GDP from its current level of 16 to 25 percent within a decade and creating 100 million additional jobs in the National Manufacturing Policy 2011.

The major constraints to the growth and competitiveness of India's manufacturing sector are well known and some of these are: difficulties accessing markets (including within India), difficulties accessing finance (especially for MSMEs), infrastructure deficiencies and difficulties for MSMEs to access technology and lack of skilled manpower. These constraints impact the competitiveness of MSMEs operating in both upstream and downstream manufacturing industries.

Upstream industries, such as the tooling industry, that consists of developing and manufacturing dies, moulds, casts, as well as testing and prototyping, serves as the 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 decreasing time to market. Despite this tooling is a local industry (more than 60 percent of tools in the world are locally produced and consumed – including in India) dominated by MSMEs (more than 80% of firms in India, Europe, US and Japan). As in 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 US$3 billion, 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.

[1] The Manufacturing Plan - Strategies for Accelerating Growth of Manufacturing in India in the 12th Five Year Plan and Beyond

In the downstream industries, such as automotive, electronics, fragrance and flavours, glass, leather, toys etc. also, there is a 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 intense international competition in the connected world.

Demographic 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 percent[2]. For the country to gain from this demographic dividend, skilling and up-skilling its youth are key priorities for the Government of India (GoI).

Out of the 470 million labour force in India, less than 10 percent has received any kind of skills training, either through formal or informal means[3]. 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 skills development is critical to achieving faster, sustainable, and inclusive growth, on the 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 2022[4].

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 the Industrial Training Institutes (ITI) earned 25 percent more than two-year course students, who earned 14 percent more than those who completed the one-year course[5]. These results confirmed a 2007 study showing that the returns on vocational training in India have been found to be 8 percent. The same study showed that, increased educational attainment by one year is associated with 5.8 percent higher firm-level productivity in India[6].

Against this backdrop, the Technology Centre Systems Program seeks to develop the technological and skill base of MSMEs in selected manufacturing industries, via upgraded and new Technology Centres (earlier called Tool Rooms [TR] and Technology Development Centres) has been envisaged.

1.2. Indian Tooling Industry Overview: Opportunities & challenges

The tooling industry, that consists of developing and manufacturing dies, moulds, casts, as well as testing and prototyping serves as the interface between product design and product manufacturing. Growth of these manufacturing related industries therefore drive the growth in demand for tooling. The constraints to the growth and competitiveness of the Indian tooling industry mirror the ones affecting manufacturing as a whole. 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.

Indian Tool room industry size is estimated at ~INR 13,000 Cr. (2010-11)[7]. Tool room industry in India can be divided into two key segments - Domestic (Captive and commercial) and Exports. Domestic

[2] According to the Report on the Third-Annual Employment & Unemployment Survey (2012 – 2013) of the Ministry of Labor, Government of India.
[3] 11th and 12th Five Year Plan
[4] http://labour.nic.in/upload/uploadfiles/files/Policies/NationalSkillDevelopmentPolicyMar09.pdf
[5] Vocational Training in the Private Sector (Goyal 2011)
[6] The Knowledge Economy and Education and Training in South Asia (world Bank 2007)
[7] Indian Tool room Industry Report, TAGMA (2011)

TRs market is estimated at INR 8,284 Cr out of which INR 3,129 crores is captive and commercial tool rooms (CTRs) account for INR 5,955 crores. Imports are to the tune of INR 4,150 Cr.

Captive tool rooms mainly belong to the large and medium scale companies which develop tools for in house requirement, e.g. auto component, plastic, packaging etc. Such tool rooms have state of art equipment and meeting all internal requirements. Auto components and OEMs[8] constitute around 70% of this segment. Quality tooling is critical to produce high quality finished components and such companies perceive that quality of the components can be maintained only by developing tools in house or through imports from their foreign counterparts which also ensures steady supply as per requirement. Another major reason for captive tool making is, these companies don't want to share their design as the design of each and every tool is the intellectual property of the company. Indian CTRs suffer from capacity constraint causing an increase in the lead time for manufacturing the tools to meet the demand of the end users.

Commercial Tool Rooms (CTRs) supply tooling on a commercial basis to a variety of industries and operate as independent companies. Besides manufacturing tooling some CTRs also undertake precision machining and component manufacturing. It has been observed that CTRs have insufficient capacity which in term leads to increase in the lead time for manufacturing of tools.

Imports account for ~ 31% of the total tooling market which is around INR 4,000 crores. Key reasons for tooling import are;

a) Quality: Better, good surface finish, low delivery period and higher degree of accuracy.
b) Capacity: Insufficient capacity to meet domestic demand and lack of infrastructure to make certain types of tools also results into imports.
c) Cost: High price, non-availability of materials at par with the international standards, use of out dated technology due to absence of advance machinery compromises the quality of CTRs tools leading to demand for imports. In Countries like China and Taiwan, the tooling cost is lower than India.
d) Design: International companies based in India prefer procurement of their tooling from their parent company to maintain design standards across the globe. e.g. LG & Samsung imports most of their tooling from Korea.

1.3. Indian Aerospace Industry Overview

The global & Indian Civil aerospace sector is also expected to witness robust growth. The growth in the economy is driving demand for scheduled passenger and cargo services higher. Increasing Public Private Partnerships models and recently allowed 100% FDI in Civil Aviation sector are likely to play a large role in the growth story of the Indian Aerospace sector.

