

**REPORT OF
THE WORKING GROUP ON**

**SCIENCE & TECHNOLOGY FOR
SMALL & MEDIUM SCALE
ENTERPRISES (SMEs)**

**FOR
THE ELEVENTH FIVE YEAR PLAN
(2007-2012)**

Terms of Reference

- **To suggest effective methods to promote innovations in the sector of SMEs**
- **To suggest a system for providing institutional support for encouraging innovation and**
- **To suggest a system for providing special support both technical & financial to innovators to set up enterprises**
- **To consider any other important and relevant item**
- **To indicate approximate financial outlay for implementation of the recommendations**

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Executive Summary

Small- and medium-scale enterprises (SMEs) occupy an important and strategic place in economic growth and equitable development in all countries. Constituting as high as 90% of enterprises in most countries worldwide, SMEs are the driving force behind a large number of innovations and contribute to the growth of the national economy through employment creation, investments and exports. Their contribution to poverty reduction and wider distribution of wealth in developing economies cannot be underrated.

The Working Group has tried to look at SMEs from the view-point of S&T interventions, examined the global scenario of SMEs, status of the Indian perspective, looked into various schemes in existence in India and finally suggested ways to improve the health of SMEs and impart them an edge to compete in the global market.

According to the newly enacted Micro, Small and Medium Enterprises Development Act 2006, which will come into effect from October 2, 2006, enterprises are classified into Micro, Small and Medium according to the following criteria:

Type of enterprise	Engaged in manufacture or production of goods	Engaged in providing or rendering of services
	Investment in plant and machinery	Investment in equipment
Micro enterprise	Does not exceed 25 Lakh rupees	Does not exceed 10 Lakh rupees
Small enterprise	More than 25 Lakh rupees, but does not exceed 5 Crore rupees	More than 10 Lakh rupees, but does not exceed 2 Crore rupees
Medium enterprise	More than 5 Crore rupees but does not exceed 10 Crore rupees	More than 2 Crore rupees but does not exceed 5 Crore rupees

The factors – strengths coupled with opportunities – that work in favour of Indian SMEs include their high contribution to domestic production, significant export earnings, low investment requirements, operational flexibility, location wise mobility, low intensive imports, capacities to develop appropriate indigenous technology, import substitution, contribution towards defence production and competitiveness in domestic and export markets

While we look into new approaches to strengthen them effectively, one has to understand the limitations of SMEs, which include low capital base, concentration of management functions in one/ two persons, inadequate exposure to international environment, inability to face impact of WTO regime, inadequate R&D and lack of professionalism

Besides these, the most formidable problem faced by the SMEs has been in accessing technology and maintaining competitiveness. The reasons for the inability of SMEs to identify their technology needs are

- Poor financial situations and low levels of R&D;

- Poor adaptability to changing trade trends;
- Desire to avoid risk;
- Non-availability of technically trained human resources;
- Emphasis on production and not on production costs;
- Lack of management skills;
- Lack of access to technological information and consultancy services;
- Isolation from technology hubs.

To enable SMEs overcome the above problems and enhance their access to new technologies for increasing their competitiveness in the international market, it is imperative to give them a conducive environment, which includes formulation of appropriate national policies and programmes, building up technological capacity, knowledge flows and technology databases and finally, R&D and inter-firm linkages.

Networking offers an important route for individual SMEs to address their problems as well as to improve their competitive position. Evidence from developing and developed countries shows that networking is more likely when enterprises operate in proximity and share business interests such as markets for products, infrastructure needs or challenging external competition. Within such groups or clusters, enterprises' joint initiatives are stronger, because of the critical mass of interested parties, more cost-effective due to shared fixed costs and easy coordination with proximity fostering mutual knowledge and trust.

In Section 2, we have presented a summary of various schemes and programmes launched by S&T Departments and various Ministries of the Government of India, the numerous industry Associations and UN organizations. We have tabulated such schemes irrespective of the agency involved to fall into the following three categories.

Category 1: Technology/ Knowledge-based new start-ups (who need S&T inputs for incubation)

Category 2: Manufacturers of consumer products/ ancillaries, driven by user/market needs. (who need S&T interventions for innovation in process/ product/ packaging *etc.*)

Category 3: Micro, Rural, Agro/ Artisan based traditional industries (who need S&T as tool for technology upgradation, training, skilling, marketing *etc.*)

The recommendations are presented in Section 3 and are summarized below:

- *Special efforts are needed to increase the level of awareness about Government schemes/ programs for benefit of SMEs. The Working Group recommends that all the programmes and schemes should be continued into the 11th Plan with augmented outlays; the increase in outlays should be two to three times the outlay in the previous plan.*
- *There are about 20 incubators in India today as against over 1000 plus in US, 300 in Korea 100 in Finland. TBIs must be promoted in a big way not only in terms of numbers but also their size. Universities, Engineering Colleges and Business Schools should be the preferred sites for these TBIs.*

We make a distinction between (TIB) and Technology Innovation Centres (TIC). The former are located at educational institutions and aim at converting the result of R&D to industries. The latter are located in SME clusters and provide them, technical services required for technology upgradation and new product development. The best example for the TIC is Germany where today there are 500 Technology Innovation Centres, giving vibrant and active support to SMEs

The Working Group recommends that a total of 170 Technology Business Incubators and 50 Technology Innovation Centres, should be set up during the 11th five-year plan with a total outlay of Rs. 1100 Crore.

