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Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

Department of Science and Technology

Technology Localisation Plan

A Framework for Engagement in
National Technology Localisation Actions

14 October 2008

EXECUTIVE SUMMARY

The major State-Owned Enterprises (SOEs) are set to embark on large-scale infrastructure recapitalisation and expansion programmes over the next 20 years and beyond. Eskom aims to spend in the region of R1.3 trillion up until 2025 on new power infrastructure. Transnet has estimated an expenditure over the next five years of at least R76 billion.

Currently, and to a large extent, technology is procured from foreign suppliers, linked to company practices on global strategic sourcing. It is therefore clear that localisation of supplies to the major SOEs presents a massive economic opportunity for the South African manufacturing and related industries. However, in many categories of procurement, the local industries lack the competitiveness necessary to enter the supply chains of the SOEs. Bold intervention is needed to raise the capabilities of local manufacturing companies so that they can earn a share of the recapitalisation investments, and ultimately enter export markets as competitive suppliers to the OEMs (Original Equipment Manufacturers).

In a bid to increase the participation of local companies in these major procurement opportunities, Government recently launched its Competitive Supplier Development Programme (CSDP) aimed at increasing the capacity, capability and competitiveness of the local supply base, through a range of demand-side and supply-side measures. The Department of Public Enterprises, together with the Department of Trade and Industry and the Department of Science and Technology, are the main drivers of this Programme, in partnership with industry and development agencies.

The CSDP presents a massive economic opportunity for local business. These include:

- enhanced participation of local companies in the huge capital expenditure programmes, thus increasing the GDP of the country;
- reduced foreign exchange outflows;
- a platform from which the local supplier industries can export niche offerings;
- shortened lead times for product delivery to the SOEs, thereby improving the availability of capacity to meet end-user demand.

In line with the requirements of the CSDP, the two major SOEs have already produced their Supplier Development Plans (SDPs) in consultation with Government stakeholders and industry. The SDPs contain detailed expenditure and product/technology analyses. By

including CSDP requirements into tender documents for prioritised focus areas, the SOEs will be stretching their sphere of influence to reach second and third tier suppliers (OEMs' first tier suppliers). This influence will require OEMs to develop innovative proposals on ways to increase the localisation of their supply chains, and could include, amongst others:

- Aligning OEMs with appropriate second tier suppliers;
- Defining the degree of localisation in the manufacturing / assembly / maintenance of the equipment;
- Recommending that second tier local suppliers participate in supplier benchmarking, as part of their commitment to continuous improvement, thereby increasing OEMs' visibility of local suppliers' capabilities, and enabling OEMs to broaden their supply base on a more scientific basis; and
- Requiring that chosen second/third tier local suppliers should be contributors to Broad-based Black Economic Empowerment (BBBEE) by predefining acceptable BBBEE contribution levels.

In addition to the localisation opportunities presented by the SOEs' capital expenditure programmes, DST has recognised similar major opportunities in other areas related to its portfolios. It has therefore recognised the opportunity to replicate the model in other areas of both public and private sector procurement, particularly in areas where it has the ability to play an influential role in facilitating partnerships between buyer agencies and supplier networks. The spectrum includes the localisation of technology related to:

- Competitive Supplier Development Programme for State Owned Enterprises
- Mining Capital Equipment
- ICT
- MeerKAT
- Space Science and Technology
- Active Pharmaceutical Ingredients (APIs) and Antiretrovirals (ARVs)

This Technology Localisation Plan therefore presents an overarching and generic framework for DST's engagement in technology localisation initiatives including the CSDP. It presents a clear roadmap for this engagement, from the identification of Technology Products for Localisation through to the structuring of Technology Assistance Packages (TAPs) for participating companies. The initial part of the roadmap will require DST to support the necessary investigations into proposed technology localisation opportunities. This includes the identification of specific technology products for localisation, the mobilization of supplier networks and related technology capability and gap analyses, and the development of an integrated strategy for achieving the localisation goals.

The Technology Localisation Plan further defines the various elements of the DST TAP, which will create the basis for DST investment into approved localisation initiatives. The main elements of the TAP are:

- **Benchmarking and Technology Capability Evaluation Services:**
This involves the development of a collaborative IT-based system aimed at facilitating the increased participation of local suppliers in supply chains linked to major local buyers such as the State-Owned Enterprises. At the same time, and of greater importance, access to the supply chains of OEMs (systems suppliers) will open the doors for exports. DST will be involved in implementing the technology-based component of the benchmarking system, referred to as the Technology Capability Evaluation component, in partnership with UNIDO, as part of the overall benchmarking system. Companies are benchmarked against world-class competitiveness, and a continuous improvement plan is generated against which other elements of the TAP are designed.
- **Technology Capability Platforms, or Shared Technology Facilities:**
This refers to the development of technology platforms to address the gaps for migration to world-class manufacturing. These platforms will be focused on the enhancement of technology capabilities within well-defined applications for technology localisation, and established off the strength of existing public research and higher education institutional bases for wider industry impact. The National Nuclear Manufacturing Centre is an example of such a platform, supporting the localisation of fabricated structures and components for the nuclear industry. Such market-pull platforms can be established within the context of the Centres of Competence Programme.

DST Technology Localisation Plan

- Access to Technical Expertise:

This involves DST support for companies to access technical expertise to guide them in addressing the identified technology gaps, and mentoring company personnel in the successful diffusion of innovative technologies. The sourcing of technical experts will be linked to the establishment of, and commitment to, a Continuous Improvement Plan based on the identified gaps from the Technology Capability Evaluations.

- High-End Technical Skills Development Programmes:

This involves the development of specialist training programmes (undergraduate and post graduate) for the delivery of high-end engineering skills focusing on the identified areas of technology localisation.

- Design and Tooling Support:

This involves the development and alignment of technology support platforms specifically aimed at Design and Tooling support, such as the Institutes for Advanced Technology and the CHPC. These two technology areas are indispensable in migrating targeted companies and supplier networks towards sustainable world-class manufacturing for localisation and export.

- Technology Transfer Benefits/Offset Programmes:

This involves leveraging on offsets emanating from large public sector procurement contracts, for technology transfer to local supplier networks. Areas of engagement could include: exchange of students and researchers, joint R&D projects, technical training, management training, partnerships with innovation platforms, and standards accreditation. A good example is the current Airbus/SA Indiza R&T (Research & Technology) Programme leveraging off the Defence procurement of the A400M aircraft. This has led to workshare packages in the construction of the aircraft, as well as research cooperation in natural fibre reinforced composite structures (NATFIBIO) led by CSIR, alternative synthetic fuels in aeronautics (Alfa-BIRD) involving SASOL, light alloys, and human resource development in aeronautics (funded through the AMTS and the NACoE) in partnership with selected South African universities. The major local suppliers to Airbus, Aerosud and Denel, are within the aero-structures sector, with two smaller suppliers in the avionics sector, SAAB Grintek and Chelton Avionics.

DST Technology Localisation Plan

For the Plan to be effective, a number of crucial challenges have to be overcome. These include:

- Inter-Governmental cooperation at all levels and spheres;
- Alignment of the programmes within the relevant DST Technology Missions to the Technology Localisation opportunities; and
- The engagement of DST with the major demand-side measures, including the identification of suitable supplier networks in line with the strategic sourcing processes of the buyers.

The DST Technology Localisation Plan provides a framework against which DST can develop a structured investment portfolio aimed at advancing the technological capabilities of the targeted supplier industries and networks. Moreover, it reflects the commitment and desire of DST to participate as a major stakeholder in the CSDP.

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LIST OF ACRONYMS

AMI	Advanced Metals Initiative
AMTS	Advanced Manufacturing Technology Strategy
API	Active Pharmaceutical Ingredient
ARV	Antiretroviral
ASGISA	Accelerated Shared Growth Initiative of South Africa
CHPC	Centre for High Performance Machining
CIDP	Chemical Industry Development Plan
CSDP	Competitive Supplier Development Programme
CSP	Customised Strategy Programme
DoH	Department of Health
IAT	Institute for Advanced Tooling
ICCPP	Integrated Capacity and Capability Procurement Programme
IPAP	Industrial Policy Action Plan
JIPSA	Joint Initiative for Priority Skills Acquisition
KAT	Karoo Array Telescope
MPRDA	Mineral and Petroleum Resources Development Act of 2002
NACoE	National Aerospace Centre of Excellence
NIPF	National Industrial Policy Framework
NIPP	National Industrial Participation Programme
NNMC	National Nuclear Manufacturing Centre
NTIS	National Titanium Industry Strategy
OEM	Original Equipment Manufacturer
PBMR	Pebble Bed Modular Reactor
PWR	Pressurised Water Reactors
SITA	State Information Technology Agency
SDP	Supplier Development Plan
SKA	Square Kilometer Array
SOE	State-Owned Enterprise
TAP	Technology Assistance Package
TIA	Technology Innovation Agency
TRE	Transnet Rail Engineering
TTBS	Technology Transfer Benefits Strategy
UNIDO	United Nations Industrial Development Organisation

1. INTRODUCTION

Over the past decade, South African industry has not been at all successful in responding to the lucrative economic opportunities linked to Government procurement deals. This has led to a low level of local content in imported technology and technology services, resulting in an unfavourable balance of payments for the country. A number of examples can be mentioned to substantiate this trend. These include the deployment of Information Security systems for the State; repairs and maintenance to the country's nuclear power plant in Koeberg; technology deployed in the construction of Gautrain, including the rail, control and ticketing infrastructure and rolling stock; the recent large-scale procurement of military equipment by the Department of Defence; amongst others. More recently, the procurement of 110 locomotives by Transnet is being closely watched to see the level of value addition by local industry.

In many of these cases, technological capability has been the underlying reason for South Africa's inability to participate in the value chain. A host of related reasons have added to this situation. These include the inflexibility and lack of innovative capability of existing industry to exploit high value add opportunities; the shortage of relevant technical skills and the inadequacies in the skills delivery system; and the lack of vision by industry to follow longer term globally sustainable business trajectories. Also, South African buyers and industry have found it difficult to develop collaborative relations with OEMs (Original Equipment Manufacturers) within complex supply chains, and to comply with the ever-advancing international benchmarks on quality and efficiency.

It is clear that if this trend is to continue, South African industry will not be able to participate effectively in major procurement opportunities linked to Government's new infrastructure expansion programmes. In this light, Government has committed to driving a major effort aimed at leveraging massive public sector expenditure, particularly in the expansion of electricity and transport infrastructure, thereby significantly increasing the local content of technology inputs, and reducing capital outflows. This effort is seen as crucial if South Africa is to have any chance of making appreciable inroads into the desired economic growth rate necessary for realising its poverty reduction and job creation targets.

The fundamental principles of this commitment and effort are embodied within the Competitive Supplier Development Programme (CSDP), which aims to increase the capacity, capability and competitiveness of the local supply base so as to participate in the public expenditure programmes, particularly those of the major State-Owned Enterprises. Together with the Department of Public Enterprises and the Department of Trade and Industry, the Department of Science and Technology, through its role in building the technological and innovative capabilities of the local supplier industries, will be a key player in this initiative. A strong feature of this initiative is the development of local supplier capabilities to the desired levels of global competitiveness to qualify for entry into the global supply chains of OEMs, thus creating export potential.

Although the CSDP is driven by SOE procurement, DST has recognised the opportunity to replicate the model in other areas of both public and private sector procurement, particularly in areas where it has the ability to play an influential role in facilitating partnerships between buyer agencies and supplier networks. Examples include: the design and build of the new polar research vessel to replace the Agulhas; the procurement of technology and services for the design and build of MeerKAT (and opportunities related to the Square Kilometer Array if South Africa is to win the bid to host this facility); the localisation of satellite technology within the Space Science and Technology Strategy; and the localisation of capital equipment supplies to the mining industry.

TECHNOLOGY LOCALISATION

The term Technology Localisation refers to the increase in *local content* of technology inputs in imported systems. This implies the expansion and development of the *local supplier base* to enter the supply chains of the foreign OEMs, and hence requires the supply of globally competitive components, subsystems and services.

For this reason, DST aims to develop a more generic approach to Technology Localisation, as described in this Plan. This will require a number of important issues to be addressed, without conflicting with the processes already defined in the CSDP. These include the model or protocol for engaging the role-players at various levels in the process, from the identification of suitable supplier networks in line with the strategic sourcing processes of buyers to the structuring of assistance packages for participating companies; the development of innovation networks linked to identified supplier networks; the evaluation and benchmarking of technology capabilities of companies; etc.

This document, the Technology Localisation Plan, presents substantial contextual background in Section 2 on the National Industrial Policy Framework within which these activities must take place. Section 2 also explains the important linkages with the DPE-led CSDP. In subsequent sections, substantial technical detail is presented on the localisation opportunities and the state of readiness of local manufacturers, as well as the linkages with existing DST supply-side interventions. Sections 4 and 5 outline the 'protocol' framework that will guide DST and partners in engaging with technology localisation opportunities. Section 6 presents the implementation model and Section 7 the financial implications. Section 8 concludes with the outline of the impact measures that will be used to monitor the progress, both at firm and at industry levels.

