MSME Umbrella Programme

Policies and Programmes

Volume X

Strategic recommendations for MSME Tool Rooms

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MSME Tool Rooms in India
Strategic Assessment and Recommendations Report

Prepared for
Micro, Small and Medium Enterprises Umbrella Programme

Prepared by
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giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

COOPERATION REPUBLIC OF INDIA FEDERAL REPUBLIC OF GERMANY

MSME

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- **John Lawson**

Executive Summary

In the context of on-going rapid growth of the manufacturing sector in India, a vibrant tooling sector plays a key role in the viability and growth of manufacturing Micro, Small and Medium Enterprises (MSMEs). The Government Tool Room Programme plays a key part in strengthening this tooling sector, mainly by the contribution of skilled human resource. In order to plan for the next five years of this programme, GIZ is supporting the Office of Development Commissioner, MSME (DC-MSME) to review the programme performance and recommend improvements. The terms of reference call for strategic insight on the future role and ideal service portfolio of tool rooms as part of the overall MSME support mechanism, taking into account changes in the Indian economic conditions in the last two decades and international best practices.

Information was gathered from four initial tool rooms' visits in July and August 2011 to Ahmedabad, Aurangabad, Kolkata and Jamshedpur. Information was gathered from Tool room leaders, Governing Council members, industry association leaders, MSME clients and state representatives through interviews to inform the as-is situation assessment. Desktop research on international tooling programme practices, provided insights into improvement potential.

Two more tool rooms were visited on a subsequent visit in September 2011 – Hyderabad and Bhubaneswar. The draft version of the recommendations was distributed for feedback. The recommendations were interrogated at the MSME Tool Room Consultation workshop on 28th and 29th November by representatives from DC-MSME and General Managers from the 10 Government Tool Rooms. The draft document including recommendations was refined based on the workshop results.

The site visit investigations concluded that these tool rooms make a profound contribution to manufacturing MSME through the services they deliver. However, things changed over 30 years, since these tool rooms were originally conceived. Most significantly, the private tool making sector now supplies more than 33 times as much tooling to the government tool rooms. Market failure is now much less of an issue. The output in training has increased substantially in both scale and scope, but is still lagging behind industrial growth requirements. Incremental improvements are clearly evident, but somewhere over the past decade or so, misalignment of KPIs and strategic rationale crept in. Structure started dictating strategy. The emphasis shifted to tool room sustainability performance, rather than on maximising economic impact.

An integrated set of ten recommendations are made to increase the impact of the tool room programme - reducing constraints to manufacturing MSME growth. The recommendations are based on good international practice, some of which is already evident in the leading government tool rooms. The scope of these recommendations spans improvements at 3 levels:

- Tool rooms (6 recommendations)
- Region/state (1 recommendation)

- National tooling programme level (3 recommendations)

Recommendation	Expected results	Need context
1. Scale up training to meet market demand (double up)	TRs contribute trainees in greater numbers. The gap in the supply of advanced manufacturing skills is systematically reduced.	Manufacturing investment is reportedly driven by the availability of skills. The massive shortage of skilled manpower therefore constrains manufacturing growth. As demand has outstripped supply of these skills, government requires additional investment to reduce this bottleneck. Training revenues will also substantially improve TR sustainability.
2. Support private tooling sector to mature to excellence	Besides 10 government tool rooms, hundreds of private tool rooms contribute to increased manufacturing MSME competitiveness by providing more complex tools at lower prices.	A competitive tooling sector strengthens manufacturing competitiveness and is the key to viability and growth of manufacturing MSMEs. The more the private sector does, the less it costs government to reduce constraints. Private tool rooms already supply more than 33 times as much tooling as government tool rooms, mainly because they are quicker and cheaper. However, private tool rooms still struggle with the more complex tooling.
3. Speed up absorption of advanced manufacturing technology	Increased numbers of MSMEs access advanced technologies which enables them to secure larger contracts at better margins.	MSMEs need access to advanced technologies to move up the sophistication ladder, to secure larger contracts at more profitable margins. Even though this is not a large revenue generator for TRs, it is critical to enable faster growth of manufacturing MSME.
4. Engage in strategic partnerships	Partnerships with large manufacturers helps realise large scale opportunities for manufacturing MSME. TRs benefit from large scale and long lasting demand for services and increased revenue.	Large opportunities to increase economic impact and unlocking new revenue opportunities are not utilised despite industry enthusiasm. Market development in partnership with large firms in value chains, unlock these opportunities.
5. Systematically build and leverage networks of capacities	Networks of collaborating stakeholders support the TRs to unlock more opportunities. Sub-contractors enable TRs to expand the scale and scope of their services.	Many TRs do not yet systematically leverage external capacities to increase value addition. Large firms utilise hundreds of suppliers to offer integrated solutions. Networks of collaborating stakeholders provide more intellectual capital and capacity to execute than a single organisation.

Recommendation	Expected results	Need context
6. Re-organise "business model" of government tool rooms	More 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.	The public-sector-nature of TRs impedes performance in issues such as staff retention, innovation and optimal utilisation of assets. A business model that closer simulates private sector behaviour can improve results.
7. Map out the TRs role in the local innovation system	TRs benefit from integration with the local innovation system. Increased opportunity results from increased stakeholder awareness and support.	The performance of both tool rooms and other stakeholders in this larger innovation system can be enhanced if they cooperate effectively.
8. Move away from hierarchy to network governance	TRs benefit from more autonomy which enables them to respond better to opportunities.	Many economic development opportunities do not wait for government bureaucracy. The ability to act swiftly and decisively on big issues is critical.
9. Establish a strategic framework	TRs utilise a coherent strategic framework clearly articulates programme goals, sound economic development principles and good practice. Revised KPIs promote sound strategy that result in greater, sustained development impact.	Sound economic development principles and robust strategic concepts will assist leaders involved in the tooling programme to think and act more strategically. The best strategies from TRs are captured and shared for benefit of other TRs
10. Establish a strategic facilitation capacity	TR learn faster to achieve greater development impact. TR are international level of competitiveness.	Substantial changes are required for TRs to think and act more strategically. New skills are required. Successful implementation will require substantial technical and financial support.

By the end of the two day workshop process; recommendations were prioritized and the participants reached a consensus on activities that seemed most viable in the year 2012. *Supporting the private tooling sector* was the main area of resistance by the tool rooms. Consensus on its need and importance could not be reached. Recommendation 2 now becomes a policy decision for DC MSME.

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Abbreviations

DC	**Development Commissioner**
GIZ	**Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)**
GM	**General Manager**
IGTR	**Indo German Tool Room**
IDTR	**Indo Danish Tool Room**
KPI	**Key performance indicator**
MSME	**Micro, Small and Medium Enterprises**
MoMSME	**Ministry of Micro, Small and Medium Enterprises**
TR	**Tool room (Government)**

Chapter 1
Introduction

In the context of on-going rapid growth of the manufacturing sector in India, a vibrant tooling sector plays a key role in the viability and growth of manufacturing micro, small and medium enterprises (MSMEs). The government tool rooms play a key part in strengthening of this tooling sector.

A number of Government Tool Rooms (TRs) were set up under the Indo-German, UNDP and Indo-Danish collaborations, to assist MSMEs to improve their quality and productivity. These tool rooms provide training and consultancy in the area of tool and die making, and also provide good quality tooling through designing and producing tools, moulds, jigs & fixtures and components.

After many years of operation, GIZ is now supporting the Office of Development Commissioner MSME (DC-MSME) to review the tool room programme. The purpose is to evaluate their long-run performance, recommend improvements in their services, outreach and revenues and define a time-bound action plan to implement these recommendations. This support falls under the framework of on-going Indo German bilateral cooperation project named the MSME umbrella programme. GIZ and DC-MSME are the implementing partners.

1.1 Origin and rationale

The idea of operating Government supported tool rooms as instruments to facilitate the development of MSME emerged in India in the late 1960s. This was at a time when products and manufacturing processes became increasingly diversified and the demand for precision tools and high-skill technical personnel grew rapidly. Under the Indo-German, Indo-Danish and UNDP collaborations, ten MSME-Tool Rooms were set up. They are:

- MSME-Tool Room (Central Tool Room), Ludhiana;
- MSME-Tool Room (Indo German Tool Room), Ahmedabad ;
- MSME-Tool Room (Indo German Tool Room), Indore;
- MSME-Tool Room (Indo German Tool Room), Aurangabad;
- MSME-Tool Room (Central Tool Room & Training Centre), Kolkata;
- MSME-Tool Room (Central Tool Room & Training Centre), Bhubaneswar;
- MSME-Tool Room (Indo Danish Tool Room), Jamshedpur;
- MSME-Tool Room (Tool Room & Training Centre), Jalandhar;
- MSME-Tool Room (Central Institute of Tool Design), Hyderabad;
- MSME-Tool Room (Tool Room & Training Centre), Guwahati.

These tool rooms were set up for fulfilling the requirements of the manufacturing MSME, in the fields of tool design and manufacture and training of technical personnel in these fields.

1.2 Developments since establishment

Over the decades a number of reviews of tool rooms were conducted. The most significant review culminated in the Vision Paper entitled "Tool Rooms in India - Concept, Past Experience, Challenges Ahead", released on 21 March 1998. This review was prepared in late 1997 and early 1998 following a suggestion of BMZ[1] to facilitate future guidance and strategic decisions. Since its release it has served as a basis for the orientation of the development of tool rooms in India. In particular, the issue of sustainability received greater prominence:

> *"In the future, Government supported tool rooms will fully align the delivery of their production and training services with the expectations of their target group. This goes primarily for the in-time provision of high quality services at competitive prices. But it also relates to serving the customers on a continuous basis and in a demand responsive way requiring the tool rooms to keep their capacities and capabilities always in line with market and technological changes.*
>
> *To achieve sustainability and to ensure innovation calls for the tool rooms to generate sufficient resources, in turn demanding adherence to the full cost recovery principle for production and technical services for SSE (while large and medium-scale enterprises should pay an additional margin of 15 to 20%), to cash cost recovery for short-term training courses, and to partial cash cost recovery for long-term training courses. These principles will be applied at all times."*

The principles defined at the time, have to a large extent, shaped the "business model" of the tool rooms today.

1.3 Purpose of study

This study calls for a comparison of the tool rooms with international tool rooms programmes. A consulting firm from India was appointed in May 2011 through competitive tender to conduct the study. In addition, an international expert was required to complement the work of the Indian consultants. The international consultant was expected to deliver:

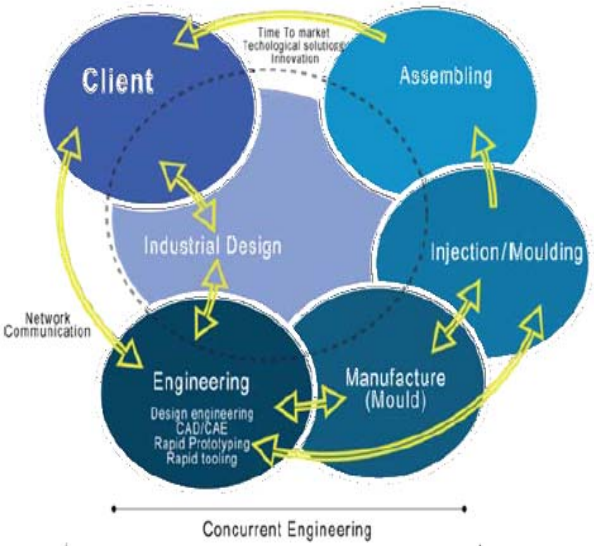
- An institutional comparison of the tool rooms with international tool rooms
- A comparative assessment of the production and training services with particular reference to industry requirements for tool room services in international markets.
- Strategic insight on the future role and ideal service portfolio of tools rooms, taking into account changes in the last two decades and international best practices.

[1] German Ministry for Economic Cooperation and Development (Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung)

Chapter 2

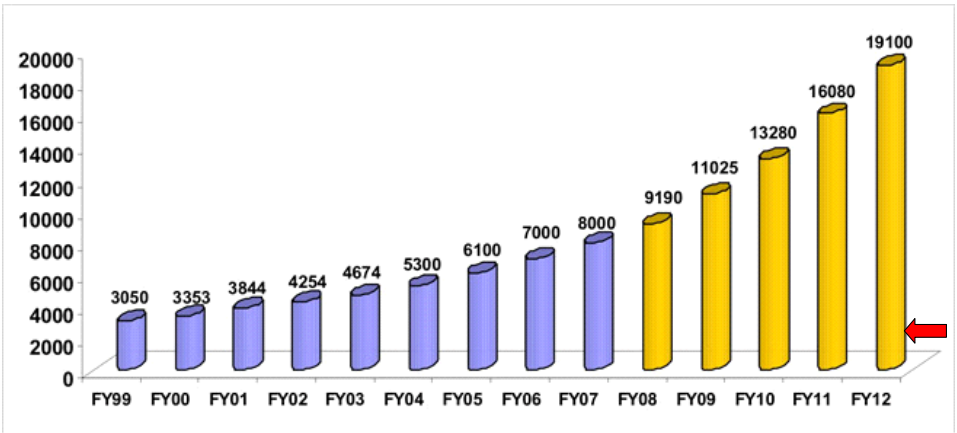
Current Situation (strengths and weaknesses)

The tooling industry supports activities of design, engineering, manufacturing and production, as illustrated for plastic injection moulding in the figure on the right. Growth of these manufacturing related industries therefore drive the growth in demand for tooling. This market context for the tooling industry is described by the Tool and Gauge Manufacturers Association (TAGMA) of India, in their comprehensive study on the Indian Tool room industry published in 2008. Apparently a 2012 version will be published soon.

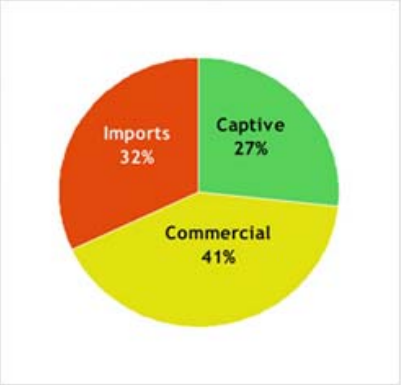


The trend of growing demand is illustrated in the figure below:

Size of the Tooling market in India: Growth & projected growth @ 20%



The current production output of all 10 government tool rooms is indicated by the red arrow above, estimated at less than 1/33 of local supply. It is clear from this fact that the tooling market is not failing. The fact that commercial tool rooms are growing faster than captive tool rooms, dispels the myth that commercial tool rooms are not viable.[2]



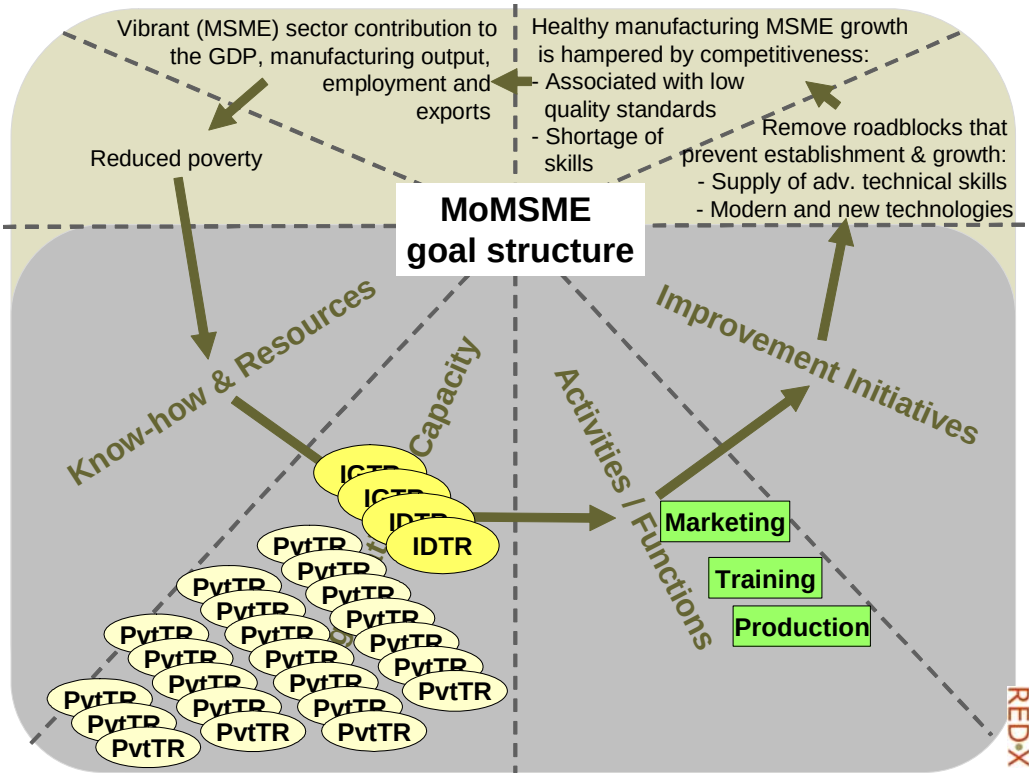
[2] www.tagmaindia.org

2.1 Strategy concept

In the context of on-going rapid growth of the manufacturing sector in India, a vibrant tooling sector plays a key role in the viability and growth of manufacturing MSMEs. The government tool rooms play a key part in strengthening of this tooling sector.

2.1.1 Tool Room programme rationale

The government tool rooms are accountable primarily to the DC MSME, Ministry of Micro, Small and Medium Enterprises (MoMSME), which sets strategic direction by setting targets in priority performance areas. The MoMSME goal structure[3] pertaining to the government tool room programme is illustrated in the framework for economic development below. The framework maps the rationale of cause and effect. The top section illustrates the basic rationale for the programme of government intervention. The bottom section illustrates four elements of the tool room programme configuration.



Starting at the top left quadrant: Poverty is reduced by growth in: GDP, manufacturing output, employment and exports, much of which results from growth of MSME and large business.

Top right quadrant: Growth of MSME is a consequence of firm competitiveness, in relation to market demand. Rates of MSME establishment and growth are hampered by constraints in

[3] MSME-Annual-Report-2010-11, 3.7.2 Vision, Mission, Objectives

the form of low quality standards and a shortage of advanced manufacturing skills. Quality of manufacturing depends on the quality of tools and skills of machinists.

***Bottom right quadrant*:** The government tool rooms are expected to remove these constraints:

- to supply enough advanced technical skilled persons, and
- to enable absorption of the modern/new technologies required for competitiveness.

The current output and activities are defined as: Training, Production and Marketing.

Bottom left quadrant: Appropriate capacity to realise these goals is required. Current capacity consists of the government tool rooms as well as private sector tool rooms. The activities of government tool rooms are financed partially from their operations which draw income streams from trainees, small and large firms and various forms of national and regional government.

The impact chain (or strategy map) is evident when reading the framework logic in an anti-clockwise direction, starting from the bottom left quadrant: The investment in government tool rooms establishes capacity to provide tools and advanced manufacturing skills that result in reducing the key constraints to manufacturing MoMSME growth. Increased MoMSME growth contributes to increased employment and reduced poverty. This justifies continued investment by government.

Based on the trainee output and placement claims, these tool rooms contribute in the order of 40 000 manufacturing jobs per annum. Economists believe that up to 5 additional jobs are created elsewhere in the economy as a consequence of each manufacturing job created. This would indicate a total employment contribution to the Indian economy of up to 200 000 jobs p.a.

2.1.2 Performance Indicators

The purpose of key performance indicators (KPIs) is to measure the impact chain to verify if things are working as planned. When KPIs are used as a management instrument to reward or punish, organisation behaviour aligns in strict pursuit of higher scores. If these KPIs are well conceived, organisational behaviour aligns with the impact chain. If they are not, unintended consequences result.

The current KPIs measure mainly the organisational output:

1. Financial targets: Revenue, Revenue expenditure, Recovery ratio.
2. Number of trainees to be trained
3. Number of MSME units assisted

Since the Vision Paper[4] was published in 1998, increased emphasis has been placed on sustainability of tool rooms. Improvements in sustainability are evident from increased training revenues. The tool rooms that perform better in sustainability are rewarded with larger capital expenditure budget allocations. As a consequence, this financial target is

[4] Entitled “Tool Rooms in India - Concept, Past Experience, Challenges Ahead”, 21 March 1998

prioritised by general managers (GMs), at times to the detriment of overall economic impact. This is evident from statements such as:

- "We make more money from larger firms, and service MSMEs in the time in between",
- "Our investment decisions are based on where we will make the most money", and
- "Post vacancies (exceeding 50% in some places) are not filled to keep costs down".

Sustainability pressures are also undermining the ability to stay in touch with international technological advances. GMs are finding it hard to send trainers to external training, and the skills of their people are not being updated.

The sustainability KPI has also driven tool room focus on self-survival, rather than on maximising impact. Sustainability is important, but not at the cost of compromising manufacturing MSME growth. The best form of sustainability is achieved if the private sector does the work (such as making tools for MSME), as this costs the government nothing.

Private tool rooms now supply more than thirty three times as much tooling to the Indian market. The market is clearly not failing. This poses the question as to why the government tool rooms are still actively involved in this market. Private sector tool rooms do not benefit from government subsidised equipment and infrastructure, which creates a position of unfair competition in the market. This market distortion makes it much harder for private sector tool rooms to move into the advanced tooling market segment. The consequence is that in some places, private tool rooms are not being supported effectively to migrate upwards to the required levels of sophistication. The challenge now is to reconcile policy objectives with self-sufficiency.

2.1.3 Industry priorities

The realised tool room strategies are not only shaped by the MoMSME KPIs, but also by industry requirements. Service offerings have evolved substantially towards meeting changing industry requirements. But tool rooms have struggled over the past ten years to keep up with all the changes in the private sector.

According to industry associations, the supply of skills is the priority requirement for tool rooms. Manufacturing investment is reportedly driven by the availability of skills, and the massive shortage of skilled manpower constrains manufacturing growth. Trainees are required in much greater numbers. MSMEs will struggle to retain skills when larger firms need them.

The second priority is the absorption of more competitive technologies. MSMEs need access to advanced technologies in order to move up the sophistication ladder, and to secure larger contracts at more profitable margins. This process is constrained by the abilities of MSME to:

- Produce quality at levels required by international value chains,
- Re-engineer components and develop manufacturing processes, and
- Raise finance to purchase expensive technology.

2.2 Governance and Steering mechanism

2.2.1 Strategic direction

Annual strategic planning is typically limited to reviewing the previous year's performance and negotiating new KPI targets with the DC MSME. These KPI targets are used as a management instrument to reward or punish. So tool rooms pursue behaviour that is rewarded and avoid behaviour that is punished. Strategic direction is thus set by these KPIs. There is little evidence of deep dialogue in search of more strategic alternatives though.

Strategy should follow sound economic development principles and respond to the specific regional industry requirements. These requirements are best understood by industry. Although industry does succeed to influence the strategic agenda to some extent, it is not involved to the extent that would be most beneficial.

2.2.2 Tool room autonomy

The tool rooms are independent in theory, but in practice they find it very hard to operate with business like efficiency. Efficiency is largely constrained by the "business model" where the GM does not have the same powers as the private sector. GMs are not authorised to make appointments. Appointments are reportedly not always based on the required competencies, and non-performers are not easily removed. This undermines the factor that is most critical to success: the development of a strong and committed team.

2.2.3 Governing Council and Leadership Issues

As is expected, tool room performance is also affected by the strength of leadership. Some TRs have good leaders and others not. Weaker leaders result in poor tool room performance which is further aggravated by punitive budgeting measures. Poor tool room performance results in less effective support to manufacturing MSMEs. Stakeholders suffer the consequences of leadership crises, which have in some cases continued for years. Ensuring continuation of good leadership is the responsibility of the Governing Council. In such a case, this points to limitations in the Governing Council's ability to act swiftly and decisively in important matters.

2.2.4 Public sector processes are stifling

Government tool rooms are supposed to demonstrate excellence in tool making and advanced manufacturing. Whereas the quality standards of production meets expectations, high prices and late deliveries almost always disappoint. Excellence entails simultaneous quality, on-time delivery and competitive prices. A major contributor to slow responses and higher prices is the public sector nature of government tool rooms.

A public sector procurement system slows down delivery. Expert employees are regularly lost to the private sector due to various contributing factors such as substantially higher salary scales at managerial level in the private sector. Staff promotions are apparently not always based on merit. At many TRs, the majority of senior staff members have never been promoted to a higher post. Some people have been in the same posts for twenty years with little change. These factors make it difficult to attract appropriately qualified employees. The consequence is lower productivity and less innovation. Understandably, the GMs would prefer to operate

more like the private sector.

2.3 Leadership and administration

As already indicated above, the GMs lack autonomy with regard to issues such as:

- remuneration in line with private sector,
- promotion, appointments and dismissals, and
- changing the organisation structure to maximise performance.

Some GMs manage to overcome these "business model" constraints much better than the other leaders, are unable to overcome these challenges. In some of the leading tool rooms, staff are proud, motivated, dedicated and disciplined. In other tool rooms, staff are totally de-motivated and produce at lower performance levels. The more sustainable TRs retain their customers whilst others struggle to retain their customers.

The business-like approach of tool rooms which is promoted with sustainability objectives has produced many good results. A large degree of sustainability has been achieved, with the income of many tool rooms exceeding their operational expenditure. The main strength is in quality and the weaknesses remain in terms of high costs and late deliveries. Cost and on-time delivery controls do exist, but not with vigour as in the private sector. Management information systems and controls exist but are limited. The exception is in the area of quality assurance where many tool rooms are ISO certified.

2.4 Training services

Industry is generally satisfied with the quality of training candidates they receive from tool rooms. The feedback is very positive: "The training is excellent, very practical - especially longer courses. We know these people coming from tool rooms are sure to perform". The success of the training service is further verified by an almost 100% job placement result. The success is attributed largely to the hands-on-training approach and the training on real life jobs, which differentiates it from offerings from other institutes.

Training currently contributes **60 - 70% of tool room income**. This has grown considerably when compared with the training contribution in the Indo-German tool rooms in **1996/7 of 11%** and in **1999/0 of 22%.** According to industry associations, a massive shortage of skilled manpower still exists. Trainees are required in much greater numbers. Aurangabad for example is training 4500 persons p.a., whilst the requirement is estimated at as much as 20 - 30 000 per annum. The high market demand that exists for growth in training output presents an opportunity to increase revenues and sustainability. A number of TRs are already expanding their training capacities rapidly and innovatively, something others can emulate.

The training offerings have responded to changes in industry requirements over the years. Requirements for change originate mainly from industry associations, but the training offering and scale of supply do not always stay abreast with needs and changes. The original TR training offering focussed mainly on tool and die making. Training services now include

courses such as: CNC, Cad/Cam, hydraulics, pneumatics, PLC. Some TRs now have plans to include courses such as mechatronics, robotics, Very Large Scale Integration (VLSI).

Despite the successes, a number of tool rooms are struggling to retain and attract the right trainers. Limited on-going development of existing trainers further exacerbates this challenge. A further concern is the lack of international benchmarking and exposure to international good practice, which poses the risk of not staying abreast with international competitiveness.

2.5 Production services

Tool room production activity is pressurised to chase revenue targets for sustainability, instead of contributing optimally to reducing constraints to MSME manufacturing employment growth. In recent years, not only the service offering, but also investment in future capacity is biased towards increasing tool room revenues. Many managers are aware of the income-target conflict with respect to support role to MSME.

The market situation has changed since the original conceptualisation of these tool rooms, which included the supply of tools when the market was failing to do so. The tool making market is clearly no longer failing, which poses the question as to why government tool rooms are still actively involved in this market. Private tool rooms do not benefit from government funding for tools and infrastructure. This makes it very difficult to compete in the advanced tooling market segment. Government tool rooms currently occupy the technically advanced market niche in their location. In these areas this supply of actual tooling makes it harder for emerging tooling firms to grow into this market space. In these places, there is low motivation to grow private tool rooms into this niche as this may reduce the income of government tool rooms. Some TRs argue that the private tool rooms are not able to produce the more complex tools, others argue that there are many that can and then insist the market is working effectively.

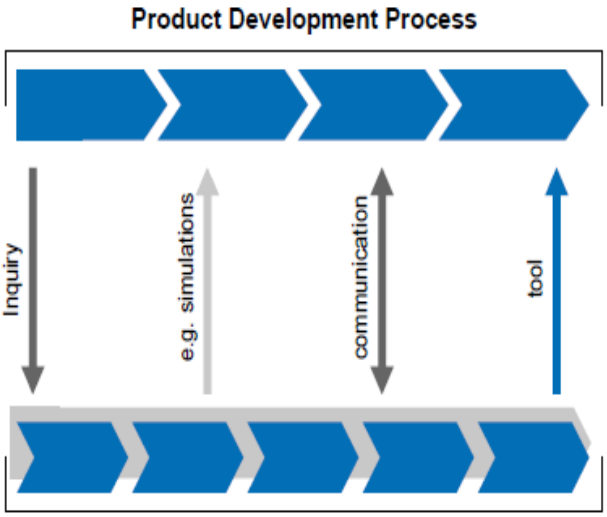
Effective government tool rooms should contribute towards increase in the:

- supply of competitive tools to manufacturing MSME,
- absorption of advanced manufacturing technologies required to compete, and
- development of advanced technical skills, not only in the trainees, but also in the product and manufacturing process development skills of MSME leaders

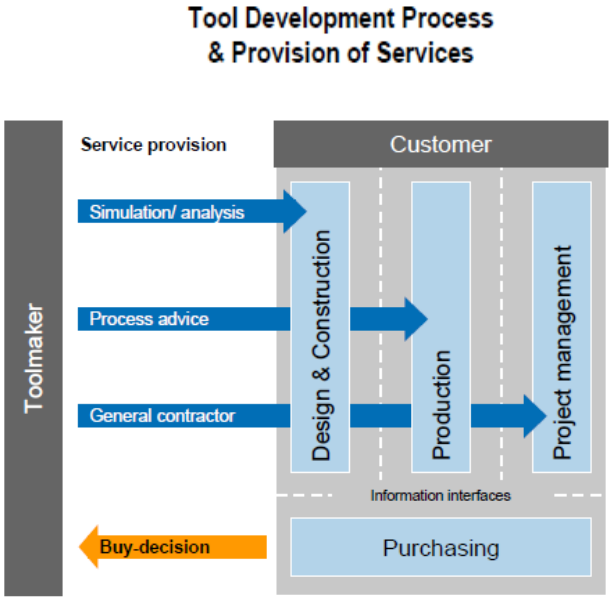
The production service offering has in many cases already evolved into a broader, new set of services to respond to market demand for assistance to:

- produce quality at levels required by international value chains,
- increase re-engineering and manufacturing process development skills, and
- gain access to technologies which are not yet affordable.

The current production services include: Product Design (mostly limited to re-engineering) > 3-D modelling > Design reviews > Modifications > Tool design > Manufacture > Testing and production of first of samples. However, this adaptation of the service offering seems constrained. This is evident from some tool rooms that provide support to plastic injection mould making, but do not yet have mould-flow analysis software.



Capital constraints deny most MSME access to important technologies. By utilising the advanced machinery or services at the government tool room, it will enable them to qualify for more complex work. Income generated from this work will later pay for the acquisition of their own technology.



Industry is generally satisfied with the quality of production output, but complains about lead times that are long (150 – 200%) and costs that are high (130 – 150%). A number of GMs who refer to their tool rooms as "Centres of Excellence" - operating at a world class level however require simultaneous performance in quality, on-time delivery and price competitiveness.

2.6 Marketing

The marketing functions of the government tool rooms have demonstrated their ability to secure some orders. The higher performing tool rooms are easier to market than others. Better performing tool rooms are concerned about keeping their promises, and are able to retain customers. The tool rooms with weak performance disappoint customers and fail to retain them. In most cases, the marketing capability is under developed.

TRs find it is easier to obtain orders for work that industry finds difficult, and for activities that benefit from new technologies that others do not yet have. At a number of TRs, no clear marketing strategies are apparent. Little attention is given to brand development. There is limited understanding of market price points, nor experience in complex sales methods.

At many TRs, orders received are more from walk in clients than getting the order pro-actively. The marketing approach focuses mainly on individual orders (single transaction), which limits the scale of opportunity it can realise. There is some, but limited utilisation of opportunities to partner with industry value chains and clusters in a systematic manner.

2.7 Cooperation

Manufacturing industry associations are formally linked through membership of the Governing Councils. Two or three industry associations are typically represented on a council but have limited influence through that mechanism and therefore take limited interest. Whilst industry input is received, GMs work to the targets as set by their chairman.

TRs participate in industry association activities, where they get feedback on requirements of members. This informs what skills and technologies are required. GMs also get input from industry regarding what to buy/ invest in, which they then submit for MoMSME approvals.

Informal dialogue with private sector in the better government tool rooms is substantial and meaningful, but hardly ever systematic as one would expect in participatory planning. There is also evidence of cooperation in industry cluster partnerships, such as the foundry cluster in Ahmedabad and a surgical cluster shared services facility in Kolkata. Other industries have also requested cluster partnerships.

Success of the private sector tool rooms is not prioritised even though this is the most sustainable answer to supply of tooling to the manufacturing sector. Cooperation with TAGMA is surprisingly far below expectation. Private tool rooms provide quicker and cheaper tooling solutions to manufacturing MSMEs than subsidised government tool rooms and reach more MSMEs. These advantages of private tool rooms are seldom utilised systematically by government tool rooms as a strategy to reach and support more manufacturing MSMEs.

Cooperation with other training institutions with regard to curricula content seems to be the norm in the establishment phases of new training offerings. Tool rooms enjoy a competitive advantage in offering hands on practical training. This has led to the development of a top up training offer for Polytechnic three year diploma students who struggle to get jobs. Some TRs have succeeded in securing subsidy funding for national government accredited training courses.

The state governments seem very supportive of the government tool rooms. In some cases, the Industries' Commissioner is on the Governing Council. The State government functions as the regional government owner and co-sponsor. Land has been donated and many training courses of targeted support development programmes sponsor/subsidise student training.

Business development service providers are utilised on occasions such as temporary advisory committees, which utilise external experts and machinery suppliers. Suppliers of technology such as CAD/CAM, provide training support and with training of trainers. Some, but limited activities are outsourced.

Government tool rooms compare themselves and share learning, but not in a systematic manner. International cooperation and benchmarking is however limited.

2.8 Learning

Organisational behaviour has been driven mainly by the sustainability KPI and learning has pursued the same path. Service offerings have adjusted towards higher income. Investment decisions are based on where they will make more money. Learning and adaptation has thus become disconnected from the overall strategic intent. Tool room financial performance was prioritised over manufacturing MSME economic development impact. These shifts have happened gradually and are not the result of conscious and systematic reflection on strategy, learning and adaptation.

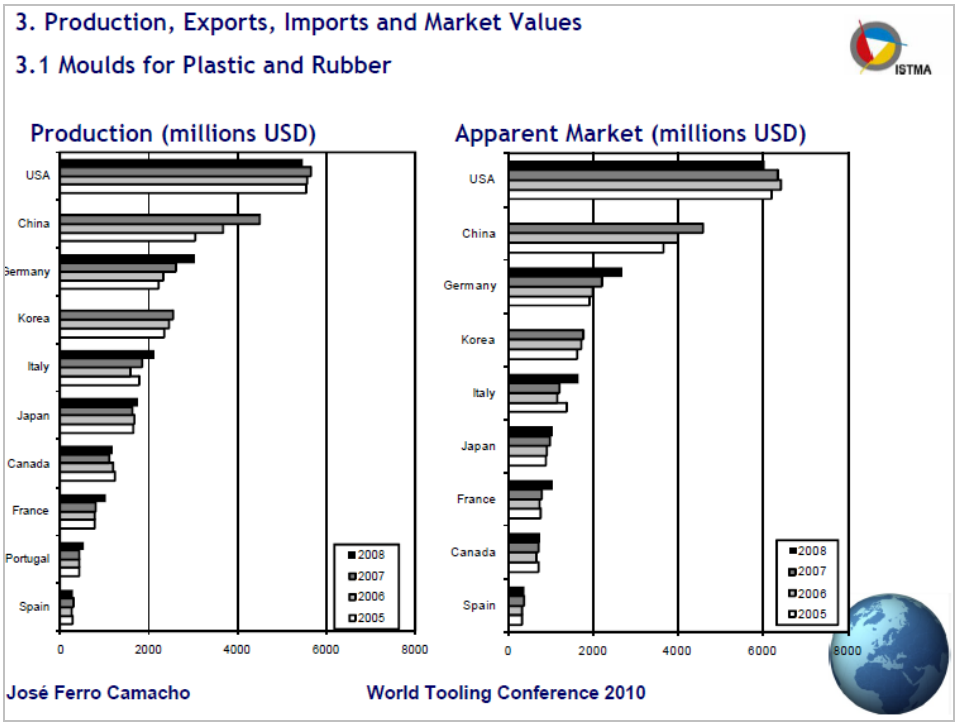
The absence of a coherent strategic framework has contributed to the bigger picture being lost. Many interviewees are aware of the required catalytic impact, but commented that their performance is not measured as such. Revision of the KPIs is therefore of critical importance.