- Innovation and Entrepreneurship hold the key to enhancing the role of SMEs in improving the Indian economy. As their importance is not well realized, countrywide programmes on entrepreneurship and innovation must be launched in the shape of a national movement. Entrepreneurship should be promoted as a preferred career and not as an alternate career. Entrepreneurship/ Incubation should be a part of the engineering curriculum. Towards this, among other things the training of teachers/trainers is necessary and special steps should be taken in this direction. Recognition / Incentives for innovation and entrepreneurship in the clusters and education institutes must be introduced. An enhancement in budget in all schemes promoting innovation and entrepreneurship is recommended*
- It is understood that there are plans to launch schemes for revamping and modernizing polytechnics and ITIs in 11th plan. When these investments are made, the special role that they can play for SMEs in the neighbourhood, must be emphasized and prioritized*
- The Working Group strongly recommends that polytechnics and industrial training institutes should be encouraged to organize short-term programs for vocational training of school dropouts in a variety of multi-skilled job positions that would be available in SMEs. In evolving these training programs. Industry involvement should be mandatory and employer-based training programs should be encouraged.. There should be a special initiative to ensure proper training to the trainers engaged for conducting such courses. The resource persons should be offered attractive remuneration to make the programme interesting and useful.*
- Self Help Groups (SHGs) of Women, their federations and networks etc. need support in the form of augmented micro financing and revolving credit during the 11th Plan. The possibility of the organized sector linking up for quality and international reachability is to be encouraged. The activities under 3.4 and 3.5 could be integrated into the PURA mission – about 7000 for the country.*
- The importance of S&T interventions in SMEs on a cluster basis is today well appreciated internationally. As discussed in Section, there have been many attempts for technology of duration of clusters of SMEs in India by the Ministries of*

Small-Scale Industries Agro industries, Food Processing etc. Some of the sectors like Casting, Sports Goods, Scientific Instruments, Surgical Instruments, Diesel Pump & Engineering Industry, Agricultural Implements Industry and Pottery are already identified by TIFAC & Ministry of SSI for a Mission Mode approach for technology intervention in the 11th Plan to help increase their productivity and exports significantly. An outlay of Rs. 50 Crore is recommended for this mission mode programme for the seven selected SME clusters.

- *A strong need for preparing sectoral technology profiles of the SMEs has been felt. These Technology profiles will help in critically examining and addressing technology needs in line with the business requirements of the respective sectors. To begin with, 10 SME sectors viz. Food and allied industries, Wood and wood products, Paper products, Leather and leather products including footwear, Rubber products, Plastic products, Glass and ceramics, Electrical machines, appliances and apparatus, Bicycle parts, tricycles & perambulators and Sports goods can be taken up for technology profiling. TIFAC will coordinate the activities of technology profiling of SME clusters with active cooperation and involvement of CII, UNIDO and INAE. Working Group recommends a financial outlay of Rs 50 Crore during the 11th Plan for this activity.*
- *The application of ICT is not limited to shop floors only; it is rather widely used in non-production processes also, which are considered major source of non-price factors of competitiveness. Awareness about safety, health, ergonomics, occupational hazards and environmental issues needs a high priority and must go along with schemes and not separately. It is understood that Ministry of SSI is working out a programme for helping SMEs to identify their ICT needs and providing resources for its implementation. A total budgetary outlay of Rs.160 Crore with another Rs. 140 Crore from private partnership is envisaged for this endeavour.*
- *It is felt that the productivity of SMEs can be improved significantly by making available to them Special Purpose Machines (SPM). A national level committee / Group should be assigned the task of identifying such machines and also suggesting if they should be developed indigenously or imported for these SMEs. A strong view was expressed that "appropriate man-machine systems design" (avoiding total automation) are needed for employment-linked industrial growth through recognition of the reality of a "Community Scaling". TIFAC & INAE can be entrusted the task of identification of such machines. Institutions like IITs, CMERI, NITs etc. can take up development of machines. An outlay of Rs. 50 Crore is recommended towards implementation of this scheme.*
- *There is a strong need for spreading awareness of IPR amongst the SMEs. Patenting should be encouraged by offering financial support/ subsidies. Likewise, quality assurance, ecolabelling, barcoding etc. of products should be encouraged in a big way.*

- *Every engineering College in the country will be encouraged to interact with as many SMEs in its neighbourhood is possible. Such interaction should necessarily involve the whole spectrum of MSMEs, and it may be stipulated that the minimum 20 of this should be micro and small enterprises, should be taken up by each College for the following interactions*
 - (i) Specific research development design and engineering programs for technology inputs and upgradation.*
 - (ii) Summer vacation internship (in-plant training) for undergraduate students.*
 - (iii) B. Tech. projects to be carried out in the SME environment on process/ products improvement, engineering research and new product development.*
 - (iv) Consultancy and visits by faculty to SMEs*

- *There are a large number of engineering and technological/ professional societies in the country. They are content with interactions with the big enterprises, who support them by way of corporate membership and sponsorship of events there is a need to bring a paradigm shift in this approach so that these professional societies would be evolve, during the 11th Plan, specific programs which will go a long way in improving the scientific and technological capabilities of the SMEs. Some of the recommended activities are:*
 - (i) Seminars and Workshops, Discussion Meetings etc at locations; close to SME clusters to discuss specific technology, science and technology advancements in the respective areas.*
 - (ii) Continuing education programmes aimed at SMEs at levels of technicians, supervisors, engineers and entrepreneurs*
 - (iii) Train the trainer programs for upgradation of skills and human resource development in SMEs.*

- *DST/TIFAC or the Office of PSA to GOI may launch a pilot programme to be coordinated by the Indian National Academy of Engineering (INAE) for two years aimed at colleges, community polytechnics, ITIs and professional Societies as outlined above with an outlay of Rs 120 Crore. The programme could be extended subsequently after assessing its impact.*

The Report ends with a few general recommendations, which relate to support policies for SMEs.

1.0 Introduction

Small- and medium-scale enterprises (SMEs) occupy an important and strategic place in economic growth and equitable development in all countries. Constituting as high as 90% of enterprises in most countries worldwide, SMEs are the driving force behind a large number of innovations and contribute to the growth of the national economy through employment creation, investments and exports. Their contribution to poverty reduction and wider distribution of wealth in developing economies cannot be underrated.

However, the potential of SMEs is often not realized because of problems commonly related to size, isolation, market opportunities, standards/quality, supply chains, logistics and technology innovation. To preserve their narrow profit margins, small-scale entrepreneurs in developing countries do not opt to innovate products and processes and resort to tactics that deters their growth in the long run. Left on their own, many SMEs face difficulties arising from liberalization-induced adjustments. With SMEs varying widely in size, capabilities, environment (urban or rural-based) and organizational structures (in the case of cooperatives), coherent region-wide approaches to address their problems have been difficult to craft.