2. STRATEGIC FRAMEWORK FOR TECHNOLOGY LOCALISATION

2.1 New Industrial and Innovation Policy

The National Research and Development Strategy of the Department of Science and Technology established a set of technology and Innovation Missions as central elements for accelerated and sustainable economic growth. One of these key technology missions, Advanced Manufacturing, was later institutionalised through the Advanced Manufacturing Technology Strategy (AMTS). The AMTS in turn gave rise to the Advanced Metals Initiative (AMI) and the South African Nanotechnology Strategy which are key drivers for the development of upstream and future advanced manufacturing technology platforms.

The manufacturing sector is an appreciable contributor to the economy with 16.0% (2007) of the National gross domestic product (GDP) ascribed to it. However, growth in this sector has slackened over the past year to 3.2% compared to 5.2% in 2006 and 4.6% in 2005. (*Statistics South Africa, Gross Domestic Product annual estimates 1994-2007, first quarter 2008*). Not only is it important to sustain the contribution to GDP from the manufacturing sector, it is likewise important to sustain its growth if South Africa is to achieve its economic growth target of 6% per annum in GDP by 2010.

Whilst the aforementioned strategies provide a comprehensive policy framework for promoting advanced manufacturing technology in South Africa, they depend largely on the responsiveness of industry towards exploiting the new technology platforms for economic gain. For the manufacturing sector to realise its growth potential, it needs the support of a strong and coherent industrial policy, with effective levers for growth.

The National Industrial Policy Framework (NIPF) is Government's policy response, aimed at setting South Africa's industrialisation strategy towards 2014 and beyond. Although the NIPF aims to promote all sectors of the economy, it has identified advanced manufacturing as one of five sectors in which major opportunities for economic growth lie.

The NIPF focuses on identifying and addressing the cross-cutting and sector-specific constraints and opportunities prevailing in the industrial economy through thirteen strategic programmes, illustrated in Figure 2.1 below. The Department of Science and Technology will be required to play a crucial role in many of these strategic programmes, namely *Innovation and Technology, Skills and Education, Spatial Industrial Development, Industrial Upgrading Programmes and Leveraging Public Expenditure*.

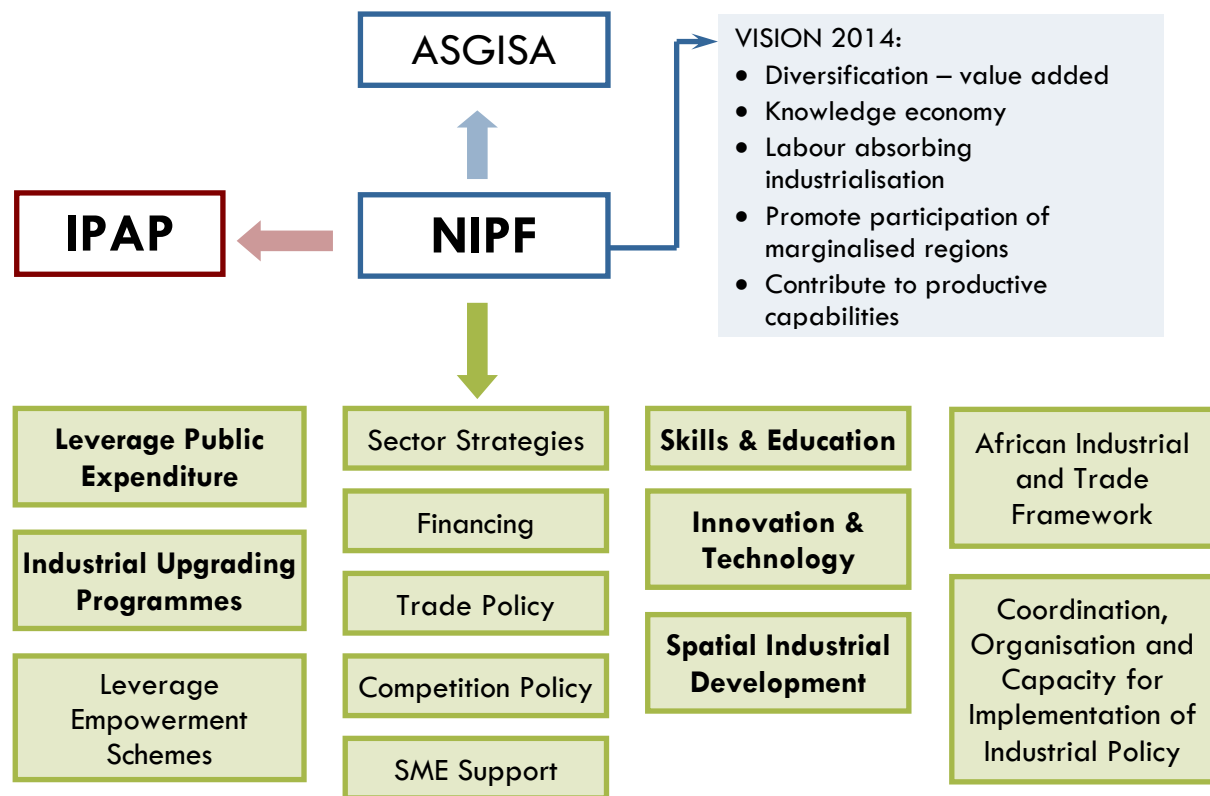


Figure 2.1 The NIPF and its thirteen strategic programmes.

In line with the NIPF, the Industrial Policy Action Plan (IPAP) reflects a set of priority sectoral actions which are ready for implementation. These actions fall within four lead sectors that have emerged as high potential sectors for economic growth: Capital/Transport Equipment and Metals; Automotives and Components; Chemicals, Plastic Fabrication and Pharmaceuticals; and Forestry, Pulp and Paper, and Furniture. The IPAP further reflects the implementation of other substantive sector projects in: Diamond Beneficiation and Jewellery Manufacture; and Agro-processing; amongst others, and also suggests the development of further strategy work in: Mining and Minerals Beneficiation; Agriculture and Agro-processing; ICT (services and products) and Creative Industries and White Goods.

The importance of technology and research in realising the sustainable competitiveness of the IPAP priority sectors has prompted the Department of Science and Technology to pay particular attention to the prioritisation and alignment of its innovation missions and programmes in this area. Although substantial synergy has already been achieved, as depicted in Figure 2.2, a next level of engagement is warranted for directed economic impact and substantial economic growth.

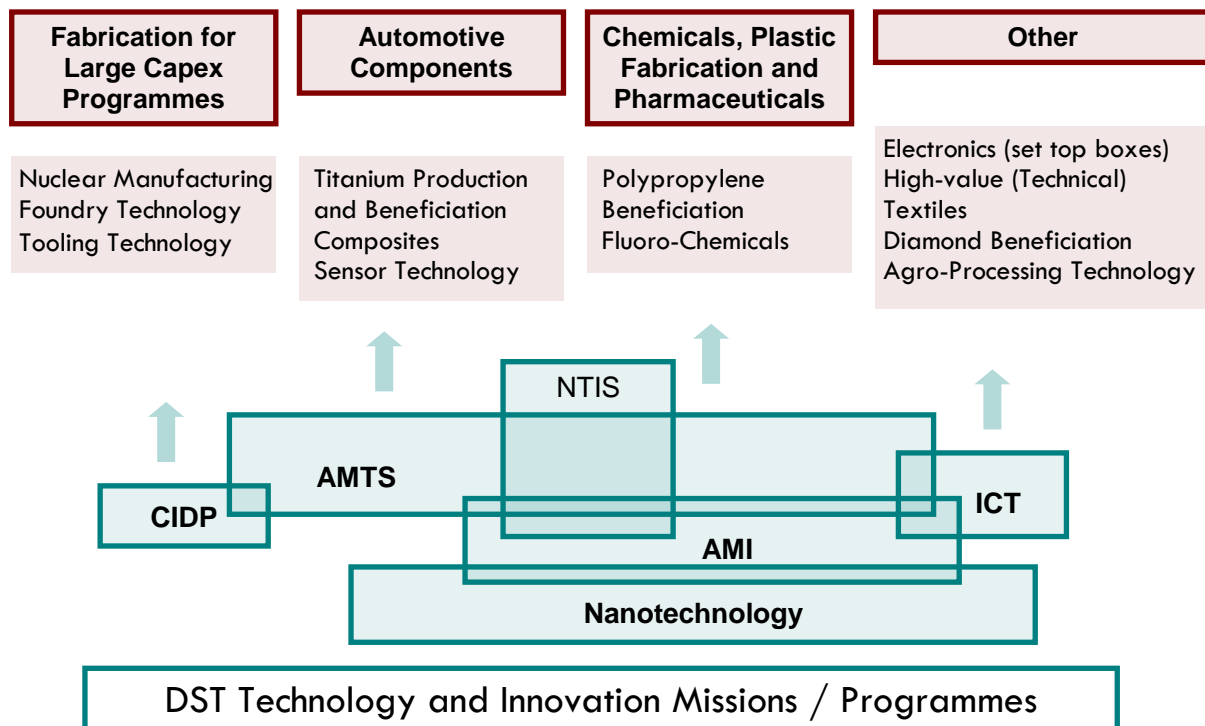


Figure 2.2 Alignment of DST's Advanced Manufacturing and related programmes with the Industrial Policy Action Plan.

A significant aspect of the new industrial policy relates to the leveraging of public expenditure programmes for economic growth over the next 20 years in particular. Large-scale plans are being developed and implemented to both upgrade and install new infrastructure (electricity, rail and ports), as well as for broader expenditure plans in areas related to ICT, health, housing, etc.

On the back of this massive investment arises a major opportunity to leverage public expenditure by ensuring that domestic firms are sufficiently competitive to capture significant portions of this public expenditure. It is clear that creating an impact in this regard will entail substantial coordination between public procurement managers and potential suppliers, amongst firms that can potentially form supply consortia, and between Government departments, particularly linking DTI's Customised Strategy Programmes (CSPs), the Department of Public Enterprise's expenditure plans and the Department of Labour's training plans, amongst others.

2.2 Government Localisation Initiatives

The major State Owned Enterprises (SOEs) are set to embark on large-scale infrastructure recapitalisation and expansion programmes over the next 20 years and beyond. Currently, to a large extent, technology is procured from foreign suppliers, linked to global and company strategic sourcing practices. It is clear that localisation of supplies to the major SOEs offers a massive economic opportunity for the South African manufacturing and related industries. However, the industries lack the competitiveness necessary to enter the supply chains of the SOEs. These competitiveness factors not only include price, quality and delivery expediency, but also the innovation capability (knowledge generation capabilities, technology levels, skills levels, networking capabilities, leadership and organisational capabilities, etc) necessary to sustain competitiveness.

The Competitive Supplier Development (CSD) Policy

In January 2007, Cabinet approved the CSD policy. Until then, SOEs had to comply with the National Industrial Participation Programme (NIPP) managed by DTI. The new dispensation means that SOEs may use the CSD policy instead, as an alternative method of achieving the goals of the NIPP.

In terms of the CSD Policy, DPE and the SOEs established the Competitive Supplier Development Programme (CSDP), with the aim of increasing the competitiveness, capacity and capability of the local supply base. The participation of DST and DTI are critical to the success of the CSDP.

Improving the capacity and competitiveness of the local supply base will also contribute to the ASGISA goals of shared growth, employment creation, poverty reduction, skills development, and Broad-Based Black Economic Empowerment (BBBEE). Consumers' spending power will increase due to electricity and transport being cheaper than it would have been with more expensive suppliers, and SOEs purchasing more locally will result in increased employment. The sustainability of this employment will also be enhanced through the development of more competitive employment-enhancing local industries.

The CSDP consists of demand-side and supply-side measures aimed at increasing the capacity, capability and competitiveness of the local supply base. SOEs are largely responsible for the demand-side measures. Industry and Government are largely responsible for the supply-side measures. On the demand side, the focus of the Programme is on fostering a culture in the SOEs that focuses on long term supplier network development and win-win partnerships with suppliers to achieve best value for money over the product life-cycle (as opposed to lowest initial cost).

The primary demand-side measures are:

- (a) The development by SOEs of Supplier Development Plans (SDPs) which identify items for which local supply could be expanded or developed or improved, and for setting targets in this regard; and
- (b) The use of planning, specification, procurement and strategic sourcing by SOEs as instruments to achieve the targets in the supplier development plans and to create a conducive environment for the development of local supply networks.

These demand-side measures will require SOEs to develop internal capacity and capability to deal with medium to complex Supplier Development deals. Supplier Development is an advanced skill in supply chain management. An Integrated Capacity and Capability Procurement Programme (ICCPP) will be instituted for the development of capacity, capability and professionalism in the SOEs’ supply chain management systems.

The supply-side measures involve mobilising and providing support to the supplier industries targeted in the supplier development plans, to assist them to develop the capacity and capability to respond competitively to the demands of the SOEs. Local supply industries have lost key capabilities and skills, especially since SOEs have not built any major infrastructure in recent decades. The local suppliers have not adequately invested in plant and technology to meet the SOEs’ latest requirements. There is therefore a need for supplier support and development initiatives, such as the introduction of supplier benchmarking systems, skills development initiatives, access to finance, and funding for technology development as well as process and competitiveness improvement programmes.

