Country Paper-2

Technology Capacity Building Policies to Enhance Competitiveness of SMEs in Nepal

By

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NATIONAL WORKSHOP ON SUB-NATIONAL INNOVATION SYSTEMS AND TECHNOLOGY CAPACITY BUILDING POLICIES TO ENHANCE COMPETITIVENESS OF SMEs

ORGANISED By

UNITED NATIONS ECON0MIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC,
MINISTRY OF INDUSTRY, COMMERCE AND SUPPLIES (MOICS)
DEPARTMENT OF COTTAGE & SMALL INDUSTRY (DOICS)
IT PROFESSIONAL FORUM (ITPF)

KATHMANDU, NEPAL
21-22 DECEMBER, 2006

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Abbreviations

APCTT	Asia Pacific Centre for Technology Transfer
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
APO	Asian Productivity Organisation
BIMSTEC-FTA	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation-Free Trade Area
BYS	Balaju Yantrashala
CDM	Clean Development Mechanism
CP	Cleaner Production
CSIDB	Cottage and Small Industries Development Board
CTEVT	Council for Technical Education and Vocational Training
DCSI	Department of Cottage and Small Industries
DOI	Department of Industries
EE	Energy Efficiency
EMS	Environmental Management Systems
EQMS	Environment and Quality management Systems
FITTA, 1992	Foreign Investment and Technology Act, 1992
FNCCI	Federation of Nepal Chamber of Commerce and Industries
FNCSI	Federation of Nepalese Cottage and Small Industries
FTA	Free trade agreements
GDP	Gross Domestic Product
GNP	Gross National Product
GTZ	German Technical Cooperation
ICT	Information and Communication Technology
IEA, 1992	Industrial Enterprises Act, 1992
IEDI	Industrial Enterprise Development Institute
INGO	International Non-governmental organizations
IP	Intellectual property
IPR	Intellectual Property Rights
ISO	International Standards Organisation
IT	Information technology
MDG	Millennium Development Goals
MoEST	Ministry of Environment and Science & Technology
MIGA	Multilateral Investment Guarantee Agency
MOICS	Ministry of Industry, Commerce and Supplies
NARC	Nepal Agricultural Research Council
NAST	Nepal Academy of Science and technology
NBSM	Nepal Bureau of Standard and Metrology
NCST	National Council for Science and Technology
NIS	National Innovation System
NITC	National Information Technology Centre
NGO	Non-governmental organizations
NTDC	National Information Technology Development Council
R&D	Research and Development

RECAST	Research Centre for Applied Science and Technology
SAFTA	South Asian Free Trade Agreement
SBPP	Small Business Promotion Project
SIS	Sub-national Innovation System
SME	Small and Medium Enterprise
SMI	Small and Medium Industry
SPS	Sanitary and phytosanitary
S&T	Science and Technology
TBT	Technical Barriers to Trade
TEVT	Technical Education and Vocational Training
TRIPS	Trade Related Aspects of Intellectual Property Rights
TTDP	Technology Transfer and Development Project
TU	Tribhuvan University
UNCTAD	United Nations Conference on Trade and Development
UN-ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNIDO	United Nations Industrial Development Organisation
WEAN	Women Entrepreneurs' Association of Nepal
WIPO	World Intellectual Property Organisation
WTO	World Trade Organisation

1. Introduction

1.1 Background

Nepal opened up its economy to outside world in the second half of the twentieth century and since then it has been exposed to vagaries of international trade. While it has favourable trade treaty with its traditional trading partner, India, which is on non-reciprocal basis, other multilateral and regional trading arrangements are largely on reciprocal basis. Nepal is party to regional free trade agreements (FTAs) such as South Asian Free Trade Agreement (SAFTA) and Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation-Free Trade Area (BIMSTEC-FTA) while it entered into multilateral trading arrangements by becoming the member of World Trade Organisation (WTO) in 2004.

Nepal's accession into the multilateral and regional trading arrangements has brought with it both opportunities and challenges. While these twin processes of globalisation and liberalisation have made Nepal an attractive destination for investment and opened up new markets to Nepalese industries, they have also enhanced competition in the domestic market. Lowering or completely eliminating tariffs and systematic dismantling of non-tariff barriers imply that Nepalese industries are experiencing threat from imported products (Shrestha 2004:20). As per the available statistics for the year 2005/06, while the export of goods and services was 18.5 per cent, the import constituted 37.7 per cent of Gross Domestic Product (GDP) leading to unhealthy ratio of import to export trade volume of 49 per cent (ES, 2006:12).