Many positive learning outcomes are also apparent over the past decade. Service offerings have adapted towards changing industry demands. Staff complain however that the knowledge base is stagnant, and that little pro-active investment is made into learning. It is for instance, very hard to send trainers to external training.

Chapter 3

Comparison with International Programmes (improvement potential)

According to the International Special Tooling and Machining Association (ISTMA), the USA still led both demand and supply of tooling in 2008. As illustrated for moulds in the figure below, China is catching up quickly. Germany is third, and unlike the USA, in 2008 was still growing.



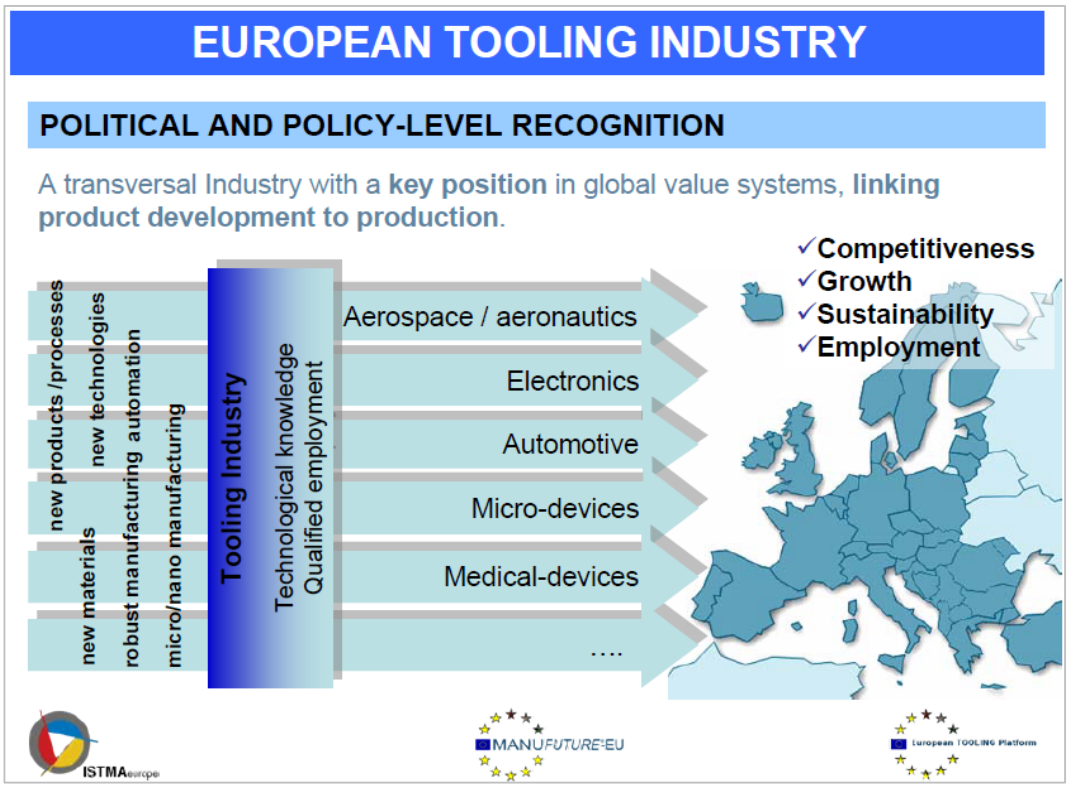
The India tool room programme is compared in next page to the approaches in USA and Germany (as some of the leaders in the field) to illustrate the pertinent differences.

Overarching strategic goal

India	International
The main aim is to **reduce key barriers to manufacturing MSME growth**: ▪ a supply of advanced technical skills, and ▪ rapid absorption of competitive technologies. MoMSME provides mainly CAPEX funding to **government tool rooms**, and grants for private tool room cluster initiatives.	The European **tooling sector** plays a strategic role in the **rejuvenation and development of the European industrial activity and economy**. The EU will continue to **reinforce the industry competitiveness** through investing in skilled workforce and high technology, supported by research and innovation. (See the figure below which illustrates **conceptualisation with links to key value chains and the research and development** programmes)

Main insight: International approaches are conceived more holistically.

The EU strategic perspective of the tooling industry is illustrated below.



3.1 Strategy concept

India	International
Focus mainly on removing tooling related constraints to manufacturing MSME growth.	Healthy tooling sector viewed as a strategic part of strengthening manufacturing competitiveness, deemed critical for overall economy.
Primarily a "fast follower"[5] strategy.	Developed economies follow primarily an "innovation and technology leadership" strategy. Developing economies with smaller R&D budgets pursue "fast follower" strategies.
Government tool rooms provide training, manufacture tools and offer advanced manufacturing services and advice.	Industry led public private partnerships determine skills development strategies and approaches that are implemented by vast networks of public and private training institutions. Manufacturing of tools is done by the private tool making sector. Support is provided when needed in the form of technical advice and outsourced services, by a variety of service providers. These include technology suppliers, manufacturing extension centres and by technology institutes such as Fraunhofer Tool and Mould making unit.

Main insight: Other countries don't pursue healthy, large government tool rooms, but prefer instead to pursue a healthy, large private tooling sector. Extensive support is provided through a network of more specialised public and private entities, that all cooperate well.

[5] "Fast follower": Uses/copies good innovation quickly once clear evidence exists of proven success. Stays ahead of most, but follows the innovation leaders with largest R&D budgets.

3.2 Governance and Steering mechanism

India	International
Governing councils for each tool room.	Governing council for the national programme as well as regional governing councils. Regions represented at the national council.
Strategic direction is set top down by means of government KPI targets: • Financial targets: Revenue, Revenue expenditure, Recovery ratio. • Number of trainees to be trained • Number of MSME units assisted	Strategic direction is set by means of a bottom up, and top down partnership approach: • Stakeholders, led by Industry, come together to agree a common vision. • Stakeholders define a strategic agenda, setting out the necessary medium/long term objectives. • Stakeholders implement the strategic agenda with mobilization of significant human and financial resources.
Governing council led DC MoMSME who typically appoints the general manager.	Governing council led by regional industry leaders and typically appoint an experienced private sector person as general manager.
GMs lack autonomy with regard issues such as remuneration, promotions, appointments and process innovation.	Formal delegations of authority transfer power to the general manager to have autonomy but remain accountable for good corporate governance.

Main insight: Government plays more of a supportive and enabling role whilst industry takes a more pro-active leading role to shape a healthy tooling sector. Strategy receives much greater attention and is better informed by leveraging intellectual capital of key stakeholders.

The European Tooling Platform example below illustrates industry led strategic direction setting and the conceptualisation of tooling within the context of manufacturing competitiveness.

EUROPEAN TOOLING PLATFORM ***toolingplatform@manufuturenet.eu***

Responsible for the setting-up, implementation and fulfilment of policy objectives and the adequate alignment of R&D priorities, resources and funding to Industry's needs.

- *Address to key technological challenges and integrative value chains,*
- *mobilize private entities and public authorities, at European, National and Regional level*
- *and foster effective Private-Public Partnerships …*

Future Manufacturing Technologies Mission: "to propose, develop and implement a strategy based on Research and Innovation capable of:

- *speeding up the rate of industrial transformation to high-added-value products, processes and services,*
- *securing high-skills employment and*
- *winning a major share of world Manufacturing output in the future knowledge-driven economy."*

Strategic actions:

- *Promotes an active participation of stakeholders towards the definition and implementation of a Tooling Industry Strategic Research Agenda;*
- *Proposes, develops and implements Research and Innovation activities to promote the competitiveness and differentiation of the Tooling companies;*
- *Development of Strategic Roadmaps for the Tooling Industry;*
- *Creation of Specific Working Groups in specific disciplines and domains towards the definition, implementation and continuous evaluation of the Strategic Research Agenda priorities and objectives.*

3.3 Leadership and administration

India	International
The government tool rooms are a hybrid of a training institution, a production business and an advisory service. Organisations of diverse services are more difficult to manage than focussed organisations. The culture and value system of the training- and production-functions for example may conflict because client needs and power relationships differ.	Separate more focussed organisations; • training institutions do not produce to market demand, and partner with private sector for on the job experience. May sub-contract external experts to strengthen training offering. • private firms produce tools to market demand, provide on the job experience for trainees, and may provide limited manufacturing process advice. • specialist manufacturing process advisory services do not produce, but may lecture on contract for training organisation Focussed organisations are easier to manage.
Tool rooms try to operate in a business like manner.	Experienced private sector general manager has delegated authority and autonomy to operate with business like efficiency, and good governance.
Stifling public sector culture, processes and norms.	Autonomy and powers to establish performance based organisation culture, processes and norms.
Large facilities, well equipped, large headcount which all contribute costs.	More focussed entities with less overheads, are more easily controlled and are more responsive.

Main insight: Formal delegation of powers based on good corporate governance principles frees organisations up to become much more responsive. Leaders and managers get more freedom but are held more accountable for performance, with less job security.

3.4 Training services

India	International
Large gap in supply of skills.	Smaller gap in supply of skills.
Well equipped government tool rooms pursue the goal of skills development by training themselves.	Industry led public private partnerships determine skills development strategies and approaches. These are implemented by networks of public and private training institutions with appropriate and up to date equipment for hands on training. These institutions receive government subsidies.
Students gain experience inside the government tool rooms before being placed with private firms.	Students gain commercial experience inside private sector firms which pay them a wage for their work contribution.
The tried and tested training programmes originated from European donor country partnerships is well received by India industry.	Some developing countries like South Africa have opted to utilise the proven US training programmes[6], to ensure current international competitiveness thereof.

Main insight: Leverage other organisations in public and private sector to increase output and efficiency.

[6] International benchmarking of various training course content and approach enable

3.5 Production services

India	International
Production of tools that compete with private sector. Government tool rooms supply the niche of more complex tools. Not competitive on speed or cost	Private sector tool rooms produce tools to quality, on-time and at competitive prices.
Private tool rooms supply +33 times as much as government tool rooms.	
Establish new technology platforms in partnership with vendors for transfer to private sector. Private tool rooms and manufacturing MSME are supported with re-engineering, new and advanced manufacturing practices. New technology is made accessible as a shared service through jobbing.	Establish new technology platforms in partnership with vendors for transfer to private sector to reduce costs for both parties. Networks of development service providers provide advanced technology support to private sector tool rooms and manufacturers. They don't manufacture with the exception when new technologies are introduced and private sector has not yet adopted widely. Advanced technology is accessible as a shared service.

Main insight: Become a catalyst for growth of an advanced private tooling sector and utilise others (network) to do as much of the work as possible. Provide access to technology to address gaps in private tool room ability to meet international level of competitiveness.

The scope and sophistication of the advanced manufacturing services in developed economies (such as the Fraunhofer Institute in Germany) far exceed what is currently offered at the government tool rooms. Note the extent of advisory services.

Fraunhofer Institute: Tool and Mould making services unit

Process chain development

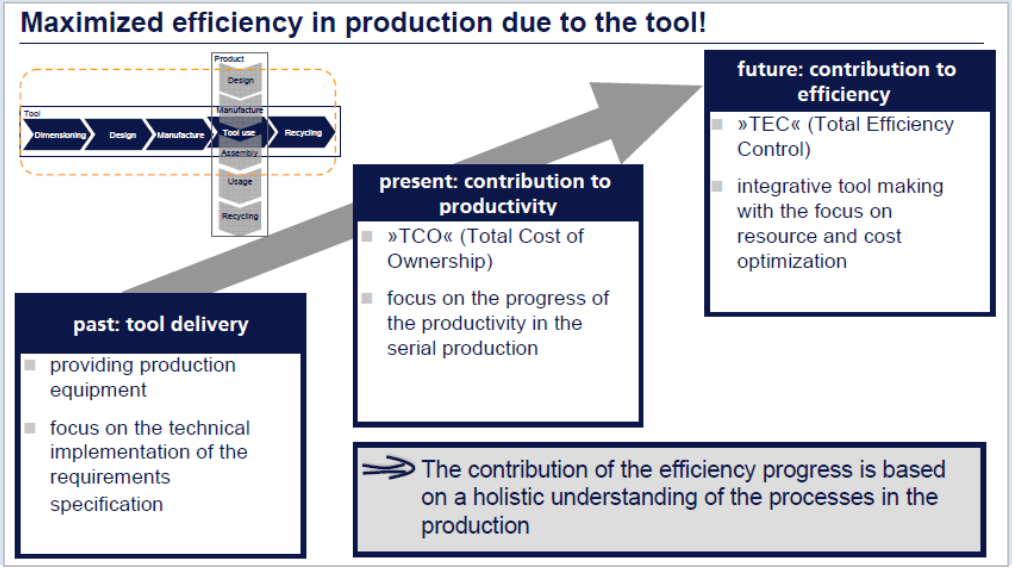
Market analysis, Process chain analysis, Process optimisation, Cost/benefit accounting, Development of manufacturing concepts, Outline and detailed planning of technological processes, Technological dimensioning of processing machinery, Recommendations on machinery investments

Development and assessment of processing strategies

Market analysis, Feasibility studies, Development of technology, Formulation of process parameters, Formulation of optimised processing strategies, Benchmarking of Cad/Cam systems

Quality assurance

Photogrammetrical logging of component and tool geometry, Measurement of micro-components using confocal microscopy and strip projection, Machine and tool measuring using laser trackers, Structural analysis using scanning electron microscope



3.6 Marketing

India	International
Limited marketing activities focussed mainly on selling production services.	Systematic partnering with local clusters and value chains, to support local MSME in supply chains, to meet demanding requirements – both in skills development and with technology transfer. Partnerships with large firms result in substantial financial contributions, large scale and long lasting demand for services.

Main insight: Systematically partner with industry and large manufacturing firms to realise large scale opportunities for manufacturing MSME, toolmakers and training.

3.7 Cooperation

India	International
Limited cooperation with TAGMA, Tool and Die Manufacturers Association of India.	Tooling associations lead the partnership with the public sector providing a supporting role.
No systematic leverage of external capacities to achieve development objectives.	Extensive networks of collaborating stakeholders provide much more intellectual capital and capacity to execute on a larger scale.

Main insight: Systematically leverage external capacities to achieve development objectives.

3.8 Learning

India	International
Annual strategic planning limited to finding better ways of meeting KPI targets.	Large investment in effort to determine better strategies, and learning from past mistakes.
Input from industry and other stakeholders takes place quite informally.	Insights from a broad base of stakeholders is systematically utilised to inform improvements in strategy and practices.

Main insight: A broad base of stakeholder intellectual capital provides different perspectives to existing patterns of thinking, and is therefore more conducive for learning and innovation.

Chapter 4

Assessment Summary (Current situation and improvement potential)

These tool rooms make a profound contribution to manufacturing MSME through the services they deliver. The leading TRs have been innovative with their growth and demonstrate many international good practices.

However, some things have changed over the past thirty years since these tool rooms were originally conceived. Most significantly, the private tool making sector now supplies more than thirty three times as much tooling to the government tool rooms. Market failure is now much less of an issue. The output in training has increased substantially in both scale and scope, and is still lagging industry growth and needs. Incremental improvements are clearly evident, but somewhere over the past decade or so, misalignment of KPIs and strategic rationale crept in. Structure started dictating strategy. The emphasis is on the tool rooms as institutions, rather than being primarily concerned about maximising economic impact.

A brief summary of current strengths and weaknesses are listed in the table below.

Strategy:

- Training is functioning quite well, but demand still exceeds supply by far.
- Production is chasing revenue targets for sustainability, instead of **contributing optimally,** to reducing constraints to MSME manufacturing employment growth.
- The focus on production of tools distracts attention from growing private sector tool room capacity.
- This results in an ongoing manufacturing MSME growth bottleneck in tooling expertise and services

Training:

- Industry generally satisfied with quality of candidates
- Respond to changes in industry requirements
- Growing in scale
- Good facilities
- Hands-on training
- Supply does not keep up with demand
- Limited international benchmarking and exposure to international good practice

Production: • Occupies technically advanced market niche • Industry generally satisfied with quality of production output • Low motivation to grow private tool rooms into this niche (may reduce own income) • Supply does not keep up with demand • Lead times (+150 – 200%) • Cost (+130 – 150%)
Marketing: • Some success in securing orders • Marketing approach • Limited orders • Marketing and market development skills • Customer retention (at some TRs)

The international comparison points to a number of improvement opportunities, as listed below.

Main insights from international practices	Improvement potentials for TRs
Overarching strategic goal: International approaches are conceived more holistically.	A more strategic approach
Governance and steering mechanism: Government plays a supportive and enabling role whilst industry takes a more pro-active leading role to shape a healthy tooling sector. Strategy receives much greater attention and is better informed by leveraging intellectual capital of key stakeholders.	Move towards greater autonomy and network governance. Continuously improve strategy. Partner better with the private sector. Leverage stakeholder insight, experience and resources to become more strategic.
Leadership and administration: Formal delegation of powers based on good corporate governance principles frees organisations up to become much more responsive. Leaders and managers get more freedom but are held more accountable for performance, with less job security.	Provide more autonomy whilst retaining good governance. Support TRs with strategic guidelines. Support TRs to gain new capacity to become more strategic.

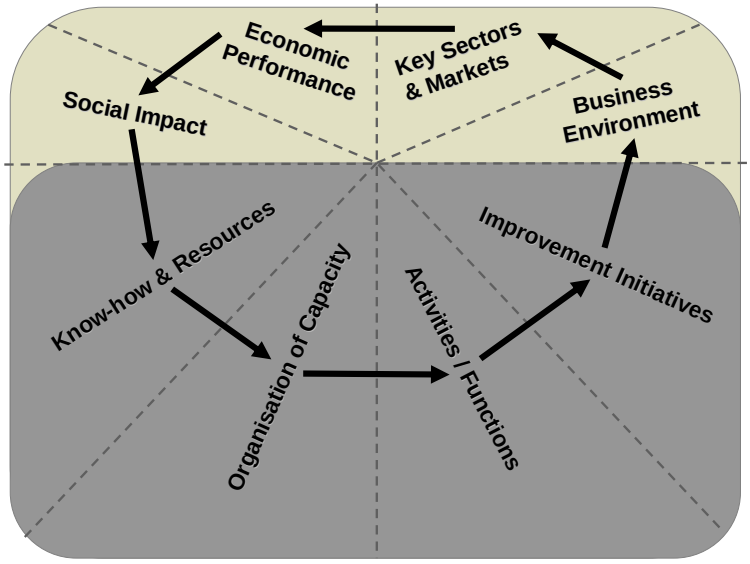
Learning: A broad base of stakeholder intellectual capital provides different perspectives to existing patterns of thinking, and is therefore more conducive for learning and innovation.	Introduce participatory planning approaches.
Strategy concept: Other countries don't pursue healthy, large government tool rooms, but prefer instead to pursue a healthy, large private tooling sector. Extensive support is provided through a network of more specialised public and private entities, that all cooperate well.	Review the TR business model to support the private tooling sector better. Partner and contract other organisations to form better networks of capacity.
Marketing: Systematically partner with industry and large manufacturing firms to realise large scale opportunities for manufacturing MSME, toolmakers and training.	Establish strategic partnerships with large firms and MSME clusters.
Cooperation: Systematically leverage external capacities to achieve development objectives.	Systematically build and leverage networks of capacities Partner better with the private sector.
Training: Leverage other organisations in public and private sector to increase output and efficiency.	Leverage external capacities to grow faster.
Production services: Become a catalyst for growth of an advanced private tooling sector and utilise others' (network) to do as much of the work as possible. Provide access to technology to address gaps in private tool room ability to meet international level of competitiveness.	Leverage partners to do as much as possible. Support the private sector to produce more complex tools. Provide access to technology to address gaps in private tool room ability.

The situation assessment and comparison with other country approaches, has provided some valuable insights. The differences point to a number of opportunities for improvement, not only in the efficiency of government tool rooms, but increased overall impact on manufacturing MSME. Some of these insights imply "more of the same", with slight changes, whereas others imply substantial changes. The recommendations are generalised for all the TRs. TRs differ in practice and some are already doing what is recommended to all.

Chapter 5

Recommendations (How to improve performance and impact)

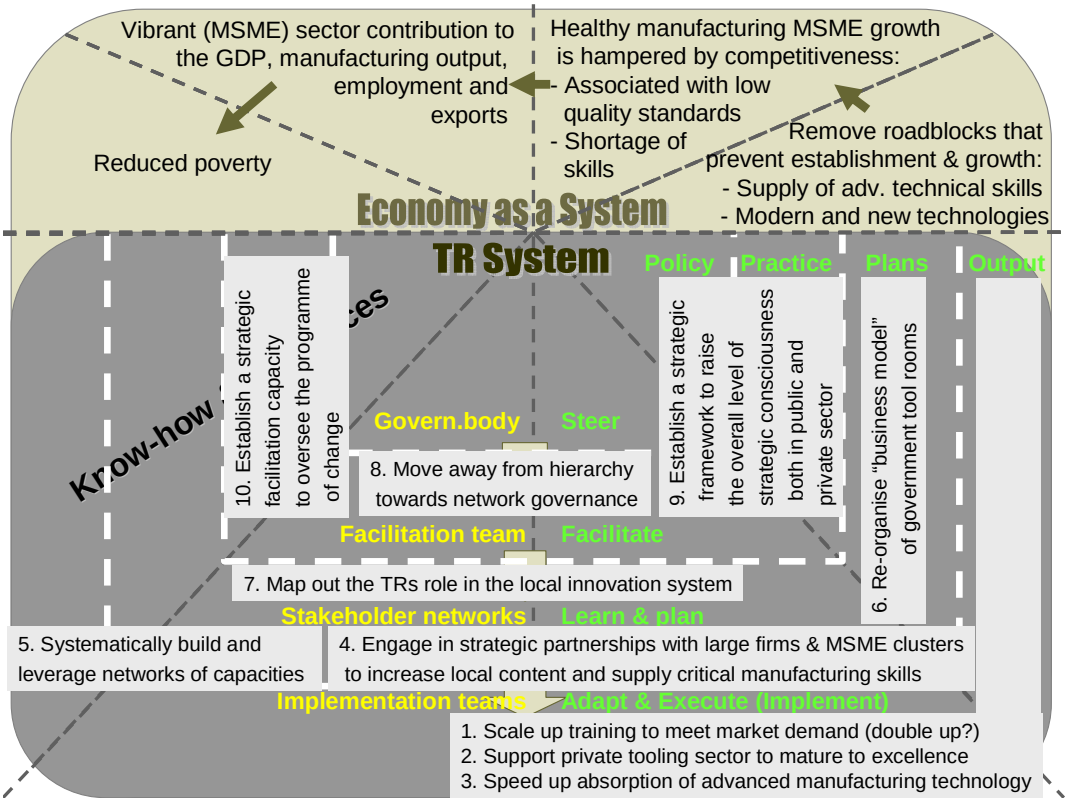
As the government tool room programme heads into its next five year planning cycle, it is an appropriate time to introduce changes that would result not only in greater efficiency, but more importantly, increase the overall impact on manufacturing MSME. Stakeholders lost sight of this programme economic rationale, which now needs to be re-emphasized. The recommendations will therefore be structured according to the logic of the generic economic development framework below. The strategic coherence and policy alignment becomes evident.



This framework separates **the economy** (top half) from the **economic development system** (bottom half), which exists to improve **the economy**. The ultimate goal is **social impact** in the form of reduced poverty and improved quality of life, which is pursued by means of improved **economic performance**, growth, employment and so forth. To realise this improved economic performance, business **sectors** need to increase earnings for the local economy from **markets,** by competing better. These businesses benefit from competitive advantages and suffer the disadvantages of operating from a particular local **business environment**. I**mprovement initiatives** aim to improve the competitiveness of firms in the market and to reduce constraints in **the business environment**. These **improvement initiatives** require **work / activity/ functions** to be realised. Stakeholders alone or in collaboration provide the **organisational capacity** to execute and draw on available **know-how and resources**. Achievement of the desired **social impact** justifies the investment of the **resources**.

Considering the current Indian economic context, it does not require a significant policy shift in the tool room programme. Whereas Europe's high cost structure forces it to compete as leaders in know-how, Indian manufacturing currently competes mainly on cost, with good quality and on-time delivery. In this context, a fast follower strategy regarding manufacturing technology and innovation is logical. The emphasis should therefore remain on reducing the

key constraints such as the short supply of advanced manufacturing skills, as is required to manufacture tooling. No change is therefore proposed in the MoMSME government tool room programme goal structure[7] (illustrated in the top half of the framework below).



With regard to the current government tool room system, ten improvement recommendations are proposed (illustrated in the bottom half of the framework). These recommendations are based on the insights gained from the assessment and comparison with international practices. They are also congruent with the following "Strategy Challenges" identified by the Planning Commission for preparation of the XII Five Year Plan:

- Enhancing the capacity for growth
- Enhancing skill and faster generation of employment
- Markets for efficiency and inclusion, and
- Technology and innovation

The scope of recommendations is relevant to three levels of government organisation:

- Tool rooms (6 recommendations)
- Region/State (1 recommendation)
- National Tooling Programme level(3 recommendations)

[7] MSME-Annual-Report-2010-11, 3.7.2 Vision, Mission, Objectives

The ten recommendations are conceived as an integrated set of activities, that are mutually dependant and supportive of each other. The dependencies are illustrated as arrows in the table below, where the recommendations are organised according to the GIZ Capacity Works framework.

Capacity Works perspective of 10 recommendations

	National	State / region	Tool room
Strategy	9. Establish a strategic framework to raise the overall level of strategic consciousness both in public and private sector		6. Re-organise the "business model" of government tool rooms
Governance and steering	8. Move away from hierarchy towards network governance		
Cooperation	10. Establish a strategic facilitation capacity to oversee the programme of change	7. Map out the TRs role in the local innovation system	4. Engage in strategic partnerships with large firms and MSME clusters to increase local content and supply critical manufacturing skills 5. Systematically build and leverage networks of capacities
Process	New 5 year programme		1. Scale up training to meet market demand (double up?) 2. Support private tooling sector to mature to excellence 3. Speed up absorption of advanced manufacturing technology
Learning	Pilot projects	Participatory planning processes to yield new 4,5,6,7	

Each recommendation is described more substantially in the following format:

- *What must be done?*
- *Why is it important?*
- *How (in principle)?*
- *By whom?*
- *Accountable* to?
- *Supported by?*
- *Source of funding?*
- *Desired result?*
- *Performance indicator*

5.1. Scale up training to meet market demand (double up)

Mainly relates to: Training

What must be done?

The government tool rooms already contribute in the order of 40 000 trainees per annum, but industry requires much greater numbers. The high market demand that exists for growth in training output, presents a great opportunity to increase revenues and sustainability.

Training in the Indo-German tool rooms contributed 11% of revenue in 1996/7. This doubled to 22% in 1999/0. Training currently contributes 60 - 70% of tool room income. Doubling up of training would increase revenues by another 60 – 70% of current levels.

Why is it important?

Manufacturing investment is reportedly driven by the availability of skills, and the massive shortage of skilled manpower therefore constrains manufacturing growth. The objective is to reduce this bottleneck.

Training revenues will also substantially improve TR sustainability.

How (in principle)?

- Diversifying and increasing short, medium and long term training courses, mainly manufacturing related;
    - e.g. automation related- mechatronics, robotics, pneumatics based, advance fabrication technology like welding, skill requirement in welding technology is very high,
    - Introducing AICTE approved/NCVT approved courses
    - starting part time courses
    - Expansion in IT-based training requiring less infrastructure e.g. CAD-CAM technology, modules for online training
- Some TRs are already expanding their training capacities rapidly. Their methods would assist others to grow faster.
- Regional demand and supply patterns can be informed by close cooperation with clusters in key manufacturing sectors. (see recommendation 4)
- Benchmarking of training for the courses can be prepared in consultation with or provided by private sector.
- Doubling up of training means admission of more trainees; therefore trainees can be drawn from any level- central, state govt. and industry. The numbers can also be increased by increasing economically sponsored trainees.
- The Govt. Tool Rooms must systematically build and leverage outside facility to expand training; e.g. Polytechnics, ITI, engineering colleges. Access to facilities, equipment and skill sets can increase the reach and scope of service offerings. (see recommendation 5)
- CITD Bhubaneshwar has made made exceptional progress in scaling up its training.

- When outsourcing - Government TR need to act as certifying agency/ franchising agency
- Nettur Technical Training Foundation(NTTF) can be a best practice example when scaling up.
- The doubling up can be done with approval of the DC-MSME for new courses and infrastructure.
- Capacity development of human resource for scale up is necessary and therefore, training of trainers is required

By whom

Accountable: General Managers
Supported by: New strategic facilitation capacity, GIZ MSME umbrella programme

Source of funding

Funding can be leveraged from other government departments and organisations which have manufacturing training targets. They will be interested to cooperate because the tool rooms could assist them to realise an increase in target numbers.

A number of organisations like NSDC and Planning Commission of India have been mandated to support any type of training in few key sectors that promotes skill development since Government of India has a vision to skill 500 million people by 2022. Apparently, NSDC (one of the leading agencies mandated to fulfil this target) is entrusted with a huge target of fulfilling 30% of skilled manpower by 2022. They are willing to fund sound ideas that provide them more scale. Most of the organizations they are funding are private initiatives in service sector. However, manufacturing sector still remains a challenge and that is the area where a lot still needs to be done quantitatively and qualitatively.

The Planning Commission set a target for the manufacturing sector to create 100 million jobs by 2025. Since Tool Rooms are registered under Societies Registration Act 1860, it makes them eligible to receive grants from the Planning Commission. Tool Rooms also match other criteria mentioned in category 'Eligibility of Institutions for seeking Grants-in-aid' under the scheme for "New Initiative in Skill Development through PPP".

The Ministry of Labour and Employment runs following training schemes, some of which can also provide funding streams to finance training program of Tool Rooms.

- Craftsmen Training
- Craft Instructors Training
- Apprenticeship Training
- Modular Employable Skills (MES) Scheme

It is mainly the Craftsmen Training Scheme, Craft Instructors Training Scheme and Modular Employability Scheme that may be useful here. Tool Room Services in training areas like Tool and Die maker, Machinist, CAD/CAM Technology and several other are also provided by Industrial Training Institutes. Since most of the tool room centres are well-equipped with machinery and trainers unlike many ITI, the same training services can be delivered under the ITI scheme. Many Tool Rooms under MoMSME are running ITI training courses in their institutes already. For instance, Indo-Danish Tool Room (IDTR) Jamshedpur runs two long-term courses of ITI. These are 2 years ITI Machinist Course and 2 years ITI Fitter Course[8]. Similarly

[8] http://idtrjamshedpur.com/ltcourse.php

other tool rooms like Central Tool Room and Training Centre, Bhubaneshwar too are providing ITI Machinist course.

The NSDC (National Skill Development Cooperation) was set up as part of the National Skill Development Mission (NSDM) to fulfil the growing need in India for skilled manpower across sectors and narrow the existing gap between the demand and supply of skills. It is a not-for-profit company set up by the Ministry of Finance under Section 25 of the Companies Act. It has an equity base of Rs 10 crore, of which the Government of India accounts for 49%, while the private sector holds the balance 51%.

Its official objective is to contribute significantly to the overall target of skilling / upskilling 500 million people in India by 2022, mainly by fostering private sector initiatives in skill development programmes and providing viability gap funding. It aims to promote skill development by catalyzing the creation and the support of vocational institutions. It provides viability gap funding to build scalable skill development initiatives. Its mandate refers also to enable support systems such as quality assurance, labour market information systems and train the trainer academies either directly or through partnerships.

The mission statement of MSME Tool Rooms refers to:

- Upgrade skills to international standards through significant industry involvement and develop necessary frameworks for standards, curriculum and quality assurance;
- Enhance, support and coordinate private sector initiatives for skill development through appropriate Public-Private Partnership (PPP) models; strive for significant operational and financial involvement from the private sector;
- Focus on underprivileged sections of society and backward regions of the country thereby enabling a move out of poverty; similarly, focus significantly on the unorganized or informal sector workforce.
- Play the role of a "market-maker" by bringing financing or viability gap funding, particularly in sectors where market mechanisms are ineffective or missing;
- Prioritize initiatives that can have a multiplier or catalytic effect as opposed to one-off impact.

Desired result?

- TRs contribute trainees in greater numbers.
- The gap in the supply of advanced manufacturing skills is systematically reduced.

Performance indicator:

Industry partnership targets are met. TR trainee output doubles in 3 years.

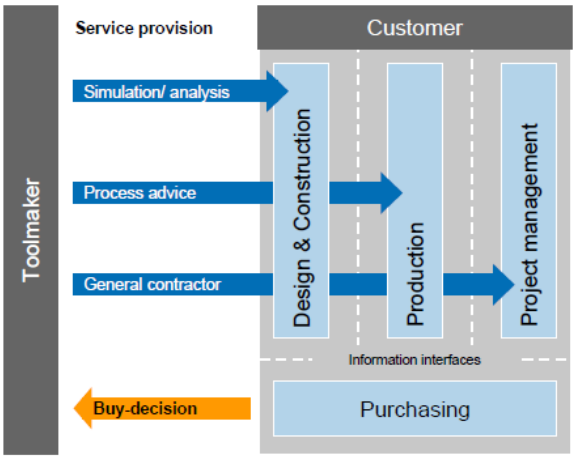
5.2. Support private tooling sector to mature to excellence

Mainly relates to: Production services

What must be done?

The government tool rooms were established by the government of India to *provide tooling solutions to increase manufacturing MSME growth*. If MoMSME still supports this goal, the best means of achieving maximum impact as efficiently as possible should remain a priority.

Government tool rooms currently only supply a tiny fraction of manufacturing MSME tooling requirements. Private tool rooms already supply more than 33 times as much tooling to the Indian market. Their tools are supplied quicker and cheaper than government tool rooms. This means that the goal (of *provide tooling solutions to increase manufacturing MSME growth)* is mostly achieved by the private sector. Most impact is achieved via the market – not directly by the supply of tools by government tool rooms. The government tool rooms contributed to the growth of these private tool rooms by training many of the owners of these private tool rooms.



Manufacturing MSME are more price sensitive. They benefit and enjoy price competitiveness offered by small private tool rooms operating in an efficient market system. These smaller private tool rooms however still experience difficulty in producing complex tools.

Government TRs currently produce these complex tools, and by doing so competes with the private sector in this market space, whilst receiving government subsidised technology. In some places this stifles the private sector's growth path - to supply more advanced tooling.

Using sport as an analogy, government tool rooms should recognise their main function as a "coach", which should be primarily concerned with optimally supporting team India's "players" in the tooling sector. The "coaching" role should increase the number of private tool rooms that are able to meet international standards of competitiveness.

This recommendation is disputed by many government tool rooms, as was evident at the November'2011 workshop[9]:	**Counter arguments:**
• *"Problem with serving MSME Tool Rooms is that there is no guarantee that they will serve the MSMEs since these may focus more on getting bigger and more lucrative assignments from bigger companies."*	Most of their customers are already MSME …
• *"These private tool rooms may hijack Govt. tool rooms business. E.g. many Govt. tool rooms in the past have experienced where jobs have been taken away by pvt tool rooms."*	Can only happen if they offer better service to client. Competition is a good thing for performance improvement.
• *"Govt. TRs need a working model for supporting the private tooling sector"*	Many TRs already have 1 or more persons that do similar work. Train 1 dedicated person to function as "coach". Use benchmarking process (such as Fraunhofer) to facilitate learning at promising private tool rooms, that wish to learn pro-actively. Charge a fee for participating in benchmarking. Find additional sponsorship for a national benchmarking programme.
• *"Supporting small tool rooms does not fetch required revenues."*	Just aim for recovery of direct costs. Overhead costs can be cross subsidized by growth in training.

Government tool room fears did not seem to be rooted in the best interest of Indian MSME. The government owned tool rooms do not want to do this, even though they should for the overall benefit of manufacturing MSME in India. A top down MoMSME policy decision is thus required to pursue this recommendation.

Why is it important?

MSME manufacturers can grow their employment substantially if they can purchase more complex tooling at more competitive prices. Private tool rooms are quicker and cheaper in the supply of tooling solutions. The private tooling sector reaches and services more than 30 times the number of manufacturing MSME than government tool rooms. This 30+ fold amplified impact can be systematically increased or not, is a matter of policy decision.

The more the private sector does, the less it costs government to reduce constraints.

How (in principle)?