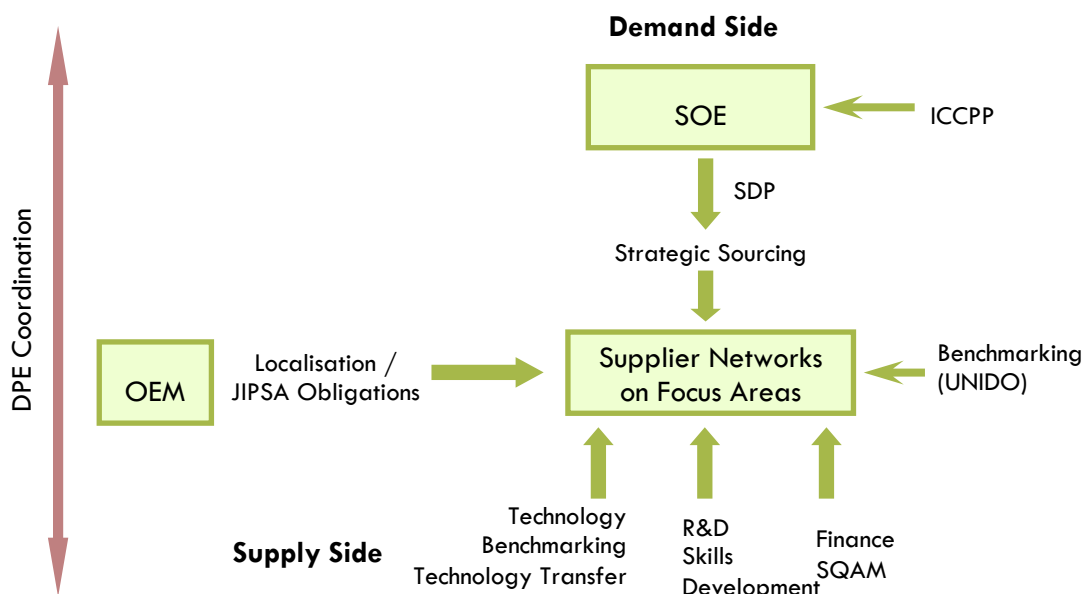


Figure 2.3 The CSDP – Supply Side and Demand Side Measures.

DST’s role in the development of supply side measures will essentially be to address the innovation and innovative capabilities of the local suppliers. As illustrated in Figure 2.4 in the case of precision casting capabilities in the Foundry Industry, this would involve a range of

interventions channeled through an innovation network. A comprehensive list of measures is given later in Section 5.

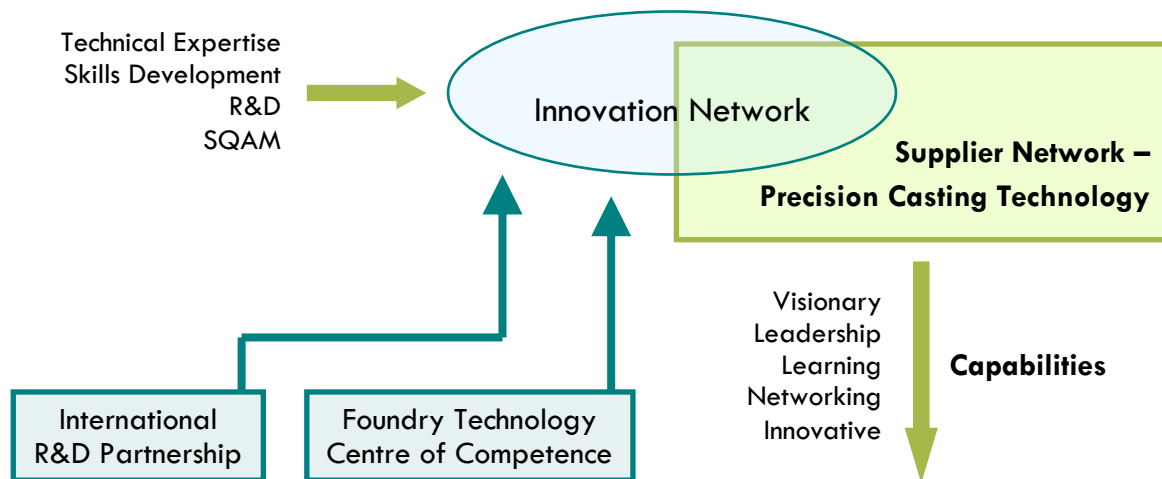


Figure 2.4 The CSDP – DST-type Supply Side interventions.

The Supplier Development Plan

The CSD Policy also resulted in the following obligations to SOEs participating in the CSDP:

- (a) To submit Supplier Development Plans (SDPs) to the Government within a year of formally informing Government of an intention to utilise the CSDP rather than the NIPP (National Industrial Participation Programme);
- (b) To consult with the relevant sector teams within DTI during the process of drawing up the SDPs, to ensure that the contents of the plans are in line with the sector strategies of DTI;
- (c) To consult with industry during the process of drawing up the SDPs.

Supplier Development Plans are long term plans to achieve supplier development goals based on an assessment of opportunities and constraints. The SDPs have to contain the following:

- Capital and operational spend analysis (all tiers)
- Supplier industry and supply market analysis (local and global supply and demand, strengths and weaknesses and opportunities)
- Priority areas for intervention
- Targets for increasing competitiveness, capacity and capability of the local supply base
- Key Performance Indicators and delivery milestones

In addition, SDPs have to illustrate an incremental approach in developing the local supply base and have to be updated periodically.

The process of supporting the development of the SDPs demands that Government undertakes studies and develops strategies and support interventions that will contribute towards growing the various supplier industries and leveraging sector capabilities into world-class competitive offerings. Strengthening the local supplier base would:

- provide security of supplies to the SOEs;
- enhance the participation of South African firms in the huge capital expenditure programmes, thus increasing the multiplier effect in South Africa and hence the contribution to GDP;
- reduce the requirement for foreign exchange outflows;
- provide a platform from which the local supplier industries can export niche offerings;
- shorten the lead times for product delivery to SOEs, thereby improving the availability of capacity to meet end-user demand.

Owing to the technological element of the SDPs, the SOEs have recognised the importance of DST's involvement, both in the process of developing the SDPs and in the process of implementing the SDPs.

3. LOCALISATION OPPORTUNITIES LINKED TO DST PROGRAMMES

3.1 Capital Expansion Programmes of Eskom and Transnet

Eskom

In February 2007, Eskom agreed to implement the CSDP. Prior to this, Eskom implemented the National Industrial Participation Programme (NIPP) of the Department of Trade and Industry (DTI). Whereas NIPP obliged Eskom's suppliers, for imported contracts over \$10 million, to invest 30% of the imported contract value (or the equivalent in offset credits) in industries not necessarily related to the Power Industry, the CSDP will oblige suppliers to involve the participation of local suppliers within the Power industry including related supplies. Eskom aims to spend in the region of R1.3 trillion up until 2025 on new power infrastructure.

Eskom will deliver its infrastructure investment programme through procuring goods and services from both local and global suppliers. Global suppliers are used for products and services which are only available overseas, or when there are problems with the capacity, capability and competitiveness of the local supply base. Eskom, together with Government, will take the opportunity to develop a local supplier base which would not only have the advantage of lowering Eskom's costs and increasing its competitiveness as a world-class power supply company but also increase revenue and employment within the broader South African economy.

Eskom's CSDP aims to leverage its R1.3 trillion expenditure to develop competitive National supplier industries and to build export capabilities. Coupled to this, increased global demand for power technologies provides scope for South African suppliers to increase their capacity and capability and to compete successfully in both local and global markets. This implies that price premiums will not be factored into the SDPs. Besides leading to added cost to consumers, it will not lead to the development of a globally competitive supplier industry and hence access to global OEM supply chains.

Research by DPE has indicated that a modest increase in the contribution of South Africa's own local industry to Eskom's capital programme will result in a large increase in the contribution of the capital expenditure programme to economic growth. The Power cluster is expected to stimulate in the order of R1 trillion in Gross Domestic Product (GDP) contributions. In addition, it could result in an improvement of R170 billion in exports and create about 66 000 jobs, depending on the realisation of the desired local spend targets.

Other advantages to the localisation of supplies to Eskom include: (a) removal of exposure to foreign currency fluctuations in terms of pricing, (b) lower stock level requirements, (c) greater responsiveness, (d) ease of communication, (e) shorter delivery times, (f) being part of an industrial cluster and (g) increased potential for collaborative partnerships and innovation for local conditions.

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Within the next twenty years Eskom will build nuclear capacity of 20000 MW of which 16000 MW will be extracted from power plants consisting of Pressurised Water Reactors (PWR) technology and 4000 MW will arise from power plants consisting of Pebble Bed Modular Reactor (PBMR) technology. Eskom will build a further 20000 MW of capacity of which 18000 MW will arise from coal-based power technology and 2000 MW arising from a mixture of other types of advanced technology including renewable energy.

Table 3.1 Eskom's list of categories and items for procurement

Category	Description	Import Content			
		Nuclear Tech	Coal Tech	Trans & Distribution	Advanced Tech
R&D / Design	Design	80%	100%		80%
Construction (EPC)	Civils Project management Erection	10%	40%	5%	
Structural steel	Rebar Columns	20%	20%	10%	
Fabricated steel (3 types of processes – forging, casting and rolling. Includes finishing and machining)	Electric motors Pipes Tubes Hot gas ducts Condensation extraction	80%	80%		
Forging	Turbine rotors, blades and casings Valves Reactor pressure vessel (RPV) Pre/intercooler and tube plates PBMR recuperator head Inlet and outlet pipes for RPV	80%	90%		
Pipe manufacture and bending	3 processes (pipe milling – welded and seamless pipes, prefabrication and bending).	60%	80%		
Component manufacturing	Metal and plastics conversion Assembly of small components.	100%	80%		
Batch assembly	Assembly of large components	100%	100%		
Cables and Conductors		0%	20%	10%	
Electrical components	Switchgears, transformers	50%	50%	45%	
Electronics and Instrumentation	Control and safety	80%	100%	80%	
Services	Routine maintenance	35%	35%		

Table 3.1 also shows an analysis of import content. Design seems to be located mainly outside SA for both nuclear and coal based power plants - opportunities for localisation exist in design of plant and components (if licensing agreements can be made with patent holders). Other efforts to localise manufacturing should take place around fabricated steel, forging, pipe manufacturing and bending, component manufacturing (including assembly of small components), batch assembly (assembly of large components) and electronics and

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instrumentation. The spend analysis in these and other categories of procurement are listed in Table 3.2 below.

Table 3.2 Eskom's spend analysis for its capital expenditure programme

Category	Coal power (R billion)	Nuclear power (R billion)	T&D (R billion)	Advanced Technology (R billion)	Total capital (R billion)	Total (adding 20 yrs of replacement and O&M spend) (R billion)
Construction	73	119	55	0	247	258
R&D / Design	41	12	0	45	98	114
Structural steel	70	11	18	0	99	111
Fabricated steel	71	58	0	0	128	172
Forging	21	43	0	0	64	71
Component manufacturing	39	17	0	0	56	116
Cables and conductors	0	5	73	0	78	90
Electrical components	36	9	85	0	130	165
Batch assembly	38	11	0	0	49	61
Pipe manufacturing and bending	40	5	0	0	45	75

Eskom will support a partnership model with established local and global suppliers as well as possible new entrants in developing local manufacturing capacity. This involves a procurement process that gives full credit in any aspect of the scoring process to partners of at least 25% participation in local manufacturing initiatives when evaluating potential suppliers in the procurement process. It will continue to score the price and technical specifications of supplies at about 80%, allowing for 20% scoring towards technology localisation within the context of the CSDP.

Transnet

Transnet's capital expenditure over the next five years will be at an unprecedented high level. This will require the focus of numerous Transnet resources to ensure the successful achievement of these expenditure targets, as it is of critical importance to the country that these capital expenditure targets are met. Failure to meet these targets may result in economic infrastructure constraints limiting the achievement of Governments' overall growth initiatives and Transnet's service improvements.

Similarly to Eskom, Transnet gave formal notification to participate in the CSDP. It has estimated an expenditure over the next five years of at least R76 billion, including both capital and operational expenditure. Within the CSDP, it will focus on those opportunities that emerge as part of the expenditure programme's capital equipment. The major projects (and equipment purchases) are listed below.

Table 3.1 Transnet's list of capital expenditure projects

Category	Description
Rolling Stock	Upgrade of 100 GM diesel locomotives Upgrade of 100 GE Electric Locomotives 400 new locomotives 7000 new wagons Replacement of On-Trac machines
Infrastructure	Coal Line expansion to 86 million ton per annum Ore Line expansion Eskom – Majuba coal supply Coega Line Substation upgrades
Pipeline	New Multi-Purpose Pipeline (NMPP) from Durban to Johannesburg to replace current line
Port Equipment	Straddle carriers Rubber Tyred Gantries (RTGs) and cranes Ship to Shore (STS) Cranes Reclaim / reach / mobile stackers Rail siding cranes Haulers and trailers Forklifts Tug Boats Dredgers

Within these existing and new capital expansion projects, Transnet has recognised a number of localisation opportunities, categorised as follows:

Local Expansion (creating local business in the short term to meet contract obligations and possible exports). This type of opportunity will occur when a supplier, based on the increased Transnet spend, is able to expand their current capability to not only meet the Transnet requirement but also to take on other customers. It will mostly involve a foreign company partnering and investing with a local (preferably empowerment status) entity. Technology localisation opportunities include wheels testing; straddle carriers and RTGs; and GBF locomotives.