India with its high level of technical skill and low wage rates is rapidly becoming a major centre for the manufacture of aerospace sub-component. Nearly 27,000 private sector aerospace MSMEs are supplying to Government's strategic manufacturing establishments, Indian private sector OEMs and in some cases also exporting to foreign OEMs.

Some of the key issues faced by MSMEs in the aerospace sector are as follows

a) Aerospace business is characterized by long and complex procurement procedures. Companies need protracted staying power and adequate financial endurance for long term sustenance. Volatile nature of the industry and lack of clarity in returns creates constrained cash flow cycle which makes it unviable for the MSME to continue.

[8] Others (General Engineering, Packaging, Tractor OEMs & Misc. sectors)

b) MSMEs have limited or no access to easy availability of raw material, labour, markets and business development opportunities in the sector
c) MSMEs also face issues in access to technology due to limited support from government technology centres, OEMs not willing to pass on technology for fear of IPR etc. and limited capacity to absorb and imbibe the technology
d) The Indian regulatory landscape in aerospace sector is constantly evolving. This throws up challenges and creates uncertainty. SMEs with their limited resources are especially affected by these

The proposed program aims at supporting MSMEs directly on issues related to talent crunch and access to world class technology & quality practices and addressing issues related to cost competitiveness by creating upgraded and new dedicated Technology Centres.

1.4. Institutional context

The MSME Ministry, through the Office of the Development Commissioner (O/o DC, MSME), currently operates eighteen Technology Centres (TCs): ten for the tooling industry and eight for other industries such as ESDM (electronics system design and manufacturing), designer & decorative, footwear & leather and fragrance & flavour etc. The list of the existing TCs is given below:

Existing Technology Centres of the Office of the DC, MoMSME

S.No.	Name	Focus sectors and services offered
1	Central Tool Room & Training Centre (CTTC), Bhubaneswar (Odisha)	Tooling (specializing in precision manufacturing) and Training
2	Indo Danish Tool Room (IDTR), Jamshedpur (Jharkhand)	Tooling (specialization in Automotive) & Training
3	Central Tool Room & Training Centre (CTTC), Kolkata (West Bengal)	Tooling (specializing in precision manufacturing and foundry & forging) & Training
4	Tool Room & Training Centre (TRTC), Guwahati (Assam)	Tooling & Training
5	Indo German Tool Room (IGTR), Aurangabad (Maharashtra)	Tooling (specialization in Automotive) & Training
6	Indo German Tool Room (IGTR), Indore (Madhya Pradesh)	Tooling (specialization in Automotive and Plastics) & Training
7	Indo German Tool Room (IGTR), Ahmedabad (Gujarat)	Tooling (specialization in Automotive and Plastics) & Training
8	Central Tool Room (CTR), Ludhiana (Punjab)	Tooling & Training
9	Central Institute of Hand Tools (CIHT), Jalandhar (Punjab)	Tooling (specialization in hand tools, foundry & forging and agricultural implements)
10	Central Institute of Tool Design (CITD), Hyderabad, (Telangana)	Tooling (specializing in precision manufacturing), ESDM & Training
11	Institute for Design of Electrical Measuring Instruments (IDEMI), Mumbai, (Maharashtra)	ESDM, Tooling and Training
12	Electronics Service & Training Centre (ESTC), Ramnagar (Uttarakhand)	ESDM and Training
13	Process and Product Development Centre (PPDC), Agra (Uttar Pradesh)	Foundry & Forging and Training

S.No.	Name	Focus sectors and services offered
14	Process cum Product Development Centre (PPDC), Meerut (Uttar Pradesh)	General Engineering (specializing in Sports Goods) and Training
15	Central Footwear Training Institute (CFTI), Agra (Uttar Pradesh)	Leather Footwear & Training
16	Central Footwear Training Institute (CFTI), Chennai (Tamil Nadu)	Leather Footwear & Training
17	Fragrance & Flavour Development Centre (FFDC), Kannauj (Uttar Pradesh)	Fragrance & Flavours, Agro & Allied Industries and Training
18	Centre for Development of Glass Industries (CDGI), Firozabad (Uttar Pradesh)	Designer and Decorative Glass and Training

Several of these were set up through support from German and Danish Government under bilateral agreements as well as with the United Nations Industrial Development Organization (UNIDO). These Technology Centres are largely self-sustaining entities that have been providing technical and vocational training programs to more than 1,00,000 trainees annually. Some of these include training programs certified by the All India Council for Technical Education (AICTE) and National Council for Vocational Training (NCVT). They also provide design and manufacturing support to entrepreneurs alongside technical consultancies.

The existing TC's, were set up between 1967 and 1999, primarily 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 trades with a view to improve employability and livelihood opportunities.

The following map identified the location of the existing TCs focused on Precision Manufacturing and General Engineering that are included in the package for the Technology Partner in the current scope of work.