- DC MSME needs to make a policy decision to pursue this opportunity.
- Government TRs need to adhere to the policy decision and commit to action.
- Appoint champions (coaches) of this service at TRs

[9] MSME Tool Room Consultation Workshop held in November,2011

- Train them in coaching, benchmarking and market development principles.
- Establish a national benchmarking programme.
- Select promising private sector tool rooms to participate in benchmarking for a fee.
- Implement annual benchmarking process. National effort supports government TRs.
- Support consequential learning through coaching.
- Strengthen the services to proactively support private tool room growth.
- Provide access to technology to address gaps in private tool room ability
- Offer a jobbing service to enable private tool rooms to supply complex tooling.

By whom?

Accountable: Policy decision first- DC MSME, thereafter General Managers

Supported by: New strategic facilitation capacity, GIZ MSME umbrella programme

Source of funding

- Benchmarking fees
- Clustering initiatives
- Larger throughput generated from strategic partnerships.

Desired result?

Besides 10 government tool rooms, hundreds of private tool rooms contribute to increased manufacturing MSME competitiveness by providing more complex tools at lower prices.

Performance indicator:

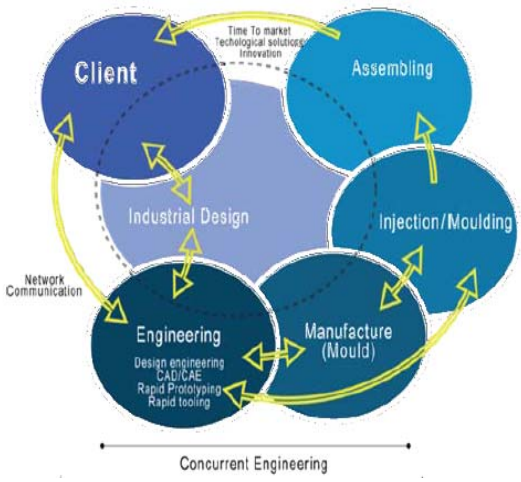
Number of private tool rooms manufacturing complex tools for the market

5.3. Speed up absorption of advanced manufacturing technology

Mainly relates to: Production services

What must be done?

The production service offering has in many cases already evolved to a broader new set of service to respond to these requirements. The current services typically include: Product Design (mostly limited to re-engineering) > 3-d modelling > Design reviews > Modifications > Tool design > Manufacture > Testing and production of first of samples. This adaptation of the service offering seems however constrained and lagging due to recent prioritisation of revenue generation. The requirement now is to grow this service substantially in quality and reach – the number of MSME supported.



Keeping in mind the overall goal to reduce manufacturing MSME barriers to growth, the requirement from MSME for TRs support is to better enable them to:

- Produce quality at levels required by international value chains,
- Reverse engineer components and development manufacturing processes,

Support is required in the form of technical advice and by providing access to advanced technologies they cannot yet afford. This allows MSME to move up the sophistication ladder earlier. Increased revenues enable them to buy the technology later.

This unit of the tool room can be classified as an *MSME Technology Development Centre (MSMETDCs)* - for addressing plastic and or metal component re-engineering problems. The MSMETDC programme will benefit from increased reach.

Why is it important?

- MSMEs need access to advanced technologies to move up the sophistication ladder, to secure larger contracts at more profitable margins.
- Even though this is not a large revenue generator for TRs, it is critical to faster growth of manufacturing MSME.
- Staying abreast with new technologies will feedback also into the training offerings.

How (in principle)?

- The requirement is to grow this service in quality and reach. Improvement priorities in this service offering from a market perspective may be informed by cluster dialogues.
- Technical support as to what are the latest technologies that are being used the world over is required, to assess and identify the technological gap.
- TRs need to establish the critical new technology platforms in partnership with vendors for transfer to private sector.
- Ongoing tie-up with leading international organizations can be established. TRs may access to experts through GIZ This partnership could be possible through hiring CIM experts.
- Tie-up with other Indian institutions is also possible for technology upgradation
- Services can be provided by the TRs and/or a variety of service providers. The service offering does not need to be limited to TR services only.
- This would require technological upgradation of current human resource

By whom

Accountable: General Managers
Supported by: New strategic facilitation capacity, GIZ MSME umbrella programme

Source of funding

Additional investment is required to strengthen the service offering. One option is to classify the tool room as an MSME Technology Development Centre (MSMETDCs. Operational revenue should after a few years, cover salaries and direct costs.

Desired result

Increased numbers of MSMEs access advanced technologies which enable them to secure larger contracts at better margins.

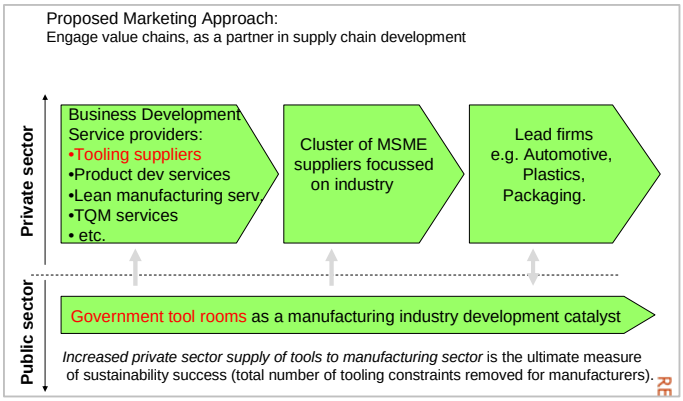
Performance indicator

Number and value of new contracts subsequently secured by MSMEs.

5.4. Engage in strategic partnerships

Mainly relates to: Marketing, Training, Production

What must be done?



Pro-active and systematic partnering with large manufacturing firms in local clusters and value chains will realise increased opportunities for manufacturing MSME, toolmakers and training. TRs can support local MSME in supply chains to meet demanding requirements – both in skills development and with technology transfer. This reduces costs and risks for the larger firms. TRs will benefit from increased revenues from large scale and long lasting demand for services.

TR general managers see the following opportunities/ benefits for:

Government tool rooms	**Large manufacturers and their MSME support cluster**
• Volume of business will increase because of timely payment • Profit margins are high compared with small vendors because of open tenders • On successful completion; repeat orders expected because of good relationship with the customers • Technology levels are high and therefore upgradation planned better • Orders from tier-1 and tier2 suppliers • Better technology expansion can be planned • Better access to placement services	• Better quality tools • Better technological support to their suppliers • Better project planning • Skill planning needs addressed

There is already evidence of cooperation – some examples are:

- Repeat orders (e.g. Auto industry, general engineering, Defense) at Jamshedpur and

Aurangabad toolrooms.

- Bhubaneshwar-ISRO e.g. of tie-up going beyond direct orders

Why is it important?

Large opportunities to increase economic impact and unlock new revenue opportunities can be utilised.

How (in principle)?

Apply concepts of market development approach (MDA[10]) to:

- TRs facilitate strategic partnerships with large manufacturers and MSME suppliers.
- TRs support clusters of local MSME to meet demanding requirements of large buyers.
- TRs reduce risks/costs for the large buyers.

By whom

Accountable: General Managers, TRs require a new market development competency – a new appointment or else a GIZ seconded expert.

Supported by: New strategic facilitation capacity, GIZ MSME umbrella programme

Source of funding

Link to MoMSME cluster programme.

Desired result

Partnerships with large manufacturers realise large scale opportunities for manufacturing MSME, toolmakers and training. MSME get more and ongoing work/sales. Tool makers get more work/sales. TRs benefit from large scale and long lasting demand for services and increased revenue. Increased local content reduces imports.

Performance indicator

- Net present value of documented partnership agreements.
- Alternative: Value of private sector investment in partnerships.

[10] Specific methodology as taught and promoted by donors such as GIZ, DFID, and so forth.

5.5. Systematically build and leverage networks of capacities

Mainly relate mainly to: Cooperation, Learning, Training, Production

What must be done?

Some cooperation with other organisations is already evident in activities such as: curricula content development, development of a top up training offer for Polytechnic three year diploma students and suppliers of CAD/CAM technology provide training support and with training of trainers. Cooperation is however not yet a deliberate and systematic strategy to increase capabilities and efficiencies.

Systematic leverage of external capacities can assist significantly in activities such as:

- Identifying new opportunities,
- Expanding service offerings by contracting in temporary skills, such as specialist lecturers.
- Expanding TR service provision outreach by hiring facilities and sub-contracting elements of service provision.
- Learning faster by drawing on insights and experience of a variety of stakeholders, such as local industry, sources of international tooling expertise such as Fraunhofer institute in Germany, and International Special Tooling and Machining Association (ISTMA) as a global link to discover specific pockets of tooling expertise.

General Managers see the related opportunities/ benefits as follows:

For govt. tool rooms	For complementary service providers
Increase in- • turnover • outreach • know how • market info Decrease in • market cost • International representation e.g. Participation in international exhibition	• Good Commission • Goodwill • Greater Outreach • Increase in sales

Good examples of cooperation are already evident in TR Bhubaneswar and Ahmadabad, as well as from the inter Tool Room Cooperation. The TR in Bhubaneshwar has already utilised this concept of leverage well. They are training in the order of 14000 persons this year with only 23 full time staff.

Why is it important?

Most TRs do not yet systematically leverage external capacities to increase their value addition. Large firms utilise hundreds of suppliers to offer integrated solutions.

Networks of collaborating stakeholders provide more intellectual capital and capacity to execute than a single organisation.

How (in principle)?

Leveraging external capacity to execute is just a matter of agreeing to cooperate in a structured and controlled manner. Sometimes cooperation is by means of sub-contracting.

All it requires is a shift of thinking, experience and systems of contracting and management of suppliers.

Sub-contracting entails risk though that must be managed. The OEM, MSME & Service Providers can:

- capture Government TR market share
- misuse their name
- spoil goodwill
- Legal issues
- Lead to conflict of interest if common customers
- Ethical conflicts

By whom

Accountable: General Managers
Supported by: New strategic facilitation capacity, GIZ MSME umbrella programme

Source of funding

No additional funding required.

Desired result

- Networks of collaborating stakeholders support the TRs to unlock more opportunities.
- Sub-contractors enable TRs to expand the scale and scope of their services.

Performance indicator:

Value added / TR employee

5.6. Re-organise the "business model" of government tool rooms

Mainly relates to: Tool room autonomy, stifling public sector processes, leadership and administration, sustainability

What must be done?

Networks of self-goal seeking teams and organizations are able to respond better to a large set of opportunities, strategic goals and actions than a hierarchy, especially a public sector hierarchy. By delegating more responsibility downwards, closer to the value addition, quicker and more efficient responses are possible. Teams with more responsibility feel more challenged and motivated. They simultaneously reduce the work of higher level leaders who can then focus better on the more strategic issues.

In order to achieve more impact, general managers expressed the need for freedom in day to day operations similar to private sector. Government regulations often limit the scope of activity and therefore, outreach and impact created by TRs. The constraints were attributed in part to the inherent contradiction between need for autonomy and government regulations and policy decision-making. GMs also described several constraints to developing a motivated team of professionals.

Operational efficiencies are affected by the system of governance

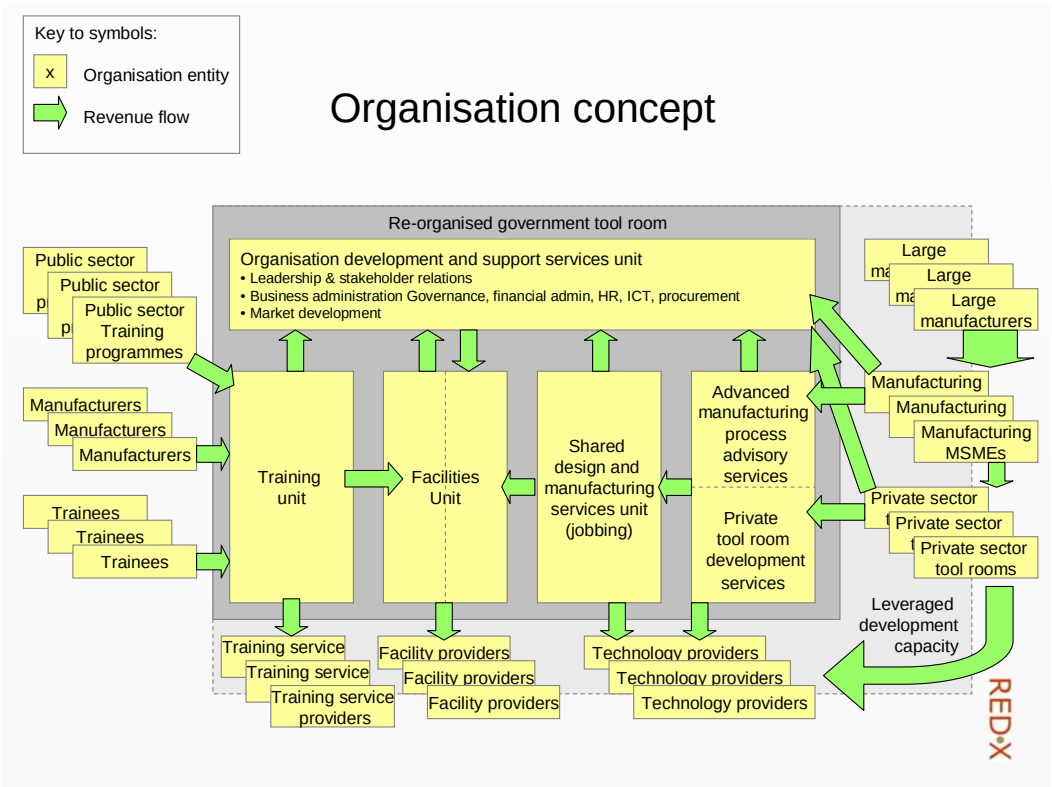
Constraints to Performance	Proposals to Overcome Problems
• No incentives for high performer • Low retention of good manpower • Govt. directives are not conducive to need-based recruitment • Problems with creation of new middle management post • Underemployment of surplus employees • Disruptive labour union resulting in negative motivation/attitude of employees • New skill requirement not addressed • Correct assessment of ACR/APAR • Procurement as per GFR rules Approval delays. e.g. • Less power to handle disciplinary matters • Approval for international business visits • Approval for business related decision (MoU) • Approval for international business generation- training	• Modification of RR • Merit-based promotions • HR policies to be framed as per market trend • Development of career oriented recruitment rules • CEO should be authorized for short term appointment- Up to salary Rs. 50,000/pm • Modification of leave related rules • Relaxation in govt. norms for procurement • Development of purchase manual at TR level • Higher delegation of power to the CEO • CEO to be authorized for utilization of surplus funds • Setting up FMIS

• Capital purchases from additional funds also need govt. approval often creating delays Performance Measurement of Govt. Tool Room • of financial recovery • measurement as per objective of tool rooms, including CRR	

Some practices from the private sector that would help to increase TR performance of people and better utilisation of assets. Reorganisation into a number of more focused and responsive business units will promote greater efficacy (see figure below). Profit centre accounting and "transactions" between the different "business" units would also contribute to increased performance. Just like in the private sector, transfer payments can be withheld if quality or service levels are not up to standard. Transfer pricing can be adjusted by the general manager to establish appropriate creative tensions.

TRs are currently typically organised into the following units: Leadership and administration, marketing, production and training. The configuration illustrated in the figure below separates out the facilities as a separate business unit to ensure better utilisation of assets. Production is reduced to a shared jobbing service unit, whilst advice/ professional services are also separated out to allow this to grow to more significance. External relationships are also leveraged to access more opportunities and increase capacity to respond to opportunities.

This organisation concept promotes establishment of self-goal seeking business units, which are incentivized based on performance; a practice already in place at Bhubaneshwar.



The **training unit** generates most revenue by responding to increased demand. Income streams include more public sector training programmes, manufacturers and trainees. The scope of training services and reach to other localities is increased by the use of external training service providers. These service providers are paid for value added, and do not increase the fixed costs. This allows faster expansion as less investment is required.

Private sector tool rooms are supported (for a fee) by a dedicated **development service**, which assists them with:

- improvement strategies,
- technological capability development, and
- jobbing of specific tasks (by the shared design & manufacturing service unit) which they cannot yet do.

Manufacturing MSME are supported with:

- **advanced manufacturing process advisory services** (for a fee) and
- with jobbing of specific tasks (via the shared design & manufacturing service unit) which they cannot yet do.

The **shared design and manufacturing services unit** earns revenue by executing the jobbing services as a sub-contractor to the advisory services. The shared design and manufacturing services "own" the technology/equipment/systems which they purchase at large discounts from technology suppliers. Partnering **technology suppliers** offer discounts on technology supplied because these items are then effectively endorsed and benefit from years of effective marketing to future clients.

All units pay rental to the **facilities unit.** The facilities unit which pursues efficient use of space and buildings, grow revenues by providing and utilising the assets more innovatively. The unit also organises access to external facilities for use by other units. By so doing, the unit enables other units to expand more easily. They merely by placing an order similar to a private sector lease agreement.

All units also pay for the support services offered by the **organisation development and support services unit.** Their services include:

- Leadership & stakeholder relations,
- Business administration governance, financial administration, HR, ICT, procurement, and
- Market development which creates large demand for all services through strategic partnerships.

Other business units complain when costs and service levels are not efficient / of good value. The peer pressure to perform better is maintained.

The market development function increases the demand for tooling and for manufacturing of new components.

Why is it important?

The public-sector-nature of TRs impedes performance in issues such as staff retention, innovation and optimal utilisation of assets. A business model that closer simulates private sector behaviour can improve results.

How (in principle)?

- Provide proper autonomy to the GMs by formal delegation of powers linked to good governance. This will better enable GMs to establish performance based organisation culture, processes and norms. Autonomy should include appointments, dismissals, promotion, remuneration, organisation structure and organisation strategy.
- Re-organise the TRs utilising a participatory approach – to allow persons impacted to shape their own destiny to some extent and buy into the change
- Further delegate power, increase accountability, reward performance and reduce job security to the business units.
- Incentivise performance and dismiss non-performers (+- bottom 5% per annum)
- Attract new talent into the organisation to grow in areas weakness.
- Increase utilisation of external capacities (sub-contractors) will increase value added per person. Typically expertise[11] that could benefit the organisation, is not required full time and is too expensive to retain on a full time basis. Else non-core activities.
- Establish efficient and robust procurement and governance systems (which could be copied from other organisations that have a similar public private partnership context).

By whom

Accountable: General Managers
Supported by: New strategic facilitation capacity, GIZ MSME umbrella programme

Source of funding

No cost implication of significance.

Desired result?

More 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.

Performance indicator:

Business units all contribute to increased scale of impact and to operational efficiency.

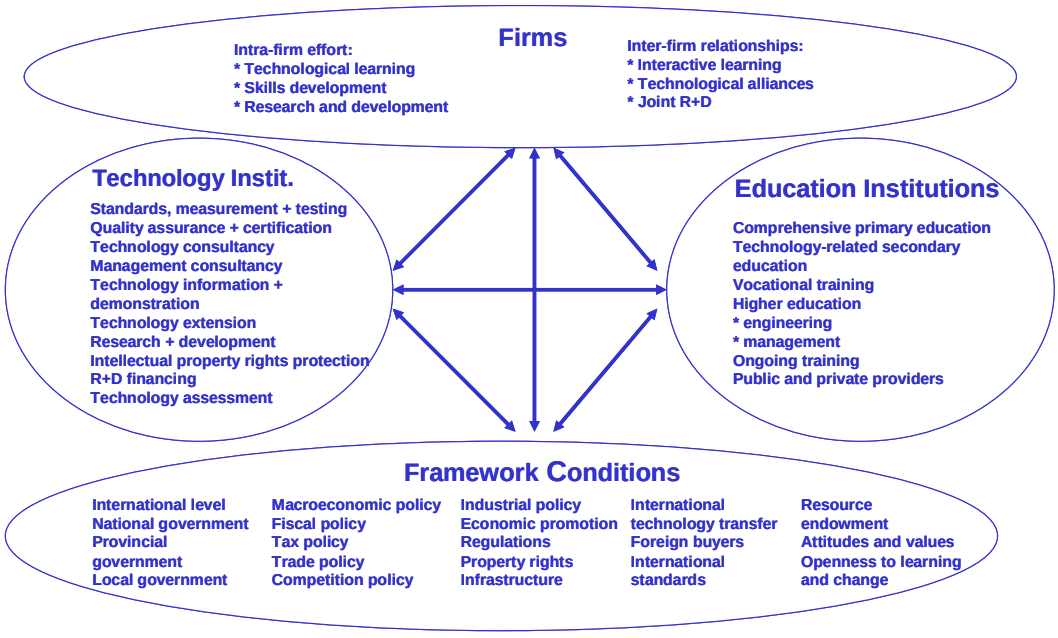
[11] Many international business schools (MBA) utilise contractors to lecture only when required

5.7. Map out the TRs role in the local innovation system

Mainly relates to: Strategic direction, Learning

What must be done?

Tool rooms form part of a larger system of regional stakeholders that contribute towards growth of the regional manufacturing MSME. The typical stakeholders in such an innovation system are illustrated in the *Four-Pillar-Model of Technological Capability* below:



Cooperation results in improvements, which benefits all. A facilitated process is required such that stakeholders are informed and for an agreed pattern of cooperation:

- Strategic direction is set by means of a bottom up, partnership approach.
- Stakeholders define a strategic agenda, setting out medium/long term objectives.
- Stakeholders implement the shared strategic agenda with better mobilization and more efficient utilisation of human and financial resources.

Why is it important?

The performance of both tool rooms and this larger innovation system can be enhanced if they cooperate consciously and effectively.

How (in principle)?

The Rapid Appraisal of Local Innovation Systems (RALIS©) methodology is specifically developed to obtain an overview of the main features of a local innovation system within a

short period of time. The methodology is rapid, practical, bottom-up participatory and network stimulating. The process is facilitated by a specialist RALIS facilitation team which conducts

- mini-workshops
- qualitative, structured interviews
- in a given economic setting (province, value chain)
- within a short period of time (2 weeks)
- involving representatives of all four pillars of the local innovation system

By whom

Accountable: State department responsible for manufacturing innovation
Supported by: GIZ MSME umbrella programme, TAGMA, local industry cluster facilitators

Source of funding

State department responsible for manufacturing innovation

Desired result

- TRs benefit from integration with the local innovation system.
- Increased opportunity results from increased stakeholder awareness and support.

Performance indicator

Scope of innovation support services available to manufacturing MSME, from the service provider network.

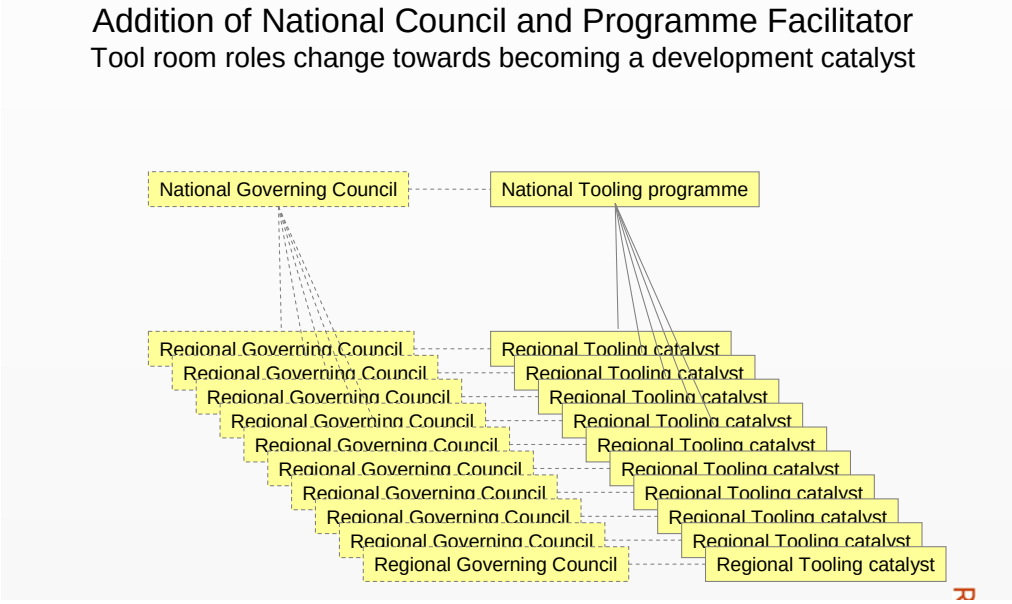
5.8. Move away from hierarchy towards network governance

Mostly relevant to: Governance, Governing Council, leadership, administration, cooperation

What must be done?

Networks of self-goal seeking self-maintaining organisations are able to respond better to a large variety of opportunities than a hierarchy, especially a public sector hierarchy. The developed economies favour this approach because decision making takes place closer to the ground, where the opportunity are better understood and which enables much quicker responses.

The current TR structure requires the same chairperson at all TR councils. The limited time available for such meetings, results in the Governing Council's inability to engage in strategic issues at each TR, in depth and on demand. The Governing Council mechanism should enable quicker strategic support at TR level. To enable this responsiveness, two levels of Governing Council are therefore proposed, local TR and national. TR councils would be held accountable by a new overarching governing council at national level, appointed to govern the national tooling programme. This national council would control budget and pay due attention to the strategic issues that concern all tool rooms and the tooling sector in India. Each TR would



retain a governing council which is more autonomous.

Governing councils in developed economies are led by regional industry leaders. Tooling associations like Tool and Die Manufacturers Association (TAGMA), lead the partnership with the public sector providing a supporting role. Much closer cooperation with TAGMA is therefore proposed. They should have much more say in the shared strategic agenda - success matters much more to the private sector than for public sector employees.

The public sector must however ensure that individuals do not take advantage of the power and resources involved in a programme such as this, for personal gain. Good governance is

therefore the critical pre-condition for delegating power. The ideal outcome is a public private partnership where different stakeholders, all contribute to success in the best way they can.

Governing councils should also provide appropriate autonomy to the GMs by formal delegation of powers linked to good governance. This will better enable GMs to establish performance based organisation culture, processes and norms. Autonomy should include appointments, dismissals, promotion, remuneration, organisation structure and organisation strategy.

General managers expressed concerns that moving away from hierarchy towards network governance can lead to greater mal-functioning as autonomy can be misused e.g. mal-practices like favouritism or corruption might prevail. Network governance is however a more robust governing mechanism than hierarchy.

Why is it important?

Many economic development opportunities do not wait for government bureaucracy.
The ability to act swiftly and decisively on big issues is critical.

How (in principle)?

- Establish a national governing council in partnership with TAGMA and other manufacturing sector bodies:
  - Define the roles, responsibilities and governance mechanisms (in the strategic framework, see recommendation)
  - Obtain nominations for council members and make the appointments.
  - Cal the first meeting.
  - Develop formal delegations of authority for the GM
  - All governing councils to meet 4 times per annum, to review progress quarterly.
- Prepare guidelines for delegated authority – what decisions can GMs make and what must be presented to the governing council. Obtain formal approvals.
- Ensure the regional governing councils function according to good practice

By whom

Accountable: DC MSME
Supported by: GIZ MSME umbrella programme, TAGMA, other manufacturing sectors

Source of funding

MoMSME should budget not only for tool rooms but also for tooling programme governance.

Desired result?

Manufacturing associations and TAGMA represented.
TRs benefit from more autonomy which enables them to respond better to opportunities.

Performance indicator:

Value added by the Governing Councils.

5.9. Establish a strategic framework

Most relevant to: Overarching strategic goals, strategy concept, strategic direction, steering mechanism

What must be done?

In recent years, government tool room organisational behaviour and learning have been driven mainly by the sustainability performance indicator. Tool room financial performance was prioritised over MSME impact. Investment decisions focussed on TR income, not on optimising impact. Learning and adaptation became disconnected from the overall strategic intent.

The development of a strategic framework which clearly articulates programme goals, sound economic development principles and good practice is proposed. This document will assist key stakeholders to remember lessons already learnt. It will help to raise the level of strategic insight, contribute towards a shared vision and make it easier to pursue sound strategy. Revised key performance indicators (KPIs) should accurately promote sound strategy that will result in greater development impact, and sustainability of government tool rooms.

Why is it important?

Sound economic development principles and robust strategic concepts will assist leaders involved in the tooling programme to think and act more strategically.

How (in principle)?

Contract a consultant to draft an appropriate strategic framework. GIZ can assist with preparing the terms of reference.

By whom

Accountable: DC MSME
Supported by: GIZ MSME Umbrella Programme

Source of funding

MoMSME should budget for this activity.

Desired result?

TRs utilise a coherent strategic framework clearly articulates programme goals, sound economic development principles and good practice.

Revised KPIs promote sound strategy that result in greater, sustained development impact.

Performance indicator:

Number of TRs that utilise the strategic framework.

5.10. Establish a strategic facilitation capacity

Mostly relevant to: Learning, strategy concept, strategic direction

What must be done?

Substantial changes are required to get TRs to think and act more strategically. New functions and skills are required. Sustainability pressures are also undermining ability to stay in touch with international technological advancement. GMs are finding it hard to send trainers to external training, and the skills of their people are not being updated.

Whereas programme strategies were largely influenced by external donors in the past, local stakeholders should start to take more ownership in driving innovation of the tooling strategy. This could start with implementation of these very recommendations and continued innovation thereafter. Establishment of the right expertise at the national level will not only serve to ensure implementation support to TRs, but could systematically grow organisation memory through effective knowledge management.

The first activity could be the technology benchmarking of tool rooms by Fraunhofer institute. First the government tool rooms and thereafter the private tool rooms (recommendation 2).

Why is it important?

Successful implementation of these recommendations will require technical support. The developmental impact on MSME should increase with effective implementation.

How (in principle)?

This capacity would require appointment of one expert economic development facilitator and one support administrator. They will be dedicated to support TRs in their strategic transition. GIZ can provide support in the specification of required competency profiles.

Temporary additional technical expertise can be contracted to assist TRs with specific tasks.

By whom

Accountable: DC MSME
Supported by: GIZ MSME umbrella programme

Source of funding

This activity requires one expert economic development facilitator and a support administrator. GIZ to initiate technical support. CIM expert required to head the unit initially. MoMSME should budget not only for tool rooms but also for tooling programme innovation.

Desired result?

TR learns faster to achieve greater development impact.
TR has international level of competitiveness.

Performance indicator:

Rate of TR improvement based on new KPIs.

Chapter 6

Consultation Workshop: Feedback and Prioritisation

The recommendations above were shared for input by the tool rooms and officials from DC MSME, for feedback prior to a workshop on the recommendations. The workshop was attended by all general managers and the DC MSME representatives who deliberated on the recommendations (in conjunction with the Grant Thornton recommendations) at a conceptual level. The joint set of recommendations discussed is unpacked below according to workshop focal areas, as defined in column 1.

Recommendations:	Grant Thornton	John Lawson
Training	GT2. Rapid scaling up of training output – long term	JL1. Scale up of training (Double up)
Production and Tooling services	GT4. Introducing innovative technology for MSME	JL2. Support private sector tooling sector to mature to excellence. JL3. Absorption of advanced manufacturing Technology (JL10). Benchmarking technology of TRs (Fraunhofer)
Marketing strategy	GT1. Adopt a cluster development approach	JL4. Engage in strategic partnerships
Governance, leadership and administration	GT6. FMIS GT7. Procurement manual	JL5. Build and leverage networks of capacities JL6. Reorganise the business model of government tool rooms JL7. Map out toolroom role in the local innovation system JL8. Move from hierarchy to network governance.

DC MSME Tool Room Programme	GT3. Incentivising technology upgradation of private sector MSME tool rooms GT5. Institutional mechanism for strategic direction and scale up (SPV).	JL9. Establish strategic framework for Toolroom programme JL 10. Establish a strategic facilitation capacity

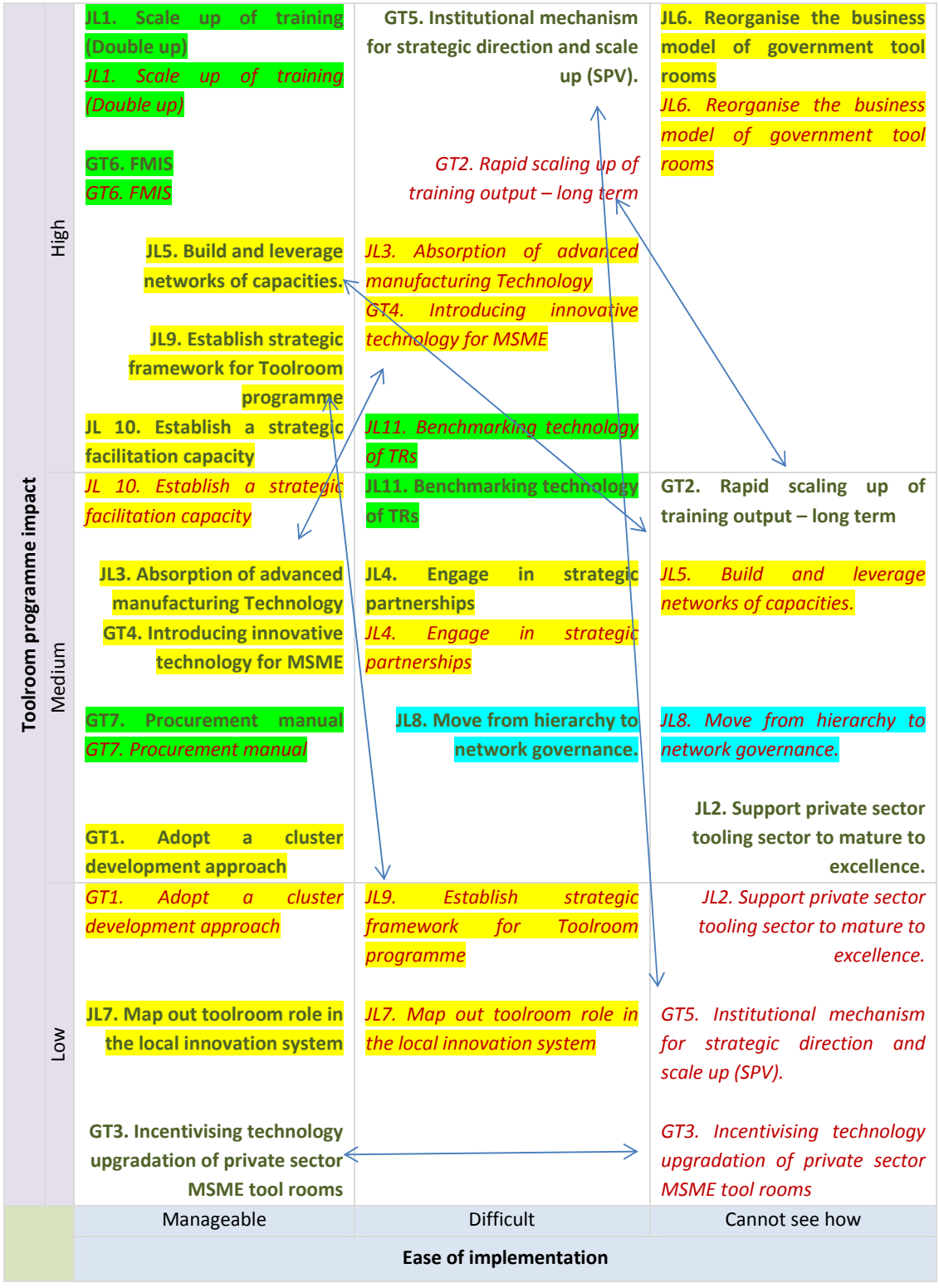
The Workshop was successful on the following dimensions:

- There was a clear **ownership for recommendations** by the end of two days. The stakeholders understood the proposed recommendations, openly expressed their concerns and gave feedback;
- The key constraints and realistic expectations got defined for consultants to revise recommendations to make it more decentralized and grounded;
- The **recommendations were ranked in order of their priority** where on several aspects the expectations of GMs with DC-MSME converged while on the others, it diverged. This was necessary to have an initial idea of readiness and reservations of the stakeholders on various issues;
- A **plan** for immediate implementation by tool rooms, tool room division and MSME Umbrella Project was identified.

Additional suggestions from the workshop included the following:	**These topics can be included under existing headings:**
1. Modifications/Development of career oriented recruitment rule	JL6. Reorganise the business model of government tool rooms
2. HR policies to be framed as per market trend	
3. Merit promotions	
4. Incentives for higher performers	
5. Modify leave rules	
6. Creation of new middle management posts	
7. Relaxation in GOI norms for procurement	GT7. Procurement manual
8. CEO authorised for short term appointments up to Rs 50 000 p.m.	JL8. Move from hierarchy to network governance.
9. VRS, CRS	
10. CEO authorised for utilisation of surplus funds	

The recommendations were prioritised by ranking based on three key parameters:

1. Programme impact potential (Y-axis)
2. Ease of Implementation (X-axis)
3. Sequence of implementation (Coloured shading of text)



KEY:

Italic: *Ranking by Tool rooms* **Bold:** **Ranking by DC MSME**

Implementation priority colour codes: 1st 2nd 3rd

GTx. Grant Thornton recommendations JLx. John Lawson recommendations

Chapter 7

Phased Implementation

The short, medium and long term priorities are listed in rows of the table below, and according to lead responsibility, by columns.