Increased Export Capacity (local business expansion to meet contract obligations and exports). In this instance, a local manufacturer can expand its capacity to provide Transnet requirements and foreign demand. This will usually be carried out at the company's own expense and risk. Technology localisation opportunities include pipeline pipe and tool manufacture.

OEM Manufacturing (local manufacture of OEM parts for export). This opportunity is specifically aimed at promoting local businesses as offshore suppliers of choice for OEM companies. Transnet would broker deals with foreign suppliers to partner with local manufacturers who are capable of competitively manufacturing their capital equipment spares under licence, thus ensuring local source of supply for spare parts and an increased export base. Technology localisation opportunities include parts for GBF locomotives.

Optimising NIPP Obligations (finding alternate solutions that are industry related). Seven of Transnet’s suppliers, including Alstom, Kalmar, Mitsui and Liebherr, have NIPP obligations with the DTI, based on past Transnet contracts for imported manufactured goods. In conjunction with the DTI, Transnet will be developing a model for unwinding and/or implementing solutions to meet these NIPP obligations and incorporate subsequent CSDP programmes, without duplication of obligation. Technology localisation opportunities relate to straddle carriers and RTGs; and ore/coal line locomotives.

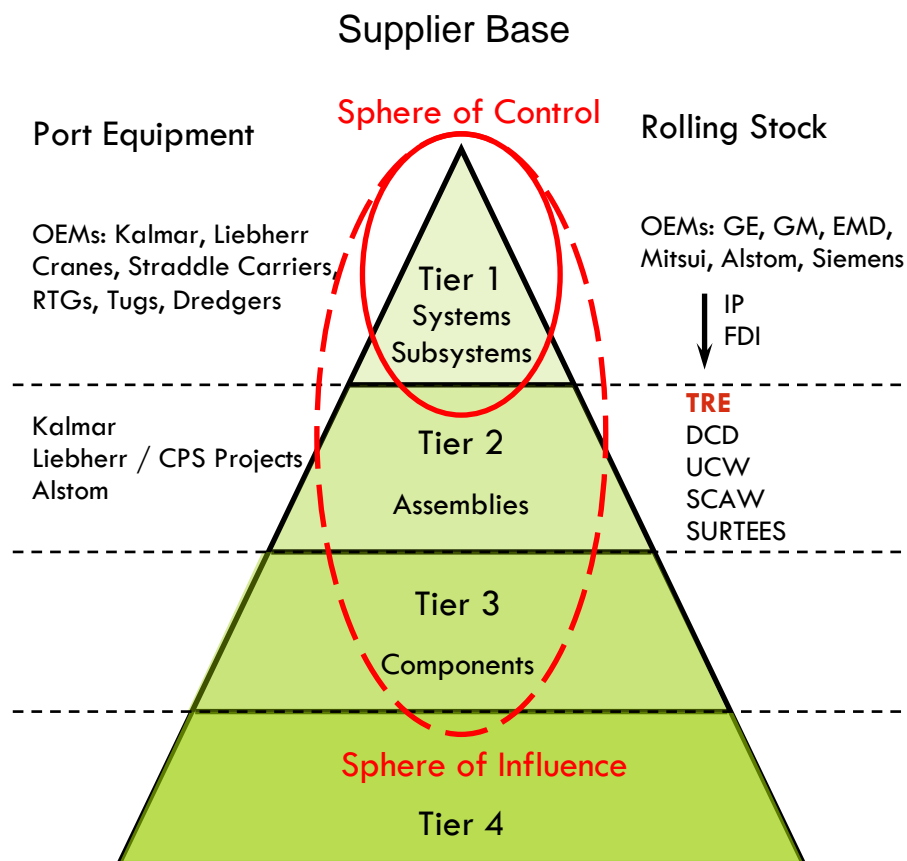


Figure 4.1 Transnet Supplier Base.

Transnet intends to use its direct *sphere of control* to contract with OEMs as first tier suppliers. By including CSDP requirements into tender documents for prioritised focus areas, Transnet will be stretching its *sphere of influence* to reach second tier suppliers (OEMs’ first tier suppliers). Examples of CSDP related requirements, which Transnet could utilise in tenders to influence OEMs to develop innovative proposals on ways to increase the localisation of their supply chains, could include, amongst others:

- Aligning OEMs with appropriate second tier suppliers;
- Defining the degree of localisation and the role that Transnet Rail Engineering (TRE) should play in the manufacture / assembly / maintenance of the equipment;

- Recommending that second tier local suppliers participate in supplier benchmarking, as part of their commitment to continuous improvement, thereby increasing OEM buyers' visibility of local suppliers' capabilities, and enabling OEMs to broaden their supply base on a more scientific basis, while increasing their security of local supply; and
- Requiring that chosen second/third tier local suppliers should be contributors to Broad-based Black Economic Empowerment (BBBEE) by predefining acceptable BBBEE contribution levels in terms of DTI's Codes of Good Practices.

3.2 Active Pharmaceutical Ingredients (APIs) and Antiretrovirals (ARVs)

The Pharmaceutical Industry is characterised by a limited capacity in the manufacture of Active Pharmaceutical Ingredients (APIs), chemicals used in the manufacture of drugs. Local manufacture of APIs is almost non-existent. The situation with Antiretrovirals (ARVs) is even worse - there is no local ARV production capability.

The localisation of API and ARV manufacture has been identified as a possible economic growth area, linked to major procurement opportunities from the Department of Health (DoH) and the private hospital groups. The establishment of an SOE within the pharmaceutical industry has been proposed to National Treasury by an inter-Governmental task team from DoH, DTI and DST.

Localisation of API and ARV manufacture could also lead to export opportunities, especially within the African continent.

3.3 Mining Capital Equipment

In the mining and minerals processing industry, the local capital equipment and metal fabrication sectors have developed important capabilities. Technological leadership has been achieved in a range of niche areas related to capital equipment for the mining sector, such as valves and pumps.

However, in general, these sectors have underperformed for a variety of reasons. These include:

- Low levels of expenditure on public infrastructure in transport and energy over the last three decades
- Uncompetitive pricing of raw material inputs such as steel and aluminium
- Lower than optimal mining infrastructure investment

The public expenditure programmes will not only improve public infrastructure, thereby impacting positively on the mining industry, it will also stimulate the development of the metal

component and fabrication industries, and in the process develop a more competitive supplier base to the mining and minerals processing industry.

As indicated in the NIPF and IPAP, there is a major opportunity to develop and grow these local suppliers and the mining industry on the back of the public expenditure programme in energy and transport (in addition to the current minerals boom). There is also good opportunity to further build and strengthen capabilities for technological leadership.

Companies in the mining and minerals industry generally need to adopt more efficient (water and energy) and environmentally-friendly production systems. A systematic drive to develop both the scale and depth of skills across these types of production systems will be required. This includes supportive technological infrastructure such as tooling and casting facilities, providing opportunities for local supplier technology development and upgrading. Systems to support longer term research, product development and innovation must be strengthened.

This will require a coordinated effort by the mining industry to institute demand-side measures for the development of local suppliers of equipment, such as valves and pumps, as well as tooling and castings. This effort can be stimulated through the new legislative and regulatory framework for mining and minerals. This new framework was mainly aimed at opening the door for historically disadvantaged South Africans to participate in the industry. The Mineral and Petroleum Resources Development Act of 2002 (MPRDA), which came into effect in May 2004, the Precious Metals Act of 2005 and the Diamond Second Amendment Act of 2005 created a new dispensation around licensing, ownership and industry practices. Added to this, the Mining Charter provides a framework to guide mining companies to comply with the new legislative framework. This includes leveraging mining investments and expenditure to realise localisation opportunities.

MINING CHARTER

In terms of procurement from local manufacturers/suppliers, the Mining Charter states that: Stakeholders must undertake to give historically disadvantaged South African (HDSA) companies a preferred supplier status, where possible, in all three levels of procurement: capital goods, services and consumables.

To this end, stakeholders undertake to:

- Identify current levels of procurement from HDSA companies;
- Commit to a progression of procurement from HDSA companies over a 3 to 5-year time frame reflecting the genuine value added by the HDSA provider;
- Encourage existing suppliers to form partnerships with HDSA companies, where no HDSA company tenders to supply goods or services; and
- Commit to help develop HDSA companies' procurement capacities.

3.4 ICT

The Government procurement programme for information and communications technology, to be implemented by the State Information Technology Agency (SITA) involves four mega projects:

- E-Government – systems for providing Government services online.
- Integrated Financial Management System - Transversal system for human resource, financial, asset and logistics management.
- SMS - Large scale procurement of personal computers (desktop and laptop).
- Identification (Who am I online) – system for integration into the Automatic Fingerprint Identification System.

These projects will provide major opportunities for technology localisation in areas such as:

- Assembly of personal computers
- Manufacture of smart-chip based products such as electronic passports, drivers licenses and smartcard IDs
- Free and Open Source software development
- Development of systems for Information Security
- Development of Mobile Applications and Communication Systems

Besides the Government procurement programme, a set of major private sector procurement programmes will also provide opportunities for technology localisation. These include the procurement of telecommunications equipment and infrastructure by Infracore and Neotel, the procurement of undersea cables, and the procurement of multimedia systems by the film industry.

3.5 MeerKAT

MeerKAT, a precursor to the Square Kilometer Array (SKA), will be one of the world's premier mid-frequency radio astronomy facilities that will put South Africa at the cutting edge of radio astronomy. The telescope will be constructed in phases:

- The first phase, a one-dish prototype, has already been constructed at the Hartebeesthoek Radio Astronomy Observatory (HartRAO) in Gauteng.
- KAT-7, a seven-dish engineering testbed and science instrument near Carnarvon in the Northern Cape Province, will be commissioned towards the end of 2009.
- The full array of 50 or more dishes should be ready to do science by 2012. A high speed data transfer network will link the telescope site in the Karoo to a remote operations facility.

The South African Government, through DST, has committed R860 million to the SKA effort in South Africa, which includes the design and construction of MeerKAT. This expenditure can be leveraged for a range of high technology localisation opportunities, which include:

- Concentrating Solar Power (CSP) and Photo-Voltaic (PV) Technology to supply power to the radio telescopes
- Design and manufacture of composite dish structures
- Design and fabrication of structural elements for the radio telescopes

These technology localisation opportunities could be linked to existing strategic research and technology initiatives. This includes the initiative to develop a fully biodegradable natural fibre-reinforced composite for aerospace applications currently supported under the AMTS. Furthermore, these technology localisation opportunities could be linked to other market demands, especially in the case of solar energy applications.

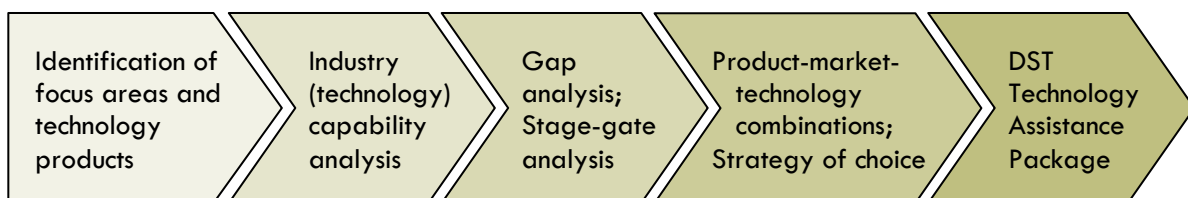
4. PROTOCOL FOR ENGAGING LOCALISATION OPPORTUNITIES

DST's role in the CSDP, and indeed in other technology localisation initiatives, is complimentary to those of DPE and DTI, as articulated before. DPE's coordinating role between demand-side and supply-side is seen as essential in building SOE capacity, systems and capability in supplier development. On the supply-side in particular, DPE's role in coordinating the development and piloting of the supplier benchmarking system is key in ensuring an effective supplier development approach to the procurement practices of SOEs.

DTI's role in ensuring compliance by SOEs with the requirements of the CSDP, especially in terms of their SDPs, will be necessary to ensure that SOEs and their suppliers are committed to a programme of lower-tier supplier development. More importantly, a special focus on CSDP-related deals will be required in applying its range of incentives and assistance programmes for supplier development (such as recapitalisation of capital equipment for manufacturing).

This, together with the range of DST-supported supply-side measures for addressing the innovation capabilities of the local suppliers, will form the range of interventions aimed at supplier capability development. The approach will be systematic, informed by the supplier benchmarking programme.

The establishment of a clear roadmap for DST's role in the CSDP is necessary for developing a synergistic and complimentary partnership with other role-players in mobilising localisation opportunities. The key elements of this roadmap are presented below.



- *Opportunities for Technology Localisation – identification of Focus Areas and Technology Products*

The focus areas for intervention are generally identified through consideration of the results of both the expenditure analysis and the supplier industry analysis established in the SDPs. This includes areas in which there is a lack of competitiveness in the local supply base or in which there is a need to increase the security of supply. It involves identifying technology products which are currently imported for which there appear to be comparative advantages for local supply. Other factors include:

- High spend / high value products, allowing for strategic focus with high impact
- Products for which global demand is increasing and there is potential for exports

DST Technology Localisation Plan

- Products for which the cost structure of local supply is potentially competitive with the cost structure of competing global suppliers
- Products for which market failures appear to be preventing investment
- Products for which local supply could be made more competitive or viable through realistic demand-side or supply-side interventions
- Products for which there is repetitive spend over time (to create sustained local demand)

All this, in essence, represents a pre-feasibility on the identified opportunities for technology localisation.