Industrialisation in Nepal is in its early stage. While the contribution of agricultural and forestry sector in Gross Domestic Product (GDP) is around 40 per cent, that of manufacturing sector is less than eight per cent (CBS 2005:403). The growth rate of manufacturing sector has shown declining trend in recent times and is expected to grow at a rate of two per cent in the year 2005/06 (ES, 2006:10). Amongst the manufacturing sector, small and medium enterprises (SMEs) form the backbone of Nepalese industrial sector as they constitute more than 96% in numbers, are widespread and have 'high employment intensity' (Shrestha 2004:21). While one may argue that industrialisation process in Nepal is at low ebb, the need for proactive policies and strengthening of suitable institutions requisite for enhancing competitiveness of industrial sector in general and that of SME in particular cannot be ruled out.

In order to meet these challenges and opportunities, there is a strong need to enhance the competitiveness of SMEs by building domestic technological and innovation capabilities. It is believed that National Innovation System (NIS) and a Sub-national Innovation System (SIS) are strategic policy frameworks that can address these challenges and ultimately meet the Millennium Development Goals (MDGs) (Zengpei, 2006).

United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP) has taken timely initiatives to promote dynamic and competitive SMEs in the region by organising the regional meetings that assess the country specific innovation, and technological capabilities and explore the required strategies to overcome the challenges faced by them. In continuation of the series, present country paper of Nepal assesses the prevailing policies, laws and organisations intended for technology capacity building,

identifies the elements of success factors, and suggests the strategies to enhance the competitiveness of SMEs in Nepal.

This paper is organised into five chapters. The remaining portion of this introductory chapter gives the overview of Nepalese SMEs and their future prospects, and analyses the regional policy trend for the development of SMEs to lay down the foundation for further discussions. The second chapter presents the current status of SME technology and innovation capacity building in Nepal with a focus on national institutional (policy and legal) and organisational frameworks. The third section will identify the key elements and success factors for technology capacity building by analysing the domestic, regional and international successful case studies. The fourth chapter will suggest the suitable initiatives, strategies, efforts or actions that the relevant stakeholders should take to promote the competitiveness of SMEs in the country. Finally, based on the discussions the conclusions will be made.

1.2 Overview of Nepalese SME Sector

As per the Population Census of Nepal held in 2001, about 840,000 families were engaged in small income generating activities. Most of these families were engaged in unregistered and informal sector such as the 'production of household items, utilitarian goods, handicrafts, textile fabrics, food and daily consumer goods, timber and non -timber based products, retail, trading, to mining and quarrying' (Pandey, 2004:7). However, a comparative study of what constitutes the SMEs would reveal that they are commonly defined either in terms of investment (fixed as well as working capital) or direct employment generated. If weighed against these criteria, these data do not lead to clear analysis.

The policy documents of Government of Nepal do not define SMEs. As per Industrial Enterprise Act, 1992 (with first amendment in 1997) industries with fixed assets not exceeding Rs 30 million are termed 'small industries', industries with fixed assets between Rs 30 million and Rs 100 million are termed as 'medium industries', and while those with fixed assets exceeding Rs 100 million are called 'large industries'. These definitions are applicable to industries only that are defined by the said Act and exclude host of other potential areas such as business enterprises and service businesses not defined by the Act (Pandey, 2004:63). However, the available data are only for manufacturing sector and exclude other industrial sector related to mining, construction, energy tourism, services and so on. Moreover, the data are broadly segregated into three categories: those with fixed asset investment less than Rs. 10 million, with fixed asset investment between Rs. 10-50 million, and with fixed asset investment over Rs. 50 million. Hence, in the subsequent discussions SMEs and SMIs are used interchangeably, and essentially mean the small and medium-manufacturing firms with gross fixed asset up to NRs. 50 million, unless otherwise mentioned.