Implementation priorities:	Tool Room	DC MSME
First: Short term (see also way forward / next steps below)	JL1. Scale up of training (Double up)	JL11. Benchmarking technology of TRs GT6. FMIS GT7. Procurement manual
Second: Medium term	JL3. Absorption of advanced manufacturing Technology GT4. Introducing innovative technology for MSME JL7. Map out tool room role in the local innovation system JL5. Build and leverage networks of capacities GT1. Adopt a cluster development approach JL4. Engage in strategic partnerships JL6. Reorganise the business model of government tool rooms	JL9. Establish strategic framework for Tool room programme JL 10. Establish a strategic facilitation capacity
Third: Longer term	JL8. Move from hierarchy to network governance.	
Still recommended but not supported at workshop	GT2. Rapid scaling up of training output – long term JL2. Support private sector tooling sector to mature to excellence.	

The workshop finished off by developing a plan of action for implementing the first priorities. These initiatives and responsibilities are detailed on the next page.

Chapter 8

Next steps

	Key Pilot Projects	Decision Points
1.	**Double up training in 3 years**	• GMs showed a high level of initiative and mentioned that they do not need any support to start with this activity for the start; • TR Kolkata, however, mentioned that they would need infrastructural support & expert for designing new training programmes ;
2.	**First step towards Network Governance**	• Encouraged by the two-day process, the stakeholders agreed to constitute a self-moderated knowledge forum of General Managers that shall meet twice a year to discuss strategic and operational issues in a similar format as done in the workshop; • Mr. Shujayat Khan is the member secretary for the 2012 meeting of the forum; • Agenda for the meeting; o Doubling up of training o Advanced Manufacturing Technology- Bench-Marking Technology using Fraunhofer Institute's methodology;
3.	**FMIS**	• Pilot Locations- Jamshedpur & Ahmadabad • Timeline to start the pilot- February,2012
4.	**Procurement Manual**	• Responsible- R.K.Rai, Director, Tool Rooms • Mailing all Govt. TRs the draft manual & arriving at consensus • Timeline to start pilot- February,2012
5.	**Capacity Development of the Human Resources**	• Mapping skills & Identifying gaps at any level- A,B,C • The mapping of skills and identification of skill gaps shall be carried out using secondary level data that is already available with govt. tool rooms • GIZ support needed here • Timeline to start pilot- March 2012
6.	**Cluster Development Approach**	• Pilot location to be defined • Responsible- Mr. R.K.Rai
7.	**Bench-Marking Technology using Fraunhofer Institute's methodology;**	• GIZ to initiate technical support

8.	**Creation of a Strategic Facilitation Unit**	• GIZ to initiate technical support • CIM expert required to head the Unit

Decisions required

DC MoMSME is requested to make the following decisions:

- Approve the recommendations.
- Commit to funding the required changes, starting with the pilot projects.

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MSME TOOL ROOMS

Synthesized Report based on the findings and recommendations by Grant Thornton and John Lawson

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Tooling Industry in India

- Tooling Industries in India is approximately **valued at 13225 crore,** projected to **further grow at 20%**. Close to 70% of this demand is being met by Indian tool and die industry, which basically consists of "captive tool rooms" and commercial tool rooms". However, the tool and die industry comprises of large number of micro and small tool room enterprises and face following challenges:
  - **High Technology Obsolescence:** The TDM industry has very **high level of technology obsolescence** with new technologies fast replacing the older ones.
  - **Capital intensive with** relatively **low rate of return on investment**
  - **Shortage of skilled manpower**
  - **Need for Process upgradation**

- **Improving the availability of quality tools, dies, moulds and adoption of advanced manufacturing technology for enhancing the overall competitiveness of manufacturing MSMEs and bridging the gap between the demand and supply of trained manpower**" is the overall policy goal of Ministry of MSME, with reference to tool and die industry and MSMEs.

1. Performance of 10 MSME Tool Rooms

- **Training:** Total number of person trained by all tool rooms in 2010-11 was **46451**. **Training revenue** has increased by more than **300 per cent over the last 5 years**. In terms of absolute numbers, the **share of long-term courses is only 30 per cent** and balance is contributed by the short term courses.

- **Production** (Tool, die, Job works and consulting): The production output **has not grown** significantly over the years; it was Rs.20 crores in 2006-07 and **increased only by 30 per cent** in 5 years to about Rs.26 crores in 2010-11. Further, **significant share of production** is from component production/ job work for large scale units and PSUs.

- **MSME assisted:** Share of MSMEs in total revenue of the Tool-Rooms is 26 per cent in the last year which is up from 20 per cent in 2006-07 while there is significant increase in the number of MSMEs served. At 26 per cent of revenues, the total value is Rs.6.76 crores which is contributed by **10,667 MSMEs** at an average order value of Rs.6000 indicating that majority of MSMEs users are not using tooling services but testing and quality assurance services or minor machining or heat treatment facilities.

- **Self Sustainability:** While 6 Tool-Rooms (Aurangabad, Ahmedabad, Bhuwaneshwar, Hyderabad, Jamshedpur and Guwahati) have been consistently achieving cost recovery without depreciation, there are only two – Aurangabad and Bhubaneshwar Tool- Rooms which have achieved full cost recovery including depreciation.

2. Challenges and Constraints

Though their individual performance varies a lot but there are common factors that are determining the current performance of TR. Key identified challenges and constraints are:

❖ **Lack of coherence between Policy goals and strategic directions of self sufficiency**

- TRs are chasing revenue targets for sustainability, instead of **contributing optimally,** to reducing constraints to MSME manufacturing employment growth. Sustainability is important, but not at the cost of compromising manufacturing MSME growth. The **best form of sustainability** is achieved if the private sector does the work (such as making tools for MSME), as this costs the government nothing. The absence of a coherent strategic framework has contributed to the bigger picture being lost.

- Therefore the **challenge now is to reconcile policy objectives with self-sufficiency** and develop consistence strategic directions which follow sound economic development principles and respond to the specific regional industry requirements.

❖ **Lack of Real Autonomy:**

- A major contributor to slow responses and higher prices is the **limited autonomy** (though autonomous) and **public sector nature** of government tool rooms. A public sector procurement system slows down delivery and efficiency is largely constrained by the "business model" where the GM does not have the same powers as the private sector.

- Operating under public administrative framework, it **may not be realistically possible for the tool rooms to have the complete autonomy** but there are various area (such as procurement, partnership arrangement with private sector , service and training fee, recruitment system etc) where greater autonomy to the tool rooms can be provided with the help of standardized process norms and guideline.

❖ **Sub optimal functioning of governance and steering Mechanism:**

- Current governing council mechanism though based on sound principle of industry participation but **suffers from representation of very few (less than 20%) independent (non government/industry/ association) members**, less frequent meetings than intended – many cases only once in a year, insignificant contribution in shaping the business model and service portfolio .
- There is **no institutional capacity to provide strategic support** in terms of market research, technology trends, tie up with private sector and international institutions.

- Performance of a tool room is completely dependent on the ability of leadership i.e General Manager (GM). While the **better GM manage to overcome the constraints** but weaker leadership results into a poor performing tool rooms leading to less effective support to manufacturing MSMEs.

❖ **Absence of activity based costing approach:**

- There is no comparison or closer scrutiny of estimated and actual costs. **The activity-based costing (ABC) approach** is an accounting method for allocating overhead charges based on an equipment / space /overhead resource leasing per unit time concept.

❖ **In sufficient training output to meet the existing skill gap**

Industry is generally satisfied with the quality of training candidates they receive from tool rooms. However, **Current strategy** of tool rooms on training suffers from following constraints:

- Training output growth is based on the **"internal growth strategy"** i.e expanding own infrastructure and efficiency. With 300% growth achieved in last 5 years, further growth through this strategy is difficult to achieve.
- **Appropriate mix** between long term courses aimed at filling the skill gap need of the industry and short term courses aimed at skill upgradation has been compromised. At present only 30% of the training output is from long term courses. Both are required for the industry, but tool rooms appears **more inclined towards short term courses as it provides more number and revenues ,** important for self sustainability.
- A number of tool rooms are **struggling to retain and attract the right trainers**. Limited on-going development of existing trainers further exacerbates this challenge.

❖ **Business model for production (tool, die & job work) services is not synchronized with changed market situation:**

- The market situation has changed since the original conceptualisation of these tool rooms, which included the supply of tools when the market was failing to do so. The tool making market is clearly no longer failing, which poses the question as to why government tool rooms are **still actively involved** in this market with earlier business models.

- Industry is generally satisfied with the quality, but complains about lead times that are long (150 – 200%) and costs that are high (130 – 150%).

- **Current business model** of the tool room consists of direct delivery of services to enterprise and doesn't take into account market development principles i.e supporting and strengthening the competencies of private sector small tool room to move up in the value chain of complexity and sophistication along with direct delivery of services as market stabilizer.

❖ **Under developed Marketing capabilities:**

- **No clear marketing strategies** are apparent, which are based on any organized and systematic need assessment and client segmentation. Targets are fixed on previous year's performance and estimates of % growth.
- Little attention is given to **brand development**. There is limited understanding of **market price points, nor experience in complex sales methods.** In most cases, the marketing capability is under developed.

❖ **Lack of Proper Human Resource Development plan:**

- Most of the tool rooms do not have a proper human resource development plan in terms of career progression, continuous skill and capacity building measures. Resulting into a situation where in some important functionaries is stagnating at the same position for 10-15 years.

- **Knowledge base is stagnant,** and that little pro-active investment is made into learning. It is for instance, very hard to send trainers to external training.

❖ **Lack of systematic cooperation with related stakeholders:**

- Cooperation mechanism with stakeholders such as manufacturing industry associations is formally ensured through membership of the Governing Councils but they have limited influence through that mechanism and therefore take limited interest.

- Informal dialogue with private sector in the better government tool rooms is substantial and meaningful, **but hardly ever systematic** as one would expect in participatory planning. **Cooperation with TAGMA is surprisingly far below expectation**.

- **Advantages of private tool rooms are seldom utilised** systematically by government tool rooms as a strategy to reach and support more manufacturing MSMEs.

- Government tool rooms compare themselves and share learning, but not in a systematic manner. International cooperation and benchmarking is very limited.

3. Comparison with international strategy

Comparing the India tool room programme with the approaches adopted in USA and Germany (as some of the leaders in the field), there exists pertinent differences.

Main insights from international practices
▪ **Overarching strategic goal**: International approaches are conceived more holistically.
▪ **Governance and steering mechanism:** Government plays a supportive and enabling role whilst industry takes a more pro-active leading role to shape a healthy tooling sector. Strategy receives much greater attention and is better informed by leveraging intellectual capital of key stakeholders.
▪ **Leadership and administration:** Formal delegation of powers based on good corporate governance principles frees organisations up to become much more responsive. Leaders and managers get more freedom but are held more accountable for performance, with less job security.
▪ **Learning:** A broad base of stakeholder intellectual capital provides different perspectives to existing patterns of thinking, and is therefore more conducive for learning and innovation.
▪ **Strategy concept:** Other countries don't pursue healthy, large government tool rooms,

but prefer instead to pursue a healthy, large private tooling sector. Extensive support is provided through a network of more specialised public and private entities, that all cooperate well.
▪ **Marketing:** Systematically partner with industry and large manufacturing firms to realise large scale opportunities for manufacturing MSME, toolmakers and training.
▪ **Cooperation:** Systematically leverage external capacities to achieve development objectives.
▪ **Training:** Leverage other organisations in public and private sector to increase output and efficiency.
▪ **Production services:** Become a catalyst for growth of an advanced private tooling sector and utilise others' (network) to do as much of the work as possible. Provide access to technology to address gaps in private tool room ability to meet international level of competitiveness.

4. Suggested Recommendations

❖ **Develop a coherent strategic framework and facilitation unit**

- In the absence of "strategic framework" response of MSME TR is driven by the direction from the top, which is not consistence always.

- **Development of "strategic framework"** for a shared vision which clearly articulates progarmme goals, revised approach of the tool rooms, interlinkages of different programmes, holistic measurement of TR performance including impacts.

- Strategic framework **should also clearly outline** the appropriate autonomy to the GMs by formal delegation of powers to establish performance based organization culture, processes and norms. Autonomy should include appointments, dismissals, promotions, organization structure etc.

- **Establish a strategic facilitation capacity:** It is proposed that the delivery is separated from overall strategy formulation, planning, product development, resource management and quality assurance. The tool rooms retain autonomy in delivering the services. Such a strategic facilitation capacity can be established following a two step process
    i. To start with strategic unit attached to Tool Room Division with appointment of one expert economic development facilitator and one support administrator. They will be dedicated to support TRs in their strategic transition. Temporary additional technical expertise can be contracted to assist TRs with specific tasks
    ii. Based on the experience of impact of the unit , the unit is institutionalized as a Special Purpose Vehicle. The SPV may be a Private Public Partnership with industry participation. The SPV may be a corporate body; given the development mandate, a section 25 (not for profit) company may be more appropriate. The corporate structure would improve governance as also bring greater transparency and accountability.

❖ **Holistic Performance Measurement/ Targets**

Monitoring of performance currently, is mainly on financial parameters and not as much on outreach and impact. Management efforts are hence directed accordingly. **MIS tool should incorporate the following aspects and weightage for long term sustainability:**

- Financial – 40%
- Outreach – 35%
- Processes – 15%
- Capability Enhancement – 10%

❖ **Revised mandate and approach for Tool Room to support private sector tool rooms**

- In view of the changed business environment, mandate and approach of MSME tool rooms need to be revised to go one level up in the value chain. Along with directly producing tools and dies for the manufacturing enterprises, MSME TR should play the role of coach and mentor to these small private sector tool rooms.
- **Policy decision in this regard is needed and then MSME TR can carry out this role through following broad strategies without comprising on their financial position.**

i. Leveraging/Implementing existing support programme such as MSE CDP, QMS/QTT , Lean

ii. Developing new service offerings aimed at small private tool rooms in area such as design, costing, MIS, Lean manufacturing , modular training programme , available sophisticated machinery , technology selection on commercial terms.

iii. There are some major clusters of commercial tool rooms in Ludhiana, Jalandhar, Bangalore, Mumbai, NCR, Chennai, Ahmadabad, Mumbai, etc. This approach can be initiated first with MSE CDP at few of the tool rooms.

- ✓ Appoint champions (coaches) of this service at TRs
- ✓ Train them in coaching, benchmarking and market development principles.
- ✓ Establish a national benchmarking programme.
- ✓ Select promising private sector tool rooms to participate in benchmarking for a fee.
- ✓ Implement annual benchmarking process. National effort supports government TRs.
- ✓ Support consequential learning through coaching.
- ✓ Strengthen the services to proactively support private tool room growth.
- ✓ Provide access to technology to address gaps in private tool room ability
- ✓ Offer a jobbing service to enable private tool rooms to supply complex tooling.

❖ **Rapid Scaling up of training : double up in 3 years with "Hub and Spoke" model**

- **Double the trainee output in next 3 years** through adopting "hub and spoke" model i.e adopting and leveraging infrastructure and knowledge available with other private /public sector. The MSME TR must systematically build and leverage outside facility to

expand training; e.g. Polytechnics, ITI, engineering colleges. Nettur Technical Training Foundation (NTTF) can be a best practice example for scaling up

- Even though CITD Bhubaneshwar has been able to make an exceptional progress in scaling up its training; when applied to all the Govt. Tool rooms and to **systematically achieve this, TR will require support** in the following:

  i. Uniform and transparent partnership arrangement system and revenue sharing mechanism
  ii. Quality assurance system and multimedia training content
  iii. Capacity development of human resource for scale up is necessary and therefore, training of trainers is required
  iv. Clarity on focus: appropriate mix of training aimed at revenue and meeting the skill gap

❖ **Speed up absorption of advanced manufacturing technology**

- The MoMSME tool rooms need to continuously upgrade their technologies, demonstrate their commercial viability and train manpower for disseminating the technologies to the MSMEs. This has been successfully undertaken by several MSME tool rooms in the past like Jalandhar (forging hammers) and Ludhiana (heat treatment). However this needs to be done on a continuous basis and for this MSME TR will need

  i. Technical support as to what are the latest technologies that are being used the world over is required, to assess and identify the technological gap.
  ii. TRs need to establish the critical new technology platforms in partnership with vendors for transfer to private sector.
  iii. Ongoing tie-up with leading national and international organizations needs to be established.

❖ **Engage in strategic partnership with large firms and develop collaborative business model with other networks of capacities**

- MSME TR **need new market development competencies** to effectively carry out the above three functions i.e support private sector MSE tool rooms, doubling the training and speeding up the absorption of advanced manufacturing technology.

- **Pro-active and systematic partnering** with large manufacturing firms in local clusters and value chains will realise increased opportunities for manufacturing MSME, toolmakers and training. TRs can support local MSME in supply chains to meet demanding requirements – both in skills development and with technology transfer.

- Systematic development of collaborative business models with other network of capacities e.g machiney manufacturers, service providers, sub contractors, private sector to increase their value addition, outreach and impact.

- This has to happen under a common platform and leveraging the strength of all 10 MSME TR together through a common branding approach.

❖ **Development of Procurement Manual and Standard Bidding Documents**

Under the overall framework of GFR, there is a need to develop a procurement manuals, which should include –

- Principles of Procurement including Value for Money and whole-life costing principles.
- Delegation of authority in alignment with functional and operational needs and defined responsibilities
- Methods of sourcing suppliers
- Types of procurement for goods, civil works, services – professional and others
- Detailed Procurement Planning and documentation of processes for different types of procurement
- Detailed processes and procedures for alternate procurement via Rate Contracts, Long term agreements, Framework agreements, Emergency procurement procedures.
- Evaluation procedures under various methods of procurement

❖ **Development of an Integrated FMIS**

- A system to compare and analyse the cost estimates prepared at the time of quoting and actual cost on completion and analysis of reasons for deviations for futures guidance, should be implemented in all tool-rooms. Similarly data for machine cost during the year should be captured on perpetual basis so that rates per hour of all cost centres are known. Also training and production costs should be captured on actual basis rather than on percentage basis, this will assist in understanding training costs. Design of IT enabled and integrated Financial and Management Information System (FMIS) is a requirement.

- Continual improvement and accountability can be enhanced through the use of FMIS which can be linked to a suitable reward / incentive system. Suitable training and capacity development of the staff is necessary alongside.

- Training plan and training modules for training of officials should be developed and training workshops at regular time periods can be organised to train the staff in preparing cost estimates.

❖ **Re-organise the "business model" of government tool rooms**

Some practices from the private sector that would help to increase TR performance of people and better utilisation of assets. Reorganisation into a number of more focussed and responsive business units will promote greater efficacy.

5. Key outcome of Consultation workshop with MSME Tool Room

2 day workshop was organized in a participatory approach and focused mainly on **developing a common understanding** of the suggested recommendations by the national and international consultant team , **feasibility of these recommendations for implementation** taking into account **existing constraints and challenges** and **need for resources**.

Workshop was **successful** in achieving its prime objective of **developing an ownership of the whole change process** and getting a **bottom up feedback** about the recommended change process and **foreseen challenges** in its implementation. It has also provided valuable input and feedback to the consultants to revise formulation of certain recommendations and change in certain recommendations to make it more practical. Another important take away from this was identification of **"pilot change action"** for immediate implementation by tool rooms, tool room division and MSME umbrella project.

Key Observation:

- Change processes recommended by the consultants goes beyond just the "performance, outreach and impact of MSME Tool Room" and are aimed at achieving the overall policy goal of Ministry of MSME i.e "improving the availability of quality tools, dies, moulds and adoption of advanced manufacturing technology for enhancing the overall competitiveness of manufacturing MSMEs and bridging the gap between the demand and supply of trained manpower ".
- Most of the Tool rooms visualized "the potential impact, challenges and resource required" very well for those recommendations which are directly aimed at Tool Room. However there was visible gap in understanding, lack of appreciation and clear disconnect for those which are aimed at improving the overall response of MOMSME towards achieving its policy goal.
- Tool Rooms generally perceive that main reasons for their current level of performance are existing process, governance mechanism and lack of clarity in policy directives. While some of this are valid but many are misplaced as some tool room are performing better than others in the same enabling framework.

Some key Strategic Recommendations: discussions and observations

A. Tool Room level:

1) **Scale up training : Double up through partnership**

Found to be viable and Manageable by tool rooms in 3 years. Partnership with educational institutions e.g polytechnics, ITI, Engineering colleges was preferred in first phase than industry partnership

Remarks:

Though most TR confident to achieve this without any support but to systematically achieve this, TR will require support in the following:

- Uniform and transparent partnership arrangement system and revenue sharing mechanism
- Quality assurance system and multimedia training content
- Train the Trainer
- Clarity on focus: training aimed at revenue or meeting the skill gap (more than 1 year)

B. DC MSME office

1) Support Private tooling sector to mature to excellence or adopt market development approach

2) Establish a strategic facilitation capacity or creating an institutional mechanism for strategic direction and scaling up

3) Speed up absorption of advanced manufacturing technology or introducing innovative technologies

While "support to pvt sector tool room" met substantial resistance as expected but idea of strategic facilitation capacity was appreciated and needed greater operational details for the tool rooms to make a clear position on this. With reference to advanced technology, it was seen as a necessary step but emphasized the need for updated and systemic knowledge transfer learning mechanism.

Remarks:

Resistance of the tool room towards this idea is well placed from their operating lenses. Arguments ranged from "that its already being done whatever is possible to concerns like guaranteeing that they will serve MSME , will take away whatever little business TR are having from manufacturing and tooling services. However this when seen against the overall strategic thrust of Mo MSME to enhance the competitiveness of manufacturing MSMEs through various schemes in addition to Tool Room ; it fits perfectly. Following schemes from office of DC MSME confirm its resolve to achieve this goal.

- Mini Tool Room and New Mini Tool Room schemes
- NMCP schemes on incubators and QMS /QMT { Tool Rooms are already identified as an implementing agency}
- Capital Linked subsidy schemes

Therefore this should be operationalised , to start with existing appropriate mechanism such as cluster development programme and at one or two pilot locations.

Setting up of strategic facilitation unit is of also of paramount importance to provide cross cutting support to all tool rooms in the field of strategic planning , market research , technology upgradation need , knowledge and networking with national and international industry and institute.

During the conclusion and way forward session, following were the change project identified for immediate implementation

	Key Pilot Projects	Decision Points
1.	**Double up training in 3 years**	✓ GMs showed a high level of initiative and mentioned that they do not need any support to start with this activity for the start; ✓ TR Kolkata, however, mentioned that they would need infrastructural support & expert for designing new training programmes ;
2.	**First step towards Network Governance**	✓ Encouraged by the two-day process, the stakeholders agreed to constitute a self-moderated knowledge forum of General Managers that shall meet twice a year to discuss strategic and operational issues in a similar format as done in the workshop; ✓ Mr. Shujayat Khan is the member secretary for the 2012 meeting of the forum; ✓ Agenda for the meeting; ▪ Doubling up of training ▪ Advanced Manufacturing Technology- Bench-Marking Technology using Fraunhofer Institute's methodology; ▪ Technical support for benchmarking Fraunhofer Institute's methodology will be considered by GIZ
3.	**FMIS**	✓ Pilot Locations- Jamshedpur & Ahmadabad ✓ Timeline to start the pilot- February,2012
4.	**Procurement Manual**	✓ Responsible- R.K.Rai, Director, Tool Rooms ✓ Mailing all Govt. TRs the draft manual & arriving at consensus ✓ Timeline to start pilot- February,2012

5.	**Capacity Building of the Human Resources**	✓ Mapping skills & Identifying gaps at any level- A,B,C ✓ The mapping of skills and identification of skill gaps shall be carried out using secondary level data that is already available with govt. tool rooms ✓ Timeline to start pilot- March 2012
6.	**Cluster Development Approach**	✓ Pilot location to be defined ✓ Responsible- Mr. R.K.Rai

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Gap Analysis of Seven MSME Tool Rooms

Wrap-Up of Tool Room Visits

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MSME

Delhi, 06 September 2012

Fraunhofer IPT

WZL RWTH AACHEN

Agenda

Wrap-Up: 06 September 2012, Delhi

1	**Introduction**	Mr. Sinha, IAS	11:00 – 11:15
2	**Wrap-Up Presentation (I/II)**	WZL/ Fraunhofer IPT	11:15 – 12:00
2.1	Status of Project		
2.2	Review of Tool Room Visits		
2.3	Performance Estimation & Investment Feedback (I/II)		
	Break		12:00 – 12:15
3	**Wrap-Up Presentation (II/II)**	WZL/ Fraunhofer IPT	12:15 – 13:00
3.1	Performance Estimation & Investment Feedback (II/II)		
3.2	Summary & Further Steps		
4	**Final Discussion**	all	13:00 – 14:00

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WZL RWTH AACHEN

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WZL RWTH AACHEN

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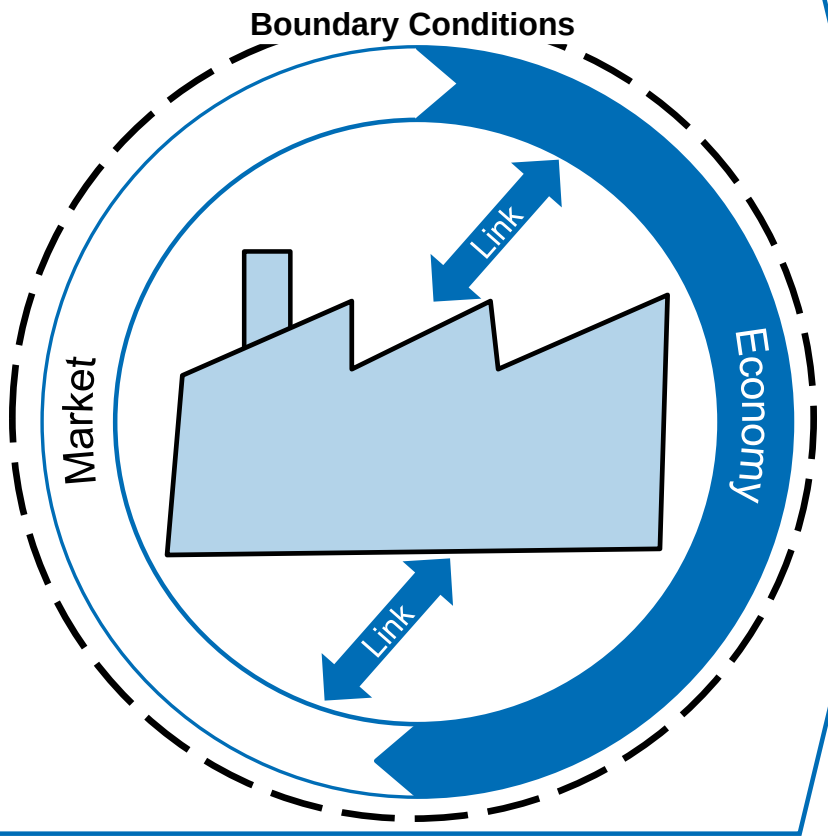
Analysis Approach

Applied approach for a holistic analysis of a Tool Room

Introduction

How is a Tool Room connected to boundary conditions?



Links represent the interactions between outside influences and the Tool Room

In general there are two generic connections between a Tool Room and relevant boundary conditions

- **Economy link** between the environment and the outer structure of a Tool Room (culture, values, and norms)
- **Market link** between the market and the inner structure of the Tool Room (strategy, organization, products, processes, and resources)

Source: Rüegg-Stürm “Das neue St. Galler Management-Modell“; Porter “Competitive Advantage“ (1985)

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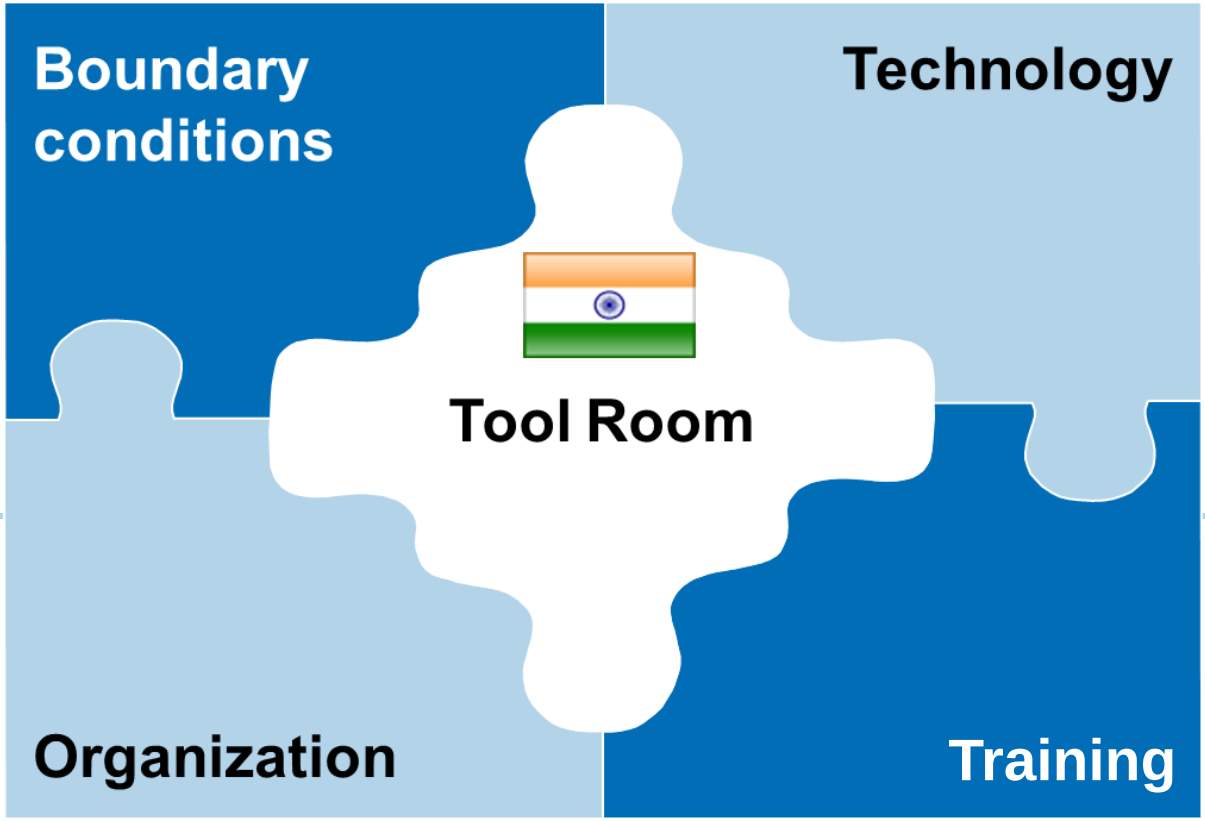
Project Approach

Analysis Framework for the MSME Tool Rooms



The Analysis Framework is the guideline for the Tool Room visits and the basis for the subsequent Gap Analysis

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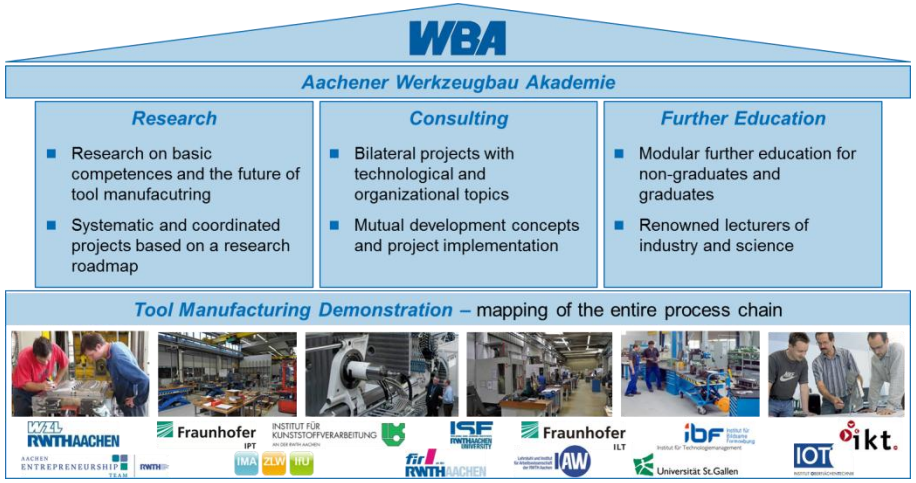
The Werkzeugbau Akademie bundles the know-how from all research institutions related to Aachen University



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WZL RWTH AACHEN

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Project Objectives and Project Results

Short-, medium- and long-term objectives and results of the project

	Short-term	Medium-term	Long-term

Objectives	**Data acquisition of each Tool Room:**
	■ Boundary Conditions
	■ Technology
	■ Organization
	■ Training
		Gap analysis for each Tool Room:
		■ Displaying the gaps concerning
		  ■ Technology
		  ■ Organization
		  ■ Training
		according to boundary conditions
			■ Set-up a framework for long-term cooperation in order to strengthen MSME Tool Rooms in terms of technological, organizational and educational topics
			■ Definition of the cooperation forms and detailed 3 years working plan

Results	■ Summary of data acquisition for each Tool Room ■ Estimation on technological, organizational and educational performance ■ Feedback on MSME investment plan	■ Detailed technology road map with investment advice ■ Detailed organizational advice ■ Competency/ Training advice ■ Road map for innovation cluster project and further cooperation	■ Detailed framework for a long-term strategic partnership ■ Procedure for gap closing ■ Execution of joint „gap closing“ projects

20 Aug.: Kick-Off — **06 Sept.: Wrap-Up** — **01/ 02 Nov.: Milestone**

Timeline

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Wrap-Up Orientation

The overall target will be achieved by completion of the results

Overall Target

- Review of visits to seven MSME Tool Rooms with regard to boundary conditions, technology, organization, and training

Results

- Summary of the acquisition of data and information in all seven visited MSME Tool Rooms ☐
- Estimation on technological, organizational, and training performance of all seven visited MSME Tool Rooms ☐
- Feedback on existing investment plans of all seven visited MSME Tool Rooms ☐

Source: Kick-Off Meeting – Delhi, 20 August 2012

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Agenda

Wrap-Up: 06 September 2012, Delhi

1	**Introduction**	Mr. Sinha, IAS	11:00 – 11:15
2	**Wrap-Up Presentation (I/II)**	WZL/ Fraunhofer IPT	11:15 – 12:00
2.1	Status of Project		
2.2	Review of Tool Room Visits		
2.3	Performance Estimation & Investment Feedback (I/II)		
	Break		12:00 – 12:15
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3.1	Performance Estimation & Investment Feedback (II/II)		
3.2	Summary & Further Steps		
4	**Final Discussion**	all	13:00 – 14:00

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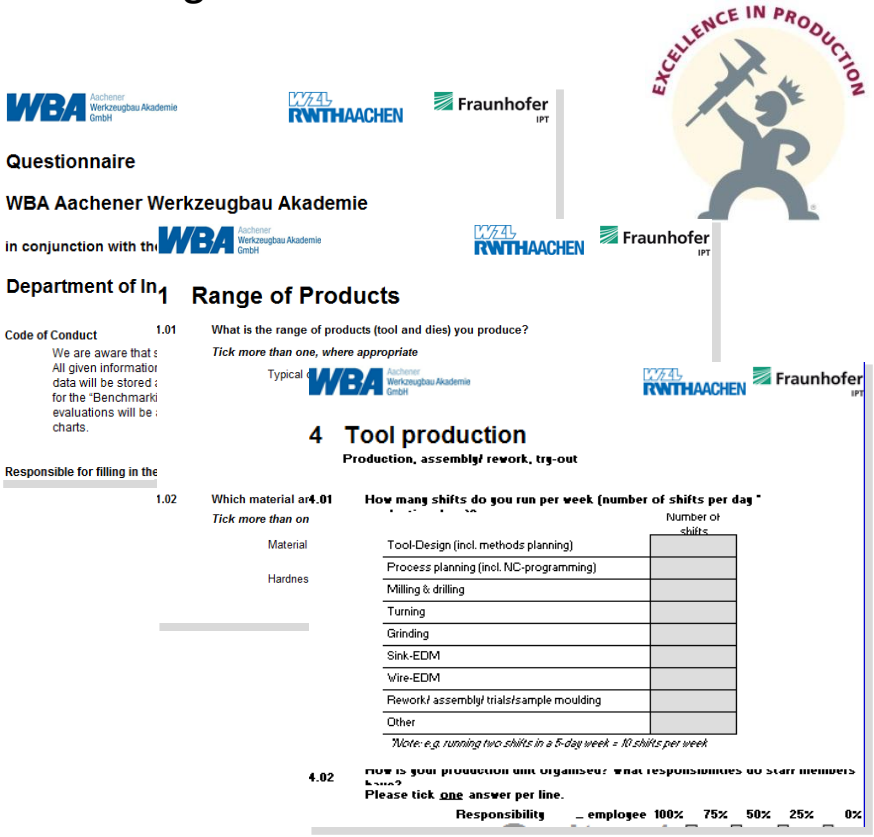
During the past three weeks seven MSME Tool Rooms were visited

Visit Schedule

1	*Tuesday,* *Wednesday,*	*21 Aug.* *22 Aug.*	**IGTR Aurangabad**
2	*Thursday,* *Friday,*	*23 Aug.* *24 Aug.*	**IDEMI Mumbai**
3	*Saturday,* *Monday,*	*25 Aug.* *27 Aug.*	**IGTR Ahmedabad**
4	*Tuesday,* *Wednesday,*	*28 Aug.* *29 Aug.*	**IGTR Indore**
5	*Thursday,* *Friday,*	*30 Aug.* *31 Aug.*	**CITD Hyderabad**
6	*Saturday,* *Monday,*	*01 Aug.* *03 Sept.*	**CTTC Bhubaneshwar**
7	*Tuesday,* *Wednesday,*	*04 Sept.* *05. Sept.*	**IDTR Jamshedpur**
Wrap-up	*Thursday,*	*06 Sept.*	**Delhi**

An extensive set of established measures was employed for the gathering of data and information

Gathering Measures



Questionnaire

WBA Aachener Werkzeugbau Akademie

in conjunction with the WBA Aachener Werkzeugbau Akademie GmbH

Department of In

Code of Conduct

We are aware that s
All given informatio
data will be stored
for the "Benchmarki
evaluations will be
charts.