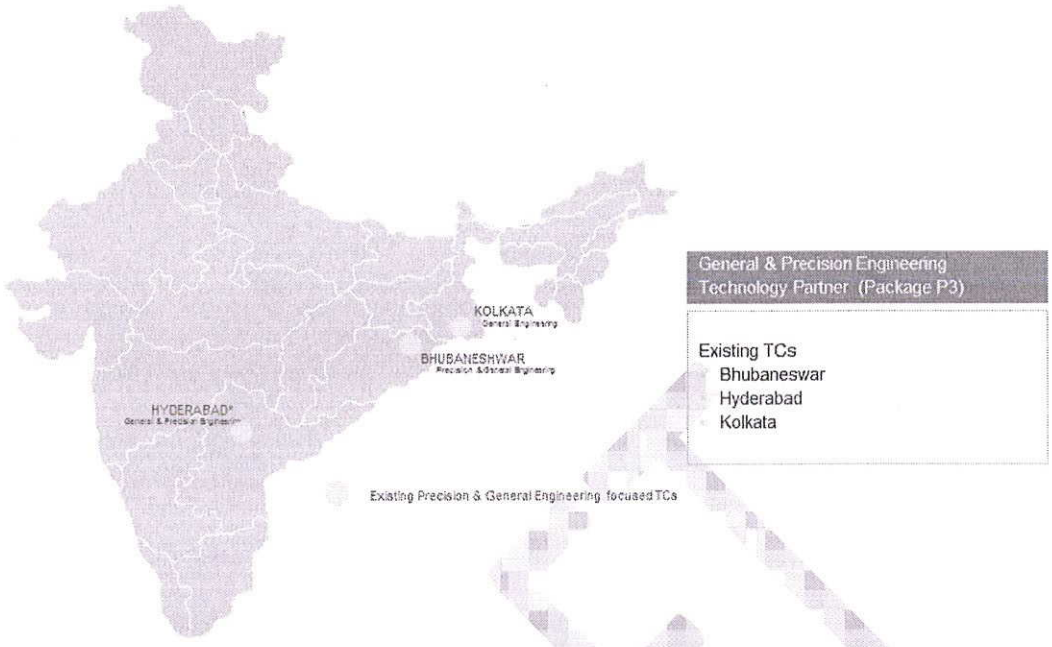

Figure 1: Existing Technology Centres focused on Precision Manufacturing and General Engineering

Please Note: In addition to these existing TCs, 2-3 new TCs will be established that will focus on precision manufacturing and general engineering sector.

The key services offered by the existing TCs focusing on precision manufacturing and general engineering mainly include:

i. Design & Manufacturing
   - Design & manufacturing of tools, dies, moulds and precision components
   - Product development

ii. Skill Development
   - Long & short term training programs
   - Areas include CAD, CAM, CNC, automation, RPT, mechatronics etc.
   - International, modular and customised programs
   - Student profile varies from HSC/SSC/10th passed outs, ITI passed outs to diploma holders and graduate engineers

iii. Consultancy
   - Inspection, calibration facilities and quality systems facilities
   - Turnkey assignments
   - Course curriculum developments
   - Engineering solutions for component manufacturing and process development

All services are offered on fee basis at market/cost rates. In addition, the Government of India offers various schemes/programs to subsidize the cost of services offered by the TCs to MSMEs.

2. About the Technology Centre Systems Program (TCSP)

TCSP intends to upgrade and expand the network of Technology Centres, which have as their mission to improve the competitiveness of MSMEs in key manufacturing industries across India– with a special emphasis on Low Income States. The Program will increase the capacity and incentives of TCs to support private sector actors (as opposed to competing with them).

Technology Centres provide an integrated suite of services to MSMEs on a fee basis, ranging from technical and management advisory to technical training of workers. The Proposed Program will reinforce the technical capability of the Technology Centres as well as their governance, by further increasing the participation of the private sector in key decisions at both the national and local levels. In particular:

a. The proposed Program seeks to establish 15 new TCs and upgrade technology capabilities of existing TCs and develop linkages with Indian and international research institutes, leading manufacturers. The Program will connect leading practices that will contribute to innovation advanced technology, knowledge and innovation that can be transferred to MSMEs served by each TC, thereby creating an ecosystem that fosters manufacturing competitiveness through a national system of technology centres across the country.

Additionally the program will also

b. Build on the strengths of current TCs, complement and reinforce hundreds of public and private providers of vocational training (e.g. the ITIs, the Polytechnics and the ATIs), helping them to improve their curricula and training their trainers by placing more emphasis on learning and problem solving skills, and being more practical and adapted to local conditions and needs. To that end the proposed program will develop linkages between the TCs and the Training Institutes being set up by other ministries. The development of such synergies and linkages will also be supported by existing World Bank programs aimed at improving vocational training in India.

c. Leverage and complement other programs supporting MSMEs and manufacturing clusters being implemented by various organizations in public and private sector.

The program will be partly financed through an IBRD Loan and State Governments will contribute land for setting up new TCs. The proposed program will include the following components:

Component 1: Technical assistance to the existing and new Technology Centres

The objective of this component is to ensure that TCs (selected existing as well as new) have access to technical assistance that will help them serve their cluster of MSMEs better. This will be achieved through internationally competitively recruited Technology Partners (TPs), Cluster Network Managers (CNMs) and a IT Platform service provider.

Sub Component 1.1: Technology Partner

The Technology Partners (TPs) for each system of TC will specialize on specific industries/technologies and provide inputs to the TC on leading practices and techniques in proven and latest manufacturing technologies that can be adapted to the Indian MSME context. It is expected that the TPs will work closely with the TCs in engaging with the cluster(s) of MSME the TCs serve

including OEMs and large manufacturing enterprises, in shaping future technology road map. The TP in conjunction with other stakeholders of the TCSP identify and define globally competitive technological capability (which are also locally adaptable and sustainable) required in the cluster and assist the TC in building this capability by planning and handholding this roll out. The TP will support in identifying equipment, machinery and technical requirements to upgrade the existing TCs and in fitting out the 15 new TCs. It is expected that the TP with its international experience shall help the TC augment its service portfolio keeping in view the identified/focused technologies including updating existing offerings for training, skill development, production, equipment utilization and technical advisory. The TP will also support TCs increase efficiency and competitiveness through planned initiatives.