According to the latest national level Census of Manufacturing Establishments conducted in the year 2001/02 covering manufacturing industries that engages 10 or more persons, out of a total of 3,213 of such establishments, SMEs were 3,091 (96.2 per cent). They provided employment to 139,562 persons (77.8 per cent), had gross fixed asset investment of Rs. 12,079,384,000 (29.9 per cent), and had census value addition of Rs. 14,946,891,000 (45.8 per cent). Although most of the micro industries are located in rural areas, only 50% of manufacturing industries are located in those rural areas. Nepalese SMEs were found to be labour-intensive as they created a job by investing Rs. 86,552 on fixed asset while the larger

firms created each job for Rs. 667,563. SMEs in Nepal are the largest employer outside the agricultural sector (Shrestha 2004:21).

However, no reliable information is available regarding the actual production, export and capacity utilisation of SMEs. As is evident from their numbers, employment creation and their contribution on national value addition, one can say that SMEs account for a large share of industrial output and play an important role in the export sector. SMEs are engaged in the production of exportable commodities such as readymade garments, woollen carpets, pashmina shawls, handmade paper and paper products, leather and leather products, metal handicraft products, gold and silver ornaments, primary and processed agricultural products, iron and steel products, textile products plastic products and so on (Pandey, 2004:64; FNCCI, 2005:53-55). SMEs have also made significant contribution to domestic markets by producing bakery products, textile products, dairy products, processed foods, bamboo products, herbal medicinal plant extraction, floriculture nurseries, printed materials, plywood and boards, colour paint products, metal products, plastic products, wooden products, fresh fruits and vegetables (Pandey 2004:8, Pandey 2004:64). Similarly they have also embarked upon micro hydropower, tourism, mining, construction, and agro-business sector like tea, off-season vegetables and horticulture products, dairy and milk products, animal husbandry and floriculture (Pandey, 2004:8).

Majority of SMEs are primarily concerned with the marketing constraints they face in export market. Their international competitiveness is seriously impaired by their disadvantageous economies of scale, lower technology level, limited domestic technological capacity, and limited access to financial and other input resources. Moreover, delivery uncertainty due factors such as labour disputes and internal political rife, high transaction costs due to geophysical situation (landlocked), inadequate domestic capacity to face the commercial disputes, varying sanitary and phytosanitary requirements and higher technical and packaging requirements of export markets are putting them in disadvantageous positions (Pandey, 2004:9).

In fact, Nepalese SMEs are said to be facing problems at every stage of their development although pre-start up and start-up phases are the most crucial ones. While the number of SMEs registered in 2001 reached to 65,875 their mortality has been high (Shrestha 2004:21, New Business Age, April 2004). According to the information provided by New Business Age (April 2004 issue), 25 percent of such registered enterprises do not start up at all while another 50 per cent close down before the fifth year of their operation.

Nepal ranks very low in the global competitiveness index (WEF, 2006) indicating low level of institutional environment, infrastructure, markets and technological innovation. Out of the 125 countries included in the survey, Switzerland ranks first with the score of 5.81 while Nepal ranks 110^{th} with a score of 3.26 (WEF, 2006). Nepalese SMEs are seriously handicapped both in terms of 'hardware' and 'software' components of the enterprise operations. They are plagued with 'traditional management practice, undeveloped entrepreneurial culture, low capital base, outdated and less efficient production process and technology, and poor knowledge and information about business opportunities and marketing' (Pandey, 2004:9).

An enterprise's success, or failure, is largely determined by the way the technology is used Optimum use of technology helps the manufacturer to be competitive in market place as it helps in reducing the production cost, ensures consistent production of quality products, and

enhances the productivity of the firm (Nepal *et al*:2003). However, the technologies used by many SMEs in Nepal are prone to frequent breakdowns causing high wastage and hence jeopardising the competitiveness (Shrestha, 2004:20). In the absence of effective innovation inducing measures, Nepalese SMEs are virtually dependent on the imported technology and skills for the maintenance and operation of plants (Nepal *et al*: 29). It is, therefore, right time to formulate the appropriate policies to enhance the domestic technology capacity to promote the innovation. Since the domestic experience in this regard is very limited, it is considered appropriate to draw upon the experience and strategies of other countries in the region that have been successful in promoting the innovation in their SMEs and made them competitive in the global markets.