Responsible for filling in the

1 Range of Products

1.01 What is the range of products (tool and dies) you produce?

Tick more than one, where appropriate

Typical

1.02 Which material ar

Tick more than on

Material

Hardnes

4 Tool production

Production, assembly/ rework, trg-out

4.01 How many shifts do you run per week (number of shifts per day *

	Number of shifts
Tool-Design (incl. methods planning)	
Process planning (incl. NC-programming)	
Milling & drilling	
Turning	
Grinding	
Sink-EDM	
Wire-EDM	
Rework/ assembly/ trials/sample moulding	
Other	

Note: e.g. running two shifts in a 5-day week = 10 shifts per week

4.02 How is your production unit organised? What responsibilities do staff members have?

Please tick one answer per line.

Responsibility employee 100% 75% 50% 25% 0%

Audi Werkzeugbau = Winner 2011 (Audi)

= Winner 2012 (ZF)

- On-Site Observation
  - Including all tool manufacturing and training facilities
- Individual Interview
  - Knowledge- and experience specific from all divisions
- Subject-Specific Discussion
  - Focused on a specific area or aspect of a Tool Room
- Training Check
  - Based on set-up of curriculum of WBA Aachener Werkzeugbau Akademie (tooling industry-specific organization of WZL/ Fraunhofer IPT)
- Technology Benchmarking-questionnaire
  - Proven standard for Benchmarking of tool and die making companies
- “Excellence in Production“-questionnaire
  - Proven standard of yearly award given by WZL/ Fraunhofer IPT to best German Tool Room (established 2004) of approx. 300 participants per year

Micro, small, and medium enterprises are the backbone for a strong economy and future development

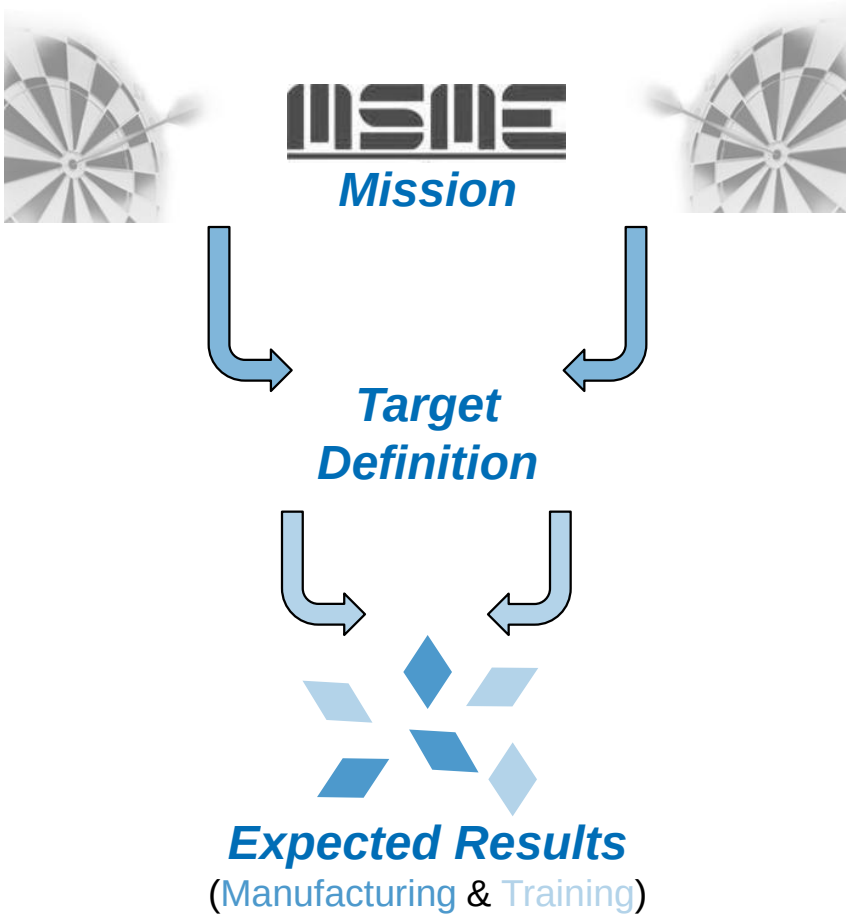
MSME Vision

Source: MSME

- The Vision Statement 2020 defines vision for Tool Rooms along multiple relevant dimensions
- Internationally renowned position for excellence in manufacturing and training
- Support and guidance of the MSME industry by example and services in different areas
- Development and adoption of innovative and state-of-the-art manufacturing technologies and processes
- Offer of relevant training for education and human resource development with latest methods
- The underlying target for MSME institutions is the realization of self-sufficiency while growing sustainably

MSME Tool Rooms are responsible self-sustainably offering training and manufacturing guidance to the industry

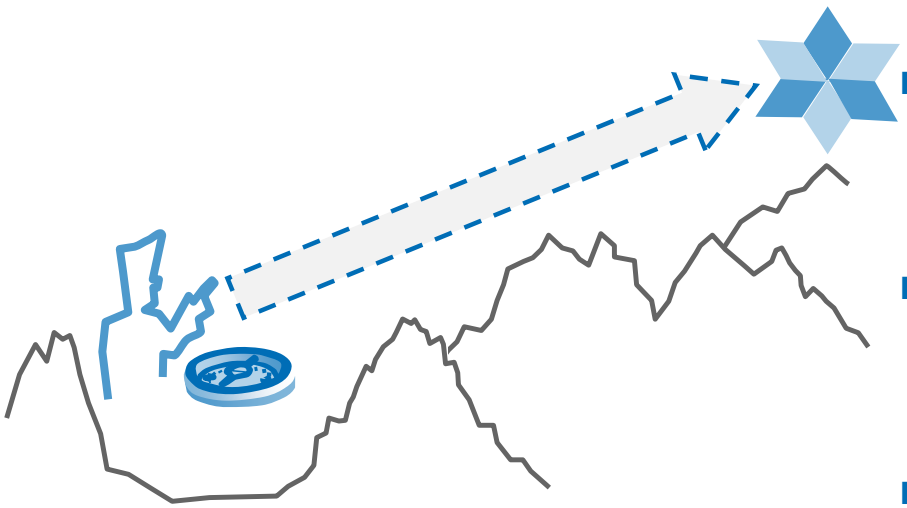
Tool Room Orientation



- The Mission is defined by the Ministry of MSME for all MSME Tool Rooms/ Institutions
- For all Tool Rooms targets are defined
  - Target definition regarding manufacturing
  - Target definition regarding training
- The defined targets are broken down into expected results
  - Expected Results regarding manufacturing
  - Expected results regarding training

The strategy and set-up of a specific Tool Room can be individually shaped by its management team

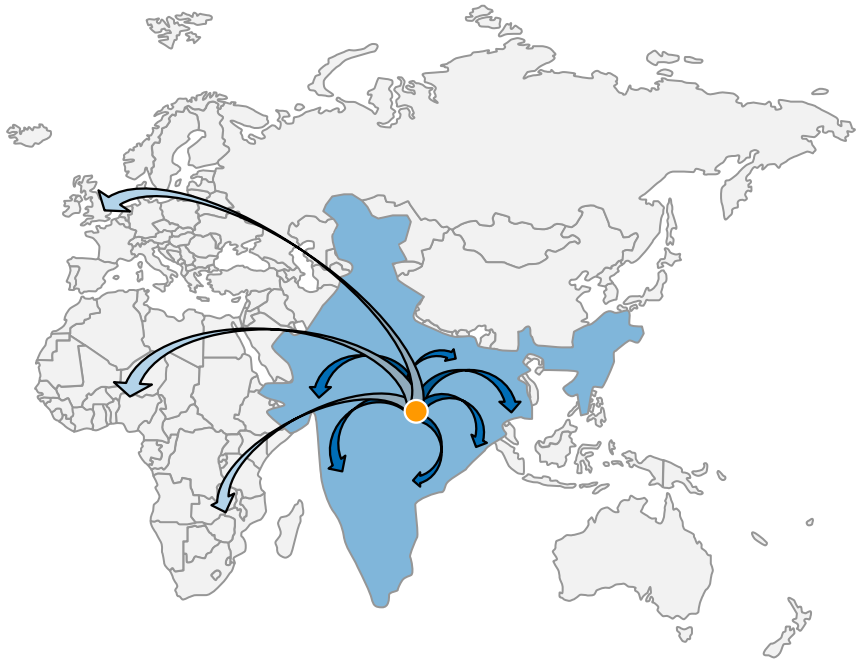
Individual Strategy



- The specific expected results have to be met by every Tool Room
- The structure of the product and training portfolio can be designed by every Tool Room individually
- The investments for each financial year (April – March) are structured in an Action Plan for the period
- The development of each Tool Room is supported by government funded investments every year
- Investments with capital generated by each Tool Room have to be approved by government

Due to different geographic positions in India the visited Tool Rooms have access to varying local markets

Market Access



- Based on the individual strategy the orientation of market access varies between the Tool Rooms
- The structure of the customer portfolio are defined by the amount, industry and duration of relationship
- The market access is furthermore influenced by the geographical position and local industry
- The customers and students are frequently in a geographically close position to a Tool Room
- International customer relations are predominately held to African countries (Manufacturing & Training)

General observations of the visits to seven MSME Tool Rooms with regard to training and manufacturing

Executive Summary

- All Tool Rooms are ***driven by*** the underlying mission of ***self-sustainability***
- The ***Boundary Conditions vary significantly*** between the different Tool Rooms
- The desired ***importance of manufacturing*** is ***not clearly defined*** and interpretation varies between the different Tool Rooms
- The ***orientation of manufacturing*** follows a ***different*** direction in all Tool Rooms
- The ***performance focus*** is predominantly ***technology-oriented*** – ***organization*** is widely ***not regarded*** as ***differentiating factor***
- ***Cleanliness & tidiness*** is in general ***not*** being valued or ***upheld – visualization*** is ***seldomly used***
- All Tools Rooms are held to the ***expectation of a 50% increase*** of their ***training intake-capacity*** regardless of prior development
- The ***tooling-specific training*** is ***comparable*** between the Tool Rooms – ***Tool Rooms specialize*** in training for ***parts of the process chain*** and for ***other sectors***
- The grounds of ***investment planning*** do ***not*** feature a ***stringent basis***

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

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The IGTR Aurangabad has a strong focus on creating revenue with its tool manufacturing division

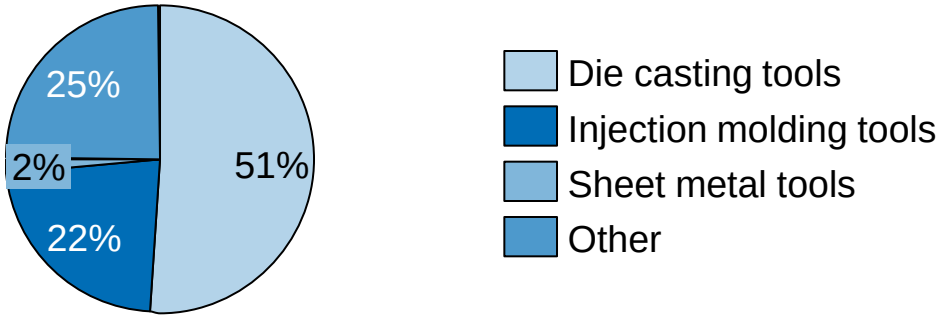
Introduction

»We stand for advanced solutions for press tools, die casting, and injection molding tools«

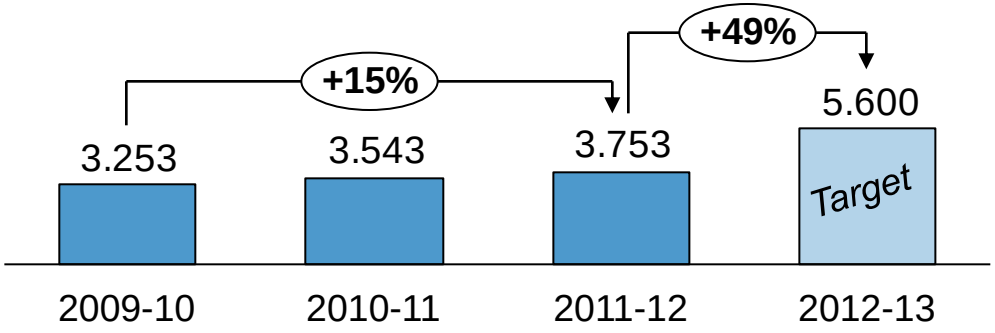
- **Aurangabad (Maharashtra) Market**
  Now: Strong industrial production with focus on the automotive sector
  Future: Automotive sector is the strongest of industrial production
- **Customer Industries**
  Aerospace, automotive, electrical, general engineering, medical

- **Business Focus** [Revenue]

- **Manufacturing**



- **Training** [Trainees Trained]



Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The capability with regard to technology is on a competitive level

Performance Estimation Technology

- Machinery
  - Broad product variety results in an unfocused technology portfolio
  - No information about machine utilization which makes an investment plan difficult

- CAx-Systems
  - Good application of the available functions offered by CAD/ CAM systems
  - Consistent media use within the CAx process chain

- Manufacturing Equipment
  - Variety of clamping systems offers flexibility but results in an increased complexity
  - Milling tools are not standardized
  - Manufacturing parameters are mostly set by experience, though there are tests accomplished
  - Increasing proportion of graphite electrodes

- Innovation
  - Tool room applies modern manufacturing technologies and enhanced its technological performance

The next step for the Tool Room is the implementation of a technology management system

The next step to a level of organization of international standard can be taken – The basis is established

Performance Estimation Organization

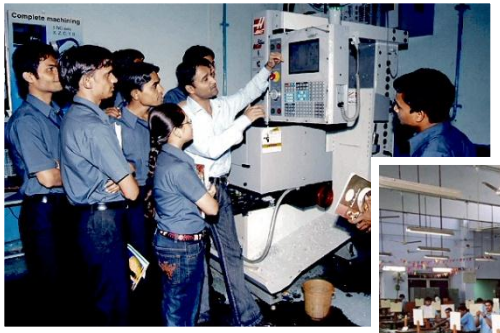
- Order Fulfillment Process
  - Due date reliability and lead time are at a competitive level
  - Milestone process is structured and consistently managed (limited use of paper)
  - A post-calculation is not part of the process; intransparent costs are inevitable result
- Capacity Utilization
  - Capacity utilization of the CNC machines has future potential
  - The value creation depth is managed well and allows a sound process planning
- System Application
  - Integration of supplier libraries as well as own standard parts are used for design in CAD
  - An electronic planning system for the order management has been set-up and customized and is developed further
- Employees
  - Trainees are integrated into the manufacturing process
  - The age and qualification of the employees meets the European standard in the tooling industry
- Surroundings
  - Cleanliness is not continuously maintained throughout the facilities; Order is at a good level

The ongoing development has to be continued – Assumption of role as organization leader is the target!

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The training program is balanced with the manufacturing routine of the production department

Performance Estimation Training



- Course Offerings
  - 13 relevant long-term courses for graduates and non-graduates as well as 47 mid- and short-term courses
  - Many courses are tool and die related which result in synergies between production and training

- Curriculum
  - Course content is very subject-specific and fits the basic requirements of the course description
  - Post diploma courses gives a deeper understanding of existing knowledge for students

- Resources
  - Comprehensive training facilities with manual working stations, conventional machines as well as a high number of CNC controlled machines
  - Simulation programs are available as a good enhancement of existing machines

- Training Staff
  - Difficult acquisition of trainers in regard to the increasing number of students
  - Trainers are well educated and are working simultaneously in the production

Management of tool making process could add a further dimension to training portfolio

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The proposed investments target upgradation of existing and acquisiton of new technologies

Aurangabad

*Investment Feedback**

Plant & Machinery

■ Manufacturing – CNC EDM, CNC surface grinder, CNC cylindrical grinder, simulation	*Focus:* *Reason:* *Cost:*	Upgradation of technological capability Reasoning not stringently derived (N/ A) N/ A	Revision Required
■ Training – CNC lathe, CNC mill	*Focus:* *Reason:* *Cost:*	Upgradation of technological capability N/ A N/ A	Sound Approach

Additional Infrastructure

■ Manufacturing – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A
■ Training – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A

* The Investment Feedback is solely based on the structural impression after WZL/ Fraunhofer IPT Tool Room visits and subject to change upon the gap analysis.
Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

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The organizational processes are a valuable asset for differentiation against competition

Strengths & Potentials

Strengths

- High number of manufactured tools shows **organizational strength**
- Application of **modern manufacturing technologies** and **continuous improvement** of own capabilitiy
- Usage of **employees in production and training** is favorable
- **Process transparency** by using milestone plans and structured work plans

Potentials

- Stringent machinery investment planning must account for **resource utilization**
- **Standardization of manufacturing tools** and development of own manufacturing parameters and strategies
- **Post calculation** of tools in order to enhance the process transparency
- **Product portfolio** seems very broad and shows focussing potential

* The strengths & potentials listed on this slide only represent an excerpt of the entirety identified by WZL/ Fraunhofer IPT. The strengths & potentials will be addressed in detail during the upcoming gap definition between India and Germany as well as in the subsequent gap analysis.

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

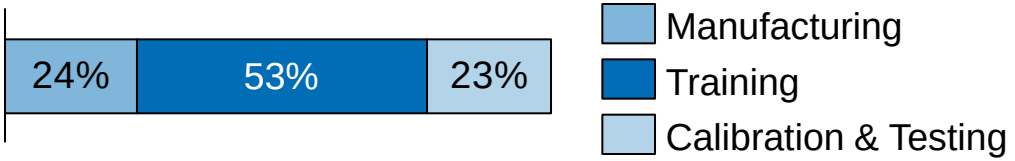
The IDEMI Mumbai is a leader for calibration & testing services – the Tool Room offer various tools and training

Introduction

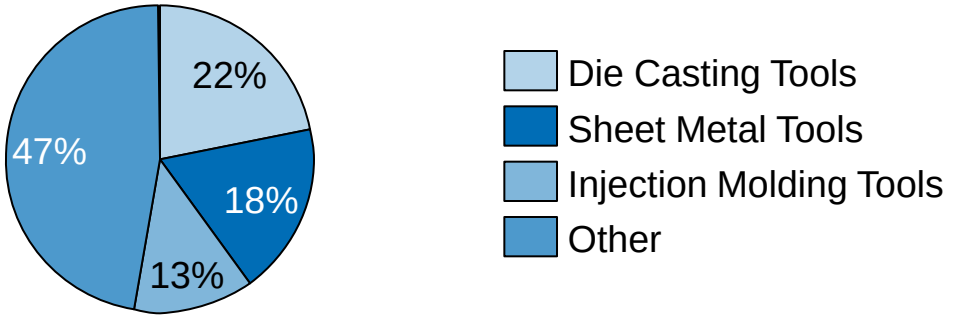
»We are one of few institutions in India with top-level testing & calibration services«

- **Mumbai (Maharashtra) Market**
  Now: Various focus with strong market for calibration & testing
  Future: Further development of power suppliers (nuclear, solar)
- **Customer Industries**
  Automotive, general engineering, nuclear, research, solar

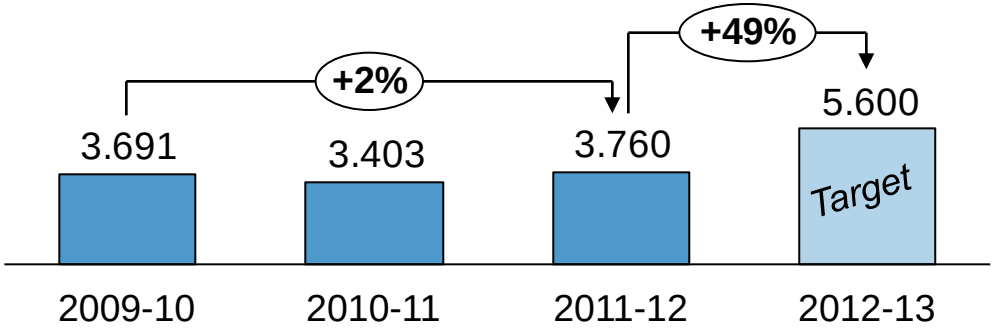
- **Business Focus** [Revenue]



- **Manufacturing**



- **Training** [Trainees Trained]



Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The overall capability of manufacturing technology is rather low because of testing and calibration focus

Performance Estimation Technology

- Machinery
  - Machinery is heterogeneous as there are some modern and many old machines
  - Machines with very large working rooms
  - Extensive testing and calibration facilities demand upgradation for exploitation of equipment

- CAx-Systems
  - Very efficient design process with good application of the CAD-system functions
  - High competencies in CAM-programming whereas the technology know how could be increased

- Manufacturing Equipment
  - Usage of copper electrodes is not state of the art and results in lower productivity and higher costs
  - Mostly usage of conventional clamping systems
  - Machining parameters are not developed by the Tool Room instead usage of suppliers recommendations

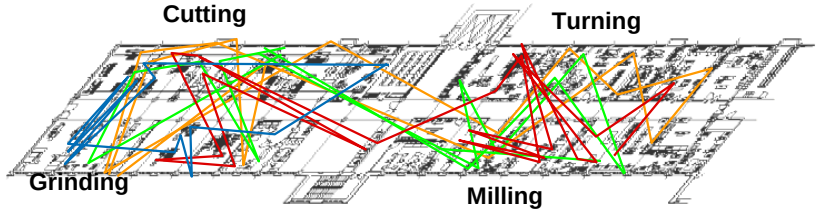
- Innovation
  - Technological innovation in manufacturing is low as only standard machines and equipment is used
  - Strong cooperation and research activities in the field of testing and calibration

It is difficult to offer good trainings in two business fields of vastly differing focus

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis Manufacturing (black); testing & calibration (blue)

The execution of tool manufacturing as well as testing & calibration request high capability of the organization

Performance Estimation Organization



- Order Fulfillment Process
  - Due date reliability and lead time are below a satisfactory level
  - Testing & calibration demand for process structure for all different order types
  - A post-calculation is not part of the process; intransparent costs are inevitable result

- Capacity Utilization
  - Capacity utilization of the CNC machines yields room for improvement
  - Capacity utilization of equipment for testing & calibration is strictly order-related

- System Application
  - Integration of supplier libraries as well as own standard parts are used for design in CAD
  - An electronic planning system is not in placed; CNC milling machines are planned weekly by hand

- Employees
  - Trainees are integrated into the manufacturing process
  - The age and qualification of the employees meets the European standard in the tooling industry

- Surroundings
  - Cleanliness and order are not maintained and demand immense improvement

Cleanliness and order are a prerequisite for capable organizational processes

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis Manufacturing (black); testing & calibration (blue)

The scope of the training portfolio encompasses manufacturing as well as testing and calibration

Performance Estimation Training

- Course Offerings
  - Trainings in testing and calibration are a market niche and are a competitive edge
  - Focus on CAD/ CAM and computer related fields results in high competencies and well trained students

- Curriculum
  - No long-term trainings for own production workers as the focus is on computer-related fields
  - Testing and calibration focus refers only on the technology but not on a suitable environment
- Resources
  - Extensive facilities and equipment for software-oriented training
  - Production related training resources are not suitable as there are just a few machines and controls for training
- Training Staff
  - Trainers have a suitable education and good practical background
  - Trainers do not switch between training and production

The competitive strength in training is shaped by unique equipment for testing and calibration activities

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The proposed investment target testing & calibration and facilities – Short- and long-term plan are in place

MSME Mumbai

*Investment Feedback**

Plant & Machinery

■ Manufacturing/ Testing & Calibration – Maintenance, testing equipment, calibration equipment	*Focus:* *Reason:* *Cost:*	Upgradation in multiple dimensions Structured explanation Amortisation periods are given though not explained	Sound Approach
■ Training – CNC lathes, CNC mills	*Focus:* *Reason:* *Cost:*	Upgradation of technological capability Consistent justification Stringent explanation	Sound Approach

Additional Infrastructure

■ Manufacturing/ Testing & Calibration – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A
■ Training – Training facilities, basic equipment, furniture	*Focus:* *Reason:* *Cost:*	Expansion of intake-capacity No structured derivation of actual demand Fit with reason not stringently defined	Revision Required

* The Investment Feedback is solely based on the structural impression after WZL/ Fraunhofer IPT Tool Room visits and subject to change upon the gap analysis.
Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis Manufacturing (black); testing & calibration (blue)

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Strategic situation of the IDEMI in Mumbai is unclear – synergies between existing business fields are weak

Strengths & Potentials

Strengths

- **Good strategic positioning** in testing and calibration
- **Renowned partner** of companies and R&D facilities for testing and calibration
- **Facilities** for **testing and calibration** are **suitable** for practical training purposes
- **Focus on computer-related** training results in a high training standard

Potentials

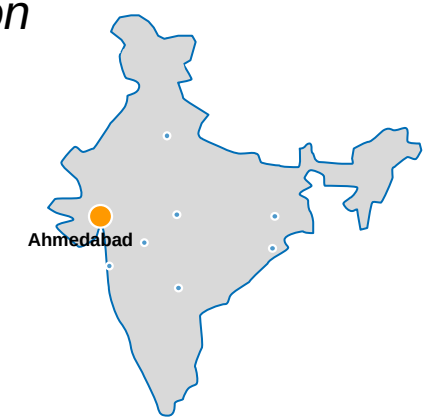
- **Product portfolio** must be sharpened as there are no synergies between the focused business fields
- Check of modern **testing and calibration environments** and application in the own facilities
- Enhancement of **order and tidiness** in order to elaborate the available space
- Strenthen of the **link between training and business** activities

* The strengths & potentials listed on this slide only represent an excerpt of the entirety identified by WZL/ Fraunhofer IPT. The strengths & potentials will be addressed in detail during the upcoming gap definition between India and Germany as well as in the subsequent gap analysis.

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis Manufacturing (black); testing & calibration (blue)

The IGTR Ahmedabad excels in injection molding tools and continuously expands its training capacities

Introduction

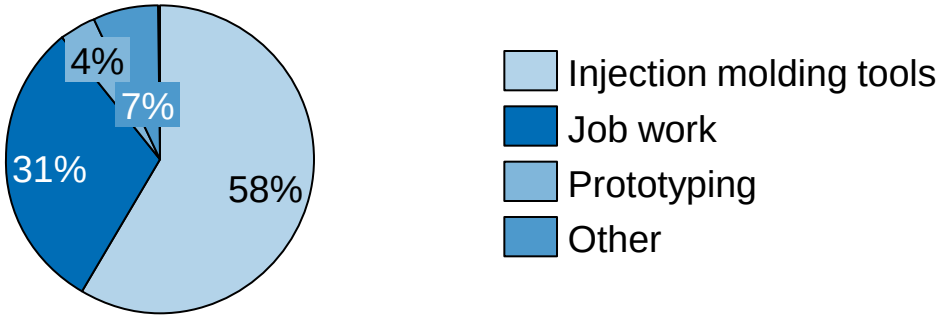


»Companies from all over India approach us for complex injection molding solutions«

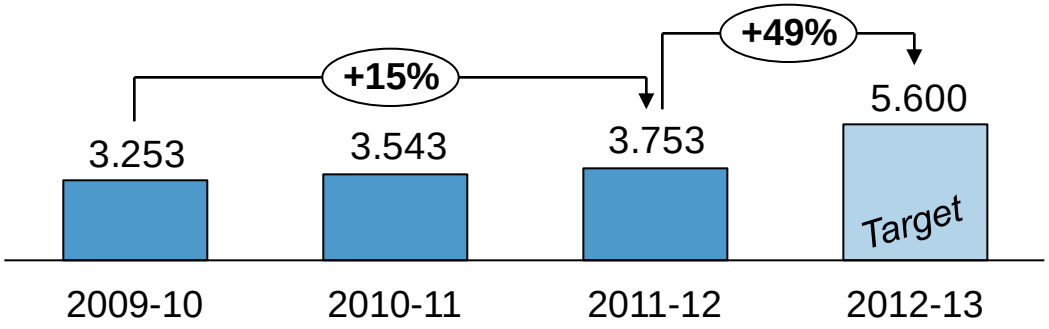
- **Ahemdabad (Gujarat) Market**
  Now: Moderate intensity with various focuses
  Future: Automotive sector will be strengthened by new plants
- **Customer Industries**
  Automotive, defense, electronics, facility equipment, medical, packaging

- **Business Focus** [Revenue]

- **Manufacturing**



- **Training** [Trainees Trained]



Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The available technology fits injection molding requirements – Quality of infrastructure must be enhanced

Performance Estimation Technology

- Machinery
  - Older milling machines lower the overall productivity of the machinery
  - New EDM-machines with high capability
  - All processes of tool making can be addressed

- CAx-Systems
  - Design know-how allows service to customer that starts with the design of the parts
  - Workshop-oriented programming fits the exisitng requirements of the manufacturing environment

- Manufacturing Equipment
  - Set-ups are time intensive due to conventional clamping systems in milling
  - High diversity of milling tools results in a difficult development of manufacturing parameters

- Innovation
  - Application of laser cusing in order to manufactur contour-near coollings
  - Extensive resources for prototyping and testing of molds enable accerlerated development process

The technological capability supports a target-oriented focus on injection molding – however further potentials as 5-axis technology have to be exploited

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The organizational capability has the potential accelerate the future development of tool manufacturing

Performance Estimation Organization

- Order Fulfillment Process
  - Due date reliability and lead time for injection molding tools show potential
  - Integration into the customer‘s process chain is performed frequently
  - A post-calculation is not part of the process

- Capacity Utilization
  - Capacity utilization of the CNC machines yield room for improvement
  - The value creation depth is high and adds complexity the process planability

- System Application
  - Integration of supplier libraries as well as own standard parts are used for design in CAD
  - An electronic planning system for the order management is not being employed

- Employees
  - Trainees are integrated into the manufacturing process
  - The age of the employees compares high to the international standard in the tooling industry

- Surroundings
  - The MSME TR standard for cleanliness and order

The required understanding of all organizational action fields is existent – Countermeasures for enhancing the performance have to be executed more consequently!

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The number of trained trainees increases rapidly – the growth rate of course diversity is even steeper

Performance Estimation Training

- Course Offerings
  - Recent increase and high amount of overall available courses enhance complexity of training management
  - Wide course range: from the 4-year diploma to 1-day seminars

- Curriculum
  - 4 year diploma as flagship program
  - Course content is very subject-specific and fits the basic requirements of the course description
- Resources
  - Extensive library, e-library, and latest industry-specific magazines available to students
  - New facilities are being built to increase the intake-capacity in the future
  - MTS simulation system increases the training capacitites for CNC machining with low financial effort
- Training Staff
  - Trainers are current production workers with daily job experience
  - External trainers are employed frequently to give specific trainings or seminars

Management of tool making process could add further dimension to training portfolio

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The proposed investments support the existing orientation of the tool manufacturing and training

Ahmedabad

*Investment Feedback**

Plant & Machinery

■ Manufacturing – Air compressor, hydraulic trolleys, machine cabinet, capital tools,	*Focus:* *Reason:* *Cost:*	Aligned with manufacturing focus Logical derivation and explanation of need Fit with need	Sound Approach
■ Training – CNC mill, CNC lathe, workshop equipment	*Focus:* *Reason:* *Cost:*	Aligned with training requirements Logical derivation and explanation of need Fit with need	Sound Approach

Additional Infrastructure

■ Manufacturing – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A
■ Training – Training building, housing facilities	*Focus:* *Reason:* *Cost:*	Aligned with ongoing construction activity Logical derivation and explanation of need Fit with need	Sound Approach

* The Investment Feedback is solely based on the structural impression after WZL/ Fraunhofer IPT Tool Room visits and subject to change upon the gap analysis.
Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

Fraunhofer IPT

WZL RWTH AACHEN

The transformation from potentials into strength is the key to becoming a leader in injection molding tools

*Strengths & Potentials**

Strengths

- **Focus on injection molding** offers opportunities over the entire process chain
- **High standard of infrastructure** for the execution of manufacutring and training
- Service to the customer for **parts and tool development**
- **Modern testing facilities** allow enhanced customer service by in-house tool testing

Potentials

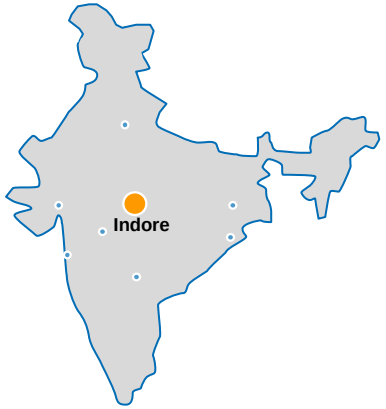
- Improvement of **order fulfillment process**
- Exploit productivity advantages by using of **graphite electrodes**
- Implement **zero-point clamping systems and palletizing systems**
- Identifiy **milling parameters** that fit the tool portfolio for selected milling tools

* The strengths & potentials listed on this slide only represent an excerpt of the entirety identified by WZL/ Fraunhofer IPT. The strengths & potentials will be addressed in detail during the upcoming gap definition between India and Germany as well as in the subsequent gap analysis.