- *Industry (Technology) Capability Analysis*

The analysis of the technology capability of the supplier industry is crucial in determining the possible level of participation in the supply chain. This allows the positioning of the supplier industry, both at supplier network and cluster levels, within the global competitiveness ladder, and the technology-based interventions required to migrate to higher levels of competitiveness. The capability analysis will generally involve two parameters – Technology Design Capability and Manufacturing Capability – as depicted in Figure 4.1.

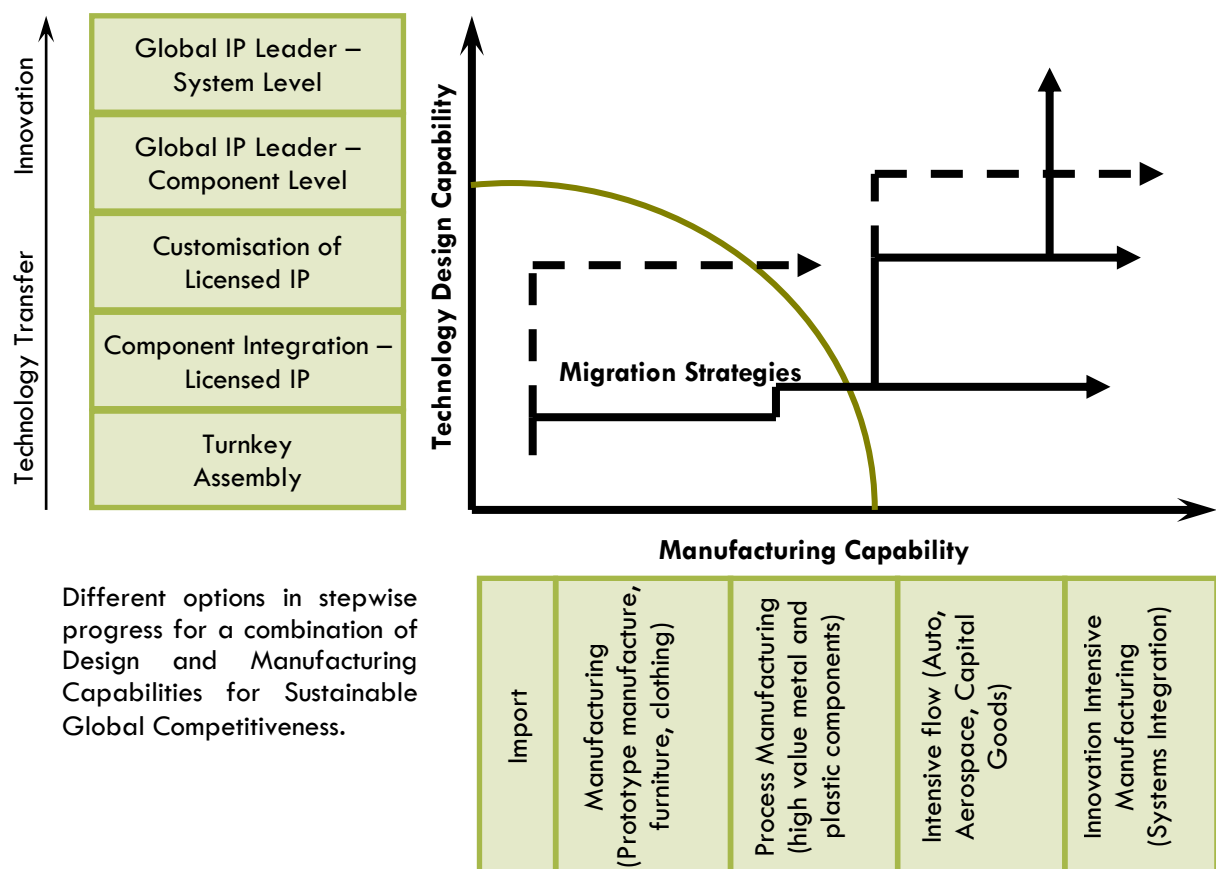


Figure 4.1 Capability Scorecard for Sustainable Global Competitiveness.

The input parameters for the capability analysis depends on the type of industry sector, such as those related to product and process innovation. Effectively, these parameters reflect the innovation capability of the industry or supplier networks.

Certain of the parameters, though, will be common across industry sectors. These refer to the innovative capability of the industry or supplier networks – that is, networking capability, learning capability, leadership, and the capability to gain access to new markets and global supply chains. Systems such as the Rapid Appraisal of Local Innovation Systems (RALIS) and the Regional (or Sector) Development Platform Method could be used to establish the innovative capability of the supplier industry or networks.

- *Gap Analysis*

In addition to the technology capability analysis, a more comprehensive gap analysis is essential in determining the overall propensity of the industry and supplier networks for sustainable global competitiveness. A list of the more pertinent technology and manufacturing related competitiveness parameters are given in the table below.

Tech	Difficulty in Hiring Foreign Labour
Tech	Graduate Standard
Mfg	Government Regulations for Manufacturing
Mfg	Impact of Domestic Trade Barriers
Tech	Technology Absorption Readiness
Mfg	Labour Legislation
Mfg	Logistics Infrastructure Quality
Tech	Intellectual Property Protection
Mfg	Decentralisation of Corporate Activity
Tech	Access to Venture Capital Funding
Mfg	Degree of Customer Orientation
Mfg	Impact on Renewable Resources
Mfg	Compliance with Environmental Management Systems

- *Stage Gate / Propensity Analysis*

The industry capability analysis and gap analysis would provide a good platform for assessing the overall propensity of the industry, at both cluster and supplier network levels, to gain global competitive advantage. Added to this would be a global competitor analysis.

For those industry sectors or technology products which appear to have potential for interventions, further research on local and global supply and demand may need to be carried out. For example, an upstream industry such as the foundry industry supplies other customers in addition to the SOEs, such as the mining and automotive industries. In order to assess the potential viability of local manufacture of an item by the foundry industry, it would be necessary to estimate the total potential local demand. In addition, viability would be

influenced by the potential for exports, which would require an assessment of global supply and demand.

The following questions may assist in bringing the expenditure and demand analyses and the capability and gap analysis together to finalise the focus areas / technology products for demand-side or supply-side interventions:

- (a) Is demand stable and sufficient to sustain local industry?
- (b) Which local supply industries are currently marginally competitive (i.e. they could be upgraded more quickly and cost-effectively than non-marginal local industries)?
- (c) Is the cost structure of local supply potentially competitive with global supply?
- (d) Are the causes of the market's failure to invest in a seemingly viable local supply opportunity potentially rectifiable through demand-side or supply-side interventions?
- (e) Can local supply be made more viable through realistic demand-side or supply-side interventions?
- (f) What kind of interventions could address a lack of competitiveness in a local supply market?

- *Product-Market-Technology Combinations*

Based on the information gathered in the aforementioned analysis, viable business opportunities can be identified, representing the best match between (a) a technology PRODUCT, (b) (SOE) expenditure / local and global MARKET demand, and (c) industry strengths and capability ratings, together with the identified TECHNOLOGY gaps for sustainable global competitiveness. These business cases are defined as PRODUCT-MARKET-TECHNOLOGY combinations.

- *Strategy of Choice*

The strategy of choice linked to a viable business case will define the actions and interventions required to migrate the identified supplier network to a position of sustainable global competitiveness. An important part of this process involves the prioritisation of the gaps. Related to this are the supply-side and demand-side interventions/measures necessary to address these gaps. These measures are based on a commitment by companies to a Continuous Improvement Plan, against which the support measures will be evaluated.

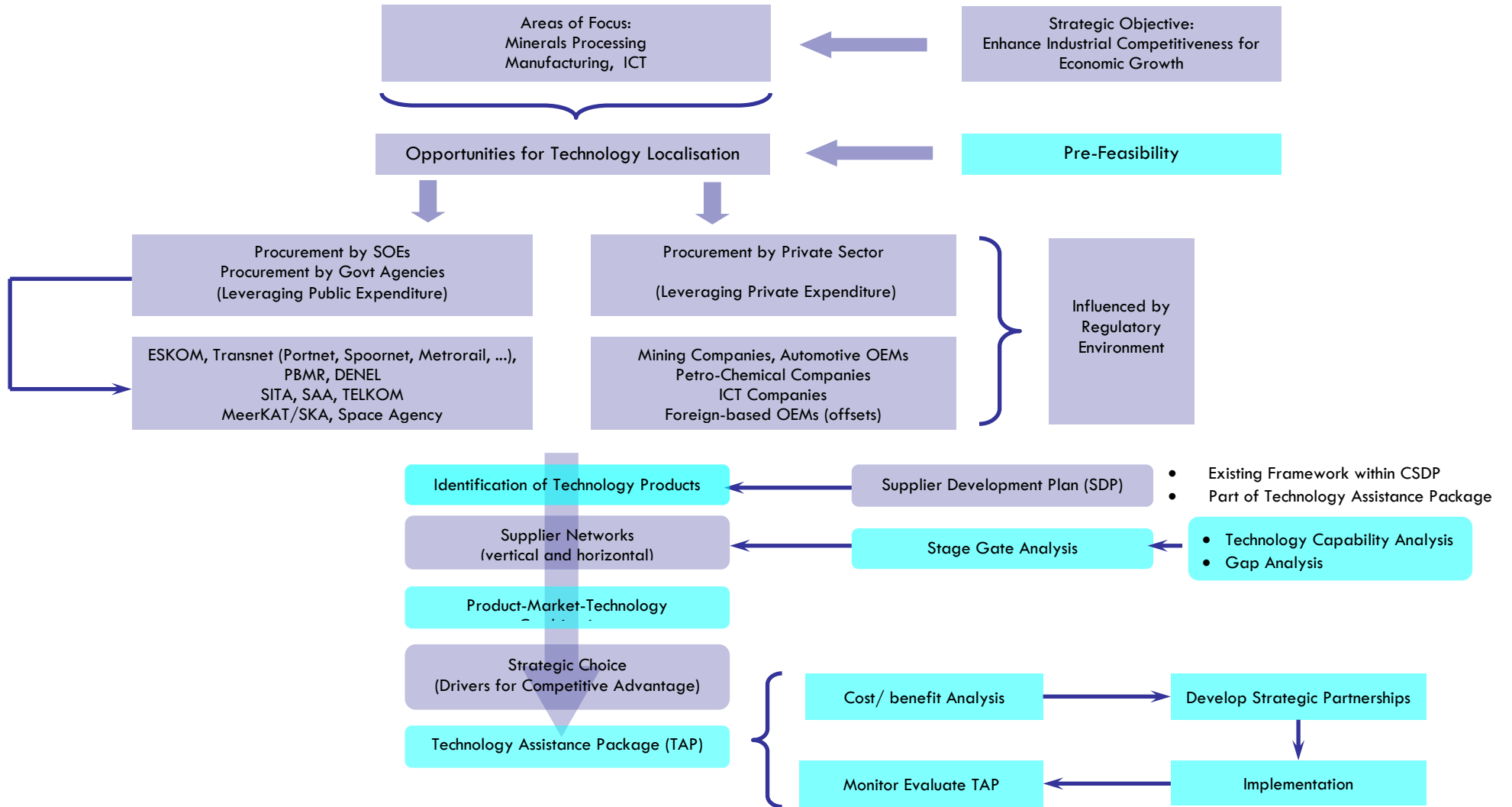
- *Technology Assistance Package (TAP)*

The business case established for a particular supplier network, together with the strategy of choice, will enable a portfolio of interventions and associated investments to be structured. These supply-side interventions can operate at both levels: cluster level (anchor investments that will enable a new value chain, such as a shared technology facility), and company or supplier network level (continuous productivity and quality improvements; technology development, etc).

A DST Technology Assistance Package (TAP), for the migration of the industry cluster or supplier network to a new level of competitiveness, can then be structured. TAP will include the allocation of funding and other resources, and will specify processes with respect to implementation, monitoring & evaluation. It will enable the development of strategic partnerships. A range of possible elements of TAP is given in the next section. Since TAP focuses on technology capability development, it forms only part of a wider range of supply-side measures. Therefore, synergy with other supply-side supporting structures will be vital for the success of TAP.

DST Technology Localisation Plan

Figure 4.2 PROTOCOL FOR DST ENGAGEMENT IN LOCALISATION INITIATIVES



5. DST SUPPLY SIDE MEASURES

The DST Technology Assistance Package (TAP), Figure 5.1, is structured to ensure that participating companies will derive a high degree of understanding of their technology capabilities benchmarked against global competitors, and that they will have a clear understanding of what DST can provide by way of support to achieve the ambitions of higher technology capabilities. Companies will have to subject themselves to ‘benchmarking’ evaluations to participate in the TAP.