Subcomponent 1.2: Cluster Network Manager

Cluster Network Managers (CNMs) for each System (or sub System) of TCs will specialize on specific geographic cluster(s)/ industry(s). The Cluster Network Manager (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 entire MSME ecosystem i.e. 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 etc. 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, 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.

Subcomponent 1.3: Information Technology Service Provider

This component will support a National Portal (NP) for MSMEs, with the vision of "creating a vibrant, interactive, self-sustainable technology platform for the needs of stakeholders of MSME for collaboration, information dissemination, and transactions". The platform will act as a common platform for information dissemination, services and support across many aspects of business that will be required by an MSME from the start of their business, to successful operations and growth e.g. access to regulatory services for entrepreneurs, assistance for financing, access to list of suppliers etc. Through the National Portal, users will also be able to access (virtually) to most of the technical information and training services provided by the TCs. This platform will extend the reach of the program to beneficiaries well beyond the TCs' physical location through access to e-learning solutions, B2B service & product market place, e-recruitment portal and e-governance services (grievance reddresal forum). In addition the National Platform will also include the Monitoring and Evaluation Platform for the TCSP program.

Component 2: Investments to develop new and upgrade existing Technology Centres

The Program will finance the development of 15 new TCs and upgrade the 18 existing TCs under the responsibility of the MSME Ministry. The development of new TCs will be phased with the first new TC

development likely to commence in 2014 and construction of all new TCs likely to complete by 2018. The investments in upgrading and building new would be based on the DPR prepared by the Program Management Unit on behalf of the O/o DC, MSME in consultation with stakeholders including the Technology Partners and Cluster Network Managers. The DPR will be approved by the PSC and will be informed to the World Bank by updating the procurement plan.

The land for the new centres will be provided by the State Governments and many State Governments have already responded positively to this program.

Sub-component 2.1: Buildings/ other infrastructure

The physical facilities of the TCs will be upgraded and developed with the following objectives in mind:

- Eco-friendly design
- Cost optimization
- Flexibility with respect to usage and future expansion/contraction
- Ensure a healthy and safe environment and user-friendly buildings for the people who work or get trained

The construction is expected to start in the second year and likely to complete by the fourth year of program implementation. A typical new TC for precision manufacturing and general manufacturing may have the following pattern:

- Main institute building (including manufacturing, training, administration and other facilities): 15,000 sqm
- Hostel and residential facility (for around 600-700 students): 5,000 sqm

Sub-component 2.2: Equipment/Software

The equipment required to upgrade the existing TCs and develop the new ones will be purchased based on the DPRs prepared by the Program Management Unit in consultation with the Technology Partner and Cluster Network Manager and also inputs of concerned sector Joint Working Groups. The advice/vetting of the Technology Partners and Cluster Network Managers will be taken once they are on board/contracted. One of the key considerations would be to identify equipment and software that is in line with the technology roadmap the TC plans to embark to support its cluster. Adequate attention needs to be provided to upgrade and build technology capabilities for the future but should be proven and fit the context of the cluster and its geography at the same time.

Sub-component 2.3: Operating costs of new Technology Centres

The Government of India (through TCs and the MoMSME) will finance 100% of the operating costs of the 15 new TCs to make them fully operational and financially self-sustainable expected within four to five years of their launch, depending on the location and sector of the TC.

Component 3: Technical assistance to the MSME Ministry for Program implementation and Monitoring and Evaluation

Sub-component 3.1: Project Management Unit

The program will be implemented with a support of a dedicated Project Management Unit

Sub-component 3.2: Small dedicated program management team

A dedicated team consisting of the National Program Manager, a Procurement Expert, and a Financial Management Expert will be appointed during the program implementation phase. Based on the suggestions of the PMU, it has also been agreed that an Information Technology Expert will be part of this team that supports the National Program Manager. This team will report into the Program Coordinator of the O/o DC, MSME and will act as the interface between the Program Management Unit and the Program Coordinator. The Program Coordinator, the PMU and the National Program Manager and his team will form the Program Implementation Unit (PIU).

Sub-component 3.3: Other technical assistance to the Office of DC-MSME and the MSME Ministry

This will include capacity building and change management for the O/o DC, MSME and support to carry out in-depth impact evaluation studies, by O/o DC, MSME in consultation with the World Bank. Other technical assistance for the program, as and when required, will be provided under this sub-component.

The M&E system will include in particular independent surveys of customers and stakeholders (including potential private competitors to the TCs) to conduct the impact evaluation and assess the transformative impact of the program as well as to ensure there is no significant crowding-out of the private sector.

The governance structure for the program is illustrated in Figure 1. Three tiers serve the different roles of: Strategic inputs, Implementation and Execution.