1.3 Future Prospect for SME Development in Nepal

As in the case of many Asian countries, SMEs in Nepal will also continue to have greater significance in national development for a foreseeable future. Some of the reasons that can be attributed for arriving at this conclusion is: small and fragmented domestic market, lower purchasing power of the people, limited capital, geographical situation and inadequate physical, technological and social infrastructures (Adhikari, 2004:78; New Business Age, April 2004; Nepal and Karki 2000:4).

Development of SMEs is in the strategic interest of a country. SMEs create large number of jobs for lower investment, has greater resource-use efficiency, offers scope for specialisation and special skills, creates the self-employment opportunities, develops entrepreneurial skills with low risk, promotes technological innovation, strengthens the manufacturing sector to enhance competitiveness, has the potential to increase the exports, offers localtional flexibility thereby bridging regional imbalances, uses the local resources, increase the income of rural people, and ensure equitable distribution of the benefits of economic growth (Shrestha, 2004:20-2, Pandey 2004:7; Adhikari, 2004:78). Therefore, government must take appropriate measures to promote them.

SMEs can also be competitive in those areas where Nepal has comparative advantages due its unique agro-climatic conditions, natural resources and so on. Production of handicraft items, medicinal herbs and their extraction, horticulture, agro -based and non-timber forest products, information and knowledge based technology services, floriculture, educational institutions, modern agro-based products and services sector, are some of the other examples where SMEs can play crucial role (NPC, 2002; Pandey, 2004:12-3). However, Nepal needs to develop the domestic capabilities to acquire new knowledge and make their own choices about technology change and establish the supporting institutional and policy environment (ITDG, 2000:4).

1.4 Emerging Policy Issues to Enhance SME Competitiveness

Low wage rate in developing countries is no longer a key factor in attracting the foreign investments as well as increasing the competitiveness of domestic industries. Change in technology changes the patterns of trade with the adoption of efficient production process and introduction of new products. With the increase in the productivity, the comparative advantage of cheap labour wanes. In such a situation, the 'quality of local capabilities and

institutions becomes the prime determinant of the ability to attract and use foreign resources' (UNCTAD, 2003:3-4).

The experience of successful countries in the region would suggest that for a country like Nepal mere liberalisation and opening up of its investment regime to foreign firms does not ensure capacity build up in ensuring competitiveness (UNCTAD, 2003:33; ITDG, 2000:2). A survey conducted by UNCTAD has shown that 80% of royalty payment was directed to parent firms from its subsidiaries implying high incidence of intra-form technology transfer and limited diffusion to build local capacity (UNCTAD 1997 in ITDG, 2000:2-3).

Many developing countries import new technology, equipment and patents, but they have not developed adequate capabilities to use them effectively. Proper and effective use of new technologies is possible through the development of indigenous "technological capabilities" building which is a combination of 'information, skills, interactions and routines that firms need in order to handle the tacit elements of technology' (UNCTAD, 2003:6). Core competence comes from technology, which is to be adapted, assimilated and innovated by building domestic technology capacity. There is visible learning hierarchy of foreign firms in recipient countries. This process can be broken done at four levels (UNCTAD, 2003:7-8)

> At the bottom are the simplest (operational) ones, needed for running a technology efficiently: these involve basic manufacturing skills as well as some more demanding troubleshooting, quality control, maintenance and procurement skills. At the intermediate level are duplicative skills, which include the investment capabilities needed to expand capacity and to purchase and integrate foreign technologies. Next come adaptive skills, where imported technologies are adapted and improved, and design skills for more complex engineering learned. Finally come innovative skills, based on formal R&D, that are needed to keep pace with technological frontiers or to generate new technologies.

Acquisition of technologies can take two broad forms: *internalised* (from a multinational company to affiliates under its control) and *externalised* (between independent firms), which may or may not involve foreign firms (UNCTAD, 2003:9). Although the internalised mode may shorten the learning time, with the increase in domestic technical capability the externalised mode of technology transfer becomes more cost effective and provides advantage to host country of 'learning benefits' (UNCTAD, 2003:9). This is likely to be the main reason why multinational firms tend to 'transfer the results of R&D rather than the process itself' (UNCTAD, 2003:11). Therefore, as the technical capability development tends to gain momentum the local innovative process should start by promoting local R&D capabilities (UNCTAD, 2003:11)