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The IGTR Indore focuses on engineering and various tool types while offering a broad training program

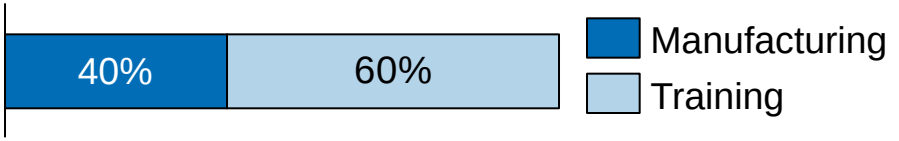
Introduction



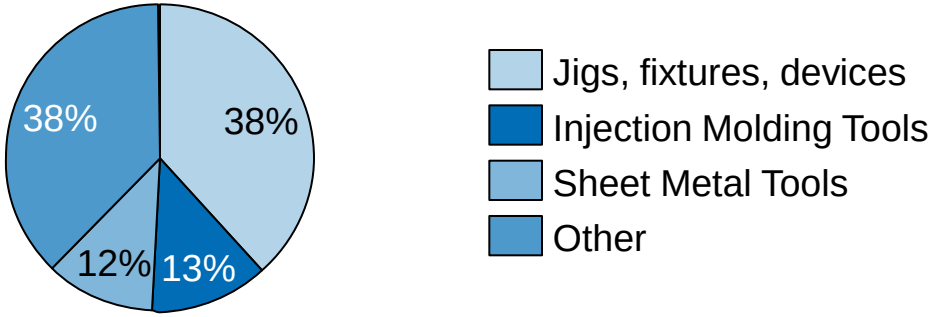
»Complete solutions for the customer under one roof«

- **Indore (Madhya Pradesh) Market**
  Now: Automotive, pharmaceutical & local physics research
  Future: Further strengthening of automotive and physics research
- **Customer Industries**
  Automotive, medical, packaging, pharmaceutical, research

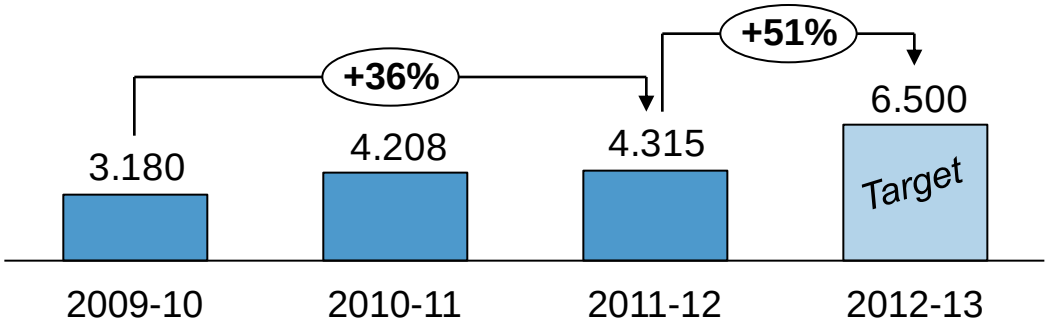
- **Business Focus** [Revenue]



- **Manufacturing**



- **Training** [Trainees Trained]



Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The machine portfolio shows weaknesses and the equipment is on the lowest level

Performance Estimation Technology

- Machinery
  - Broad manufacturing technology portfolio result in an old machinery
  - Modern and well suited measuring facilities
  - Modern machinery is not applicable as the infrastructure is not suited for precision machining (Temperature)

- CAx-Systems
  - CAx process chain without any breaks that demand manual data handling
  - Applied systems are well suited for the manufacturing environment

- Manufacturing Equipment
  - Simple clamping systems result in time extensive clamping processes
  - Turning and milling tool portfolio contains too many tools
  - No own process parameter development offers potential to productivity enhancement
  - Total switch to graphite electrodes is possible and would enhance the overall productivity

- Innovation
  - Engineering in cooperation with research centers in physics
  - Lack of modern production methods and technologies

The existing technology does not enable an efficient and profitable production

The organizational capability has to be addressed thoroughly to enable future development

Performance Estimation Organization

- Order Fulfillment Process
  - Due date reliability and lead time for all jobs are substantially below satisfactory
  - Integration into the customer‘s process chain is performed in the design process
  - The responsibilities are not clearly defined
  - A post-calculation is not existent

- Capacity Utilization
  - Capacity utilization of the CNC machines yield room for improvement
  - The value creation depth is high and adds complexity the process planability

- System Application
  - Integration of supplier libraries for design not in CAD system; no specific standard parts defined
  - A planning system for the order management and machine usage is not being employed

- Employees
  - Trainees are integrated into the manufacturing process, parts from training machines are used for manufacturing

- Surroundings
  - The level of cleanliness is moderate, the order of equipment has to be improved
  - Temperature has to be managed in manufacturing

Structured measures need to be undertaken to upgrade the level of organization

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The overall number of different courses are transparent – The focus is on software-oriented classes

Performance Estimation Training

- Course Offerings
  - 31 trainings with a speciality on CAD/ CAM and heat treatment
  - Placement quota of students in long term and tool making courses is very high
  - Class size varies a lot during a year

- Curriculum
  - 4 year diploma as flagship program
  - Distinctive 2 year program in machinist trade with certification
  - Course curricula fit technology-specific demands
- Resources
  - CNC simulation system increases the training capacities with low financial effort
  - Future purchase of a simulation system for conventional machining
  - Fully equipped training facilities for practical training
  - New training building is under construction
- Training Staff
  - About 22 permanent trainers available whose background is tool design and manufacturing
  - Good mix of trainers with different experience levels

Training is performed on a competitive level –
Balancing of capacity utilization over the duration of a year yields potential for efficiency enhancement

The proposed investments address a variety of different fields for development of manufacturing and training

*Investment Feedback**

Plant & Machinery

■ Manufacturing – Laser machine, CNC milling centre, SG, CMM, further equipment	*Focus:*	Lack of stringency of investment orientation	Revision Required
	Reason:	Explanation not consistent of invest. portfolio	
	Cost:	Cost and amortisation justification need refinement	
■ Training – Welding lab, wire cutter, CNC EDM	*Focus:*	Further enhancement of training variety	Revision Required
	Reason:	Explanation demands further elaboration	
	Cost:	Cost and benefit not sufficiently detailled	

Additional Infrastructure

■ Manufacturing – Building Renovation	*Focus:*	Maintenance activity	Sound Approach
	Reason:	N/ A	
	Cost:	N/ A	
■ Training – Solar Lighting System	*Focus:*	Aligned with energy supply reuqirement	Revision Required
	Reason:	Logical derivation	
	Cost:	Cost and benefit not sufficiently detailled	

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Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The diversity in the product portfolio results stringency-lack of organisational and technological positioning

Strengths & Potentials

Strengths

- **Highly renowed training program** for machinist trade
- **High engineering capabilities** underlined by cooperations with research institutes
- **High capabilities in injection moulding** for pharmaceutical packaging
- Infrastructure offers **enough space** for capacity increasement

Potentials

- **Due date reliability** must be increased as it is a threat for business relations
- **Productivity enhancement** by using adequate machines and equipment
- **Increase of innovation degree** in regard to manufacturing technology and production methods
- **Efficiency enhancement in training** department by balancing capacity utilization

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Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

Agenda

Wrap-Up: 06 September 2012, Delhi

1	**Introduction**	Mr. Sinha, IAS	11:00 – 11:15
2	**Wrap-Up Presentation (I/II)**	WZL/ Fraunhofer IPT	11:15 – 12:00
2.1	Status of Project		
2.2	Review of Tool Room Visits		
2.3	Performance Estimation & Investment Feedback (I/II)		
	Break		12:00 – 12:15
3	**Wrap-Up Presentation (II/II)**	WZL/ Fraunhofer IPT	12:15 – 13:00
3.1	Performance Estimation & Investment Feedback (II/II)		
3.2	Summary & Further Steps		
4	**Final Discussion**	all	13:00 – 14:00

Fraunhofer IPT

WZL RWTH AACHEN

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Fraunhofer IPT

WZL RWTH AACHEN

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Fraunhofer IPT

WZL RWTH AACHEN

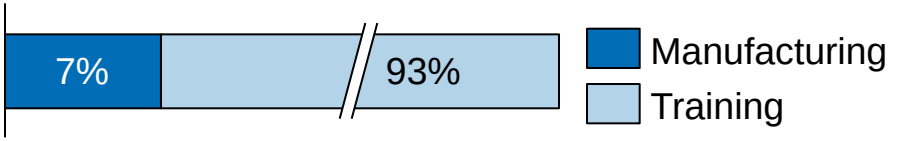
The CITD Hyderabad has a strong focus on offering training in design, tooling, and automation

Introduction

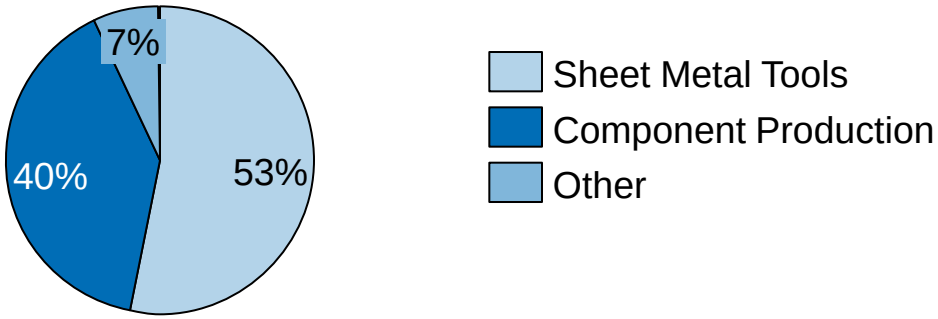
»Top-class training institutes in tool technology and design«

- **Hyderabad (Andhra Pradesh) Market**
  Now: Strong industries in aerospace, automotive, and defense
  Future: Aerospace is exepected to continue to be a key industry
- **Customer Industries**
  Aerospace, automotive, defense, explosives/ incense

- **Business Focus** [Revenue]



- **Manufacturing**



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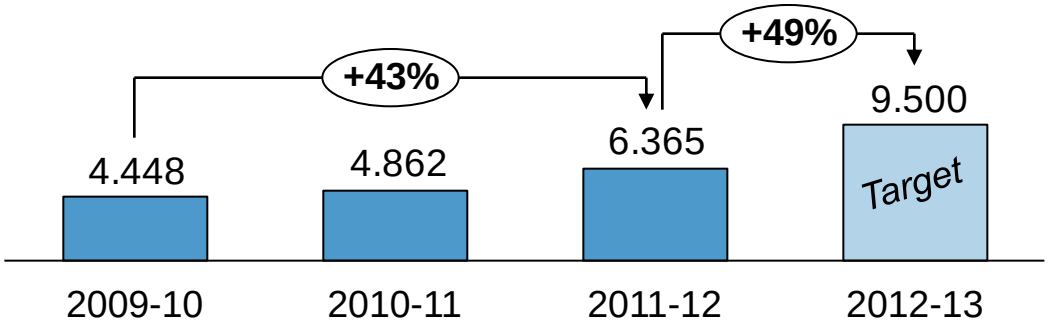

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

Most of the existing manufacturing resources are on a basic level and focus on conventional methods

Performance Estimation Technology

- Machinery
  - Machine age is high and the estimated performance is low
  - Technology selection seems good as it is resitricted on milling, turning, grinding and wire-EDM

- CAx-Systems
  - Well equipped CAx process chain with a focus on ProE
  - Every common CAD system is available enabling an efficient interaction with customers
- Manufacturing Equipment
  - Clamping systems are on a basic level
  - Manufacturing automation with NC technology, though there is automation competency within the Tool Room
  - Approaches for machine utilization enhancement are missing
  - Well equipped measurement facilities
- Innovation
  - Focus on traditional manufacturing operations i.e. basic milling, turning, grinding, wire-EDM
  - Technological know-how shows potential in the fields of manufacturing methods and organization

The first optimization step in manufacturing is a strategy for a better resource utilization and a subsequent introduction of a comprehensive technology management system

Organization shows potential in all categories – Existing employee qualification is the key for development

Performance Estimation Organization

- Order Fulfillment Process
  - Due date reliability and lead time for all jobs are substantially below satisfactory
  - The responsibilities for processes and milestones are not clearly defined
  - A post-calculation is not in place and transparency over costs not existent

- Capacity Utilization
  - Capacity utilization of the CNC machines shows extensive potential
  - Diversity in machine and product portfolio add difficulty to the proper planning of machines and their utilization

- System Application
  - Integration of supplier libraries for design not in CAD system; no specific standard parts defined
  - A planning system for the order management and machine usage is not employed or being developed

- Employees
  - Trainees are integrated into the manufacturing process
  - The average age of the employees is above the industry average; experience of employees is sufficient

- Surroundings
  - The level of cleanliness is moderate, the order of equipment shows

The demand for organisational performance has to be accepted and met to develop sustainably

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

A deep cooperation with the local university enables the Tool Room to provide master‘s degrees

Performance Estimation Training

- Course Offerings
  - Course offer contains 8 long-term and 50 short-term trainings
  - Diversity in diplomas and masters from tool related fields to electronics and robotic
  - Short-term courses mainly in computer-related fields

- Curriculum
  - Managerial and organizational topics are addressed
  - Good mix of theoretical and practical trainings especially for courses which are in cooperation with the university

- Resources
  - Well equipped with computers and latest software package for almost every standard program
  - Laboratories for automation and embedded system have accurate resources
  - Resources for manufacturing training are quiet old and not state-of-the-art

- Training Staff
  - Good mix of internal and external trainers with different educational and professional background
  - Proportion of students per trainer is increasing

The increasing proportion of students per trainer is a threat for the future training quality

The proposed investment into training and tool manufacturing are aligned with the current orientation

*Investment Feedback**

Plant & Machinery

■ Manufacturing – Horizontal machining centre, overhauling	*Focus:* *Reason:* *Cost:*	Clear orientation of technology upgradation Reasoning consistent with orientation Cost requirement is logically derived	Sound Approach
■ Training – Laboratory equipment, software licenses	*Focus:* *Reason:* *Cost:*	Focus on expansion of intake-capacity Reasoning consistent with expansion strategy Stringent justification of costs	Sound Approach

Additional Infrastructure

■ Manufacturing – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A
■ Training – Additional building, basic equipment, furniture	*Focus:* *Reason:* *Cost:*	Focus on expansion of intake-capacity Reasoning consistent with expansion strategy Stringent justification of costs	Sound Approach

* The Investment Feedback is solely based on the structural impression after WZL/ Fraunhofer IPT Tool Room visits and subject to change upon the gap analysis.
Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The training contents and facilities are on a good level but the production is not state of the art

Strengths & Potentials

Strengths

- **Measurement facilities** are on a good level and result in a good quality control
- **Simulation** of whole production processes in regard to automation
- Consideration of **managerial and organizational topics** in curricula
- Knowledge and facilities in **automation and embedded** systems are on a high level

Potentials

- Establish understanding of order fulfillment process to improve **machine utilization**
- Develop a **technology management system** which focus on technology know-how and organization
- Establish a machinery which fits the technological and economical requirements
- Invest in **modern training machines** in order to perform state-of-the-art trainings

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Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

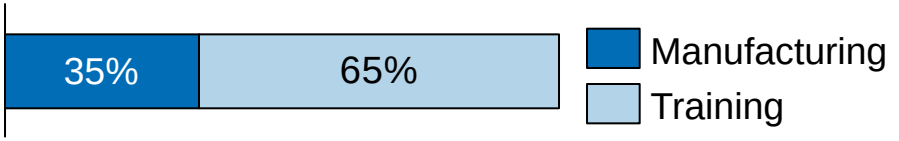
The CTTC Bhubaneswar has superior training capacities and capabilities in machining of precision components

Introduction

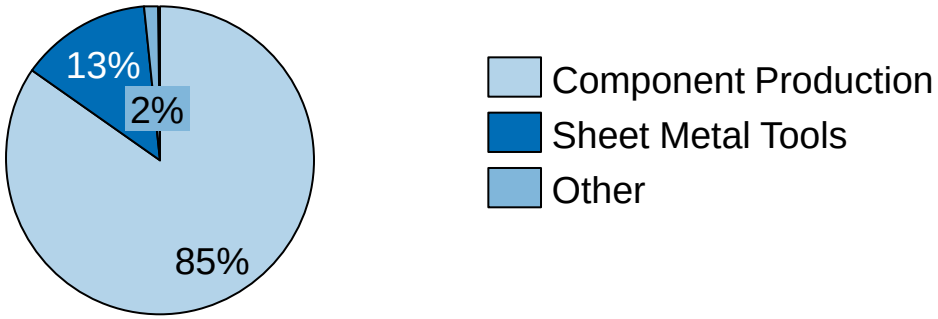
»Leader in training supplier of high-precision components to aerospace and defense«

- **Bhubaneswar (Orissa) Market**
  Now: Limited production industry and trade constraints to neighbors
  Future: Growth of market may strengthen local production industry
- **Customer Industries**
  Aerospace, automotive, defense, packaging

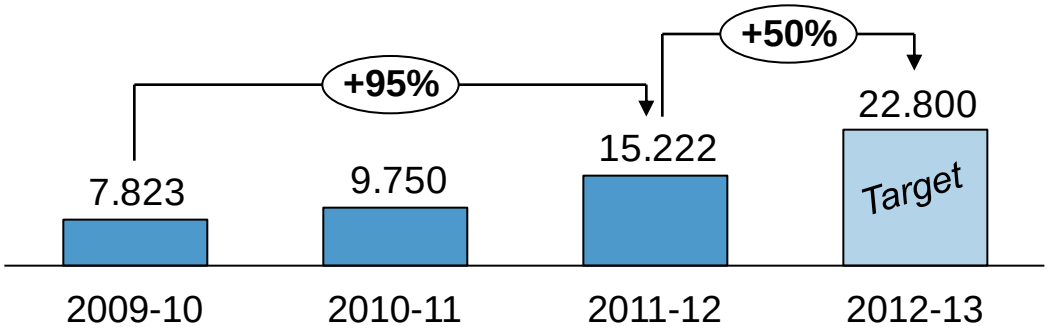
- **Business Focus** [Revenue]



- **Manufacturing**



- **Training** [Trainees Trained]



Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

Technologies resources and chains must be applicable for single batch and small batch production

Performance Estimation Technology

- Machinery
  - Degree of NC-controlled machines is above average, though there is one man, one machine strategy
  - 5-axis machine is available, but no hard machining with defined cutting edge

- CAx-Systems
  - Shopfloor-oriented programming is a suitable programming strategy
  - Manufacturing parameters available in CAM-system

- Manufacturing Equipment
  - Non-standardized milling and turning tools result in a high number of tools
  - Manufacturing parameters based on recommendations of tool and raw material suppliers
  - High degree of in-machine changeovers as there are no palletizing systems

- Innovation
  - Innovation degree on a medium level as there are efforts, but still lacking areas
  - No milling and turning after hardening lowers the overall productivity of production facilities

A non-existing technology management system results in a non-standardized manufacturing environment

Small batch and tool manufacturing demand different characteristics of the organizational structure

Performance Estimation Organization

- Order Fulfillment Process
  - Due date reliability and lead time are order fulfillment targets are on a competitive level
  - All departments along the process chain are responsible for their own quality
  - A post-calculation is being executed

- Capacity Utilization
  - Demand of management of capacity utilization is reduced by small batch focus
  - Capacity is consciously managed while focusing on order fulfillment targets
- System Application
  - A manual planning system for the order management and machine usage is being employed
- Employees
  - Trainees and apprentices are integrated into the manufacturing process
  - The average age of the employees is at the industry average paired with outstanding job experience
- Surroundings
  - Visualization is being employed for transportation of lean principles; the level of cleanliness is good

The organisation attends to small batch manufacturing and to tool making

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The very high number of students and the recent increase is a challenge for the Tool Room

Performance Estimation Training

- Course Offerings
  - International training cooperation with low developed countries but not with industrialized countries
  - Relevant number of long-term courses

- Curriculum
  - Post diploma courses give a deeper understanding of existing knowledge
  - Further organizational aspects are not considered
  - „Personal development“ for students
- Resources
  - CNC machines for training but only 8 milling and 6 turning machines are scarce for the high and increasing number of students
  - Extension of training capacities by outside rentals
  - Production is rather small in regard to the high numbers of students
  - Manufacturing simulation and offline programming
- Training Staff
  - Continuous advanced training for trainers
  - Switch between production and training

Very high number of students are trained by experienced trainers in a well equipped environment which has improved continuously

The proposed investments aim at continuing techno-logical development at increase of training capacity

*Investment Feedback**

Plant & Machinery

■ Manufacturing – High accuracy cylindrical grinder, CNC mill	*Focus:* *Reason:* *Cost:*	Clear orientation of technological development Reasoning consistent with orientation Cost requirement is logically derived	Sound Approach
■ Training – Conventional and CNC machines (various technologies)	*Focus:* *Reason:* *Cost:*	Increase of training resources Consistent with demand for intake-capacity Cost requirement is logically derived	Sound Approach

Additional Infrastructure

■ Manufacturing – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A
■ Training – N/ A	*Focus:* *Reason:* *Cost:*	N/ A N/ A N/ A	N/ A

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Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

The organizational performance is relatively high

Strengths & Potentials

Strengths

- Good **focus on aeronautical** parts results in a successful niche supplier
- **Extensive training capacities** in computer-related fields and basic machining operations
- **Order and tidiness** is comparatively on a good level
- Comparatively **well equipped machinery**

Potentials

- **Productivity improvements** by implementing palletizing systems
- **Technological enhancements** by process parameter development and change to graphite electrodes
- Enhancement **standard part proportion** and increase of usage of parametrical functions
- **Electronic order processing** results in more transparency and efficiency

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Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

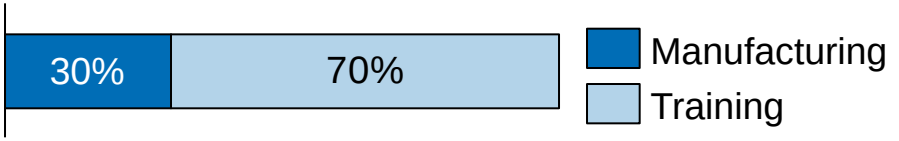
The IDTR Jamshedpur has offers extensive training and manufacturing in an automotive center

Introduction

»Manufacturing for aerospace and automotive as well as diverse training portfolio«

- **Jamshedpur (Jharkhand) Market**
  Now: Strong local industrial environment of automotive sector
  Future: Further enhancement of capacity of automotive sector
- **Customer Industries**
  Aerospace, Automotive, Steel, Telecommunication

- **Business Focus** [Revenue]



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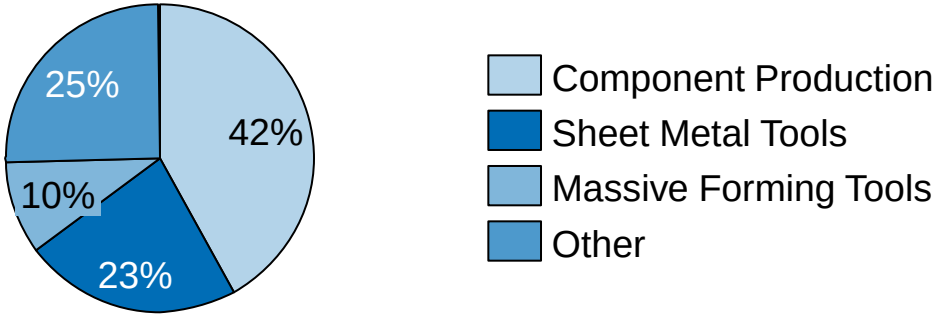

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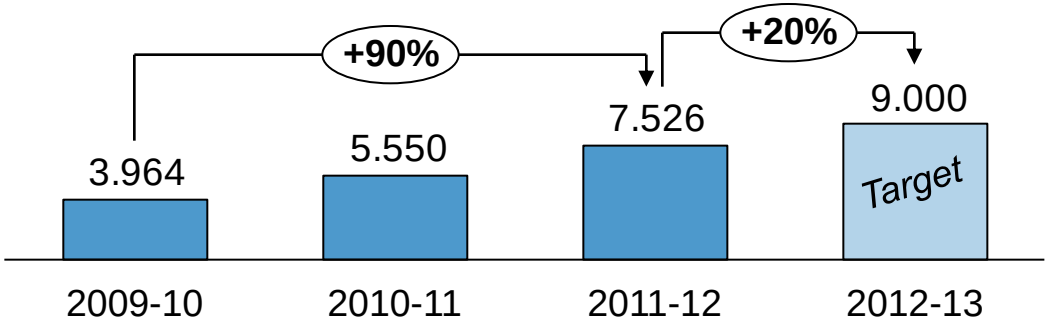

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

There is no red line for the manufacturing strategy which is shown by a high diversity in machinery and equipment

Performance Estimation Technology

- Machinery
  - Machinery with a good performance but high machine diversity in milling
  - Awareness in machine utilization is a plus
  - Well equipped measurement area with an possible accuracy of 3 µm

- CAx-Systems
  - Every necessary system is available but the usage of functionalities i.e. parametric or feature recognition is improvable

- Manufacturing Equipment
  - Standardization degree of manufacturing equipment is low for example there are 249 milling tools in total and 100 frequently used milling tools
  - Manufacturing parameters are taken from tool manufacturers and get adapted at the machine
  - Usage of copper electrodes, as there is no graphite milling machine available
  - 3R electrode holders

- Innovation
  - Technological innovation in manufacturing is low as only standard machines and equipment are used

Manufacturing strategy for tooling and part production is not state of the art

The organization aims at lower lead times for the customers in an increasingly competitive environment

Performance Estimation Organization

- Order Fulfillment Process
  - Due date reliability and lead time are order fulfillment targets are being addressed
  - The PPC department is organizing and monitoring the entire process
  - A post-calculation partially being executed

- Capacity Utilization
  - Demand of management of capacity utilization is reduced by small batch focus
  - Capacity is consciously managed with defined utilization targets for all machines

- System Application
  - Supplier libraries are used for the design in CAD; Own standard parts are not established
  - A manual planning system for the order management and machine usage is being employed

- Employees
  - Trainees and apprentices are integrated into the manufacturing process

- Surroundings
  - The level of cleanliness is good; order yields improvement in all departments

The planning of the order fulfillment process has to be support by transparent documentation for all employees involved

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

Training department offers about 75 different courses with a broad variety of training focus'

Performance Estimation Training

- Course Offerings
  - 59 different courses in design, manufacturing and computer-related fields
  - 16 long-term courses as well as 324 mid- and short-term courses
  - Special training offers for girls and under-privileged people

- Curriculum
  - Course in tool fitting is a differentiation from other curriculums and Tool Rooms
  - Screened curriculums seem accurate
  - Missing red line in courses e.g. a mobile repair course is not appropriate for a Tool Room

- Resources
  - Standard training equipment like conventional milling, turning and grinding machines as well as several CNC machines
  - Infrastructure extension in two external centers
  - Engineering colleges are not in the region which makes educational cooperations difficult

- Training Staff
  - Switch between production and training
  - Recruitment of trainers difficult, as there are many attractive, local employers

The strategic orientation of the course variety requires stringency

As a next step the milling technology is to be strengthened – Detailed long- and mid-term plans are in place

Jamshedpur

*Investment Feedback**

Plant & Machinery

- Manufacturing
  - CNC mill, Upgradation existing CNC Mill

Focus: Clear orientation of technological development
Reason: Reasoning consistent with orientation
Cost: Cost requirement is logically derived

Sound Approach

- Training
  - N/ A

Focus: N/ A
Reason: N/ A
Cost: N/ A

N/ A

Additional Infrastructure

- Manufacturing
  - N/ A

Focus: N/ A
Reason: N/ A
Cost: N/ A

N/ A

- Training
  - N/ A

Focus: N/ A
Reason: N/ A
Cost: N/ A

N/ A

* The Investment Feedback is solely based on the structural impression after WZL/ Fraunhofer IPT Tool Room visits and subject to change upon the gap analysis.
Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

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The organizational performance is rather high, but there a lot of technological potential

Strengths & Potentials

Strengths

- **Development programs** for under-privileged and girls as a good strategy to train many people
- **Order and tidiness** is on a higher level for an Indian Tool Room, but still improvable
- **Machine utilization** is detected in a realistic way
- **Order processing** is performed on a high level

Potentials

- Future **investments should consider that machine diversity** results in a more difficult environment for operators
- The potentials of **graphite die sinking** should be evaluated
- Operational machine productivity could be enhanced by development of **efficient manufacturing parameters**
- **Transparency of order processing** must be enhanced as just two employees are well informed about this topic

* The strengths & potentials listed on this slide only represent an excerpt of the entirety identified by WZL/ Fraunhofer IPT. The strengths & potentials will be addressed in detail during the upcoming gap definition between India and Germany as well as in the subsequent gap analysis.

Source: WZL/ Fraunhofer IPT MSME Tool Room Analysis

Agenda

Wrap-Up: 06 September 2012, Delhi

1	**Introduction**	Mr. Sinha, IAS	11:00 – 11:15
2	**Wrap-Up Presentation (I/II)**	WZL/ Fraunhofer IPT	11:15 – 12:00
2.1	Status of Project		
2.2	Review of Tool Room Visits		
2.3	Performance Estimation & Investment Feedback (I/II)		
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3.1	Performance Estimation & Investment Feedback (II/II)		
3.2	Summary & Further Steps		
4	**Final Discussion**	all	13:00 – 14:00

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Wrap-Up Summary

The overall target was achieved by completion of the results

Overall Target

- Review of visits to seven MSME Tool Rooms with regard to boundary conditions, technology, organization, and training

Results

- Summary of the acquisition of data and information in all seven visited MSME Tool Rooms ☑
- Estimation on technological, organizational, and training performance of all seven visited MSME Tool Rooms ☑
- Feedback on existing investment plans of all seven visited MSME Tool Rooms ☑

Source: Kick-Off Meeting – Delhi, 20 August 2012

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Project Objectives and Project Results

Short-, medium- and long-term objectives and results of the project

	Short-term	Medium-term	Long-term

Objectives	**Data acquisition of each Tool Room:**
	■ Boundary Conditions
	■ Technology
	■ Organization
	■ Training
		Gap analysis for each Tool Room:
		■ Displaying the gaps concerning
		  ■ Technology
		  ■ Organization
		  ■ Training
		according to boundary conditions
			■ Set-up a framework for long-term cooperation in order to strengthen MSME Tool Rooms in terms of technological, organizational and educational topics
			■ Definition of the cooperation forms and detailed 3 years working plan

Results	■ Summary of data acquisition for each Tool Room ■ Estimation on technological, organizational and educational performance ■ Feedback on MSME investment plan	■ Detailed technology road map with investment advice ■ Detailed organizational advice ■ Competency / Training advice ■ Road map for innovation cluster project and further cooperation	■ Detailed framework for a long-term strategic partnership ■ Procedure for gap closing ■ Execution of joint „gap closing“ projects

20 Aug.: Kick-Off — **06 Sept.: Wrap-Up** — **01/ 02 Nov.: Milestone**

Timeline

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Gap-Analysis

Originally a tool and die focus was assumed for all Tool Rooms

Original Analysis Approach

Target State Germany

Focus Tool and Die Making

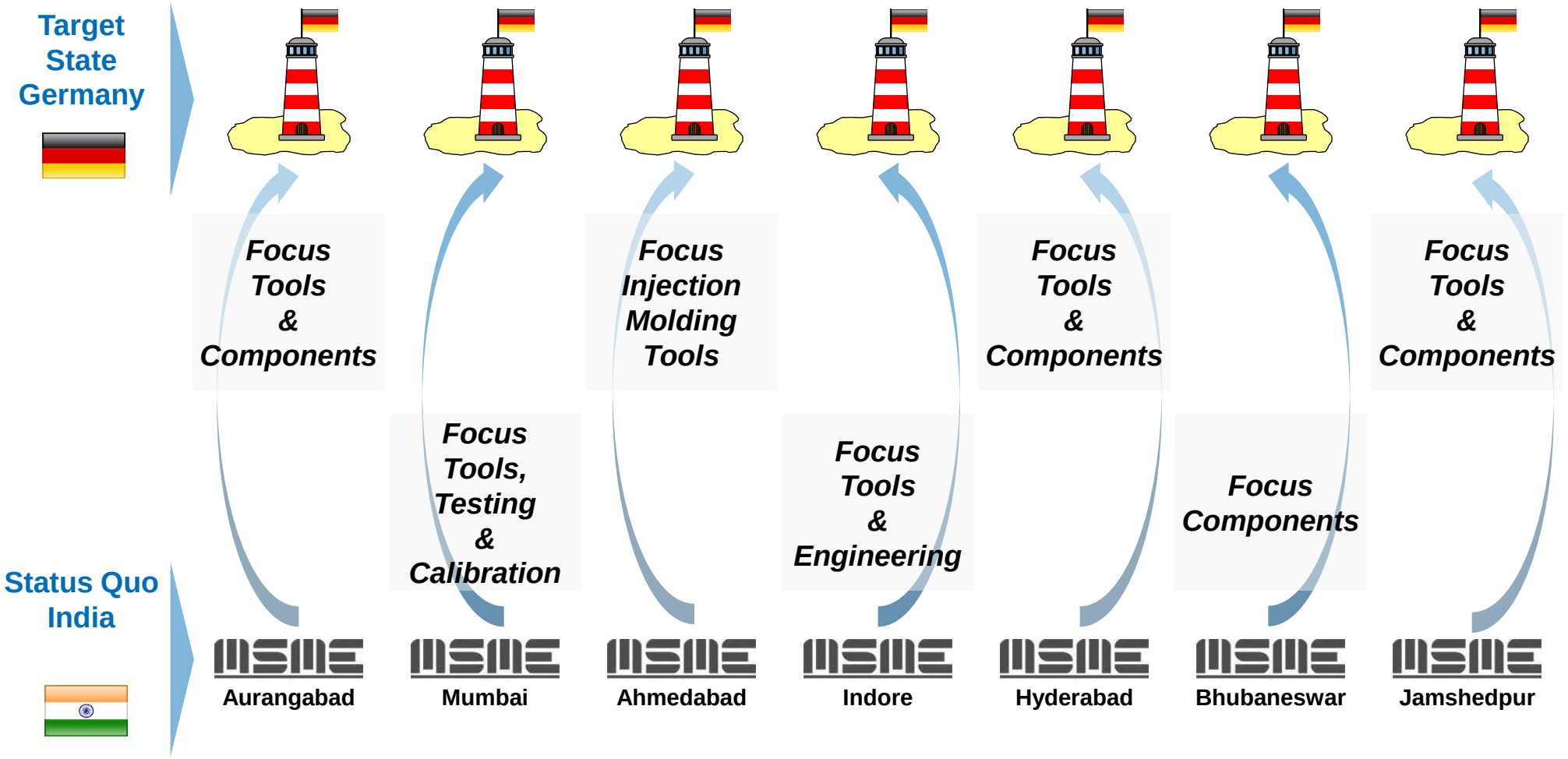
Status Quo India

Aurangabad | Mumbai | Ahmedabad | Indore | Hyderabad | Bhubaneswar | Jamshedpur

Gap-Analysis

The first analysis has to account for every Tool Room seperately

Analysis Approach after Tool Room Visits



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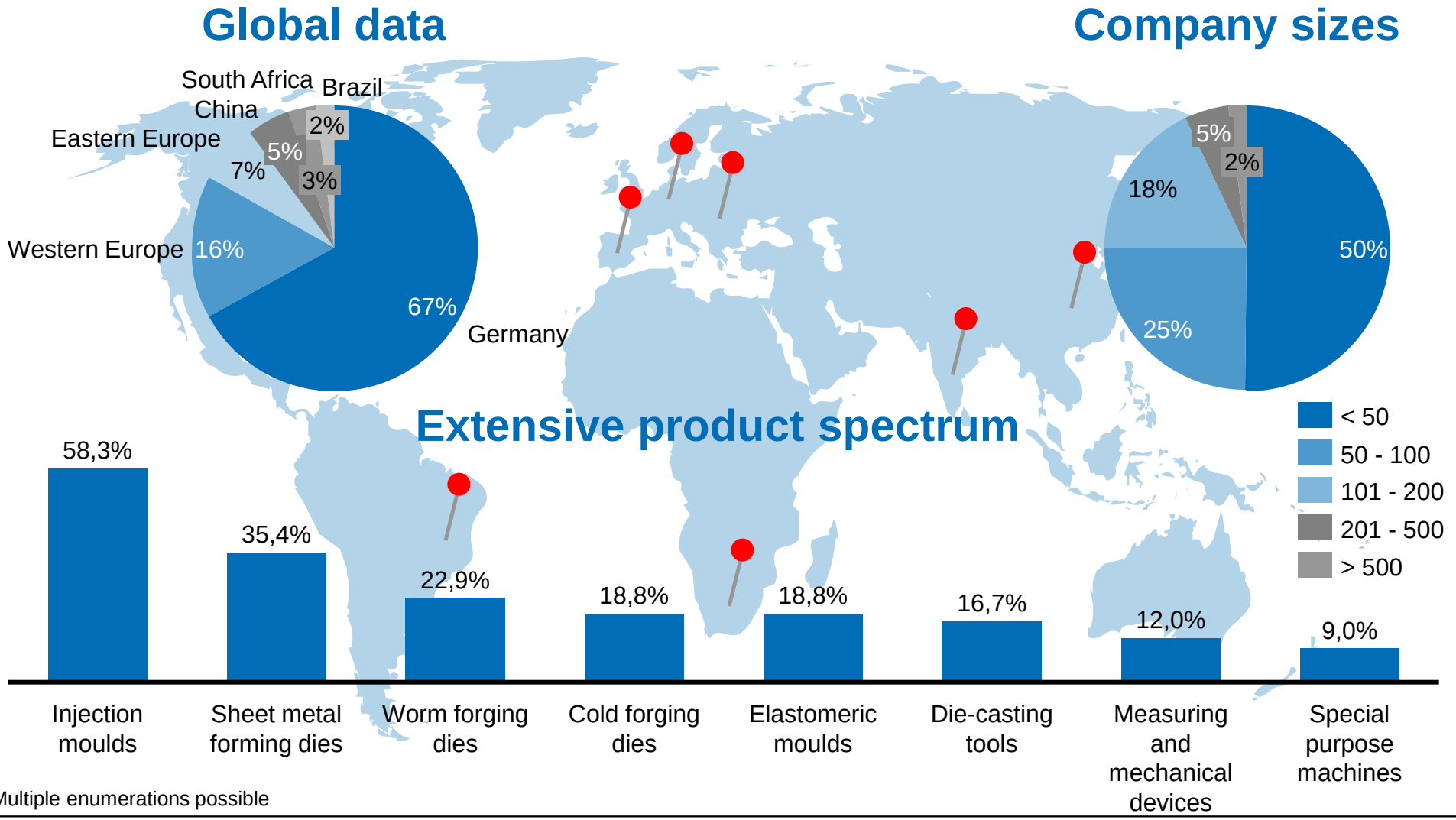
Considering a extensive product spectrum by using data sets from tool and die companies from all over the world