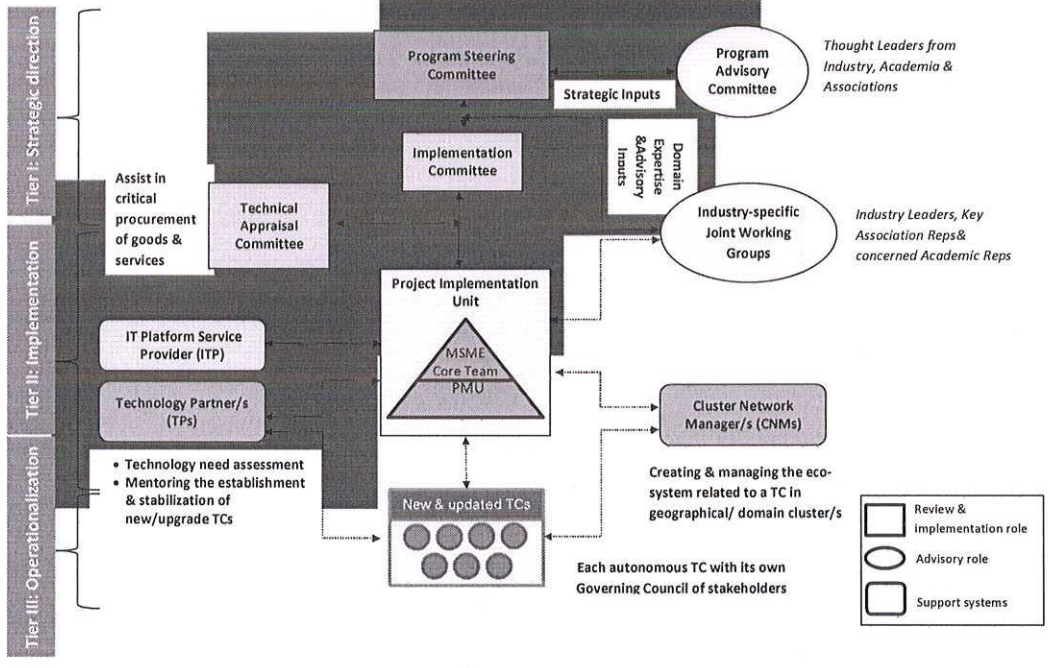

Figure 2: Technology Centre Systems Program: Governance Framework

3. Terms of Reference for Technology Partner for serving the Precision Manufacturing and General Engineering sector focused TCs

The following Terms of Reference are a draft version and may undergo changes. The final Terms of Reference will be issued as a part of the Request for Proposal to the shortlisted consultants.

The current scope of work is for the TP who will facilitate support for each system (or sub system) of TCs specialized in

i. Precision Manufacturing (e.g. Aerospace sector)
ii. Tooling and Metal Processing
iii. Advanced Welding

In total, eight out of the existing 18 TCs concentrate on the general engineering industry including tooling, precision and general manufacturing. In addition approximately 5-6 new TCs will also concentrate in the same sector.

The package for Technology Partner for Precision Manufacturing and General Engineering sector will focus on 3 existing Technology Centres namely

- Central Tool Room & Training Centre (CTTC), Bhubaneswar (Odisha)
- Central Institute of Tool Design (CITD), Hyderabad, (Telangana)
- Central Tool Room & Training Centre (CTTC), Kolkata (West Bengal)

In addition, the Technology Partner will support any existing TCs with a secondary focus on precision manufacturing and 2-3 new TCs that will focus on the precision manufacturing sector.

The duration of assignment for the Technology Partner will be up-to maximum of six years with the last year focused on hand holding and handover.

3.1. Role of the Technology Partner

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 latest equipment, developing and testing new products and patenting. 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 MSME to learn how to attain manufacturing excellence and attain associated excellence in skills development. The key role 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 precision manufacturing and general engineering 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 precision manufacturing and general engineering sector

- Support TCs to increase productivity and competitiveness of precision manufacturing and general 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) including those who directly or indirectly supply to large OEMs

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 Technology Partner will be mandated to contribute to TCSP by providing facilitation support for each system (or sub system) of TCs including:

a. *Technology development* – Identification of existing and expected future technologies and develop a strategy/roadmap and capacity building so that the MSMEs in precision manufacturing and general engineering industry can take advantage of such cutting-edge/competitive technology inputs.

b. *Human skill development* – Undertaking skill gap assessment for the workers employed for MSMEs in the precision manufacturing and general engineering industry with respect to new and relevant technologies and design training programs to address this gap

c. *Advisory to TCs on their technical set up* –Advise on the equipment and software required to upgrade existing TCs or establish new TCs. This would include providing procurement ready specifications and support in drafting the terms of reference for the selection of suitable vendors and monitoring their progress

d. *Businesses Advisory on technology matters* – Assisting TCs provide technical advice to their key clients (e.g., industrial clusters or leading manufacturing firms/OEMs with large networks of MSME suppliers or MSMEs).

3.2. Detailed Scope of Work

As discussed in the section above, the scope of work of the Technology Partner has been divided under four tracks. The detailed activities under each of the tracks are listed below:

3.2.1. Track 1: Technology Development

Activity 1: Identification & selection of existing and expected future technologies in the precision manufacturing and general engineering sector

Identification of leading global technologies and world class manufacturing techniques in the precision manufacturing and general engineering industry on a continuous basis, those have been accepted and are in use in developed/developing countries and are required by the Indian market and can be adapted for implementation in the Indian context. Sustainable, resource efficient (e.g. Energy

consumption, carbon and water footprint etc.) technologies should be considered, which will make the sector more efficient and reduce its impact on the environment. In addition the Technology Partner needs to be mindful of the future direction from a technology development perspective and help assess the impact of the same on the Indian manufacturing sector.