Since the innovation process has become risky and costlier, there is now 'greater inter-firm and cross-national collaboration and networking in innovative effort' (UNCTAD, 2003:3-4). The Asian experience has shown that SMEs with highly favourable 'cooperative inter -firm relationships' have fared better in applying technology to enhance the competitiveness, thereby penetrating export and domestic markets successfully. Such relationships have shielded the SMEs from potential risks, increased the flow of information and know -how between the firms, and 'created a rich pool of collective knowledge' (Shrestha, 2004:20-1). Such relationship can be developed by having the strategic policy frameworks such as NIS and SIS in place and ensuring their effective implementation (Zengpei, 2006). Zengpei

(2006) explains the concept of innovation, innovation policy frameworks: NIS, SIS, and the role of the government and other relevant actors, by providing the example of South Korea.

> Innovation is a continuous process and occurs in an extremely complex milieu where various elements and actors are involved. They include policy makers, entrepreneurs, researchers, large firms and SMEs, and consumers. Their mutual interaction and interdependence are at the core of a system that promotes innovation activities.
>
> Innovation policy is a horizontal issue and comprises many different policy aspects: research and technological development; economic development; promotion of entrepreneurship; creation of technology-based start-ups; firms' networking; public-private partnerships; and innovative financing mechanisms. Therefore, provincial governments and authorities must be the catalyst in bringing all these factors together, in structuring a favourable business environment by removing the barriers; by providing incentives; by encouraging R&D activities; by supporting networks and clusters. Good local conditions to set up a sound innovation system are indispensable for a successful innovation strategy.
>
> A Sub-national Innovation System (SIS) is widely recognized and in some countries adopted as an important policy mechanism for the sustainable growth of the economy at the provincial level as well as overall national economic development. However, compared with National Innovation System (NIS) concept, this SIS is a relatively new concept, which is still an evolving framework, and currently only limited countries in the Asia-Pacific region reflected SIS initiatives in their science and technology system or socio-economic development plan. It mainly focuses on industrial development and enhancing the competitiveness of the local or provincial enterprises, especially SMEs through the overall system restructuring and upgrading, including technology and innovation to support them.
>
> South Korea has initiated SIS to increase investments in high-tech industries; to raise funds to foster venture businesses; and to develop human capital for supporting sustainable growth of SMEs'. In addition, it also restructured its science and technology administrative system and is implementing policy initiatives towards setting up of a new national innovation system to drive innovation-led economic growth in all sectors of society including government, corporate, education, finance, labour, science and technology.

Deok (2005) further explains that 'SIS is small NIS' as it shares the characteristics of NIS and is influenced by national policy. He further says that SMEs are important actors in SIS as their effectiveness depends on local conditions and is also heavily influenced by local policy. In order to create the 'national wealth for innovation' there is a need to streamline the activities towards that objective. Hence, the next chapter will discuss the science and technology policy and relevant institutions that are engaged in development of science and technology in Nepal and assess their activities and performance. This is expected to serve as baseline information for devising a suitable innovation strategy for Nepal.

2. Current Status of SME Technology Capacity Building in Nepal

2.1 Introduction

Science and technology (S&T), and innovation policies play the crucial role in meeting the Millennium Development Goals (MDGs) and hence should be placed at the centre of development strategies (Zengpei, 2006). In the Nepalese context, the importance of development of science & technology for the overall economic development was felt half century ago, in 1956, which is duly reflected in the first development plan of Nepal. Realising the need for an effective body on S&T led to the establishment of the National Council for Science and Technology (NCST) and the Research Centre for Applied Science and Technology (RECAST) in 1976.

Subsequently, as stipulated in the Sixth Plan (1980-1985) document, Nepal Academy of Science and Technology (NAST) (then Royal Nepal Academy of Science and Technology-RONAST), was established in 1982. In the year 1989, NAST put forward the first ever National Science and Technology Policy and duly emphasized on: proper resource utilization and development, technology transfer, quality manpower development, and promotion, extension, participation in S&T development (NAST, 2006)

This chapter is broadly divided into three parts. The first and second parts intend to analyse the policy and legal frameworks that are in place to develop the science and technology in Nepal. The third part is primarily devoted to identify and assess the activities undertaken by the relevant organisations to achieve the broad objectives set out in those policies and laws.