* Multiple enumerations possible

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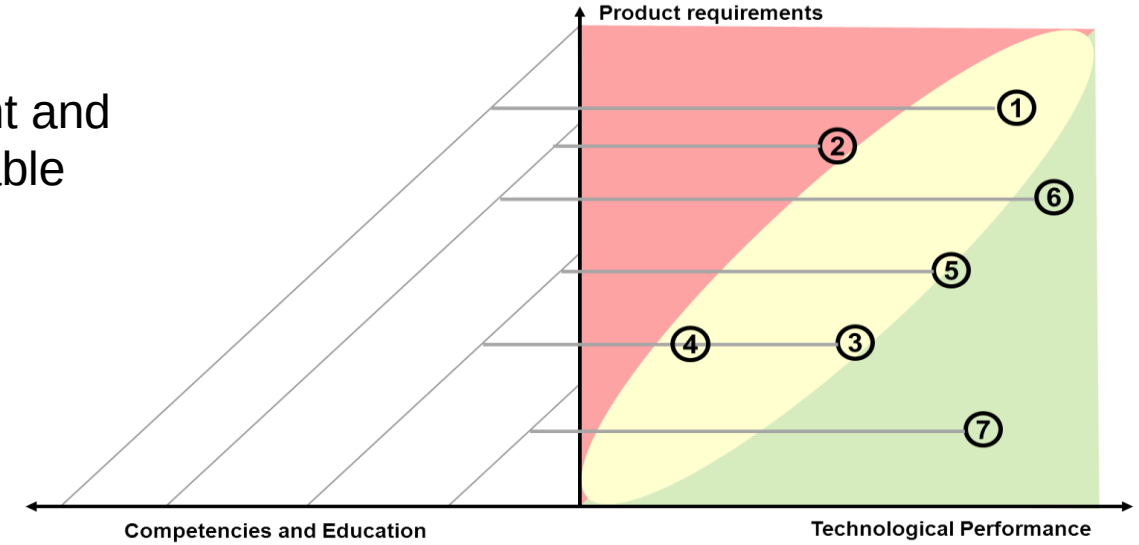
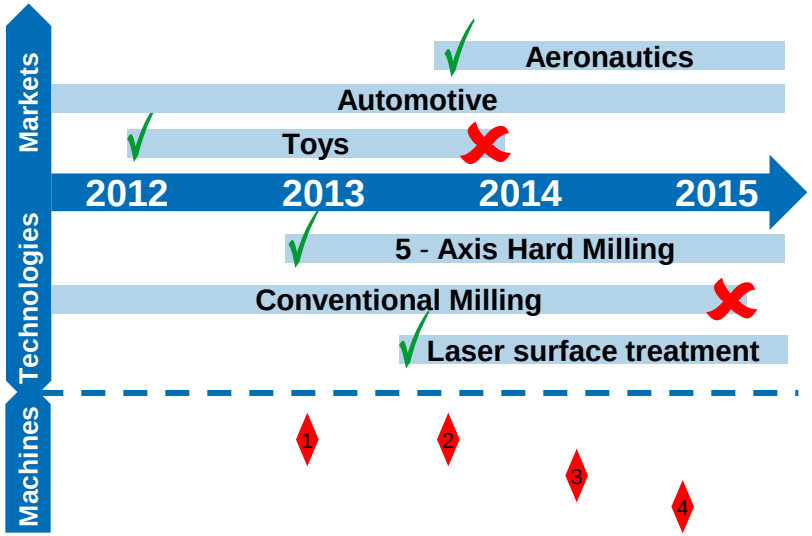
Technology & Investment Advice: A technology roadmap details future markets and required technological advancements

Gap Analysis

- Identification of gaps between current and prospective business fields and suitable technology
- Derivation of investment and future development advice





Investment and development advice

- ➔ Machine and equipment advice
- ➔ Process improvements
- ➔ Technological innovation

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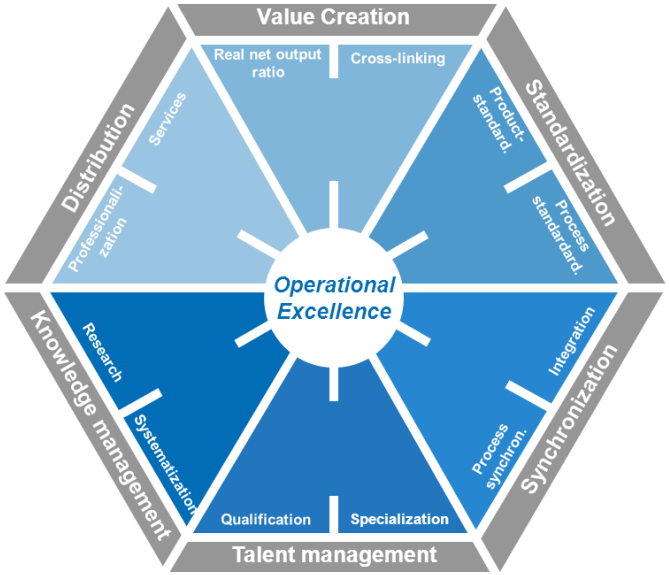
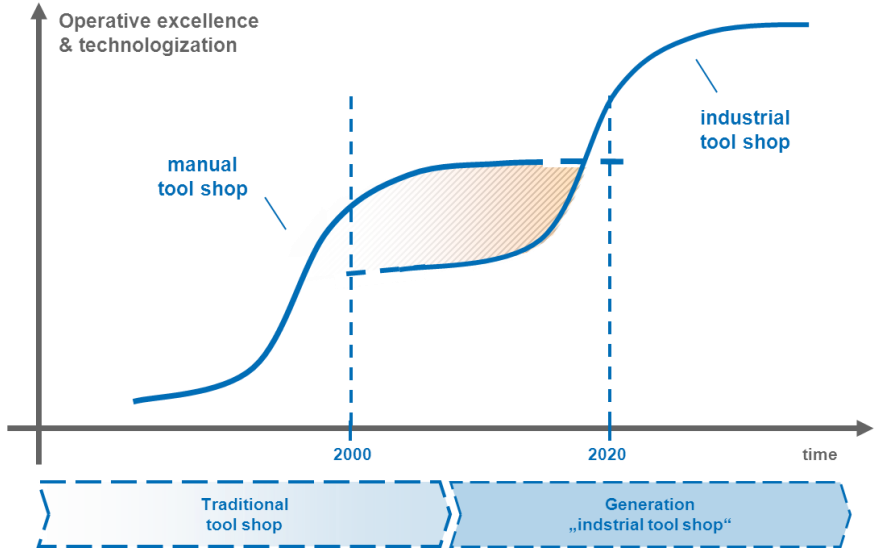
Organization Advice: Elaboration of lacking organizational standards and advices for moving forward in this field

- Evaluation of the six Operational Excellence dimensions for every Tool Room
- Derivation of the relevant gaps between high performance tool shops and the seven assessed Tool Rooms





➔ Organizational roadmap in order to strengthen the process performance of the Tool Room as this is a biggest gap of all inspected pillars

➔ Implementation advice for each Tool Room as guideline for sustainable organizational improvements

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Training Advice: Analysis of gaps in the field of training and expansion advice for future training orientation

Craftsmanship	Machine	Programming	Production Management	Tool-Making	Organization
■ Basic knowledge and ability for: – Materials – Manufacturing methods – Tools	■ Ability for an efficient use of – NC-machines – Conventionally machines ■ Clamping ■ Fault analysis ■ Tool knowledge	■ Efficient use of CAM - Software ■ Macro using and development ■ Usage of different milling, turning and grinding strategies	■ Working plans ■ Lean methods ■ Product and process standardization	■ Die spotting ■ Ability for an efficient assembly ■ Customer requirements	■ Ability to develop the production system ■ Knowledge about modern production methods ■ Standardization knowledge

Analysis of existing knowledge within the staff with a standardized questionnaire

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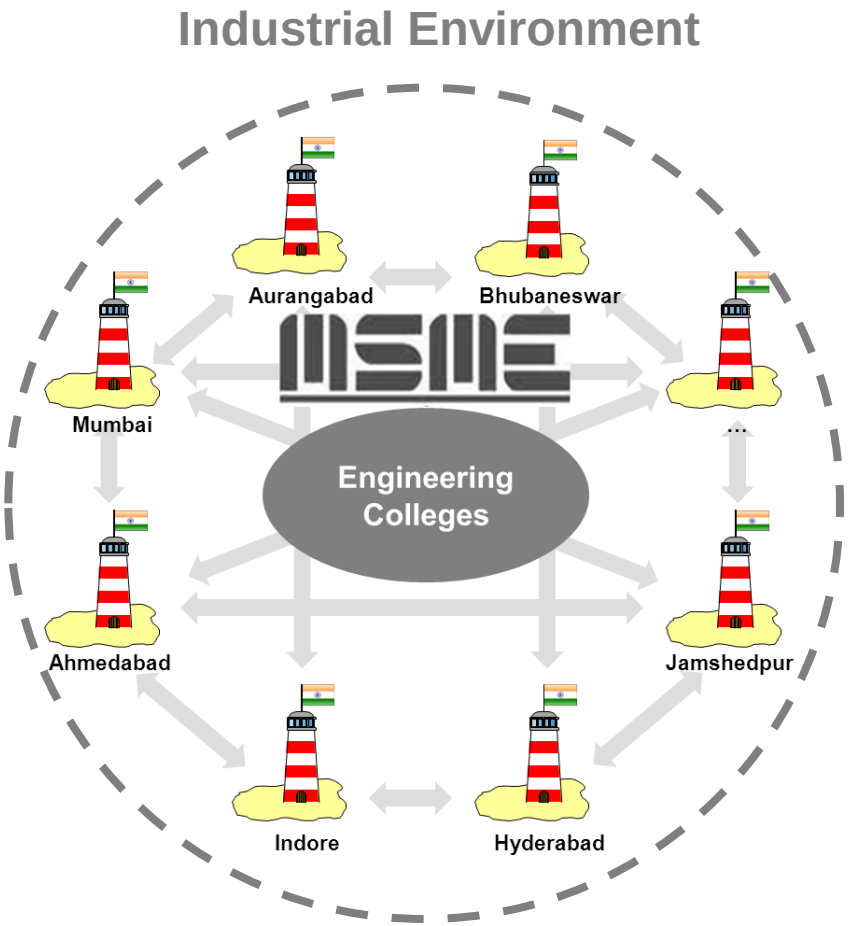
Innovation Cluster: An innovation cluster encompasses thoroughly derived individual strategies for every Tool Room & the MSME network

- Innovation cluster consists of the existing Tool Rooms
- Each Tool Room is an institute of excellence in specific business fields
- The MSME network serves as platform for knowledge transfer
- Exploitation of potential of the MSME network organization



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WZL RWTH AACHEN

Further Cooperation: The Werkzeugbau Akademie offers Research, Consulting and Further Education

WBA

Aachener Werkzeugbau Akademie

Research

- Research on basic competences and the future of tool manufacutring
- Systematic and coordinated projects based on a research roadmap

Consulting

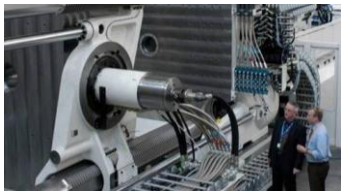
- Bilateral projects with technological and organizational topics
- Mutual development concepts and project implementation

Further Education

- Modular further education for non-graduates and graduates
- Renowned lecturers of industry and science

Tool Manufacturing Demonstration – mapping of the entire process chain






WZL RWTH AACHEN · Fraunhofer IPT · Institut für Kunststoffverarbeitung an der RWTH Aachen · ISF Welding and Joining Institute RWTH Aachen University · Fraunhofer ILT · ibf Institut für Bildsame Formgebung · Institut für Technologiemanagement · ikt · Aachen Entrepreneurship Team · RWTH · IMA · ZLW · IfU · fir an der RWTH Aachen · Lehrstuhl und Institut für Arbeitswissenschaft der RWTH Aachen · IAW · Universität St.Gallen · IOT Institut Oberflächentechnik

Fraunhofer IPT

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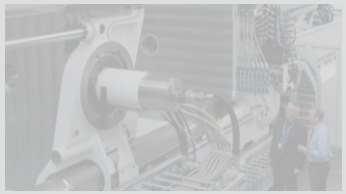
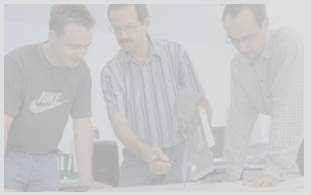
Tool Manufacturing Demonstration – Research – mapping of the entire process chain





Further Cooperation: Sustainable performance enhancement by establishing a “Reference” - Tool Room

Consulting

- Bilateral projects with technological and organizational topics
- Mutual development concepts and project implementation

Further Education

- Modular further education for non-graduates and graduates
- Renowned lecturers of industry and science

Gap Analysis

Gap Analysis

„Reference“ -Tool Room

- Establish a state-of-the-art Tool Room in terms of organizational and technological performance
- The project will take several month and will be performed by WBA experts with close cooperation with the Development Commissioner, the Tool Room manager and the employees

Perform Training

- WBA offers training for Tool Room employees within the identified gaps i.e. organizational topics
- Long-term objective to achieve an understanding of the trained topics in order that those topics can be integrated in the training calender

Fraunhofer IPT

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Project Objectives and Project Results

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20 Aug.: Kick-Off — **06 Sept.: Wrap-Up** — **01/ 02 Nov.: Milestone**

Timeline

Fraunhofer IPT

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Agenda

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Fraunhofer IPT

WZL RWTH AACHEN

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Proposal for the project

Structuring of the MSME Innovation Cluster Tooling

The WBA Aachener Werkzeugbau Akademie GmbH (WBA) proposes the project “Structuring of the MSME Innovation Cluster Tooling“.

1 Context and Initial Situation

The development of micro, small, and medium scale industrial units has been an important feature of the Government of India’s (GOI) Industrial Policy. In addition to fiscal incentives, industrial development programmes of the GOI have been directed towards the development of infrastructure conducive for the growth of the manufacturing industry.

Manufacturing excellence begins with tools and dies; thus the tool and die industry is the backbone of the manufacturing industry. The Ministry of micro, small, and medium enterprises (MSME) of the Government of India has set up tool rooms (governmental MSME tool rooms). These tool rooms were established with technical cooperation both under bilateral and multilateral programmes.

These governmental MSME tool rooms provide production facilities of tools, tool parts of other precision components, product design & tool design by use of latest CAD software packages, precision machining and heat treatment, rapid prototyping, training, long-term courses and short term courses in related subjects, and consultancy to improve productivity.

At RWTH Aachen, the WBA Aachener Werkzeugbau Akademie GmbH and its research partners, the Fraunhofer Institute for Production Technologies IPT and the Chair of Production Engineering at the Werkzeugmaschinenlabor WZL of RWTH Aachen University (WZL), have developed an extensive knowledge concerning the tool and die industry over the last twenty years.

The WZL focuses on the organisational aspects of the tool and die industry, the Fraunhofer IPT focuses on the technological aspects of the tool and die industry.

On the basis of the described background in the summer of 2012 the WBA and GIZ have engaged into a partnership with the MSME of the Government of India. Focus of the cooperation was the assessment of the status quo of the capability of seven Tool Rooms ran by the MSME and the initiation a long-term strategic partnership between the Indian and German tool and die making sector. The results of this initial cooperation are focused initiatives for the future development of the seven Tool Rooms. These initiatives are structured into four projects:

- Project A “Technology” – Initiatives addressing the upgradation of the manufacturing capability with regard to technology for all seven Tool Rooms separately
- Project B “Organisation” – Initiatives addressing the upgradation of the manufacturing capability with regard to organisation for all seven Tool Rooms separately

- Project C “Training” – Initiatives addressing the upgradation of the training capability for all seven Tool Rooms separately
- Project D “MSME Innovation Cluster Tooling” – Structuring of the MSME Innovation Cluster Tooling to enhance the cooperation of all MSME Tool Rooms and their competitiveness in all areas of manufacturing and training

This quotation addresses Project D “MSME Innovation Cluster Tooling”. The WBA proposes to structure the MSME Innovation Cluster Tooling to enhance the cooperation of all MSME Tool Rooms and their competitiveness in all areas of manufacturing and training.

2 Subject and Target of the Project

In the following subject and target of the project are described.

Target of the project is to structure the MSME Innovation Cluster Tooling with regard to content and organisation. The MSME Innovation Cluster Tooling should thereby explicitly define the cooperation between the MSME Tool Rooms, industrial partners, academia, and external advisors. The MSME Innovation Cluster should strengthen the MSME Tool Rooms with regard to manufacturing and training capabilities. As a manufacturing facility MSME Tool Rooms should be a reference model for the MSME industry with regard to organisation and technology on an internationally competitive level. Furthermore, as training institution excellent education should be offered to students.

Subject of the project is the MSME Innovation Cluster Tooling as platform for a network focused on future development of tooling for the Indian industry sector. As result of the previous project a concept for the MSME Innovation Cluster Tooling was proposed by WBA. The MSME Innovation Cluster Tooling established the continuous interaction between MSME Tool Rooms in the fields of manufacturing organisation, manufacturing technology, and training. Along these three dimensions competence fields define important abilities that have to be possessed by the MSME Tool Rooms to comprehensively cover all aspects of tool and die making as well as training in their on-going business activities. The occupation of competence fields enables the MSME Tool Rooms to successfully attend to their business activities with regard to manufacturing and training.

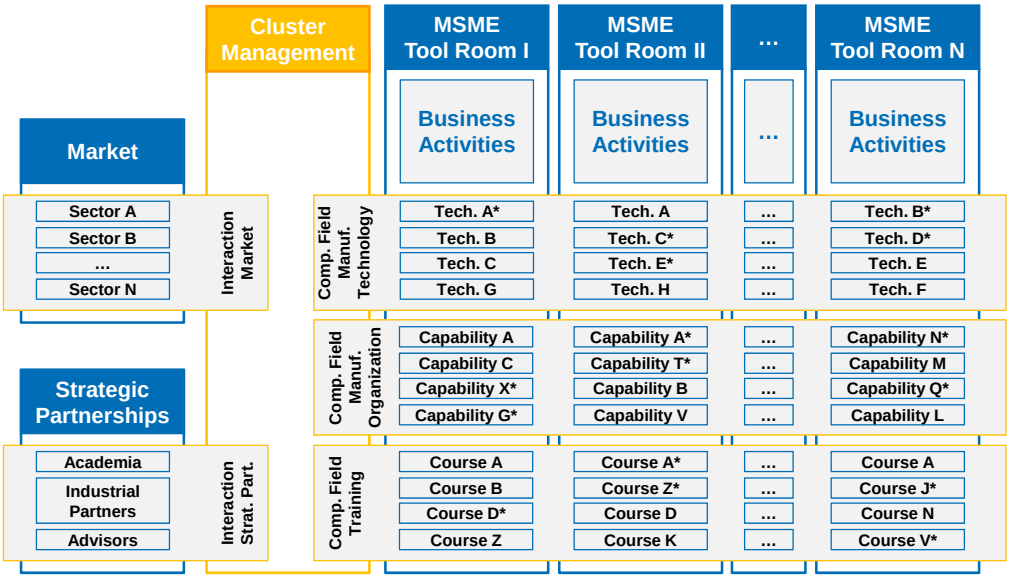

Figure 1: Concept for the MSME Innovation Cluster Tooling

However certain Tool Rooms are responsible for the development of specific competence fields that are shared among the entire MSME network. This enables the exploitation of synergies and accelerated capability increase for all Tool Rooms. The Cluster is in continuous contact with its market and engages in strategic partnership from external partners like industry, academia, and advisors. The interaction among the Tool Rooms and to the market and strategic partners is established and organised by a cluster management. The concept of the Cluster is visualised in figure 1.

Different technologies are the relevant competence fields with regard to manufacturing technologies. Competence fields of manufacturing organisation are capabilities with regard to organisation, processes and business structure. Excellent training requires competence fields with regarding the organisation and content of all courses.

In order to comprehensively address the subject and reach the described target four major steps have to be undertaken. In a first step the competence fields along the three dimensions manufacturing technology, manufacturing organisation, and training of the Cluster have to be defined and detailed. In continuation the incorporation and interaction of the MSME Tool Rooms with the market and strategic partner have to structured and detailed. In the third step the role of the cluster management and rules of interaction within the entire Cluster have to be defined, detailed, and formalised. Lastly a road-map for the implementation of MSME Innovation cluster has to be developed.

3 Execution

The whole project is divided into four work packages. The project will be managed by a chief engineer and executed by senior research fellows. The execution of the project is done in cooperation with the Fraunhofer IPT, focusing on the technological aspects of the tool and die sector and the WZL, focusing on the organisational aspects of the tool and die sector.

The locations for the execution of the project are Germany as well as India. While developments can be performed in Germany, several visits to India will be required to refine and validate developments.

The entire project incorporates the knowledge accumulated at WBA, IPT, and WZL over years of industry and research projects with tool rooms as well as cluster development .

In the following the four work packages are explained in detail.

Work Package I: Development of Competence Fields for the MSME Innovation Cluster Tooling

(Resources:

4	**(4 India/ 0 Germany)**	**Man Days – Chief Engineer**
18	**(10/ 8)**	**Man Days– Senior Research Fellow**
3	**(0/ 3)**	**Man Days – Research Assistant**
4		**Return Flights to India)**

Target

Target of this work package is the definition of the entirety of competence fields for the MSME Innovation Cluster Tooling.

I.1 Definition of Competence Fields

The competence fields address of the MSME Innovation Cluster Tooling address the three dimensions manufacturing organisation, manufacturing technology, and training. Competence fields are abilities that are required for excellent performance in these three dimensions. With regard to manufacturing technology competence fields are technological abilities. All required process abilities in manufacturing are covered by the competence fields in manufacturing organization. Different course are competence fields in the dimension of training. In an initial step the entirety of competence fields are derived and defined. The derivation is conducted based on scientific and industry research on the tool and die making industry, small batch production as well as training and education of students and industry professionals with regard to training content, resources, and methodology. All competence fields are detailed with regard to their specific target and requirements.

II.2 Detailing of Competence Fields

The competence fields, as structure with regard to content for the MSME Innovation Cluster Tooling, are detailed with experts from the MSME Tool Rooms. The detailing procedures will take the boundary conditions of the environment of the MSME Tool Rooms in India specifically into account. The results Tool Room analysis that has been conducted in the previous project will be included in the refinement process. Upon finalisation of the detailing process the MSME Tool Rooms will be evaluated with regard to their specific capability in the entirety of the defined competence field. For the seven Tool Rooms already analysed this will be derived directly from the results of the previous project. However the evaluation process is to be conducted for all existing ten MSME Tool Rooms. Those Tool Rooms that have not been analysed by the prior need to be assessed with experts from the MSME Tool Rooms in India.

I.3 Assignment of Lead Roles to Competence Fields

In the final step of this work package lead roles for all competence will be assigned to the

Tool Rooms. For all competence fields one respective lead role is possessed by a Tool Room. That Tool Room is responsible for the development of that competence field as well as the integration of other Tool Rooms into the process. New developments are disseminated among the entire MSME network to upgrade the capability of all Tool Rooms with regard to that competence field. The assignment of lead roles will be based on the evaluation process that has been executed in the prior step. Lead roles are only assigned in those competence fields where a specific MSME Tool Room fulfils the requirements of a certain competence fields and possess a high level of expertise reach the target state of a competence field. If suchlike capability cannot be identified in any MSME Tool Rooms those lead roles are not being assigned at this stage.

Result
As a result of this work package the structure of the MSME Innovation Cluster Tooling is defined with regard to content. Furthermore the status quo of the capability of the Tool Rooms in all competence fields is evaluated. Finally roles for the development of competence fields are assigned to certain Tool Rooms based on their specific capability.

Deliverables:
- Detailed competence fields for the three Cluster dimensions of manufacturing technology, manufacturing organisation, and training
- Lead roles to competence fields that have the potential to be efficiently addressed and by MSME Tool Rooms

Work Package II: Definition of Strategic Partners and Market Interaction of the MSME Innovation Cluster Tooling

(Resources:

4	**(2/ 2)**	**Man Days – Chief Engineer**
30	**(25/ 5)**	**Man Days– Senior Research Fellow**
6	**(0/ 6)**	**Man Days – Research Assistant**
6		**Return Flights to India)**

Target
In order to be able to meet the market demands and at the same time develop all competence fields further it has to continuously interact with its market and partners. Target of this Work Packages is the definition of the specific market and the strategic partners of the Cluster. Additionally adequate participants from either group have to be identified for the continuous interaction with the Cluster.

II. 1 Analysis of the Market
In a first step the market of the MSME Tool Rooms has to be identified precisely. The market has to be clustered into the groups of customers and other organisation offering similar products as the MSME Tool Room. The capability and expectation towards MSME Tool Rooms of these groups have to be defined and detailed. It is therefore necessary to assess the industrial capability of the identified market of the MSME Tool Rooms on the Indian market. This assessment has to be conducted in several companies to represent an accurate picture of the customers from series production and other organisation of tool and die making companies in India. Especially important in this regard is the analysis of other tool and die making

companies as they are not only competition to MSME Tool Rooms but rather should support them with training and manufacturing know-how. Visits to approximately fifteen companies from the tool and die industry and the manufacturing industry as customers will be required to assess the actual capability and level of expectation. The assessment will follow a comparable procedure as the analysis in the first project that was executed. Therewith it will also be possible to compare the capability of MSME Tool Rooms with the capability of the tool and die making market in India.

II.2 Derivation and Identification of Required Strategic Partners

The content structure of the Cluster developed in Work Package I and the analysis of the market as first step of this Work Package give an accurate picture of the Tool Rooms and their market environment. In the next step parties have to be identified to engage in strategic partnerships with the MSME Innovation Cluster Tooling. Continuous contact with the with the customer and the Indian tool and die making industry are essential for validating the market relevance of the business activities of the Tool Rooms. Furthermore the academia in India can be a partner for the future development of the training competence fields of the MSME Innovation Cluster Tooling. As a third group for strategic partners advisors have to be considered to enter long-term relationships of the MSME Innovation Cluster Tooling. Those can be national or international parties like the Werkzeugmaschinenlabor WZL and the Fraunhofer IPT who can interact with the Cluster on industry trends and international developments with regard to the competence fields. Based on the identified competence fields and target of the MSME Innovation Cluster Tooling relevant groups of strategic partners have to be detailed with regard to the categories industry, academia, and advisors. For all those competence fields that are not yet covered by a lead role of the MSME Tool Rooms partners have to be identified to be able to also address these competence fields in the Cluster.

Result

As result of this Work Package the environment of the MSME Innovation Cluster Tooling has been analysed. Based on that analysis relevant parties for future strategic partnerships have been identified. Therewith the entirety of required parties to participate in the MSME Innovation Cluster Tooling is identified.

Deliverables:

- Detailed market study to assess the market environment of the MSME Innovation Cluster Tooling
- Definition of strategic partners with regard to industry, academia, and advisors to engage into long-term relationships to support the development of the MSME Innovation Cluster Tooling

Work Package III: Knowledge Management Interaction and Cluster Management

(Resources:

2	**(2/ 0)**	**Man Days – Chief Engineer**
25	**(5/ 20)**	**Man Days– Senior Research Fellow**
8	**(0/ 8)**	**Man Days – Research Assistant**
4		**Return Flights to India)**

Target

After the structuring with regard to content and the definition of all relevant parties for the Cluster their interaction has to be specified. Target of Work Package III is definition of the interaction between all parties and the development of the role of the Cluster Management as organising function of the Cluster.

III.1 Development of Partnership Models

The relevant parties that have been selected can contribute to the efficient development of the Cluster. However to engage into long-term partnerships an added value has to be offered to the partners as well. Therefore attractive partnerships concepts have to be derived to enable the successful collaboration with the MSME Innovation. For all identified parties in Work Package II partnership models will be developed for the respective strategic partners. This explicitly also encompasses the partnership model that defines the relation between the different MSME Tool Rooms. A partnership model defines the basis of the future relation between Cluster and the respective partner or the relation between MSME Tool Rooms. This is inclusive of the regulations of how and through which platforms knowledge is to be shared. The models will be developed based on existing partnership concepts from efficient Clusters in the environment of the WBA. In a second step these concepts are detailed for the defined parties taking all boundary conditions in India into account. Substantial part of this step is the direct interaction with potential future partners to tailor the partnership models accordingly.

III.2 Definition of Operative Interaction within the Cluster

Based on the partnership models that have been developed the operative interaction and knowledge management for the continuous business has to be defined. It has to be structured how the MSME Tool Rooms address their on-going business activities and attend to their responsibilities in the Cluster. Additionally the incorporation of all parties of strategic partners needs to be formalised. The formalised mechanisms for the operative interaction within the Cluster has to address the aspects of competence field specific collaboration, knowledge management within the entire cluster and platforms for regular interaction for all parties of the cluster.

III.3 Derivation of the Cluster Management Function

As part of the operative interaction that has been defined in the prior steps several demands with regard to the organisation of the cluster arise. The MSME Innovation Cluster Tooling will require a separate function Cluster Management that is responsible for the organisational and administrative tasks that have to be attended to. This is an integral prerequisite to continuously operate the cluster according to the structure that has been developed to this point. This function will be derived in detail and developed with regard to the entirety of its future activities and the man power that is going to be required. Cluster Management is the only function in the Cluster that is set-up explicitly for the Cluster. Therefore it is defined which personnel and training is required to qualify the Cluster Management appropriately.

Result

As result of this Work Package all interaction mechanisms of the MSME Innovation Cluster Tooling have been specified. The interaction mechanisms are integral to Cluster's success as it describes the framework and operative execution of collaboration and exploitation of the full potential of synergies offered by the MSME Tool Rooms and strategic partners.

Deliverables:

- Specific partnership models that define the relation between all parties in the MSME Innovation Cluster Tooling
- Detailed operative interaction mechanisms with regard to competence field specified collaboration, knowledge management and further interaction platforms
- Defined tasks and costs for the development and execution of the Cluster Management function as organising party of the MSME Innovation Cluster Tooling

Work Package IV: Development of the Road-Map for the Implementation of the MSME Innovation Cluster Tooling

(Resources:

4	**(2/ 2)**	**Man Days – Chief Engineer**
14	**(4/ 10)**	**Man Days– Senior Research Fellow**
2	**(0/ 2)**	**Man Days – Research Assistant**
4		**Return Flights to India)**

Target

In the first three work packages the structure of the MSME Innovation Cluster Tooling has been developed. Target of Work Package IV is the development of the road-map that has to be followed after this project to launch the MSME Innovation Cluster Tooling

IV.1 Definition of the Road-Map

In the first step the Road-Map is structured. The starting point with regard to date is the finalisation of this project. The road-map defines the path up to the launch of the MSME Innovation Cluster Tooling. In the second step the Road-Map is detailed into separate phases that should be addressed in sequential order. These phases are described by an initial situation and a bill of requirements that has to be addressed to proceed to the next phase. All phases and thereby the entire Road-Map is finally structured with regard to time.

IV.2 Detailing of Phases of the Road-Map

All phases are lastly detailed with regard to measures, costs, and required resources. The measures will be defined to directly address the bill of requirements of a specific phase. Costs are thoroughly calculated to estimate the financial effort which will be demanded to launch the MSME Innovation Cluster Tooling. The resources will be detailed into man power, machinery, and IT-systems.

Result

As result all measures are described that need to be addressed to launch the MSME Innovation Cluster Tooling. Thereby the entirety of steps is detailed within this project until the actual operation of the Cluster.

Deliverables:

- Detailed road-map defining all phases to enable the successful launch of the MSME Innovation Cluster Tooling

4 Cooperation Schedule

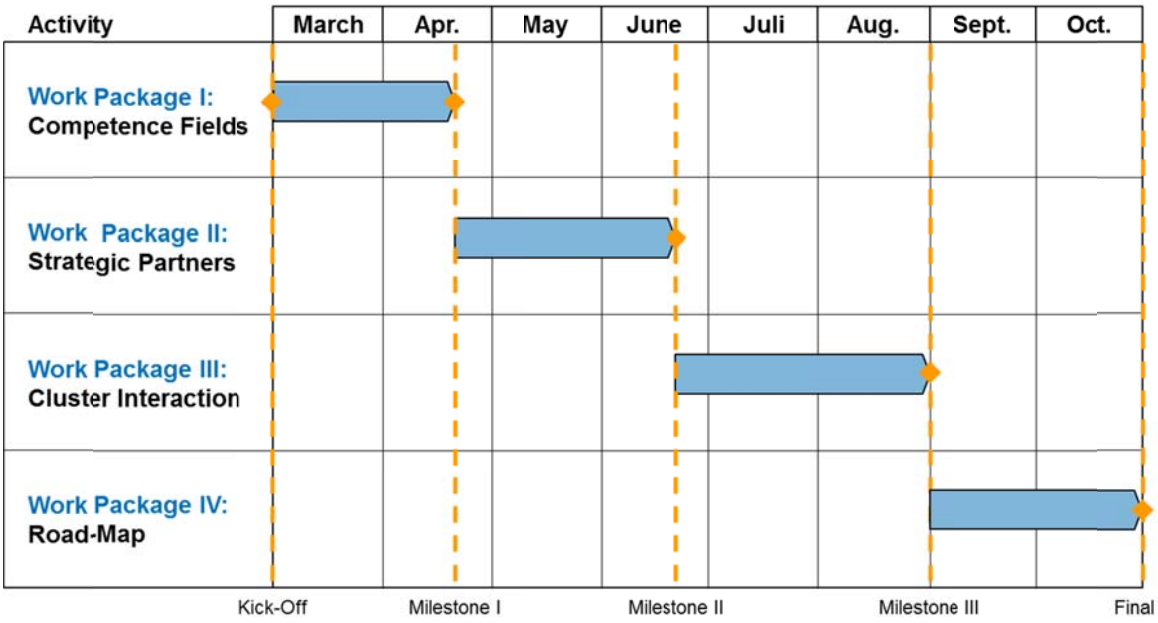

Figure 1: Cooperation Schedule

5 Cooperation with WBA

Within WBA a project team is established to realise the project. The project will be managed by a chief engineer and executed by research associates. For this the WBA may involve the chair for Production Engineering at the Werkzeugmaschinenlabor WZL of the RWTH Aachen University and the Fraunhofer IPT by a research and development contract. Those partners then act under its own name for the WBA. Contract partner is the WBA.

6 Project Effort

For the execution of the project described above the personnel efforts add up to 120 Person Days as followed:

Work Package	Personal Days Chief Engineer	Personal Days Research Team	Personal Days Research Assistant
I	4	18	3
II	4	30	6
III	2	25	8
IV	4	14	2
Sum	14	87	19

Figure 2: Personal Costs

For the execution of the project described above the travelling costs add up to:

EURO 32’900 €

as followed:

Work Package	Number of Return Flights (1‘500 €, Eco. Class)	Number of Nights in India (100 € per day)	Travelling Costs
I	4	16	7‘600 €
II	6	26	11‘600 €
III	4	9	6‘900 €
IV	4	8	6‘800 €
	27‘000 €	5‘900 €	32‘900 €

Figure 3: Travelling Costs

Proposal for the project package B

Organisation - Upgradation of the Manufacturing Capability with Regard to Organisation for Seven MSME Tool Rooms

The WBA Aachener Werkzeugbau Akademie GmbH (WBA) proposes the project package "Organisation – Upgradation of the Manufacturing Capability with Regard to Organisation for Seven MSME Tool Rooms".

1 Context and Initial Situation

The development of micro, small, and medium scale industrial units has been an important feature of the Government of India's (GOI) Industrial Policy. In addition to fiscal incentives, industrial development programmes of the GOI have been directed towards the development of infrastructure conducive for the growth of the manufacturing industry.

Manufacturing excellence begins with tools and dies; thus the tool and die industry is the backbone of the manufacturing industry. The Ministry of micro, small, and medium enterprises (MSME) of the Government of India has set up tool rooms (governmental MSME tool rooms). These tool rooms were established with technical cooperation both under bilateral and multilateral programmes.

These governmental MSME tool rooms provide production facilities of tools, tool parts or other precision components, product design & tool design by use of latest CAD software packages, precision machining and heat treatment, rapid prototyping, training, long-term courses and short term courses in related subjects, and consultancy to improve productivity.

At RWTH Aachen, the WBA Aachener Werkzeugbau Akademie GmbH and its research partners, the Fraunhofer Institute for Production Technologies IPT and the Chair of Production Engineering at the Werkzeugmaschinenlabor WZL of RWTH Aachen University (WZL), have developed an extensive knowledge concerning the tool and die industry over the last twenty years.

The WZL focuses on the organisational aspects of the tool and die industry, the Fraunhofer IPT focuses on the technological aspects of the tool and die industry.