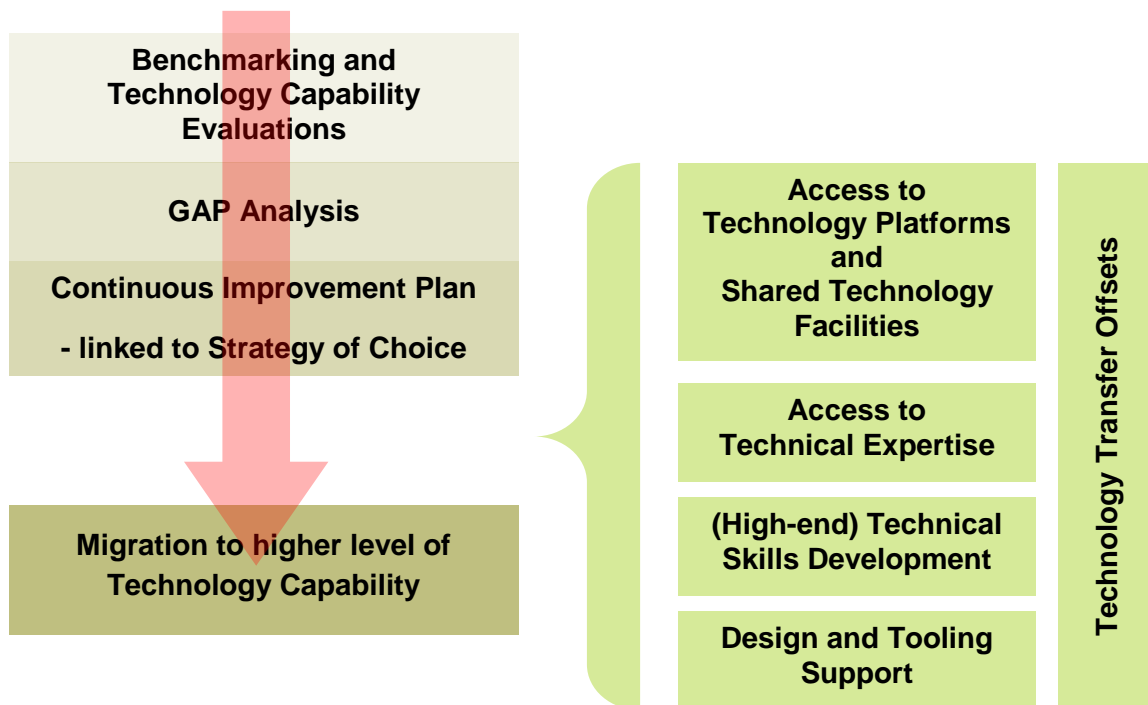


Figure 5.1 Integration of the elements of DST's TAP (supply-side measures).

5.1 Benchmarking and Technology Capability Evaluation Services

Of importance to the local industry is the opportunity, within the local content prescriptions of the SOEs' tenders and in accordance with their SDPs, to gain access to the supply chains of OEMs. This can be achieved through participation in the benchmarking programme and commitment towards a process of continuous improvement. This process is aimed at developing the ability to deliver (through leveraging of productive and technological capabilities) according to specifications, and the ability to provide total life-cycle support.

The overall benchmarking programme of the CSDP is a collaborative IT-based model which aligns the various stakeholders around a common development platform. This includes the alignment of buyer requirements with supplier capabilities, the alignment of development support from the various development agencies (such as IDC, NEF, TIA, etc), the management of FDI risk and performance, and the monitoring of development areas. These are key elements for accelerating competitiveness.

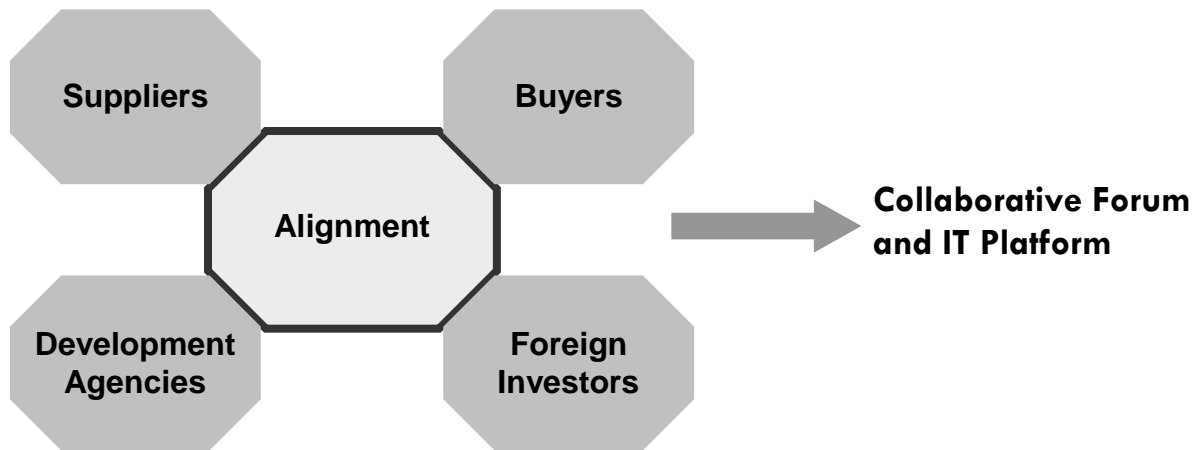


Figure 5.2 Benchmarking platform for stakeholder alignment.

The main aim of the benchmarking programme is to facilitate the increased participation of local suppliers in supply chains linked to major local buyers such as the State-Owned Enterprises. At the same time, and of greater importance, access to the supply chains of OEMs (systems suppliers) will open the doors for exports. The benchmarking system aims to target companies at second tier and third tier levels, in accordance with the buyers' spheres of control and influence, as shown in Figure 5.3.

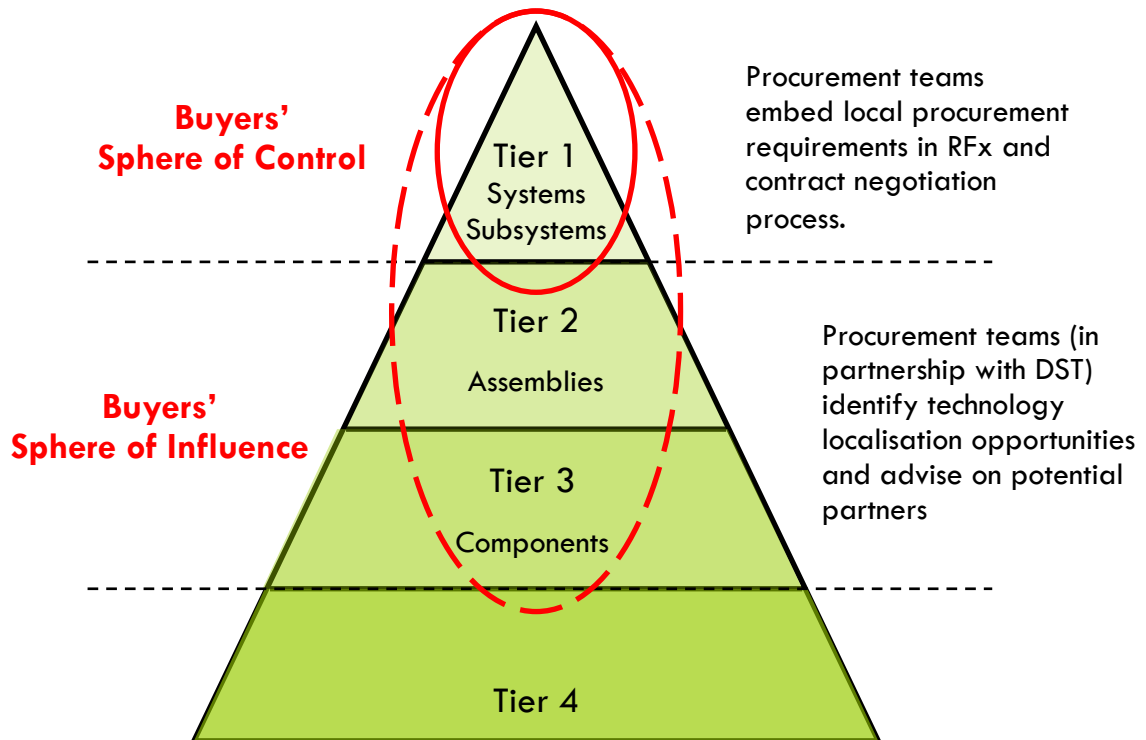


Figure 5.3 Typical Supply Chain structure.

Companies are benchmarked against world-class competitiveness across a number of key performance areas. At the same time, the benchmarking provides a detailed view of company capabilities against buyer requirements, and indicates the performance gaps to be addressed to migrate to world-class competitiveness.

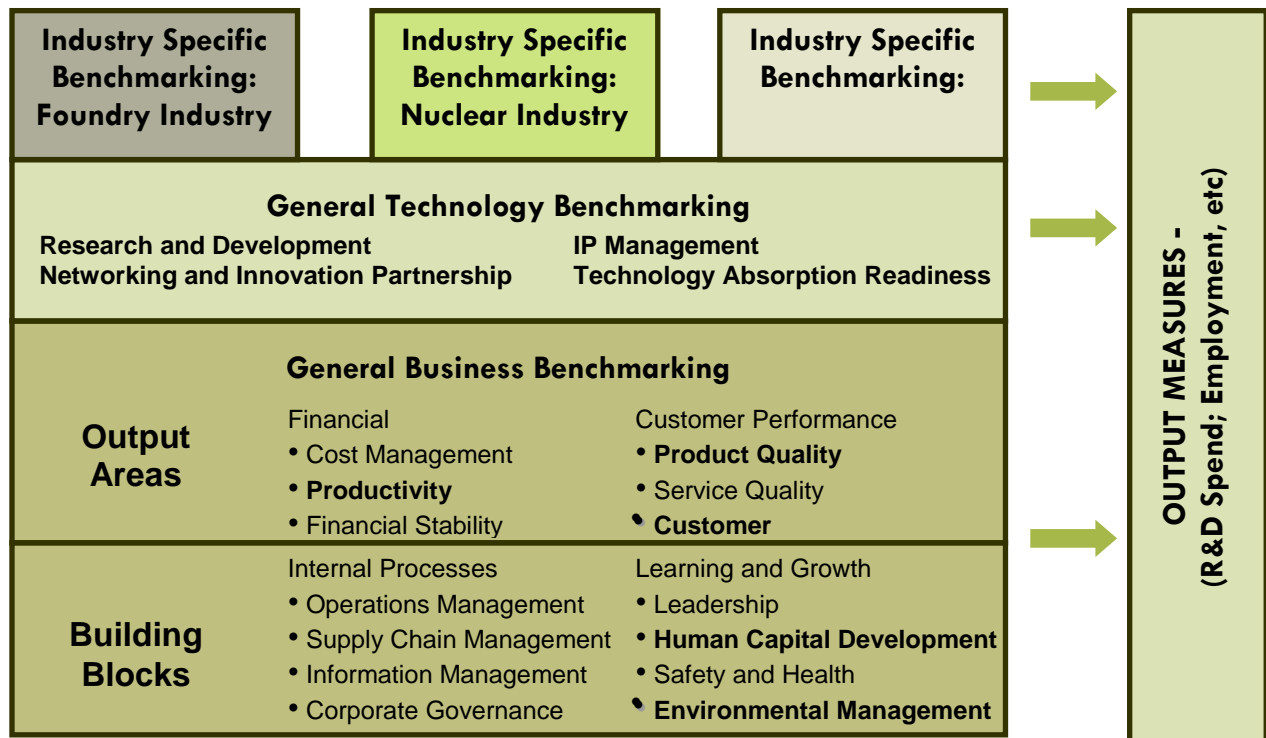


Figure 5.4 Key Performance Areas evaluated in the Benchmarking Programme

The items highlighted in Figure 5.4, such as Product Quality and Human Capital Development, clearly have a technology emphasis. DST will therefore be required to lead this part of the benchmarking process, referred to as the Technology Capability Evaluation component.

Technology Capability Evaluation: The Framework

The primary objectives of the Technology Capability Evaluation are as follows:

- To serve as a monitoring instrument to rate the technological development within organisations on a company and industry-wide level;
- To serve as a comprehensive technological development solution to assist organisations to improve their competitiveness;
- To monitor and encourage skills development associated with the deployment of technologies; and
- To maximise the participation of suppliers in local and global supply chains through the deployment of appropriate technologies.

In order to achieve the above objectives, DST in partnership with UNIDO, will have to undertake:

- The development of the Technology Capability Evaluation Framework which can be used across various technologies, based on the following:
 - The adoption of a maturity approach, which rates organisations against world-class levels in terms of sophistication, performance, practices, skills, etc.
 - The inclusion of sustainability factors, for instance associated skills, environmental issues and infrastructure, etc.
 - The incorporation of both practices and metrics within the evaluation to support global comparisons.
 - The ability to generate a clear development path.
 - The ability to translate major buyer contracts into, firstly, the type of technologies applicable, and secondly, the required rating per technology which would apply to suppliers.
- The further refinement of the current business evaluation framework to include aspects, which support technology development, specifically R&D and Technology Management.
- The testing and refinement of the Technology Capability Evaluation Framework within the foundry industry.
- The implementation of the solution within the foundry industry, and subsequent roll-out to other targeted industries.
- The further development of the existing IT platform to include the Technology Capability Evaluation Framework, as part of the overall evaluation and monitoring of suppliers. The technology evaluation solution will be hosted within the public domain on the internet, through which companies can gain free access to the evaluation solution, training material and reference to support institutions. Access to this facility can also be provided through the DST website. Other stakeholders would carry the cost of the IT development as this forms part of a shared services environment.