In order to enable SMEs tide-over the problems of technological backwardness and enhance their access to new technologies, it is imperative to offer them a conducive environment, which in the present context of globalization, calls for approach with knowledge playing a predominant role. There is a need to understand and assess the real needs of the SMEs and accordingly devise approaches that ensure their sustainable growth. The need today is also to leverage on modern technologies to harness human capabilities through the process of increased communication, cooperation and linkages, both within the enterprise as well as across enterprises and knowledge-producing organizations.

The Working Group has tried to look at SMEs from the view-point of S&T interventions, examined the global scenario of SMEs, status of the Indian perspective, looked into various schemes in existence in India and finally suggested ways to improve the health of SMEs and impart them an edge to compete in the global market.

1.1 SMEs in the global scene

Although SMEs make up the vast majority of companies around the world, in each country the total percentage of the workforce they employ varies. But the fact remains that they constitute a sizeable chunk of enterprises.

The EU

With some 23 million enterprises providing around 75 million jobs and representing 99% of all enterprises, SMEs play a central role in the **European** economy. They create wealth, foster new ideas and are a key source of new jobs.

The OECD countries

The Organization for Economic Co-operation and Development (OECD) has 30 member countries. The members include 19 of the 25 EU member states, one candidate country and three of the remaining European countries. The other seven countries are Australia, Canada, Japan, Korea, Mexico, New Zealand and the United States.

Most OECD governments promote entrepreneurship and seek to support and develop SMEs through a myriad of policies and programmes. These attempt to combat many of the common difficulties encountered by SMEs and offer solutions to problems in such areas like finance, technology and innovation, e-commerce, management, internationalization *etc.*

United States

In the United States, small business have benefited from direct cash injections. Procurement policy also seeks to increase the participation of small businesses, veteran-owned small businesses, small/ disadvantaged business, women-owned small businesses.

The Small Business Act requires that each contract with an anticipated value of greater than US\$2,500 but less than US\$100,000 be reserved exclusively for small business concerns (unless the contracting officer is unable to obtain offers from two or more small businesses that are competitive with market prices and with the quality of the goods or services to be purchased).

Latin America

After focusing on large investments and wooing multinationals for years, Latin American politicians are beginning to realize that SMEs are the true job creators as well as important players in technology supply chains. Governments have vastly reduced red-tape to ensure SMEs' needs are attended to swiftly.

Asia

Some of the world's best-performing economies, notably Taiwan and Hong Kong are very heavily based on small enterprises.

In Hong Kong in 2005, a total of almost 270,000 SMEs accounted for over 50% of employment, providing job opportunities to almost 1.2 million people. The majority of enterprises were in the services sector, specifically import and export, and wholesale and retail trade.

In Japan, where SMEs are defined as establishments employing between four and 299 employees with a turnover of less than 100 million yen, they represented 99.7% of all enterprises, with retail and manufacturing being the most popular industries.

Korea, recognizing the importance of SMEs has introduced many measures that include tax breaks and reduced interest loans for those starting new businesses in rural areas.

The developing world

In much of the developing world, SMEs are the only realistic employment opportunity for millions of impoverished communities.

A significant proportion of SMEs in developing countries are involved in traditional activities serving small, localized markets with little or no technological dynamism. In reality, few 'graduate' into larger or more modern technologies.

The role of SMEs in the economic growth need not be over-emphasized and their vibrancy is a clear pointer to the health of the economy. With this in mind we take a look at the scenario in India

1.2 SMEs: The Indian scenario

With the advent of planned economy from 1951 and the subsequent industrial policy followed by Government of India, both planners and Government earmarked a special role for small-scale industries (SSI) and medium scale industries in the Indian economy. Due protection was accorded to both sectors, and particularly for small-scale industries from 1951 to 1991, till the nation adopted a policy of liberalization and globalization. Certain products were reserved for small-scale units for a long time, though this list of products is decreasing due to change in industrial policies and climate.

SSIs always represented the model of socio-economic policies of Government of India which emphasized judicious use of foreign exchange for import of capital goods and inputs, labour intensive mode of production, employment generation, non-concentration of diffusion of economic power in the hands of few (as in the case of big houses), discouraging monopolistic practices of production and marketing, and finally effective contribution to foreign exchange earning of the nation with low import-intensive operations.

The small scale industrial sector of the Indian economy encompasses in itself almost all of the products (including a large number of services) produced by the Indian industries within the economy. Most of the times the products produced by the small and medium enterprises comprise of the intermediary products produced by the large-scale industries. They also include semi processing units and processing units, which are an important link between exports and re-exports. Thus, SMEs act both as a backward and forward linkage to the overall industrial sector of the Indian economy. Interestingly, the segment plays a crucial role in spreading the benefits of economic growth among the masses by drawing surplus workforce from the farm.

SMEs exist in almost all-major sectors in the Indian industry such as Food Processing, Agricultural Inputs, Chemicals & Pharmaceuticals, Electrical & Electronics, Medical & surgical equipment, Textiles and Garments, Gems and Jewellery, Leather and leather goods, Meat products, Bio-engineering, Sports goods, Plastics products, Computer Software *etc.*

1.3 Classification of SMEs

According to the newly enacted Micro, Small and Medium Enterprises Development Act 2006, which will come into effect from October 2, 2006, the enterprises are classified according to the following criteria:

Table 1: Classification of SMEs, according to Micro, Small and Medium Enterprises Development Act 2006.