The Technology Partner will also develop a selection criterion, including cost/benefit analysis, ease of implementation, environment impact etc. for evaluating the impact of these technologies on the TCs and the MSME sector at large. A minimum of 10 such technologies need to be identified on an annual basis and based on a selection criterion (pre-approved by O/o DC, MSME), compile a white paper with recommendations on the adoption of the technologies. The white paper should also include an implementation roadmap and business case for any investment.

Key Deliverables: (i) White paper on the state of the global manufacturing industry and future direction from the technology development perspective (ii) Cost / Benefit Analysis of adaptation of minimum 10 new and relevant technologies (to be complied every year)

Activity 2: Development of a detailed Strategy/Technology Roadmap for TCs

The technology partner will need to collaborate with DC-MSME, GMs of TCs, industry leaders, academia/ research institutes and Industry Associations to develop a strategic plan for developing a framework of new and relevant technologies which will guide the direction of the Technology centres. The TP would need to develop TC wise technology roadmap detailing key initiatives and capacity building activities and timelines for rollout. The TP is expected to increase awareness amongst stakeholders on Environmental, Health and Safety (EHS) requirements, including those related to reducing health/pollution risks, increasing resource efficiency (reducing resource consumption, like energy, oil, water etc.) and regulatory requirements. The TP will also be responsible for assisting in the implementation and handholding during the rollout of the new and relevant technology.

Key Deliverables: (i) Strategic Plan for Technology framework and roadmap for rollout of technology for each TC

Activity 3: Development of knowledge sharing framework between the TCs

For the successful implementation of the TCSP program, it is critical for all TCs along with the systems (and sub systems) that they support to share their knowledge on existing/new technologies with each other. For this the TP will be responsible for developing a knowledge sharing framework for the existing and new TCs. The TP will be responsible for the conceptualization and organization of knowledge sharing programmes such as workshops/ training programs. The TP will prepare a calendar with knowledge sharing events on an annual basis and upon approval by the O/o DC, MSME, organize these events for the complete period of engagement.

Key Deliverable: (i) Knowledge Sharing Framework (ii) Knowledge Sharing Calendar (on annual basis) (iii) Organization of knowledge sharing workshops/training programs

Activity 4: Capacity building of TCs to ensure support to MSMEs

The TP will be responsible for the capacity building of the TCs on the use of newly identified technologies/ equipment, newly implemented manufacturing processes and techniques, identified improvements in the Environmental Health and Safety (EHS) requirements etc. to enhance the support provided to MSMEs by TC. Specifically this will mean:

a) Development of a skill mapping framework and undertaking skill mapping exercise for the employees of the TCs

b) Based on recommendations from the skill mapping exercise, development of training content and structured delivery document for employees of TCs including a defined yearly calendar of workshops, training programs aimed at improving the capacity of the TCs. The calendar will need to be approved by the O/o DC, MSME
c) Delivery of training of the TC employees as per agreed calendar through a system of certified train the trainer program
d) Batch training of select TC employee at TP premises
e) Development and implementation of processes at TCs to provide production and design support for MSME. In addition the TP will also provide training and documentation for support on the new processes developed.
f) Development and implementation of processes at TCs to provide technical advisory on designing, prototyping, testing & calibration and applied research. In addition the TP will also provide training and documentation for support on the new processes developed.
g) For key EHS issues identified by the CNM for the relevant sector, develop a plan for implementation of mitigation measures while adhering to the industry standard and the regulatory requirements

Key Deliverables: (i) Skill Mapping framework for TC employees and results of exercise (ii) Capacity Building Plan for the TCs (iii) Training content and structured delivery document for employees of TCs and MSMEs (iv) Process document for TCs to provide production and design support for MSME (v) Process document for TCs to provide technical advisory on designing, prototyping, testing & calibration and applied research

Activity 5: Facilitate exposure to global leading MSMEs

The TP will be responsible for developing and executing an engagement plan for Indian MSMEs to get exposure to the world's leading MSMEs. Some of the core activities that can be included in this plan are

a) TP will need to evaluate the adoption level of identified technologies in the Indian MSMEs. In addition, the TP will need to factor specific recommendation on improving efficiencies (including resource efficiency) and overall competitiveness of the clusters served, based on benchmarking activities undertaken by the CNM.
b) Based on the findings from the benchmarking exercise, organize specialized and targeted workshops for Indian MSME leaders on leading practices, emerging market trends, issues and challenges in the current system to sensitize them on the changing trends in the sector
c) Organize at least one study tour per year in developed/developing countries with leading precision manufacturing and general engineering industries for relevant TC officials and Indian MSMEs to help gain insights on the leading practices. Study tours for MSME may be offered at cost to them.
d) Assist the Cluster Manager in promotion of joint product development ventures and technical collaboration with MSMEs in the developed countries by assessing the technical capabilities of the MSMEs involved and providing technical assistance for the joint product development.

Key Deliverables: (i) Engagement plan for exposure of Indian MSMEs to leading global MSMEs (ii) Benchmarking framework for technology adoption by MSME units in the precision manufacturing and general engineering sector (iii) Workshop and Study Tour Plan

Activity 6: Monitoring and Evaluation of Activities

While the role of the PMU would be to put in place a robust M&E framework which will include monitoring the results framework, the TP will be responsible for regularly reporting to the PMU and the O/o DC, MSME by

a) Develop reporting formats for approval by TCSP.
b) Monthly project management reporting to capture input and activity progress.
c) Prepare reports for O/o DC, MSME and TCs:
    - Monthly input and activity reporting,
    - Quarterly input, activity and output reporting, and
    - Annual input, activity, output, outcome and impact report

Key Deliverables: Monthly, quarterly and annual reports to TCSP and cluster governance structure.