Technology Capability Evaluation: Sustainability

The long term maintenance and deployment of the model ideally needs to be independent from ongoing Government financial contributions. As such, the following proposed principles will be followed to ensure sustainability:

- The evaluation and development model will be hosted within the public domain to encourage participation from universities, industries, technology providers, etc and to ensure the evaluation standard remains world-class. Contributing organisations can have access to the underlying data for non-commercial research purposes.
- Although companies can have free access to the framework to rate themselves, they can contract trained service providers at a fee to facilitate evaluations and development. This will provide a sustainable support network. The National Foundry Technology Network (NFTN) could typically fulfil this role within the foundry industry.
- Companies in the private sector, who want to use the IT platform to gain visibility on other companies in their supply chain, would be required to pay a membership fee.

Table 5.1 Technology Capability Evaluation – (Example of) Measures for the Foundry Industry

Q2. What is the level of sophistication in foundry technology modelling?		
1	3	5
Solidification modelling is not used; hand calculations for feeding.	Some castings are modelled especially when a pattern change is made or the casting has not previously been made by the foundry; the model is sometimes validated by NDT or castings are sectioned; castings are infrequently remodelled after process changes are made to the prototype.	Every prototype is modelled; castings are remodelled following a major engineering change to gating, feeding, moulding, etc; results of simulations are validated by NDT or casting sectioning; flow modelling to reduce turbulence is performed; microscopy is predicted; chemical segregation effects are predicted; casting design optimised as a result of all the simulation results.
Q9. What non-destructive testing (NDT) is routinely performed as part of quality control?		
1	3	5
Only visual inspection is performed; castings may contain cracks that cannot be detected visually.	Surface NDT such as liquid penetrate or magnetic particle is performed frequently; there is a low probability of castings containing cracks being shipped; NDT such as ultrasonic or radiography is usually performed only at the request of the buyer; castings may contain internal shrinkage porosity of level 3 or greater.	First time made castings are checked by radiography and/or ultrasonic testing methods; there is a culture that all castings shall exceed level 2 internal soundness requirements (even if there is no specific requirements imposed by the buyer); computer simulation is performed to predict the size and location of discontinuities.
Q12. To what extent do the foundry have casting design capability?		
1	3	5
Foundry has some capability to recommend small changes such as increased radii.	The foundry has some expertise changing fabrications to castings with the aid of computer simulation software to predict castability; a complete design of a complex casting is not usually with the capability of the foundry.	Foundry can run a finite element analysis (FEA) stress model and solidification model and redesign the casting to optimise mechanical performance, reduce the severity of internal and external discontinuities and predict dimensions prior to casting; the foundry can take a forging or fabrication and redesign for casting.

Participation in the Benchmarking Programmes, which will include Technology Capability Evaluations, and the commitment to the ensuing process of continuous improvement, will be an entry requirement for companies to qualify for other DST supply-side measures linked to the CSDP. It is estimated that around 50 companies will be benchmarked every year, and around 25 of these will qualify for TAP.

5.2 Technology Capability Platforms

The development and establishment of technology capability platforms to address the gaps for migration to world-class manufacturing will constitute a major part of DST's interventions within the CSDP. To date, a variety of technology capability platforms have already been established, predominantly within the universities and science councils. Many of these, however, are based on technology-push models, as opposed to ones established with clear economic off-take missions. Such market-pull platforms can be established within the context of the Centres of Competence Programme, and could leverage industrial funding, especially for operational expenditure. Under the umbrella of the Technology Innovation Agency, these platforms could be linked to IP support (and venture capital support where applicable).

Centres of Competence are aimed at pooling National resources to pursue a high level of competence across a value chain. Such centres are aimed at enhancing the innovation capability of specific industry combinations so as to respond to major economic opportunities in the form of work packages linked to supplier development.

The development of Innovation Networks, as alluded to in Section 2, is a necessary mechanism to ensure critical mass and sustainability of the innovation process. Within these Innovation Networks, the establishment of technology platforms to allow for both R&D and production may be necessary in cases where investment levels and technology risks are relatively high. Such platforms, referred to as Shared Technology Facilities, will constitute world-class manufacturing technologies, run under a strict development-versus-production utilisation model. Examples of such facilities within the technology localisation potential for South Africa include: Vacuum Investment Casting Technology for precision-cast monocrystalline turbine blades; large-scale CNC machining centre for composites tooling in applications such as radio-telescope dish and wind turbine blade manufacture; fabrication of nuclear structures to ASMEIII and NPT-Stamp standards; etc.

In the latter case, DST, in partnership with NECSA, has supported the establishment of the National Nuclear Manufacturing Centre (NNMC). The NNMC is at an advanced stage of development, having already acquired ASMEIII and NPT-Stamp accreditation within a development partnership with ENSA, the Spanish company linked to PBMR's procurement programme. The NNMC also supported the establishment of a Nuclear Skills Development facility on the NECSA campus, for the training of artisans for the nuclear manufacturing industry.

Shared Technology Facilities would require DST investment in the region of R10-R12million upwards per annum.

5.3 Access to Technical Expertise

For many companies who have developed the ability to learn and diffuse technology, access to leading experts will be an important vehicle for transferring skills and diffusing new technologies into existing production systems. Many models have been successfully deployed in developing countries for this purpose, such as the Brazilian Coupon Model. As

part of the broader TAP, DST will support companies to gain access to leading industrial experts.

The sourcing of technical experts will be linked to the establishment of, and commitment to, a Continuous Improvement Plan based on the identified gaps from the Technology Capability Evaluations. These technical experts will therefore play a vital role in guiding the companies in addressing the identified technology gaps, and mentoring company personnel in the successful diffusion of innovative technologies. It may be necessary to source the desired expertise from other countries, perhaps as part of a technology offset programme.

5.4 Technical Skills Development Programmes

An expansion in local supply capacity will require an increase in the supply of engineers and artisans. There is potential to leverage the funding which is available through the National Skills Fund and the Sector Education and Training Authorities, tax rebates, and Department of Education bursaries for artisan students at Further Education and Training institutions to obtain 100% subsidies for learnerships and apprenticeships. Funding has been mobilised in this regard under Government's Joint Initiative for Priority Skills Acquisition (JIPSA). Similarly for engineers, the Department of Education has established programmes to increase the throughput of engineers and technologists at universities and universities of technology. Engagements could take place with universities to secure adequate pipelines for the engineering skills that would be required for increased local supply capacity.

DST's primary focus in the supply of technical skills for technology localisation will be in the development of specialist training programmes (undergraduate and post graduate) for the delivery of high-end engineering skills. These programmes will mainly be established at universities of technology (UoTs). Such programmes will require the mobilisation of active partnerships between appropriate local and international institutions.

The Foundry Industry is a major focus of innovation capability development within the prospects of localisation of the capital expenditure programmes of Eskom and Transnet. SA does not have a consolidated research and training capability in this area. Fragments exist at certain institutions in certain parts of the innovation spectrum. The Foundry Institute of RWTH Aachen University is being targeted as an innovation and training development partner with an SA consortium of research and training centres.

Two areas of cooperation were identified:

- (a) Training of masters level students on the 18-month coursework-based + 6 month project-based programme in Casting Technology.
- (b) Exchange of research staff between the Foundry Institute and the member institutions of the SA consortium for technology and knowledge transfer and training programme development.

In a similar way, other high-end and specialist skills development partnerships can be established by DST within the framework and propensity for technology localisation. Investments for these interventions will be sourced from the AMTS for investigative work, and from DST's Human Capital Development Programme for implementation.

5.5 Design and Tooling Support

Design capability is one of the two major technology capability streams, the other being manufacturing capability. Fundamental to any sustainable manufacturing capability is tooling technology. Hence, the areas of design and tooling are indispensable in migrating targeted companies and supplier networks towards sustainable world-class manufacturing for localisation and export, especially at the third tier level of the supply chain.

DST aims to utilise tooling support platforms established at the Institutes for Advanced Tooling (IATs) for the support of identified companies and supplier networks.

Through a consistent activity of applied research, experimental development, technology intelligence and support and networking, the IATs are endowed with intervention capacities in cutting edge fields such as plastic injection moulding, press tooling, die cast tooling, composites tooling and high-speed machining technologies. These activities are carried out on value added projects through research and development and technical service delivery. The current Tooling Support capabilities of the IATs include:

1. *Computer Aided Design (CAD)*
Support in design of injection moulds, press tools, blow moulds, and jigs & fixtures using 3D parametric modelling systems such as ProEngineer.
2. *Computer Aided Manufacturing (CAM)*
Support in developing cutting strategies for complex-shaped mould components, which may require 5-axis and high-speed machining technologies.
3. *High-Speed and 5-Axis Simultaneous Machining*
Support in manufacturing/machining of complex-shaped mould and integral components.
4. *Process Simulation of Injection Moulding, Die Casting, etc.*
Support in carrying out simulation and analysis of component manufacture processes such as plastic injection moulding (using MoldFlow) and die casting (using Magma).
5. *Rapid Tooling*
Manufacture of core and cavities using rapid tooling technologies, such as Selective Laser Melting.
6. *Quality Control*
Support in tool metrology, using coordinate measuring machines, amongst others.
7. *Tool Validation*
Support on tool validation, which entails the tryout of the tool under optimal conditions and the provision of an Initial Sampling Inspection Report (ISIR) of the product.

In summary, the IATs will support the development of supplier networks in the following ways: (a) offering specific technological support services; (b) organising training activities for regional company employees; (c) interacting with many companies, allowing it to compare and evaluate different solutions to problems; and (d) carrying out benchmarking projects with local companies, to benchmark actual local production capabilities and performance with that of international counterparts.

Design support, though, will need to go beyond design and simulation support within the ambit of tooling, to product and process design support within other targeted technology localisation opportunities. This involves the evaluation, through modelling and simulation, of a variety of processes and product performance parameters. Areas of importance which are evident from the technology localisation opportunities include: simulation of welding and cutting processes; simulation of machining (metal cutting) processes; simulation of metal forming (forging, bending) processes; simulation of structural performance (vibration, deformation) of structures, and so forth.

DST aims to build onto existing strengths within the National System of Innovation in these areas. This, in particular, includes the development of the Centre for High Performance Computing (CHPC) as a viable partner to industry in advanced design (modelling and simulation) technologies. This is in line with its mission to function as a National research, training and service centre; producing nationally relevant research projects with visible and effective S&T, developing human resources, and developing and implementing cutting-edge computational tools

5.6 Technology Transfer Benefits Programme

In many cases, especially during the initial phases of the capital expenditure programmes of the SOEs, local companies will not have the technological capabilities to participate in the OEMs' supply chains. Through the contract negotiation process, development partnerships can be brokered between the contracted OEMs and local supplier networks (post benchmarking). This has been alluded to before as the *buyers' sphere of influence*. These development partnerships will require the OEMs to build the engineering and innovation capacity and capability of the supplier networks to the required levels to meet the demands of the OEMs/buyers.

In this regard, DST has proposed the development and establishment of a Technology Transfer Benefits Programme (TTBP) for South Africa in accordance with the principles of the CSDP. The Programme will aim to leverage on offset benefits agreements established between the SOEs with international OEMs that have been awarded large public procurement contracts. In addition to offset benefits accruing from procurement contracts, the TTBP also aims to leverage on offset benefits emanating from large public sector concessions to international operators. These include the second fixed-line operator and other cases where Government is providing major lucrative opportunities (without actually transferring funds).

The TTBP will be aligned to ASGISA and JIPSA. It will therefore compliment and strengthen the existing SOEs' ASGISA and JIPSA offset requirements which form part of their tender requirements. This particularly refers to skills development linked to the nature of the procurement contracts, aimed at ensuring that local capacity for life-cycle management is developed during the execution of the contract.

Besides a commitment by both the SOEs and their international suppliers to compensate the South African National Innovation System with offsets in the form of technology transfer and skills development, the establishment of the TTBP will require a dynamic relationship between the SOEs and the international suppliers together with South African and international innovation actors, including higher education institutions, research institutions, industry and government or public institutions, as depicted in Figure 5.5. DST's role in promoting partnerships with the respective foreign governments is evident in order to facilitate the participation of the foreign innovation players in the establishment of the TTBP.

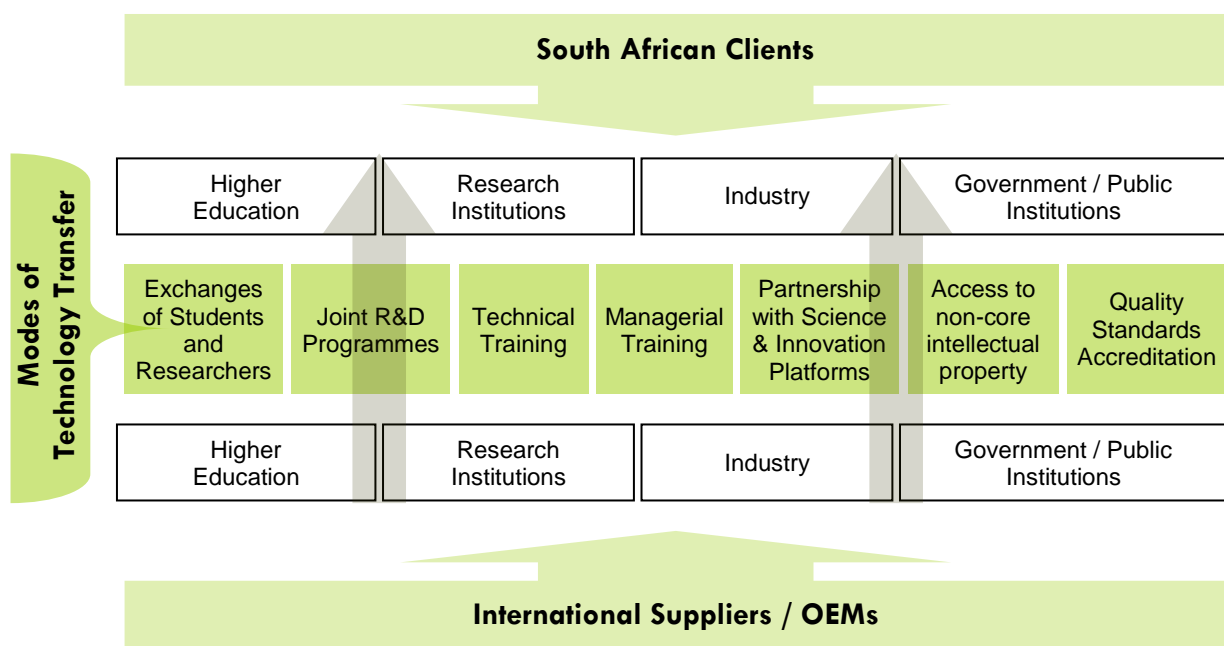


Figure 5.5 The various elements of the Technology Transfer Benefits Programme.