Type of enterprise	Engaged in manufacture or production of goods	Engaged in providing or rendering of services
	Investment in plant and machinery	Investment in equipment
Micro enterprise	Does not exceed 25 lakh rupees	Does not exceed 10 lakh rupees
Small enterprise	More than 25 lakh rupees, but does not exceed 5 crore rupees	More than 10 lakh rupees, but does not exceed 2 Crore rupees
Medium enterprise	More than 5 Crore Rs, but does not exceed 10 Crore rupees	More than 2 Crore rupees but does not exceed 5 Crore rupees

This classification follows the global trend in defining SMEs

The above definitions are to be compared with the old definition of Small Scale Industries (SSI) as an industrial undertaking in which the investment in fixed assets in plant and machinery, whether held on ownership terms or on lease or by hire-purchase that does not exceed rupees one Crore. According to the old definition, the numbers of SSI were 3.572 million units in 2002-03 with almost 50 per cent of industrial output attributable to SSIs. 45%-50% of the Indian Exports is contributed by SSI Sector.

The size and scale of **India's SME** sector as per the new SMED Act 2006 is a matter of guesswork, ranging from 7.8 million to 13 million in number; the share in GDP of SMEs may be more than 80% and if the global trend is true for India, more than 90% of all the enterprises are SMEs. Also every enterprise in its infant years is an SME.

The SSIs are industrial undertakings in which the investment in fixed assets in plant and machinery, whether held on ownership terms or on lease or by hire-purchase, does not exceed rupees one crore. The Small Small Scale Services & Business Enterprises (SSSBEs) are industry related service and business enterprises with investment in fixed assets, excluding land and building, upto Rs. 10 lakh, irrespective of the location of the units.

1.4 Opportunities & Challenges for SMEs in India

Major policy reforms aimed at substantially deregulating industrial sector and liberalizing foreign investment as well as technology imports, have been the most significant development in India since 1991. The post-liberalization era in the Indian economy has enhanced opportunities and challenges for the small industries sector. The following factors – strengths coupled with opportunities work in favour of Indian SMEs

- High contribution to domestic production
- Significant export earnings
- Low investment requirements
- Operational flexibility
- Location wise mobility
- Low intensive imports
- Capacities to develop appropriate indigenous technology
- Import substitution
- Contribution towards defense production
- Technology – oriented industries
- Competitiveness in domestic and export markets

By the very nature of their operations, industrial units in the small-scale sector enjoy certain inherent advantages over their larger counterparts. The free economy ushers in accessibility to bigger markets, greater linkages for SMEs with larger companies and marketing outfits, improved manufacturing techniques and processes. Various measures adopted by Government of India, Reserve Bank of India and SIDBI have attempted to alleviate the problems of SME sector. These initiatives coupled with other developments in the economic environment will enhance the prospects of SMEs.

With increasing globalization and entry of multinationals, immense opportunities have been created for outsourcing, sub-contracting and ancillarisation of the products manufactured by corporates particularly in non-core sectors like automobiles, engineering and consumer electronics. A vibrant SME sector can derive maximum benefit of these developments.

By its less capital intensive and high labour absorption nature, SME sector will make significant contributions to employment generation and also to rural industrialization. This sector is ideally suited to build on the strengths of the traditional skills and knowledge, by infusion of technologies, capital and innovative marketing practices. This is the opportune time to set up projects in the small-scale sector. This expectation is based on an essential feature of the Indian industry and the demand structures. The diversity in production systems and demand structures will ensure long term co-existence of many layers of demand for consumer products/ technologies/ processes. There will be flourishing and well grounded markets for the same product/ process, differentiated by quality, the value added and sophistication. This characteristic of the Indian economy will allow complementary existence for various diverse types of units.

However, the SMEs in India, which constitute more than 90% of the total number of industrial enterprises and form the backbone of industrial development continue to be in technological backwaters vis-à-vis advances in science and technology. These suffer from problems of sub optimal scales of operations and technological obsolescence. While most of the large companies, even in developing countries, have financial as well as technical capacity to identify technological sources and evaluate alternate technologies for their requirements, unfortunately, this capacity is conspicuously missing in most SMEs. It is these features of SMEs that make them an ideal target for technological upgradation through technological cooperation with larger enterprises, with R&D institutions, academic institutions and centres of technology development.

As the countries merge into a global village, these SMEs will have to respond accordingly and thus deserve special attention. To enable SMEs to mitigate problems of technological backwardness and enhance their

access to new technologies, it is imperative to give them a conducive environment, which in the present context of globalization, calls for redefining approaches with knowledge (Innovation, Technology, Entrepreneurship, Advancements in ICT) playing a predominant role.

While we look into new approaches to strengthen them effectively, one has to understand the limitations of SMEs also, which are:

- Low Capital base
- Concentration of management functions in one / two persons
- Inadequate exposure to international environment
- Inability to face impact of WTO regime
- Inadequate R & D
- Lack of professionalism

Besides these, the most formidable problem gripping the SMEs has been in accessing technology and maintaining competitiveness. The reasons for the inability of SMEs to identify their technology needs appear to be:

- Poor financial situations and low levels of R&D
- Poor adaptability to changing trade trends
- Desire to avoid risk
- Non-availability of technically trained human resources
- Emphasis on production and not on production costs
- Lack of management skills
- Lack of access to technological information and consultancy services
- Isolation from technology hubs

In order to enable SMEs overcome the above problems and enhance their access to new technologies for increasing their competitiveness in the international market, it is imperative to give them a conducive environment, which includes:

- (1) Formulation of appropriate national policies and programmes;
- (2) Building up technological capacity;
- (3) Knowledge flows and technology databases;
- (4) R&D and inter firm linkages.

Networking offers an important route for individual SMEs to address their problems as well as to improve their competitive position. Evidence from developing and developed countries shows that networking is more likely when enterprises operate in proximity and share business interests such as markets for products, infrastructure needs or challenging external competition. Within such **groups or clusters**, enterprises' joint initiatives are stronger, because of the critical mass of interested parties, more cost-effective due to shared fixed costs and easy coordination with proximity fostering mutual knowledge and trust.