3.2.2.Track 2: Human Skill Development

Activity 1: Strategy and roadmap to address skills gap

The Cluster Network Manager will undertake an assessment to identify the skill competencies required by MSME employees in the manufacturing sector, skill seekers, and students in the context of leading practices and global standards and prevailing situation in the Indian market. The study will concentrate on development of skills of the workers and students in the identified technologies. Based on the assessment the TP will be responsible for the following activities

a) Development of a strategy and roadmap for implementation of training programs related to the identified technology to address the skill gaps
b) Address any skill gaps identified in relations to equipment and software by enhancement of the BoM for hardware & equipment and software requirements for the TCs
c) As part of the technology roadmaps developed as in Track 1, the TP would also develop an implementation plan to impart skills on the identified technologies

Key Deliverables: (i) Strategy and roadmap for implementation of training programs (ii) Enhancements in BoM for vendor to address skill gap

Activity 2: Enhancement of training programs

The existing TCs have already developed and operate modular training programs. The TP will be responsible for evaluating and enhancing these programs into world class training programs for TCs as identified in the skill development roadmap. This will include:

a) Assessment and evaluation of the existing training modules
b) Enhancement of curricula including training course, syllabus, lesson plan, instructor manuals, student manuals, exercise manuals, questions banks, examination / validation/ certification systems)
c) Verification of the examination systems and recommendations so that the examination systems are at par with the best in the world.
d) Organization of pilot training modules
e) Testing and refinement of content based on the assessment of feedback received
f) Static content for e-learning modules. The conversion of static content to e-learning content will be undertaken by the IT partner.
g) Support TCs in engagement with Institutions (such as AICTE, Universities, etc.) for appropriate certification of the courses.
h) Training of Trainers (TCs, Vocational Training Institutes/ ITIs/ Polytechnics)
i) Development of a rollout and scalability plan for the training programs developed
j) Facilitate in development of Faculty Exchange Program including process document and identification of international universities and institutes for the program

k) Develop guidelines for the instructors and students to better understand and implement the EHS requirements
l) Provide regular training for continuous capability enhancement
m) Support TCs in developing the courses which can help MSMEs to be part of hi-quality global supply chain (international quality requirement)

Key Deliverable: (i) Evaluation Report and recommendations of the current training modules and examination system (ii) Enhancement in Training curricula (iii) Content for e-learning modules (iv) Training of Trainers content and plan (v) Process document and list of potential partners for Faculty Exchange Program (vi) Module informing instructors and students of EHS guidelines and its implementation

3.2.3. Track 3: Advisory on Technical up gradation of existing TCs and set-up of new TCs

Activity 1: As-is assessment and gap analysis for existing TCs

The TP will undertake as-is assessment of the technology infrastructure and manufacturing processes in existing TCs to evaluate and provide recommendation to increase the efficiency of the TCs. Following is a list of sub activities to be undertaken:

a) As-is assessment of the technology infrastructure and manufacturing processes and techniques for all service offerings of the existing TCs
b) Undertake gap analysis for technology infrastructure, manufacturing process and techniques and EHS requirements based on leading practices and global industry standards
c) Provide recommendation to help increase efficiency, productivity and quality of the existing TC's outputs by developing new manufacturing processes keeping time and cost effectiveness in mind
d) In conjunction with the IT partner, provide domain knowledge for setting up of ERPs and MIS for the technology centres
e) Suggest list of new equipment and Bill of Material (BoM) for up-gradation of TCs. Also assess & advise TCs regarding obsolescence of plant & equipment for condemnation

Key Deliverables: (i) As-is assessment report for existing TCs (ii) Gap Analysis report with recommendation on technology enhancements and manufacturing process and techniques and domain knowledge on IT enhancements

Activity 2: Selection of equipment, software & hardware provider

The TP will be responsible for developing list of machines and equipment (as part of the Bill of Material) and preparing vendor neutral specifications and support the selection of equipment, software & hardware providers for the modernization and up gradation of the existing and establishing new TCs as and when the procurement is undertaken by the O/o DC, MSME. This will include the following activities:

a) Market research and analysis for preparing vendor neutral specifications.
b) Define Terms of Reference for the vendor
c) Define Minimum Technical Requirements and Service Level Agreement for vendors after undertaking a market analysis for establishing the criterion for selection
d) Guidance on the design layout / Infrastructure requirement for the machinery and equipment:
   - Production Facility Dimensions including structural requirements
   - Training Room Dimensions
   - Classroom Dimensions
   - Tool Trying out facility

- Utilities facility including the specification for tenders (HAVC, Gen Sets, Water, Compressed Air, Safety, Fire Fighting etc.)
- Waste disposal process
- Assembly layout

e) Define the Bill of Material for each TC along with detailed budgeted estimates
f) Assist in addressing vendor queries and technical – commercial evaluation of proposals

Key Deliverables: (i) Terms of Reference for the equipment, software and hardware vendor (ii) Minimum Technical Requirements and Service Level Agreement for vendors (iii) Design layout / Infrastructure requirement for the machinery and equipment (iiv) Bill of Material for each TC

Activity 3: Assistance and monitoring the installation, trial, quality testing & commissioning and approval of the new equipment and technology setup.