2.2 National Framework Policies to Promote S&T Capacity Building

There are numerous policy documents devoted to the development of science and technology in the country. They are embodied in the constitution, plan documents, broader national policies, sectoral policies and so on. In particular, they relate to Five Year Plans (starting from 1956); Industrial Policy 1992; Foreign Investment and One Window Policy 1992; National science and Technology Policy, 1989 (with revision in 2005); National Policy on Technical Education and Vocational Education, 1999; Information Technology Policy, 2002; National Biotechnology Policy (forthcoming) (Gyanwali, 2005). The most relevant policies that are related to enhancing the technological capabilities of SMEs are discussed, under separate subsections, in the subsequent paragraphs.

2.2.1 S & T Policies in Nepalese Constitution and Plan Documents

The Constitution of Nepal, promulgated in the year 1991, has categorically stressed the need for the development of science and technology, promoting the indigenous technology and enhancing the domestic technological capability. Accordingly the Tenth Five Year Plan (2002-2007) document stipulated the following strategies in S&T sector to meet the key development objective of poverty alleviation.

1. To mobilize natural resources and infrastructure to the fullest extent and to establish new structures/institutions in the field of S&T when needed
2. To transfer, adapt and utilize foreign technologies, as per the national need, involving private sectors as well
3. To establish a working system of competitiveness in R&D activities among scientists, scientific communities and scientific institutions
4. To support economic and social development of common people by sustainable use of resources through development of knowledge and skill in the field of S&T
5. To encourage universities, research institutes and scientists to become more involved in research activities and to produce high class manpower in S& T by providing S&T special place in university curriculum

2.2.2 National S & T Policy, 2005 (Revised)

Government of Nepal announced new Science and Technology Policy in 2005 with a vision to 'build the country as a developed, dynamic and prosperous state by raising the living standards through the appropriate development and use of science and technology' (NAST, 2006). It focuses on the development of infrastructure, human resource and R & D capabilities. The broad objectives laid down in it are as follows:

- To enhance national capability by developing and utilizing knowledge, skill and competence in the field of Science and Technology and expedite economic activities by expanding S&T tool in different spheres that are directly related to development of nation.
- To contribute in the reduction of poverty by improving economic and social condition of the people at large through sustainable use of natural resources. It has emphasized the need for agriculture development and promotion of agro-based industries.
- To take the nation in competitive advantage by utmost development of Science and Technology with the government playing the role of facilitator, promoter and coordinator among the S & T organizations existing in the country.

The policy has emphasized on the need to conduct studies and research on development activities in various sectors such as agriculture, forestry, water resources, education, health, industry, environment, bio and space technology, atom science and geology. Furthermore, it has emphasized to provide quality education on S & T starting from the primary level. The policy also stresses to extend S&T to the rural areas by mobilizing and utilizing indigenous technology, resources and means. It has identified the private sector as one of the key players in the development of science and technology. It, thus, envisages on having a strong public-private partnership in harnessing scientific potentials and building the strong scientific and technological capabilities.

2.2.3 Industrial Policy, 1992

The Industrial Policy, 1992 envisaged, *inter alia*, to increase the contribution of manufacturing sector on national economy through productivity enhancement; establish the industries that use local labour, skill, and resources; provide incentives to export the industrial products; attract the foreign investment and facilitate the transfer of advanced technology and efficient management. In order to make the Nepalese products competitive in

the world market, it mainly emphasised on increasing the efficiency by upgrading the technical know how, conducting the productivity improvement campaign, developing the skilled manpower, and allowing the technology transfer even in cottage industries, which are reserved for Nepalese citizens only.

2.2.4 Foreign Investment and One Window Policy, 1992

Foreign Investment and One Window Policy, 1992 adopted the liberal and open policy with the prime objectives of importing capital, modern technology, management and technical skills. This, the policy envisaged, would increase productivity and develop industrial culture in the private sector thereby assure access to international markets. It recognises the following forms of investments as the foreign investment:

- Equity investment in the form of form of currency or capital assets and reinvestment from income generated therein
- Loans obtained in the form of foreign currency or capital assets

Furthermore, it defines the 'technology transfer' as the followings:

- Use of any technological right, specialization, formula, process, patent or technical know-how of foreign origin
- Use of any trademark of foreign ownership
- Acquiring any foreign technical, consultancy, management and marketing services.