2.0 S&T Infrastructure for SMEs

Eversince the time of independence, the scientific and the technological base of the country has grown considerably. Today it consists of a wide spectrum of infrastructure in terms of laboratories, R&D institutions, in-house R&D establishments' *etc.* covering several disciplines. The chain of laboratories/ institutions under CSIR, DST, DBT, ICAR *etc.* besides academic institutions like IIT, NIT *etc.* too play a crucial role in responding to the technological demands from the SME sector. Significant growth in the capabilities and achievements in high technology areas, namely nuclear and space sciences, electronics and defence have also caused spin-offs and technology transfers to other sectors, especially the broader production sectors, benefiting SMEs in the process. The Ministry of SSI & ARI keeping in view the concentration of such enterprises has also specially established several Tool Rooms and common facilities.

Besides, different Ministries have set-up their own R&D institutions to address the technological and training/ skilling requirements of SMEs. To cite a few examples Ahmedabad Textile Industries Research Association- ATIRA, North India Textile Industries Research Association- NITRA, South India Textile Industries Research Association- SITRA, Indian Jute Industries Research Association- IJIRA *etc.* (by the Ministry of Textiles), Indian Institutes of Packaging (Ministry of Commerce), Central Coir Research Institute – CCRI (Ministry of ARI), CIPET (Ministry of Chemicals & Petrochemicals), Indian Plywood Industries Research Institute (Department of Industrial Development) *etc.*

The third form of support to SMEs for their technology upgradation, training, reskillng, entrepreneurship *etc.* comes in the form of schemes/programmes by Ministries of SSI & ARI, Science & Technology, Textiles, Food & Agriculture, Labour & Employment *etc.* (A review of all such schemes/programmes is provided later in this Report)

Notwithstanding these efforts by various Ministries and Agencies, SMEs still struggle to engage themselves in the competitive R&D and technological development efforts due to high financial risks. In such a scenario, cooperation and coordination between Indian enterprises and R&D institutions is not a matter of choice but rather of compulsion derived from competitive pressures. The need for cooperation is to bring about value addition to the products through endogenous resources/skills; environmentally clean and economically viable processes; closely held technologies that are commercially denied to Indian industry; strategic/ dual-use technologies, technology packages as available from commercially operating units, process/ product upgradation and incremental productive improvements, and strategic alliances with

partners abroad for gaining market/ technology advantage/ dominance.

2.1 Schemes for SMEs

A wide variety of schemes to promote SMEs have been introduced by different agencies, with both the central and state governments time and again stressing the importance of their role for a balanced development of our society. These are over and above the in-house and Extra Mural Research (EMR) in laboratories under DST, DSIR, DBT, DAE *etc.* and of the socio-economic departments such as DOE, DNES *etc.*

On the basis of the nature of S&T interventions required, SMEs we can classify them into three categories. These categories are:

Category 1: Technology/ Knowledge-based new start-ups. They essentially need S&T inputs for incubation

Category 2: Manufacturers of consumer products/ ancillaries. Such enterprises are driven by user/ market need and basically need S&T interventions for innovation in process/ product/ packaging *etc.*)

Category 3: Micro, Rural, Agro/ Artisan based traditional industries. These units basically need S&T as tool for technology upgradation, training, skilling, marketing *etc.*

To enable identifying improvements, augmenting and new initiatives, various existing schemes offered by different agencies have been categorized in the following ways (Table 2-4).

Table 2: Schemes for Technology/ Knowledge-based new start-ups

Ministry of Science & Technology	<ul style="list-style-type: none"> • Science & Technology Entrepreneurship Park • Technology Business Incubator • Small Business Innovation Research Initiative
Ministry of Small Scale Industries (SSI) & Agro and Rural Industries (ARI)	<ul style="list-style-type: none"> • Technology Business Incubator
Ministry of Information Technology	<ul style="list-style-type: none"> • Software Technology Parks
Ministry of Food Processing	<ul style="list-style-type: none"> • Food Parks

Table 3: Schemes for Manufacturers of consumer products/ ancillaries, driven by user/market need

Ministry of Small Scale Industries (SSI) & Agro and Rural Industries (ARI)	<ul style="list-style-type: none"> • Small Industries Services Institutes • Science, Technology, Research & Development • Ancillary Development • Tool Rooms, Central Footwear Training Institutes • Product-cum-Process Development Centers • Regional Testing Centers & Field Testing Centers • Technology Upgradation • CAD & CAM Centers • Integrated Infrastructure Development • Credit Linked Capital Subsidy Scheme • Small Industries Cluster Development Program • Sub-contracting Exchanges for Ancillary Development • Product Development, Design Intervention & Packaging Scheme (PRODIP)
Ministry of Science & Technology	<ul style="list-style-type: none"> • Technology Development & Demonstration Programme • TechnoPreneur Promotion Programme • Home Grown Technology • Mission REACH
Ministry of Information Technology	<ul style="list-style-type: none"> • Standardization Testing Quality Certification (STQC) facilities
Ministry of Food Processing	<ul style="list-style-type: none"> • Scheme for Technology Upgradation/ Establishment/ Modernization of FPI
Ministry of Commerce & Industry	<ul style="list-style-type: none"> • Integrated Development of Leather Sector • Rubber Plantation Development Scheme
Ministry of Textiles	<ul style="list-style-type: none"> • Technology Upgradation Fund Scheme (TUFS)

Table 4: Schemes for Micro, Rural, Agro/ Artisan based traditional industries with elements of technology upgradation, training, skilling, marketing etc.