Depending on the nature of the partnership, different modes of technology transfer can be defined and implemented. These are explained below.

(a) Exchange of Students, Technologists and Researchers

The exchange of students, technologists and researchers is aligned to JIPSA in that the main focus is on human capital development, specifically knowledge and skills

development in science, engineering and technology. The objectives of such exchange initiatives are to:

- Facilitate and promote human capacity development in science, engineering and technology;
- Increase the flow of scientific/technical knowledge and resources between South Africa and international institutions through participation in joint education, research and training programmes; and
- Share best practices in industrial processes and product development.

The main mechanism for cooperation and collaboration will be the mobility of students, researchers and technologists from industry at all levels of training and development. This will include:

- Postgraduate student exchanges in the form of sandwich programmes, research visits and study abroad semesters;
- Postdoctoral fellowships tenable in each country;
- Joint research projects lead by principal investigators in each country;
- Internships and placement of graduate engineers and industry technologists for advanced training; and
- Workshops and short courses in advanced technologies and the transfer of best practices.

South Africa's research system already has several existing programmes in place that may be leveraged to promote this mode of technology transfer within the TTBP. These include the South African Research Chairs Initiative (SARChI) and the Innovation Postdoctoral Fellowships.

(b) Joint R&D Projects

The content of the procurement deals could unleash a number of research issues. These issues could relate to the adaptation of procured systems to South African conditions, which include climatic and environmental conditions, social norms and practices, technical standards, etc. Or they could relate to the use of different grades of raw materials, and how these materials would perform both in processing and in product. A common example in this case relates to South African steels and plastics, which have different properties to their (say) Japanese counterparts. These materials, besides requiring different processing parameters, will also perform differently as a finished product (produced by a local supplier) when fitted to an OEM's system.

Through an assessment of the SDPs, a profile of R&D areas and joint projects can already be established. It is clear that these joint R&D projects in, the context of the CSDP, will primarily be short term. However, the achievement of marginal innovations through this type of R&D could lead to more extensive and longer term R&D projects.

(c) Technical Training

The availability of technically skilled personnel underlies the ability of local suppliers to participate in the supply chains of the international suppliers/OEMs. This is even more important in the operational expenditure programmes of the SOEs, to avoid the import of services at very high costs to the SOEs. Through the TTBP, the opportunity exists for South Africa to build the requisite engineering capacity for the capital (and operational) expenditure programmes of the SOEs. This would require the development of specialised skills development programmes, mainly delivered in-house (within international companies) or at specialised training facilities made available by the international partners. In some cases, such programmes can be delivered in South Africa by trainers from the international partner countries.

Together with the above proactive approach, international supplier obligations on technical training are also built into the contractual conditions of tender of the SOEs. This approach has been adopted as part of the SOEs' commitment to ASGISA and JIPSA. Through the TTBP, such training obligations can be effectively streamlined.

(d) Managerial Training

Through rapidly advancing information and communications technology, and new emerging areas of technology, technology and innovation and the management thereof have become critical factors for business success. Together with the complexities of modern supply chains, it is vital that South African companies develop the know-how to manage effectively within the current paradigm. Through the TTBP, the opportunity exists for South Africa to develop management training programmes, within the context of the CSDP and technology localisation opportunities.

Managerial training programmes can be implemented through partnerships with international management development institutes and training providers. They could also take the form of management internships at companies linked to the international suppliers – this will provide management trainees with exposure to preferred product-specific environments.

(e) Partnership with Science and Innovation Platforms

Science and innovation platforms have long been the foundation on which the capability and success of the international suppliers were built. There are many examples of this, most notably those of nuclear power and aerospace technology in France, automotive technology in Germany and Japan, and railway technology in Japan. These countries, through well-orchestrated government programmes, have invested substantially in the establishment of R&D and innovation platforms in the targeted technology areas. Likewise, South Africa is following a similar approach in the establishment of Centres of Competence in key areas of National strategic importance. Through the TTBP, a real opportunity exists for South African institutions and industry consortia to develop

technology transfer partnerships in areas related to procurement deals of the SOEs. Such partnerships that can already be brokered, within the context of the CSDP, include nuclear manufacturing related to the nuclear build programme, wind power technology, solar energy technology, and railway technology. The latter refers both to the manufacture of rolling stock and the development of commuter and control systems.

(f) Access to Non-Core Intellectual Property

Non-core intellectual property of the international suppliers/OEMs, in particular, can provide the required impetus for local suppliers to embark on an innovation trajectory for new business development. The opportunity exists for the transfer of such non-core IP to local suppliers, if linked to the obligations of the international suppliers under the procurement deals. This could lead to the establishment of *development partnerships* between the international suppliers and local companies, and a pooling of intellectual property for the development of highly competitive products and processes. A mechanism for “matching” innovation players for such *development partnerships* should be developed, possibly within the envisaged Technology Localisation Programme of DST based at TIA.

(g) Standards Accreditation

This refers to development support for local suppliers to obtain relevant international standards accreditation. In this respect, international suppliers or OEMs can make available quality assurance personnel to conduct quality audits of identified companies in line with the particular standards, and to devise and apply corrective plans. Examples include ASME III and NPT-Stamp accreditation required for manufacturing in the nuclear industry.

6. OVERVIEW OF THE IMPLEMENTATION MODEL

This Technology Localisation Plan will require three tiers of integrated activity between the major role players. DST’s role focuses on policy and strategy development, and the facilitation of high-level partnerships that are vital for the success of the Technology Localisation Plan.

Central to the implementation is the role of the Technology Innovation Agency (TIA). Four main areas have been defined in the implementation model, each one requiring dedicated and specialist resourcing. These areas are consistent with the *Protocol for Engagement in Localisation Initiatives* given in Figure 4.2.

The role of the technical advisory committees (TACs) within each of the targeted industry sectors is crucial in ensuring that the localisation initiatives are embraced by the wider industry. Their role includes advising on the latest market and emerging technology trends; identifying opportunities for R&D and business development partnerships; reviewing the business plans of TIA with regard to Technology Localisation; facilitating industry exchange and other skills development placements; amongst others. The TACs must therefore have influential and technically competent representation, from relevant Government departments, technology institutions, industry and industry associations.

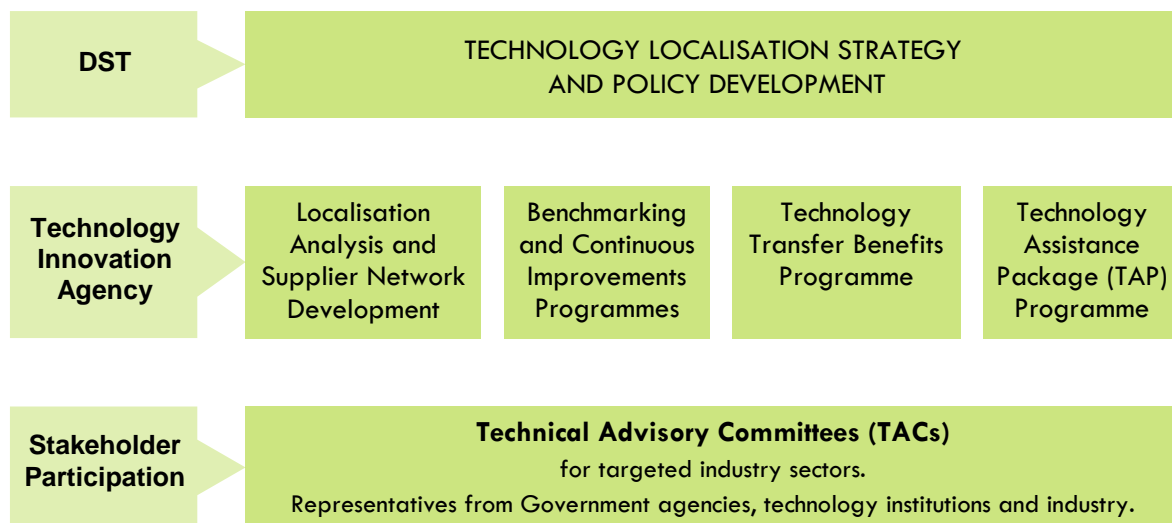


Figure 6.1 The three tiers of the Implementation Model for the Technology Localisation Plan.

7. BUDGET

Technology localisation, especially in the context of the CSDP related to the capital expenditure programmes of the SOEs, will require a long term engagement by Government for it to be effective and sustainable. There are, though, different stages requiring different types and levels of intervention, depending on the maturity of the process. The initial stage is based on a three-year time frame to coincide with the MTEF guidelines, and will, in many instances, provide DST and its partners with the necessary learning and experience to extrapolate the process more widely and in the longer term.

A range of activities with expected outputs, which are consistent with the information given in the previous sections, is listed in Table 7.1, over a 3 year period.

Table 7.1 Expected Outputs

Item/Activity	2009/10	2010/11	2011/12
Technology Benchmarking	<ul style="list-style-type: none"> • 50 Tier 2 and 3 level companies benchmarked and information available on benchmark database • Local capacity to conduct benchmarks established at all the 4 major foundry centres in SA 	<ul style="list-style-type: none"> • 50 Tier 2/3 companies benchmarked and information available on benchmark database • Benchmarking system developed to global standard/leader for supplier development 	<ul style="list-style-type: none"> • 50 Tier 2/3 companies benchmarked and information available on benchmark database
Supplier network development	First major supplier network established	2 further supplier networks established within the framework of the SDPs	2 further supplier networks established within the framework of the SDPs
Technology support for industry	25 companies provided with technology support packages	25 companies provided with technology support packages	25 companies provided with technology support packages
Major shared facilities		1 st major shared facility established for the Foundry Industry	2nd major shared facility established for the Foundry Industry

8. IMPACT MEASURES

Technology localisation will require the enhancement of the industry’s global competitiveness, leading to increased participation in local and global supply chains. A number of impact measures can therefore be established with respect to increased market share, value chain productivity, employment levels, and foreign exchange. Some of these are listed in Table 8.1.

It is noted that these industry-wide impact measures are also attributable to a variety of factors other than technology localisation interventions. However, the contribution to the indicators from the technology localisation interventions can be accurately determined through the supplier benchmarking system.

Table 8.1 Impact Measures

Impact Field	Impact Indicator	Means of Verification
1. Global market share grows in targeted markets.	Growth of market share in volume for specified commodities.	Statistics on export volume and market shares.
2. Foreign exchange from industry exports is increased.	Growth in foreign exchange from industry exports.	The Rand value of exports as registered by SARS through its customs and excise division.
3. The industry’s labour force stabilises and shows potential for growth.	Growth in industry jobs throughout the value chain.	Documented statistics on employment within the industry value chain.
4. Innovations and specialised knowledge are protected and patented within the industry.	Growth in patents and publications.	Patent registration journals. Other publications records linked to the targeted industry.

Owing to the developmental nature of the CSDP-related contracts, the effect on the above impact indicators will mainly be seen in the medium to long term. The reason for this is that supplier networks will require a longer period to migrate to the desired levels of technology capability, as the investments in knowledge, skills and infrastructure filter through. A range of interim impact measures are therefore suggested, also linked to the supplier benchmarking system and the continuous improvement plans generated for participating local suppliers. These interim impact measures are given in Table 8.2.

Table 8.2 Interim Impact Measures

Impact Field	Impact Indicator	Means of Verification
1. More companies are adopting an innovation and technology capability enhancement approach, increasing the potential for sustainability of the manufacturing industry.	Number of companies that have committed to Continuous Improvement Plans linked to Technology Assistance Packages.	Data obtained from the Supplier Benchmarking System
2. The industry's technology capability is increased, as are the prospects for local manufacture and import replacement.	Number of companies successfully migrated to higher levels of technology capability.	Data obtained from the Supplier Benchmarking System
3. There is an increase in the localisation of technology related to the SOE infrastructure expansion programmes.	Number of companies receiving Technology Assistance Packages (Tier 2 & 3 levels) linked to buyer contracts through OEM CSDP obligations, and the value of these contracts.	Data obtained from the Supplier Benchmarking System and records provided by the SOEs.

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