On the basis of the described background in the summer of 2012 the WBA and GIZ have engaged into a partnership with the MSME of the Government of India. Focus of the cooperation was the assessment of the status quo of the capability of seven Tool Rooms ran by the MSME and the initiation a long-term strategic partnership between the Indian and German tool and die making sector. The results of this initial cooperation are focused projects for the future development of the seven Tool Rooms. These projects are structured into four project packages:

- Project package A "Technology" – projects addressing the upgradation of the manufacturing capability with regard to technology for all seven Tool Rooms separately

- Project package B “Organisation” – projects addressing the upgradation of the manufacturing capability with regard to organisation for all seven Tool Rooms separately
- Project package C “Training” – projects addressing the upgradation of the training capability for all seven Tool Rooms separately
- Project D “MSME Innovation Cluster Tooling” – Structuring of the MSME Innovation Cluster Tooling to enhance the cooperation of all MSME Tool Rooms and their competitiveness in all areas of manufacturing and training

This quotation addresses project package B “Organisation”. The WBA proposes to address organisational aspects to enhance the manufacturing capability of the seven MSME Tool Rooms that were analysed.

2 Subject and Target of the Project Package

In the following subject and target of the project package are described.

Target of the project package is to enhance the manufacturing capabilities of the seven MSME Tool Rooms that were analysed by addressing organisational aspects. Even though comparable project content is offered to different Tool Rooms, the target is to be achieved in all Tool Rooms individually.

Through achieving the target in every Tool Room their respective competitiveness at the market should be increased. Thereby every Tool Room will target-orientedly develop towards a reference for the tool and die making industry in India.

Subject of the project package are the seven MSME Tool Rooms that were analysed by the WBA. These Tool Rooms are:

- IGTR Aurangabad
- IDEMI Mumbai
- IGTR Ahmedabad
- IGTR Indore
- CITD Hyderabad
- CTTC Bhubaneswar
- IDTR Jamshedpur

All Tool Rooms are addressed separately as it is a prerequisite to account for the specific circumstances of a Tool Room individually to achieve the defined target.

3 Execution

The whole project package is divided into three projects. The project package will be managed by a chief engineer and executed by senior research fellows. The execution of the project package is done in cooperation with the Fraunhofer IPT and the WZL. One project addresses the entire content of an initiative at one Tool Room. Therefore all projects are to be seen separately. If comparable content is offered for more than one Tool Room, it is indicat-

ed accordingly. All projects start with the practical introduction by the project package team in Germany and will then address the practical implementation of the respective content.

For all projects the option of “teach the teacher” is offered. Thereby teachers or trainers are taught how to convey the specific content of a project as part of the training portfolio in the future. The result of this option is a detailed structure how the project content can be taught with regard to content and organisation of a specific training format.

The locations for the execution of the project package are Germany as well as India. While some developments can be performed in Germany, several visits to India will be required to refine and validate developments.

The entire project package incorporates the knowledge accumulated at WBA, IPT, and WZL over years of industry and research projects with tool and die making companies as well as cluster development.

In the following the three projects are explained in detail.

Project B.1: Development of Competence Fields

Tool Rooms (Resources):
IGTR Aurangabad (20 man days; 3 weeks; 2 return flights)
IGTR Indore (10 man days; 3 weeks; 2 return flights)
CTTC Bhubaneswar (15 man days; 3 weeks; 2 return flights)
“Teach the Teacher” (10 man days per Tool Room)

Target
Target is the development and definition of competence fields to improve the competitiveness and shorten the lead times of order processing.

Description
Competence fields are defined groups of processes that are required for the manufacturing of a specific product. This product also matches the requirement of the relevant market. In the first step of the project all processes are evaluated with regard to their effectiveness as well as efficiency and the product spectrum is analysed (resource-based-view). In a second step the market demand for the products of the Tool Room is analysed (market-based-view). In continuation the resource-based-view and market-based-view are matched to identify possible competence fields. The competence fields are then detailed for the Tool Room specifically. As the last step an action plan describing how competence fields are to be addressed and exploited in the future is developed. The project package is executed in cooperation with a project team of the Tool Room in India. The analysis results of the Tool Rooms from the prior initiative will be used as basis for the development of the resource- and market-based-view.

IGTR Aurangabad has managed to place successful products on the market. Its organisational structure for order processing is on a competitive level. The project in Aurangabad will therefore not only encompass the development of competence fields. It will specifically be addressed how the structure of order processing has to be altered in the future to successfully increase the focus on the competence fields. This will be an enabler to competitiveness of international standard and create value as well as differentiation for the customer.

IGTR Indore has yet to precisely identify competencies for future success in manufacturing. This project will address this deficit. However as the organisational capabilities to not compare to IGTR Aurangabad at this point, the modification of order processing is not suitable at this point. Therefore the required WBA resources are significantly lower. The impact of the project will nevertheless be very considerable as competencies are the basis for manufacturing success and will improve the competitiveness of the Tool Room significantly.

CTTC Bhubaneswar is comparable to IGTR Aurangabad with regard to the organisational standard of manufacturing. At CTTC Bhubaneswar the product spectrum and structure of order processing is the most focused of all Tool Rooms analysed in India by WBA, IPT, and WZL. Therefore the required resources for the project are lower here than at IGTR Aurangabad. The project is an inevitable measure to development CTTC Bhubaneswar towards international competitiveness with regard to their product spectrum.

Deliverables:

- Detailed competence fields for the Tool Rooms improving the competitiveness with regard to their organisational capabilities of manufacturing
- Detailed structure of order processing designed for the detailed competence field to reduce lead teams and increase process effectiveness and efficiency (IGTR Aurangabad, CTTC Bhubaneswar)

Project B.2: Development of Structure for Order Processing

Tool Rooms (Resources):
IDEMI Mumbai (20 man days; 3 weeks; 2 return flights)
IGTR Ahmedabad (20 man days; 3 weeks; 2 return flights)
IDTR Jamshedpur (20 man days; 3 weeks; 2 return flights)
"Teach the Teacher" (10 man days per Tool Room)

Target

Target of this project is the upgradation of the process quality in the Tool Room to positively impact the key performance indicators lead time and due date reliability.

Description

In the first step of this project the current structure of order processing will be mapped in a workshop with the project team from the Tool Room. The methodology for the process mapping has been developed in Aachen and will be applied to create a transparent picture of the current process, its characteristics, its strengths and its weaknesses. In the next step a generic milestone process will be developed. The generic milestone process serves the purpose of conveying the general structure an order fulfilment process in tool and die making has to follow. The generic milestone process will then be adapted to fit the specific requirements of the Tool Room. All phases of the milestone process as well as the documentation that should be employed in the future will be developed and defined. As part of the project best-practices from Germany will be presented and discussed. Result is a specific milestone process for order fulfilment that is specifically developed and detailed for the Tool Room. This is the basis for improved due date reliability and lead times to enable differentiation

against the competition and strengthen the role of the Tool Room as reference for the industry in India.

The project has a similar focus for all three of the Tool Rooms. Based on the executed analysis all Tool Rooms show deficiencies with regard to the process quality. Therefore the projects require the same resources in all three Tool Rooms.

Deliverable:

- Detailed milestone process for improved process quality, decreased lead times, and increased due date reliability

Project B.3: Transfer of Automation Competencies from Training to Manufacturing

Tool Room (Resources):
CITD Hyderabad (10 man days; 2 weeks; 2 return flights)
"Teach the Teacher" (10 man days per Tool Room)

Target
Target of this project is the transfer of existing competencies in training to manufacturing. By transferring the competencies on automation a competitive edge should be shaped to create a strategic success position against competition and enhance the manufacturing productivity.

Description
In the first step the competencies on automation are structured in detail with the project team at the Tool Room in Hyderabad. Based on the know-how from Germany potential manufacturing processes and products are identified for transferring automation to improve their productivity. In the next step existing and potential customers are approached to define the automation competencies that will achieve amortisation on the Indian and relevant international market in the future. As final step a road map is detailed to define how the implementation of the automation competencies have to be executed and ultimately offered at the market. As the result CITD Hyderabad is enabled to offer a differentiating competence at the market that is based on existing know-how at the Tool Room. Thereby a success position as reference for the industry in India can be established.

Deliverables:

- Definition of specific products and processes to exploit the automation competencies with regard to manufacturing
- Road map defining the phases of the implementation process of the automation competencies into manufacturing to create differentiation at the market

4 Cooperation Schedule

Each project at a Tool Room will be executed separately. The duration of a project at a Tool Room is indicated in chapter 3. After a date for the initiation of a project has been agreed on the WBA requires six weeks for the preparation of that project.

5 Cooperation with WBA

Within WBA project teams are established to execute the projects. The projects will be managed by a chief engineer and executed by senior research fellows. For this the WBA may involve the chair for Production Engineering at the Werkzeugmaschinenlabor WZL of the RWTH Aachen University and the Fraunhofer IPT by a research and development contract. Those partners then act under its own name for the WBA. Contract partner is the WBA.

6 Project Package Effort

For the execution of the project package described above the personnel effort add up to 115 man days as followed. With the inclusion of the “Teach the Teacher” in every Tool Room the personnel effort add up to 185 man days.

Project	Tool Room	Man Days Senior Research Fellow
B.1	IGTR Aurangabad	20 (30)
B.1	IGTR Indore	10 (20)
B.1	CTTC Bhubaneswar	15 (25)
B.2	IDEMI Mumbai	20 (30)
B.2	IGTR Ahmedabad	20 (30)
B.2	IDTR Jamshedpur	20 (30)
B.3	CITD Hyderabad	10 (20)
Sum		115 (185)

Figure 2: Personnel Effort

For the execution of the project package described above the travelling costs add up to:

EURO 29’600 €

or

EURO 35’200 € including the option of “Teach the Teacher” at every Tool Room

Project	Tool Room	Number of Return Flights (1‘500 €, Eco. Class)	Number of Nights in India (100 € per day)	Travelling Costs
B.1	IGTR Aurangabad	2	16 (24)	4‘600 € (5‘400 €)
B.1	IGTR Indore	2	8 (16)	3‘800 € (4‘600 €)
B.1	CTTC Bhubaneswar	2	12 (20)	4‘200 € (5‘000 €)
B.2	IDEMI Mumbai	2	14 (22)	4‘400 € (5‘200 €)
B.2	IGTR Ahmedabad	2	14 (22)	4‘400 € (5‘200 €)
B.2	IDTR Jamshedpur	2	14 (22)	4‘400 € (5‘200 €)
B.3	CITD Hyderabad	2	8 (16)	3‘800 € (4‘600 €)
		21‘000 €	8‘600 € (14‘200 €)	29‘600 € (35‘200 €)

Figure 3: Travelling Costs

Proposal for the project package C

Training - Upgradation of the Training Capability for Seven MSME Tool Rooms

The WBA Aachener Werkzeugbau Akademie GmbH (WBA) proposes the project package "Training – Upgradation of the Training Capability for Seven MSME Tool Rooms".

1 Context and Initial Situation

The development of micro, small, and medium scale industrial units has been an important feature of the Government of India's (GOI) Industrial Policy. In addition to fiscal incentives, industrial development programmes of the GOI have been directed towards the development of infrastructure conducive for the growth of the manufacturing industry.

Manufacturing excellence begins with tools and dies; thus the tool and die industry is the backbone of the manufacturing industry. The Ministry of micro, small, and medium enterprises (MSME) of the Government of India has set up tool rooms (governmental MSME tool rooms). These tool rooms were established with technical cooperation both under bilateral and multilateral programmes.

These governmental MSME tool rooms provide production facilities of tools, tool parts or other precision components, product design & tool design by use of latest CAD software packages, precision machining and heat treatment, rapid prototyping, training, long-term courses and short term courses in related subjects, and consultancy to improve productivity.

At RWTH Aachen, the WBA Aachener Werkzeugbau Akademie GmbH and its research partners, the Fraunhofer Institute for Production Technologies IPT and the Chair of Production Engineering at the Werkzeugmaschinenlabor WZL of RWTH Aachen University (WZL), have developed an extensive knowledge concerning the tool and die industry over the last twenty years.

The WZL focuses on the organisational aspects of the tool and die industry, the Fraunhofer IPT focuses on the technological aspects of the tool and die industry.

On the basis of the described background in the summer of 2012 the WBA and GIZ have engaged into a partnership with the MSME of the Government of India. Focus of the cooperation was the assessment of the status quo of the capability of seven Tool Rooms ran by the MSME and the initiation a long-term strategic partnership between the Indian and German tool and die making sector. The results of this initial cooperation are focused projects for the future development of the seven Tool Rooms. These projects are structured into four project packages:

- Project package A "Technology" – projects addressing the upgradation of the manufacturing capability with regard to technology for all seven Tool Rooms separately

- Project package B “Organisation” – projects addressing the upgradation of the manufacturing capability with regard to organisation for all seven Tool Rooms separately
- Project package C “Training” – projects addressing the upgradation of the training capability for all seven Tool Rooms separately
- Project D “MSME Innovation Cluster Tooling” – Structuring of the MSME Innovation Cluster Tooling to enhance the cooperation of all MSME Tool Rooms and their competitiveness in all areas of manufacturing and training

This quotation addresses project package C “Training”. The WBA proposes to address training-specific projects to enhance the training capability of the seven MSME Tool Rooms that were analysed.

2 Subject and Target of the Project Package

In the following subject and target of the project package are described.

Target of the project package is to enhance the training capabilities of the seven MSME Tool Rooms that were analysed by addressing separate projects focusing in each Tool Room. Even though comparable project content is offered to different Tool Rooms, the target is to be achieved in all Tool Rooms individually.

Through achieving the target in every Tool Room their respective quality of training should be increased. Thereby every Tool Room will target-orientedly develop towards a reference for manufacturing-oriented training in India.

Subject of the project package are the seven MSME Tool Rooms that were analysed by the WBA. These Tool Rooms are:

- IGTR Aurangabad
- IDEMI Mumbai
- IGTR Ahmedabad
- IGTR Indore
- CITD Hyderabad
- CTTC Bhubaneswar
- IDTR Jamshedpur

All Tool Rooms are addressed separately as it is a prerequisite to account for the specific circumstances of a Tool Room individually to achieve the defined target.

3 Execution

The whole project package is divided into three projects. The project package will be managed by a chief engineer and executed by senior research fellows. The execution of the project package is done in cooperation with the Fraunhofer IPT and the WZL. One project addresses the entire content of an initiative at one Tool Room. Therefore all projects are to be seen separately. If comparable content is offered for more than one Tool Room, it is indicat-

ed accordingly. All projects start with the practical introduction by the project package team in Germany and will then address the practical implementation of the respective content.

The locations for the execution of the project package are Germany as well as India. While some developments can be performed in Germany, several visits to India will be required to refine and validate developments.

The entire project package incorporates the knowledge accumulated at WBA, IPT, and WZL over years of industry and research projects as well as academic and practical training .

In the following the three projects are explained in detail.

Project C.1: Establishment of a Strategic Link between Manufacturing Competencies and Training Portfolio

Tool Rooms (Resources):

IGTR Aurangabad	***(10 man days; 3 weeks; 2 return flights)***
IGTR Ahmedabad	***(20 man days; 4 weeks; 2 return flights)***
CITD Hyderabad	***(10 man days; 3 weeks; 2 return flights)***
IDTR Jamshedpur	***(15 man days; 3 weeks; 2 return flights)***

Target

Target of this project is the establishment of a strategic link between the training portfolio and existing competencies in manufacturing. With this project a success position in training should be obtained by offering content that is continuously being validated in practice.

Description

MSME Tool Rooms offer a comparable training portfolio to students across India. With regard to manufacturing the Tool Rooms have specific competencies that differ between Tool Rooms. To increase the quality of training a strategic link has to be developed between the competencies in manufacturing and the training portfolio.

IGTR Aurangabad has achieved a high level of capability with regard to the organisational aspect of manufacturing. The order fulfilment process follows a detailed structure that has been specifically developed to suit the tool and component production at the Tool Room. However in the training portfolio does not address process management or process design for manufacturing as a specific subject. In this project courses will be structured that specifically focus on the organisational aspect of manufacturing. Based on experience and knowledge of WBA, IPT, and WZL courses will be defined that address this aspect and thereby the manufacturing competency of IGTR Aurangabad. In continuation a road map will be developed formalising the phases that need to be undertaken to ultimately of these courses to students and create a unique success position with regard to training.

IGTR Ahmedabad is well-known for their capabilities in injection moulding tools. The tools and knowledge is Indian-wide demanded. In this project, this high value knowledge will be used for the enlargement of the training portfolio setting a focus' on injection moulding tools in regard with injection tool design and manufacturing. Such a training portfolio benefits from the already existing knowledge within the Tool Room and is from high value for potential customers especially for industry customers who want to teach their employees in specific injection moulding technology. This results in a "Center of Excellence" for injection moulding tools in terms of tools, knowledge and training.

CITD Hyderabad has built up high capabilities in automation and systems engineering which is already a content of its training portfolio. Compared to other Tool Rooms the first analysis assessed that the training activities in this field has still potential in order to achieve a unique selling proposition. For this reason, a roadmap for further development of know-how and teaching on automation and systems will be designed in order to upgrade this knowledge into a relevant competitive advantage.

IDTR Jamshedpur is a trustee supplier for the local automotive industry and has built up in-depth knowledge and capabilities in this field. Nevertheless, the training portfolio shows an almost similar content like the other analysed Tool Rooms. In order to transform this already existing, highly demanded knowledge into training activities, the design of a curriculum for courses that transport the in-depth knowledge on automotive tool making to students will be the main task of this project. Furthermore, the curricula has to take into account this knowledge and capabilities is demanded by young students but also by experienced industry workers.

Deliverables:

- Strategic link between existing competencies in manufacturing and training portfolio
- Road map to a success position in training through differentiating courses and increased quality of training

Project C.2: Development of New Course Offerings

Tool Rooms (Resources):
IGTR Indore (14 man days; 3 weeks; 2 return flights)
CTTC Bhubaneswar (10 man days; 3 weeks; 2 return flights)

Target

Target of this project is the development of new courses to offer training to new target groups of potential students.

Description

IGTR Indore has built up relevant knowledge and capabilities for engineering of complex customer applications with outstanding technological know-how. During the analysis, WBA assessed that the utilization of training facilities has a highly fluctuating utilization. The reason is that most of the students (especially in short-term courses) are university students who use their vacancies for those trainings. This results in a very high utilization of training facilities during student vacancies but shows just a low number of students outside of these periods. The purpose of this project is the elimination of this fact by designing an action plan to restructure the course offerings in order to balance the capacity utilization. First lever will be a higher attractiveness for the industry in order to role those students in, who work in industry.

CTTC Bhubaneswar has the same problem as IGTR Indore. But the dimension is much higher as the training capacity of CTTC Bhubaneswar is much larger compared to all other Tool Rooms. The objective is the same namely to enlarge the number of students in times with a low student enrolment quota. As CTTC Bhubaneswar has highly renowned knowledge

and capabilities in component production for several industries, this knowledge has to be sold by industry-specific training offers.

Deliverable:

- Defined structure for courses to a target group of industry professionals to balance the capacity utilization of training resources by offering further courses between semester breaks
- Defined structure of a course specifically addressing training on automation to students to enhance the spectrum of manufacturing training covered by CTTC Bhubaneswar

Project C.3: Development of a Focused Training Portfolio

Tool Room (Resources):
IDEMI Mumbai (20 man days; 3 weeks; 2 return flights)

Target
Target of this project is the development of a more focused training portfolio offered by IDEMI Mumbai to employ training resources more efficiently and increase the quality of training offered to students.

Description
IDEMI Mumbai offers a wide range of training activities. The activities range from the standard toolmaking-specific trainings to animation and video related trainings. That means that the training portfolio has no specific focus on any specific topic. Especially because of the high capabilities in testing and calibration there is a huge potential for IDEMI Mumbai to provide an outstanding, high demanded training portfolio for young students and industry professionals. Furthermore, the link between the calibration and testing capabilities combined with the knowledge in tool making can result in a powerful offer. This combination is favorable, as testing and calibration in mechanical application as well as manufacturing becomes more and more important all over the world. In this project, the core competencies of IDEMI Mumbai will be analysed and combined which results in a training portfolio characterized by a sustainable and high demanded offer.

Deliverables:

- Focused training portfolio to efficiently employ training resources and increase the quality of training offered to students by tighten the existing portfolio and creation of new offers in terms of testing and calibration in mechanical applications and manufacturing.

4 Cooperation Schedule

Each project at a Tool Room will be executed separately. The duration of a project at a Tool Room is indicated in chapter 3. After a date for the initiation of a project has been agreed on the WBA requires six weeks for the preparation of that project.

5 Cooperation with WBA

Within WBA a project package team is established to realise the project package. The project package will be managed by a chief engineer and executed by senior research fellows. For this the WBA may involve the chair for Production Engineering at the Werkzeugmaschinenlabor WZL of the RWTH Aachen University and the Fraunhofer IPT by a research and development contract. Those partners then act under its own name for the WBA. Contract partner is the WBA.

6 Project Package Effort

For the execution of the project package described above the personnel effort add up to 99 man days as followed.

Project	Tool Room	Man Days Research Assistant
C.1	IGTR Aurangabad	10
C.1	IGTR Ahmedabad	20
C.1	CITD Hyderabad	10
C.1	IDTR Jamshedpur	15
C.2	IGTR Indore	14
C.2	CTTS Bhubaneswar	10
C.3	IDEMI Mumbai	20
Sum		99

Figure 2: Personnel Effort

For the execution of the project package described above the travelling costs add up to:

EURO 30’400 €

or

Project	Tool Room	Number of Return Flights (1‘500 €, Eco. Class)	Number of Nights in India (100 € per day)	Travelling Costs
C.1	IGTR Aurangabad	2	14	4‘400 €
C.1	IGTR Ahmedabad	2	14	4‘400 €
C.1	CITD Hyderabad	2	12	4‘200 €
C.1	IDTR Jamshedpur	2	14	4‘400 €
C.2	IGTR Indore	2	12	4‘200 €
C.2	CTTS Bhubaneswar	2	14	4‘400 €
C.3	IDEMI Mumbai	2	14	4‘400 €
Sum		21‘000 €	9‘400 €	30‘400 €

Figure 3: Travelling Costs

Proposal for the project package A

Technology - Upgradation of the Manufacturing Capability with Regard to Technology for Seven MSME Tool Rooms

The WBA Aachener Werkzeugbau Akademie GmbH (WBA) proposes the project package "Technology – Upgradation of the Manufacturing Capability with Regard to Technology for Seven MSME Tool Rooms".

1 Context and Initial Situation

The development of micro, small, and medium scale industrial units has been an important feature of the Government of India's (GOI) Industrial Policy. In addition to fiscal incentives, industrial development programmes of the GOI have been directed towards the development of infrastructure conducive for the growth of the manufacturing industry.

Manufacturing excellence begins with tools and dies; thus the tool and die industry is the backbone of the manufacturing industry. The Ministry of micro, small, and medium enterprises (MSME) of the Government of India has set up tool rooms (governmental MSME tool rooms). These tool rooms were established with technical cooperation both under bilateral and multilateral programmes.

These governmental MSME tool rooms provide production facilities of tools, tool parts or other precision components, product design & tool design by use of latest CAD software packages, precision machining and heat treatment, rapid prototyping, training, long-term courses and short term courses in related subjects, and consultancy to improve productivity.

At RWTH Aachen, the WBA Aachener Werkzeugbau Akademie GmbH and its research partners, the Fraunhofer Institute for Production Technologies IPT and the Chair of Production Engineering at the Werkzeugmaschinenlabor WZL of RWTH Aachen University (WZL), have developed an extensive knowledge concerning the tool and die industry over the last twenty years.

The WZL focuses on the organisational aspects of the tool and die industry, the Fraunhofer IPT focuses on the technological aspects of the tool and die industry.

On the basis of the described background in the summer of 2012 the WBA and GIZ have engaged into a partnership with the MSME of the Government of India. Focus of the cooperation was the assessment of the status quo of the capability of seven Tool Rooms ran by the MSME and the initiation a long-term strategic partnership between the Indian and German tool and die making sector. The results of this initial cooperation are focused projects for the future development of the seven Tool Rooms. These projects are structured into four project packages:

- Project package A "Technology" – projects addressing the upgradation of the manufacturing capability with regard to technology for all seven Tool Rooms separately

- Project package B “Organisation” – projects addressing the upgradation of the manufacturing capability with regard to organisation for all seven Tool Rooms separately
- Project package C “Training” – projects addressing the upgradation of the training capability for all seven Tool Rooms separately
- Project D “MSME Innovation Cluster Tooling” – Structuring of the MSME Innovation Cluster Tooling to enhance the cooperation of all MSME Tool Rooms and their competitiveness in all areas of manufacturing and training

This quotation addresses project package A “Technology”. The WBA proposes to address technological aspects to enhance the manufacturing capability of the seven MSME Tool Rooms that were analysed.

2 Subject and Target of the Project Package

In the following, subject and target of the project will be described. The project focuses on specific, technology oriented measures which were identified within the first analysis of the Tool Rooms. The project package A “Technology” is divided into four projects which meet the individual requirements of the Tool Rooms.

Project A.1 targets on the high setup times within the manufacturing departments. In order to reduce those setup times and to enhance the capacity of the machinery, the successful “Single Minute Exchange of Die” (SMED) procedure will be accomplished. The project addresses the Tool Rooms in Aurangabad and Ahmedabad.

Project A.2 has its origin in the dismatch of existing machinery and product requirements. The first analysis has shown that the machinery does not fit to the parts which are manufactured within the considered Tool Rooms. For this reason a “Machinery Assessment” will be accomplished in the considered Tool Rooms. The target of this sub-project is to assess the existing machinery in terms of product requirements, productivity, and organizational issues. The project addresses the Tool Rooms in Mumbai and Indore.

Project A.3 focuses on the high machine diversity in Hyderabad, Bhubaneswar, and Jamshedpur. This diversity lowers potential process and technology improvements as well as the learning curve of the workers using those machines. For this reason a “Standardization of all relevant manufacturing equipment” is the target of this project in order to lower the above described issues.

The purpose and content of project A.4 were developed during the final presentation in Delhi. At the request of the Tool Room in Aurangabad, state-of-the-art milling processes will be developed in terms of optimal milling parameters. Those parameters will be developed in cooperation with scientists and technicians of the Fraunhofer IPT.

Through achieving the target in every Tool Room their respective competitiveness at the market should be increased. Thereby every Tool Room will target-orientedly develop towards a reference for the tool and die making industry in India.

Subject of the project package are the seven MSME Tool Rooms that were analysed by the WBA. These Tool Rooms are:

- IGTR Aurangabad

- IDEMI Mumbai
- IGTR Ahmedabad
- IGTR Indore
- CITD Hyderabad
- CTTC Bhubaneswar
- IDTR Jamshedpur

All Tool Rooms are addressed separately as it is a prerequisite to account for the specific circumstances of a Tool Room individually to achieve the defined target.

3 Execution

The whole project package is divided into four projects. The project package will be managed by a chief engineer and executed by senior research fellows. The execution of the project package is done in cooperation with the Fraunhofer IPT and the WZL. One project addresses the entire content of an initiative at one Tool Room. Therefore all projects are to be seen separately. If comparable content is offered for more than one Tool Room, it is indicated accordingly. All projects start with the practical introduction by the project package team in Germany and will then address the practical implementation of the respective content.

In project package A, for two projects the “teach the teacher” is offered since it is not useful to perform this action for A.2 and A.3. Thereby teachers or trainers are taught how to convey the specific content of a project as part of the training portfolio in the future. The result of this option is a detailed structure how the project content can be taught with regard to content and organisation of a specific training format.

The locations for the execution of the project package are Germany as well as India. While some developments can be performed in Germany, several visits to India will be required to execute, refine and validate developments.

The entire project package incorporates the knowledge accumulated at WBA, IPT, and WZL over years of industry and research projects with tool and die making companies.

In the following the four projects are explained in detail.

Project A.1: **Enlargement of machine capacity by SMED**

Tool Rooms (Resources):
IGTR Aurangabad ***(20 man days; 4 weeks; 2 return flights)***
IGTR Ahmedabad ***(20 man days; 4 weeks; 2 return flights)***
“Teach the Teacher” ***(10 man days per Tool Room)***

SMED is a successful procedure for reducing setup times within the machinery. SMED was once developed for the mass production by Toyota. In recent years the methodology has been successfully applied within single part and small-batch production. The experience has shown that the setup times are reduced massively and the available productive hours for the machinery increased.

The SMED methodology is divided into six steps:

1. Analysis of existing setup processes
2. Separation of internal and external setup processes
3. Compilation of internal to external setup processes
4. Optimization of internal setup processes
5. Optimization of external setup processes
6. Description and documentation of new setup processes

Internal setup processes are those processes which are executed within the machine resulting in idle times. External setup times are done outside of the machine so that this work does not result in idle times but in manual effort outside of the machine. Step one to three create the optimal stage without any optimization, it is just an analysis and realignment of existing work but in more efficient order. In addition, the separated internal and external setup processes must be optimized. In this step, the high experience of the Tool Room workers and the deep technological understanding of WBA, WZL, and Fraunhofer IPT will be combined in order to finalize this step. The last step ensures that the procedure is recognized and can be done without external help by the Tool Room itself.

Most of the work will be done as field days within the production of the Tool Rooms in order to guarantee a successful result. The project team needs one stay within each Tool Room for this project. Nevertheless, there is significant data acquisition to be performed in advance. This will be done by the Tool Room itself in order to guarantee an efficient project.

Deliverables:

- Kick-off workshop with selected employees in order to explain the procedure and results of the SMED methodology.
- Execution of the SMED methodology for one technology (for example milling) in cooperation with Tool Room workers.
- Optimization of existing setup processes and derivation of long-term measures according to the above mentioned steps.
- Every step of the SMED procedure is documented in order to enable the Tool Room to execute the methodology by itself.

Project A.2: **Assessment of existing machinery**

Tool Rooms (Resources):
IGTR Indore ***(20 man days; 12 weeks; 2 return flights)***
IDEMI Mumbai ***(20 man days; 12 weeks; 2 return flights)***

The first analysis has shown that the machinery does not exactly fit to the requirements of the considered Tool Rooms. Considered Tool Rooms are Indore and Mumbai. The optimal machinery of a Tool Room depends on the manufactured parts in terms of size, weight, and desired accuracy of geometry and surfaces. Furthermore, the machinery has to fulfil the requirements of a modern industrial production in terms of productivity and flexibility. This optimal machinery will be identified within a framework of an approved, systematically procedure which the WBA already applied at many tool shops in Germany.

The procedure starts with a collection of exigencies in the course of the machinery. These exigencies focus' on technological issues like desired accuracy of geometries and surfaces as well on organizational and other issues e.g. productivity, standardization, flexibility, etc. These exigencies are identified within a moderated workshop with executives from the Tool Room. Specific suggestions for exigencies will be given by WBA's experts.

After this, the exigencies are weighted by using the paired comparison. The ratings are given by the Tool Room executives, but the whole procedure is moderated by the project team in order to guarantee a realistic result of the paired comparison. The result is a rating matrix which is applied to the existing machinery and potential new machinery. The result of the procedure is an advice for the optimal machinery from the perspective of products, Tool Room executives and WBA.

Deliverables:

- Preparation and execution of the project in cooperation with Tool Room workers.
- Kick-off workshop with selected employees in order to explain the procedure and results of the project.
- Tool Room specific rating matrix for the machinery
- Recommendation for an optimal machinery including disinvestment advices

Project A.3: Standardization of all relevant manufacturing resources

Tool Room (Resources):
IDTR Jamshedpur (20 man days; 14 weeks; 2 return flights)
CTTC Bhubaneswar (20 man days; 14 weeks; 2 return flights)
CITD Hyderabad (30 man days; 14 weeks; 2 return flights)

The first analysis has shown that the manufacturing equipment has a wide variety. Each equipment item does have its specific applications but modern production companies try to minimize this variety in order to enhance the standardization degree. The standardization contributes to order and tidiness and simplifies organizational processes which lead to much more efficiency within the Tool Room. Furthermore, standardized equipment is the requirement for technological optimization.

The challenge in the project is the identification of really necessary equipment and equipment which also has its right to exist but could be eliminated. The term equipment contains manufacturing tools alike milling and drilling cutters, grinding wheels and EDM-materials,

associated holders in all technologies as well as clamping systems where a wide variety were detected in every Tool Room.

The project starts with a documentation of every single equipment item within the manufacturing facility of the Tool Room. The items get documented in a standardized list which is provided by WBA. Furthermore, the specific task of each item will be described and evaluated. It follows the equipment reduction which is executed within moderated workshops.

The result of these workshops is the future equipment list of the Tool Room.

Deliverables:

- Preparation and execution of the project in cooperation with Tool Room workers.
- Kick-off workshop with selected employees in order to explain the procedure and results of the project.
- Documentation about current equipment within each Tool Room
- Moderated workshop in order to reduce the number of equipment
- Documented new equipment list, which is applied in the near future

Project A.4: **Upgradation of milling productivity and process stability by developing optimal milling parameters**

Tool Room (Resources):
IGTR Aurangabad (25 man days; 2 weeks; 3 return flights)
"Teach the Teacher" (10 man days)

The project starts with the demonstration of state-of-the-art milling processes. Fraunhofer experts will present best practices and will show their expert knowledge and try to explain the theoretical background of those high performance processes. This will be done within the shop floor itself in order to show the potentials of this technology directly on the machine. The demonstration will be executed by professionals from the Fraunhofer IPT, one researcher and one technician.

After this initial day, the operational milling process optimization starts. Based on defined targets, the derivation of optimal cutting parameters will be performed. This will be done by milling tests performed at the Tool Room in cooperation with shop floor workers.

The process design for milling tests will be based on DOE (Design of experiments) approach for minimizing effort and time consumption. DOE-test schedule will be prepared by the WBA team in advance in order to guarantee efficient field days. The process parameters will be optimized iteratively by WBA team based on DOE-schedule in regard to the economic and quality specific targets defined in the first part of the project. The main optimization factors will be the right usage of milling tools, lubricants, cutting speed, feed and tool path width. The WBA team will derive guidelines and best practices for future process optimization. These guidelines will be used for teaching workers how to perform continuous improvement process development on the tool shop.

Deliverables:

- Preparation and execution of the project by a project leader, milling researcher and technician, in cooperation with Tool Room workers.
- Kick-off workshop with selected employees in order to explain the procedure and results of the project.
- State-of-the-art milling parameters for the Top 20 high runner tools
- Procedure for developing process parameters in order to enable the Tool Room to develop those parameters without external support

4 Cooperation Schedule

Each project at a Tool Room will be executed separately. The duration of a project at a Tool Room is indicated in chapter 3. After a date for the initiation of a project has been agreed on the WBA requires about six weeks for the preparation of that project.

5 Cooperation with WBA

Within WBA project teams are established to execute the projects. The projects will be managed by a chief engineer and executed by senior research fellows. For this the WBA may involve the chair for Production Engineering at the Werkzeugmaschinenlabor WZL of the RWTH Aachen University and the Fraunhofer IPT by a research and development contract. Those partners then act under its own name for the WBA. Contract partner is the WBA.

6 Project Package Effort

For the execution of the project package described above the personnel effort add up to 175 man days as followed. With the inclusion of the “Teach the Teacher” in every Tool Room the personnel effort add up to 255 man days.

Project	Tool Room	Man Days Research Assistant
A.1	IGTR Aurangabad	20 (30)
A.1	IGTR Ahmedabad	20 (30)
A.2	IGTR Indore	20 (30)
A.2	IDEMI Mumbai	20 (10)
A.3	IDTR Jamshedpur	20 (30)
A.3	CTTS Bhubaneswar	20 (30)
A.3	CITD Hyderabad	30 (40)
A.4	IGTR Aurangabad	25 (35)
Sum		175 (255)

Figure 2: Personnel Effort

For the execution of the project package described above the travelling costs add up to:

EURO 38’000 €

or

EURO 40’800 € including the option of “Teach the Teacher” at specific Tool Rooms

Project	Tool Room	Number of Return Flights (1‘500 €, Eco. Class)	Number of Nights in India (100 € per day)	Travelling Costs
A.1	IGTR Aurangabad	2	14 (22)	4‘400 € (5‘200 €)
A.1	IGTR Ahmedabad	2	14 (22)	4‘400 € (5‘200 €)
A.2	IGTR Indore	2	14	4‘400 €
A.2	IDEMI Mumbai	2	14	4‘400 €
A.3	IDTR Jamshedpur	2	14	4‘400 €
A.3	CTTS Bhubaneswar	2	14	4‘400 €
A.3	CITD Hyderabad	2	20	5‘000 €
A.4	IGTR Aurangabad	3	21 (33)	6‘600 € (7‘800 €)
Sum		25‘500 €	12‘500 € (15‘300 €)	38‘000 € (40‘800 €)

Figure 3: Travelling Costs

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