Ministry of Small Scale Industries (SSI) & Agro and Rural Industries (ARI)	<ul style="list-style-type: none"> • Training & Manpower Development • Entrepreneurship Development Programme • Management Development Programme • Skill Development Programme
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	<ul style="list-style-type: none"> • Training programmes on Packaging for Exports • PM Rozgar Yojana (SHGs) • Scheme of Fund for Regeneration of Traditional Industries (SFURTI)
Ministry of Human Resource Development	<ul style="list-style-type: none"> • Industry-Institute Partnership Cell (AICTE) • NAFETIC (AICTE) • Polytechnics/Community Polytechnics • Support to Training and Employment Programme for Women (STEP) • Rashtriya Mahila Kosh
Ministry of Science & Technology	<ul style="list-style-type: none"> • Science & Society Programme • S&T Entrepreneurship Development Programmes
Ministry of Information Technology	<ul style="list-style-type: none"> • Training programmes offered by STQC
Ministry of Food Processing	<ul style="list-style-type: none"> • Food Processing & Training Centers • Entrepreneurship Development Programme
Ministry of Agriculture & Cooperative	<ul style="list-style-type: none"> • Cooperative Education & Training • Intensive Dairy Development Programme (IDDP) • Fisheries Training And Extension
Ministry of Chemicals & Petrochemicals	<ul style="list-style-type: none"> • Programmes by Central Institutes of Plastics Engineering & Technology (CIPET)
Ministry of Textiles	<ul style="list-style-type: none"> • Powerloom Service Centers • Computer Aided Design Centers • Baba Saheb Ambedkar Hast Shilp Vikas Yojana • Special Handicraft Training Project
Ministry of Labour & Employment	<ul style="list-style-type: none"> • Vocational Training Programme • Industrial Training Institutes • Instructor Training Institute • Craftsmen Training Scheme
Ministry of Tribal Affairs	<ul style="list-style-type: none"> • Vocational Training Centers
Ministry of Rural Development	<ul style="list-style-type: none"> • Swarnjayanti Gram Swarozgar Yojana (SGSY) • YUVAJYOTI- Preparing young professionals in Rural Areas

Programs and Initiatives by UNIDO and Other International Agencies.

The United Nations organizations such as APCTT, UNIDO, UNDP and UNESCAP have also instituted many useful projects for the promotion and well being of the SME sector.

3.0 Recommendations

3.1 Ongoing Schemes and Programmes

In the previous section, we had attempted a review, though not necessarily comprehensive and exhaustive of the various schemes and programs that had been launched by different ministries and agencies of the Government of India, UNIDO etc. We had not attempted an assessment of the impact of these programmes either. The different programmes have had only significant and positive impact on the SME sector albeit with varying degrees of success. ***Special efforts are needed to increase the level of awareness about Government schemes / programs for benefit of SMEs. The Working Group recommends that all the programmes and schemes should be continued into the 11th Plan with augmented outlays; the increase in outlays should be two to three times the outlay in the previous Plan.***

3.1.2 Technology Business Incubators (TBIs) and Technology Innovation Centres (TICs)

Business incubation is a dynamic process of business enterprise development. Incubators nurture young firms, helping them to survive and grow during the startup period when they are most vulnerable. Technology incubators nurture hi-tech start-ups and present a technology-oriented variant of business incubators. They provide access to skills and competencies, access to financing and access to the market

There are about 20 incubators in India today as against over 1000 plus in US, 300 in Korea 100 in Finland. TBIs must be promoted in a big way not only in terms of numbers but also their size. Universities, Engineering Colleges and Business Schools should be the preferred sites for these TBIs.

We make a distinction between Technology Business Incubators (TIB) and Technology Innovation Centres (TIC). The former are located in educational institutions and aim at converting the result of R&D to industries. The latter are located in SME clusters and provide them technical services required for technology upgradation and new product development. The best example for the TIC is Germany where today there are 500 Technology Innovation Centres, giving vibrant and active support to SMEs

The Working Group recommends that a total of 170 Technology Business Incubators and 50 Technology Innovation Centres, should

be set up during the 11th Five Year Plan with a total outlay of Rs. 1100 Crore.

The technology innovation process is not Research & Development (R&D) alone but a larger constellation of inter-related issues, including policies for investment, education *etc.* and involving strong public-private partnerships, in-country and abroad. Indeed, R&D may typically account for only say two-thirds of the total Science & Technology (S&T) expenditures in a country. Management & mentoring staff of these centres require specific expertise in a variety of disciplines ranging from science and technology, finance, marketing, law *etc.* for the development of technology-led businesses. They have to be specially trained and more importantly, they must have a missionary zeal for the task. A special programme to attract successful middle level executives from industry for this important task has to be drawn up. Needless to say, that their remuneration should be adequately high so as to attract the right people.

3.1.3 Creating a climate for Entrepreneurship

The popular misconceptions are that entrepreneurs are born, not made. In fact, entrepreneurial skills can be identified and developed. *The entrepreneur is typically an innovator who formulates new solutions to existing problems, mobilizes resources and stimulates others to participate in the team.* These aptitudes develop over time, often starting in childhood, as the person faces new challenges and learns from failure. Cultural differences among societies affect entrepreneurial activity. The techno-entrepreneur anywhere has the challenge of moving a concept through the prototype and production phase to meet market needs at a price consistent with the value created and with the ability of customers to pay.

Innovation and Entrepreneurship hold the key to enhancing the role of SMEs in improving the Indian economy. As their importance is not well realized, countrywide programmes on entrepreneurship and innovation must be launched in the shape of a national movement. Entrepreneurship should be promoted as a preferred career and not as an alternate career. Entrepreneurship/ incubation should be a part of the engineering curriculum. Towards this, among other things the training of teachers/trainers is necessary and special steps should be taken in this direction. Recognition/ incentives for innovation and entrepreneurship in the clusters and education institutes must be introduced. ***An enhancement in budget in all schemes promoting innovation and entrepreneurship is recommended.***

3.1.4 Role of Polytechnics and ITIs for Rural /small town areas

Technical education and training in India is quite lopsided, in the sense that while the intake into engineering colleges for an undergraduate degree is about 400,000 in about 1200 colleges, the intake for diploma education in engineering in about 1200 polytechnics is only about 250,000. The number of technicians formally trained in the country is about 600000 through 6000 Industrial Training Institutes/ Industrial Training Centres and another 600000 through various apprenticeship schemes. Ideally, in a technologically advanced country, the ratio of graduate engineers to diploma engineers to technicians should be 1:3:15. There is a need to correct the situation by making education in polytechnics and vocational training more attractive and rewarding. Further, these institutions have a crucial role for generating human resources and providing training programs for skills and techniques for SMEs.