The TP will be responsible to assist TC for the installation and commissioning of the new machines, equipment and technology setup at the TCs and implementation of new manufacturing processes. Therefore the TP will need to undertake the following activities:

a) Facilitate and Monitor installation and commissioning of the new and relevant technology
b) Undertake trial and testing of the new hardware/software and equipment installed in the TCs
c) Provide approval to vendor for the commissioned hardware/software and equipment so that payments may be processed
d) Undertake capacity building for TC employees on procured equipment/software
e) Assisting TCs for implementation of recommended manufacturing processes and provide hand holding during the initial roll out

Key Deliverables: (i) Testing and Approval report for new installations

Activity 4: Assistance in Operations and Maintenance

The TP will provide assistance in the operations and maintenance of the TCs with reference to the new technology installed

a) Support the leadership of TCs in manpower planning for the newly identified technology and identification & cross-skilling of existing manpower to gain new expertise:
   - Design Expertise (Product / Process)
   - Manufacturing Process including Quality Assurance Expertise
   - Training Expertise (Practical & Theory)
   - Functional or Technical Expertise
b) Development of training plan & recommendation on the curriculum and training to be imparted to workers and students on new technology
c) Development of the Standard Operating Procedures and EHS guidelines for the production process.
d) Establishment of the production cost estimates
e) Establishment of Maintenance Department (including maintenance schedules) in the context of the newly identified technology.

Key Deliverables: (i) Manpower Plan for newly identified technology (ii) Standard Operating Procedures for the production process (iii) Production cost estimates (iv) Maintenance schedule

3.2.4.Track 4: Technical Advisory

Activity 1: Strengthen the capabilities of TCs to provide technical advice to their clients

The TP will assist the TCs to provide technical advice to their key clients (e.g. industrial clusters or leading manufacturing firms/OEMs with large networks of MSME suppliers) and also support capacity building of TCs to provide such advisory on a long term basis. The key activities under this track will include:

a) Support TCs to provide a bouquet of technical advisory services (in Products, Process, Layout and Implementation) to MSMEs approaching TCs for technical assistance such as assistance for product design, manufacturing processes and techniques, quality assurance, EHS requirements and guidelines, research and development, and development of patents for the manufacturing sector.
b) Assist TCs in providing advice to MSMEs on cost effective technology including life cycle costing.
c) Support TCs in providing consultancy to prospective entrepreneurs for setting up new enterprises.
d) Assist TCs in identification of sources for specialized raw material for manufacturing assignments undertaken by TCs
e) For the period of the engagement, the TP will provide specialized skilled resources on short term basis with subject matter expertise in the manufacturing sector such as precision manufacturing, tooling, advanced welding for assisting in any technical advisory project undertaken by the respective TCs.
f) In conjunction with CNM establish access to specialized skilled resources with subject matter expertise in the manufacturing sector such as precision manufacturing, tooling based on the requirement of the respective TC
g) Undertake capacity building exercises for creating Subject Matter Experts in the TCs: Development of Training content and structured delivery document for Employees of TCs and undertake training for TC employees

Key Deliverables: (i) Approach to improve the efficiencies and competitiveness of the cluster (ii) Technical advisory for MSMEs approaching TCs for assistance (iii) Training modules for capacity building of SMEs in precision manufacturing and general engineering sector

4. Organization Requirements and Team composition for the Precision Manufacturing and General Engineering focused Technology Partner

4.1. Organizational Requirements

The organization must have global proven track record (capability and experience) to deliver the objective of the TCSP program. Following are the minimum requirements from the consultants applying for the role of Technology Partner for Precision Manufacturing and General Engineering.

1. The consultants must be a registered legal entity and should have been in existence for at least 5 years

2. The consultants must have a minimum average annual turnover of USD 6 million over the last 3 years. At least USD 400,000 each year must be from applied research projects in the area of precision manufacturing and general engineering for sectors such as aerospace, consumer durables, capital goods etc.

3. The consultants must have at least 3 relevant completed/ ongoing projects in applied research in the area of precision manufacturing and general engineering for sectors such as aerospace, consumer durables, capital goods etc., in the last 5 years. Not all of the three projects mentioned under this criterion should have been executed in one country.

4. The consultants must have at least 3 relevant completed/on-going projects related to skill development specifically development of training programs and curriculum in the precision manufacturing and general engineering industry in the last 5 years.

4.2. Key Team Composition

Following are the minimum quantities and deployment for the team members required from the Technology Partners for the precision manufacturing and general engineering sector to deliver the project. This table is for guidance only. Participants are expected to present their own version of team structure and composition. In case Consultant wishes to apply for more than one package, the Consultant must provide separate Project Lead and Key Staff for each package.

S.No.	Role	Number of Personnel	Indicative Man Months
1.	Team Lead/ Training Expert	1	72
2.	Tool Design Expert	1	24
3.	Tool Manufacturing Process Expert	1	12
4.	Precision Manufacturing Expert	1	24
5.	Other Key Experts*	3	3 experts x 6 months
6.	Administration and Account Support	1	72

*Areas of expertise include tool design, quality assurance, advance welding etc.

Please Note: O/o DC, MSME has the right to deploy the services of the consultants within TCSP across India for the contract period. The teams will be deployed in one of the TCs in the respective clusters and will need to travel to the other TCs/ New Delhi as per requirements of the project.