The important role that these institutions can play in science and technology intervention for SMEs, particularly those based on rural areas was recognized as early as 1978. The Working Group on Technical Education, of the All India Council of Technical Education (AICTE), in February 1978, recommended that selected Polytechnics, should act as focal points to promote Community/ Rural Development on Scientific lines through Technology transfer. The scheme of Community Polytechnics was started under the Direct Central Assistance Scheme in 1978-79 in 35 Polytechnics. The scheme envisaged the Community Polytechnics to act as important centres for the application of Science and Technology in rural areas and generate self and wage based employment opportunities, through non-formal training, towards competency and need based courses, in various trades and multiple skills. As on date there are 780 AICTE approved Polytechnics covered under the scheme of Community Polytechnics. The scheme is run by the Ministry of Human Resource Development, Government of India.

Many shortfalls of the scheme have been assessed. There appears to be a compartmentalization between normal Polytechnic and the Community Polytechnic activities. Very little attempt has been made to integrate these in curricular activities. At present only a handful of staff members seem to be involved in rural development work. Also, in most of the projects undertaken by the community polytechnics, very little attention has been paid to the costing and the economic aspects of it. Here the technical documentation of work done is also weak.

Notwithstanding the above shortfalls, overall the Community Polytechnics are improving in their performance and those particularly in the states of Kerala and West Bengal have become good models. The success

depends on a unified responsive approach from the State government and also in integrating the Polytechnics management with the specific Community Polytechnics objectives. Through their role in the implementation of these schemes, the Polytechnics as a whole should raise the S&T level of their own staff and students, by solving live rural problems.

It is understood that there are plans to launch schemes for revamping and modernizing polytechnics and ITIs in 11th Plan. When these investments are made, the special role that they can play for SMEs in the neighbourhood, must be emphasized and prioritized

It is pointed out that with the current rate of birth in the country, 29 million humans are added every year. This means about 29 million people enter the schools every year. Out of these, only about 2 million go beyond the plus two-stage to university or professional education. More than 90 percent of the students, which is about 27 million in number, are dropouts. There is no formal scheme for providing them vocational skills that will make them suitable for employment. Special short-term skilling programmes should be introduced for school dropouts and youths with no formal education in emerging areas like Telephone/ Mobile-phone repair, Office equipment repair, Washing machine repair, Optical Fiber laying/ connectorization etc.

The Working Group strongly recommends that Polytechnics and Industrial Training Institutes should be encouraged to organize short-term programs for vocational training of school dropouts in a variety of multi-skilled job positions that would be available in SMEs. In evolving these training programs. Industry involvement should be mandatory and employer-based training programs should be encouraged. There should be a special initiative to ensure proper training to the trainers engaged for conducting such courses. The resource persons should be offered attractive remuneration to make the programme interesting and useful.

3.1.5 Self-Help Groups

Self Help Groups (SHGs) of Women, their federations (for example, Confederation of NGOs of Rural India -CNRI) and networks are another important sector that needs support in the Eleventh Plan. The best success story is that of the Lijjat Papad. Today, their scope goes beyond Agro/ Food Processing into many electronic/ engineering activities. As articulated by CNRI, ***what these groups need for their success are augmented micro financing and revolving credit. The possibility of the organized sector linking up for quality and international reachability is to be encouraged. The activities under 3.1.4 and 3.1.5***

could be integrated into the PURA (Providing Urban amenities in Rural Areas) mission – about 7000 for the country.

3.1.6 SME Cluster Development

The importance of S&T interventions in SMEs on a cluster basis is today well appreciated internationally. As mentioned earlier, there have been many attempts for technology of duration of clusters of SMEs in India by the Ministries of Small Scale Industries, Agro & Rural Industries, Food Processing etc. ***Some of the sectors like Casting, Sports Goods, Scientific Instruments, Surgical Instruments, Diesel Pump & Engineering Industry, Agricultural Implements Industry and Pottery are already identified by TIFAC & Ministry of SSI for a Mission Mode approach for technology intervention in the 11th Plan to help increase their productivity and exports significantly. An outlay of Rs. 50 Crore is recommended for this mission mode programme for the seven selected SME clusters.***

3.1.7 Schemes of Subsidies

It was learnt from the discussions that the Ministry of SSI operates a scheme, known as Capital Linked Capital Subsidy Scheme (CLCSS) under which 15 per cent subsidies are made available to SSI units going in for the latest technology in production and related machinery and equipment. Similar schemes are recommended in other ministries also in support of SMEs within their purview.

3.2 New Schemes/ Programmes

3.2.1 Technology Profiling of SME Clusters

A strong need for preparing sectoral technology profiles of the SMEs has been felt. These Technology profiles will help in critically examining and addressing technology needs in line with the business requirements of the respective sectors. To begin with, following, 10 SME sectors can be taken up for technology profiling-

- (i) Food and allied industries
- (ii) Wood and wood products
- (iii) Paper products
- (iv) Leather and leather products including footwear
- (v) Rubber products
- (vi) Plastic products
- (vii) Glass and ceramics
- (viii) Electrical machines, appliances & apparatus
- (ix) Bicycle parts, tricycles and perambulators
- (x) Sports goods.

TIFAC will coordinate the activities of technology profiling of SME clusters with active cooperation and involvement of CII, UNIDO and INAE. Working Group recommends a financial outlay of Rs 50 Crore during the 11th Plan for this activity.

3.2.2 Information & Communication Technology (ICT) for SMEs

Information & Communication Technology (ICT) can play a crucial role in reshaping the business models of SMEs to strengthen their competitive performance. The application of ICT is not limited to shop floors only; it is rather widely used in non-production processes also, which are considered major source of non-price factors of competitiveness. Awareness about safety, health, ergonomics, occupational hazards and environmental issues needs a high priority and must go along with schemes and not separately. Potential of ICT can be tapped for this purpose, also as one of the methods. It is understood that Ministry of SSI is working out a programme for helping SMEs to identify their ICT needs and providing resources for its implementation. Some initial work has been taken-up jointly by Ministry and the CII with a view to enhance competitiveness of Indian SMEs. ***A total budgetary outlay of Rs.160 Crore with another Rs. 140 Crore from private partnership is envisaged for this endeavour.***

3.2.3 Special Purpose Machines (SPM).

It is felt that the productivity of SMEs can be improved significantly by making available to them Special Purpose Machines (SPM). A national level committee / Group should be assigned the task of identifying such machines and also suggesting if they should be developed indigenously or imported for these SMEs. A strong view was expressed that “appropriate man-machine systems design” (avoiding total automation) are needed for employment- linked industrial growth through recognition of the reality of a “Community Scaling”. TIFAC & INAE can be entrusted the task of identification of such machines. Institutions like IITs, CMERI, NITs etc can take up development of machines. ***An outlay of Rs. 50 Crore is recommended towards implementation of this scheme.***

3.2.4 IPR and related matters

There is a strong need for spreading awareness of IPR amongst the SMEs. Patenting should be encouraged by offering financial support/subsidies. Likewise, quality assurance, ecolabelling, barcoding etc. of products should be encouraged in a big way.

3.2.5 Promoting Academia-SME interaction for Innovation

Science and Technology and innovation will become more and more important for the entire MSME (Micro-, Small- & Medium-Enterprises) spectrum. For small-scale industries, technology is a crucial factor for productivity and quality, whereas for medium scale industries, technology is a crucial factor for growth and competitiveness. SMEs by themselves are a big laboratory for innovation. They do innovate a lot and also share these innovation with their higher ups in value chain, but due to the lack of a systematic approach for managing innovations within most of the SMEs, the benefits (due to these innovations) are only short term.

Every engineering College in the country must be encouraged to interact with as many SMEs in its neighbourhood is possible. Such interaction should necessarily involve the whole spectrum of MSMEs. It may be stipulated that minimum 20 of this should be micro and small enterprises, to be taken up by each College for the following interactions

- (a) Specific research, development, design and engineering programs for technology inputs and upgradation.
- (b) Summer vacation internship (in-plant training) for undergraduate students.
- (c) B. Tech. projects to be carried out in the SME environment on process/products improvement, engineering research and new product development.
- (d) Consultancy and visits by faculty to SMEs,

There are a large number of engineering and technological/ professional Societies in the country. Just to give few examples, Institution of Engineers, Institution of Electronic and Telecommunication Engineers, Indian Institute of Chemical Engineers, Indian Institute of Metals, Materials Research Society of India, Aeronautical Society of India, Indian Physics Association, Indian Vacuum Society, Institute of Plan Engineers, Instruments Society of India, are some of the active professional Societies. The Societies have provisions for corporate membership of enterprises from the industry and also have as stated objectives programs to support the science and technology aspects of industrial growth in the respective fields. However, most of the Societies have not focussed attention on the SMEs. They are content with interactions with the big enterprises, who support them by way of corporate membership and sponsorship of events there is a need to bring a paradigm shift in this approach so that these professional Societies would be evolve, during the 11th Plan, specific programs which will go a long way in improving the scientific and technological capabilities of the SMEs. Some of the recommended activities are:

- (a) Seminars and Workshops, Discussion Meetings *etc* at locations close to SME clusters to discuss specific technology, science and technology advancements in the respective areas.
- (b) Continuing Education Programmes aimed at SMEs at levels of technicians, supervisors, engineers and entrepreneurs
- (c) Train the trainer programs for upgradation of skills and human resource development in SMEs.

DST/TIFAC or the Office of PSA to GOI may launch a pilot programme to be coordinated by the Indian National Academy of Engineering (INAE) for two years aimed at colleges, community polytechnics, ITIs and professional Societies as outlined above with an outlay of Rs 120 Crore. The programme could be extended subsequently after assessing its impact.

3.3 General Recommendations

- Comprehensive retraining programmes for the workers & employees in SMEs should be introduced with incentives/ financial support for them to stay abreast of the latest techniques/ technology in their areas of operation.
- Marketing Development Schemes with a component of overseas travel must be strengthened further. Preference should be given to visits to clusters of SMEs abroad. Financial industry/ visitor chosen for visit should have substantial financial stake to ensure maximum return advantage.
- Taxation & Duty structures for SMEs should be kept such that they encourage innovation.
- S&T Advisory Committees (STAC) in various Ministries must be made more effective to ensure that stand-alone R&D Institutions under them (like IJIRA, Coir Research Institute, ATIRA, SITRA MANTRA SASMIRA, IRMRA, CIPET, Indian Institutes of Packaging *etc.*) get integrated with existing S&T set up.
- Different successful models across the world can be examined and studied for their distinctive features.
- Better amenities need to be provided around SMEs or their clusters located in rural/ small town areas to check the concentration of population in urban areas. In this context, integrating many of the activities for SMEs with the PURA assumes special importance.
- While the previous Plans have either been focusing on agriculture or industries there is a need now for synergy between agriculture and industries. This can be brought about only through a focus on agro-industries. In the same spirit some of the heritage sectors like Ayurveda, Handicrafts and Organic Foods should be given a major thrust through R&D, quality control and packaging support. These areas should be vigorously pursued in 11th Plan.

**Recommendations on financial outlays for S&T for SMEs for the
11th Five-Year Plan**

1	Ongoing Schemes and Programmes (various Ministries mainly SSI)	Rs. 6500 Crore
2	170 Technology Business Incubators & 50 Technology Innovation Centres (DST)	Rs. 1100 Crore
3	Mission mode programmes for S&T interventions in 7 SME clusters (TIFAC)	Rs. 50 Crore
4	Technology Profiling of SME clusters (TIFAC)	Rs. 50 Crore
5	Information & Communication Technology (ICT) for SMEs (Ministry of SSI)	Rs.160 Crore
6	Development of Special Purpose Machines (TIFAC/INAE)	Rs. 50 Crore
7	Promoting Academia-SME interaction for Innovation (INAE/ TIFAC, Engineering Colleges, Community Polytechnics, ITIs etc.)	Rs.120 Crore