2.2.3 National Policy on Technical Education and Vocational Training, 1999

The Technical Education and Vocational Training (TEVT) Policy, 1999 was formulated realizing the need for a nation-wide coordinated effort to develop human resources and infrastructure in the field of technical and vocational education. The objectives set out by the TEVT policy are as follows:

- To meet technical manpower needs of the country by ensuring reasonable returns of the investment made in this sector
- To ensure increased participation of the private sector, local governments and business community in the operation of TEVT institutions
- To increase the access of TEVT services to poor and underprivileged group of the society.

2.2.4 Information Technology Policy (2000) - Nepal

Government of Nepal formulated the Information Technology (IT) Policy, 2000 with a view to rapidly develop education, health, agriculture, tourism, trade and various other sectors using information technology. It also envisages placing Nepal on the global map of information technology. The broad objectives set out by the policy are the followings:

- To make information technology accessible to the general public and increase employment through this means

- To build a knowledge-based society
- To establish knowledge-based industries.

The strategies that shall be followed to achieve the stated objectives are as follows:

1. The government shall act as a promoter, facilitator and regulator for IT development.
2. High priority shall be accorded to R & D and extension of information technology with the participation of private sectors.
3. Qualified manpower will be generated with the participation of both the public and the private sectors.
4. Domestic as well as foreign investment is encouraged for the development of IT and the other related infrastructures.
5. IT shall be used to assist e-governance and enhancing professional efficiency.
6. IT shall be applied for rural development by extending network to rural areas
7. IT industry shall be promoted in such a way that within 5 years the export earning of IT related services (software and hardware) will reach a Rs. 10 billion mark. E-commerce shall be promoted with legal provisions.
8. Computer education shall be incorporated in academic curriculum starting from the school level.
9. Speedy and qualitative service is rendered at a reasonable cost by creating a healthy and competitive atmosphere among IT service providers.

2.2.5 Telecommunication Policy, 2004

Realising the role of telecommunication in technology development, Government of Nepal announced Telecommunication Policy in the year 2004. The policy stressed the need for improving accessibility of reliable telecom services at reasonable cost.

2.3 National Legal Frameworks to Promote S&T Capacity Building

To realise the objectives set out in the National S& T Policy document, Ministry of Environment and Science & Technology (MoEST) is yet to come up with concrete action plans. It is a well-known fact that formulation of sound policy alone would not yield positive results unless it is effectively implemented for which policy needs to be translated into legal instruments. The provisions related to the development of technological capability building of SMEs that are incorporated in other sectoral Acts & Regulations are discussed in the subsequent paragraphs.

2.3.1 Industrial Enterprise Act (IEA), 1992

As per the Industrial Enterprises Act, 1992 the industries can enjoy following incentives and concessions related to technology import, environmental preservation, efficiency improvement and skill development.

- The capital goods can be imported at reduced tariff rate and no VAT/ST will be levied on them. However, no tax, fee or charge of any kind shall be levied on the machine,

tool, equipment, machineries and raw materials to be employed by the industries 'Export Promotion Industry' while producing the exportable products. Moreover, duties and taxes levied on the materials used in the production of exported products are refunded.

- Pre-operating expenses incurred in connection with skill development and training is allowed to be capitalised.
- Up to 50 per cent of the investment made on process or equipment with the objective of controlling the pollution or minimising the adverse effect on the environment can be deducted from the taxable income.
- Up to 10 per cent of the gross profit shall be allowed as a deduction against taxable income on account of expenses related with technology, product development and efficiency improvement.
- Government may grant additional facilities to any industry established in Nepal by the way of invention therein.
- Foreign national working in Nepalese industries may repatriate up to 75 per cent of his earnings in convertible foreign currency.

2.3.2 Foreign Investment and Technology Transfer Act (FITTA), 1992

Legally speaking this is the only law that governs technology transfer (from foreign countries). The definition of 'Foreign Investor' encompasses both the investor as well as those involved in the technology transfer. The Act allows up to 100 per cent investment in industries, with some reservation on sectors that are of strategic importance to the country such as cottage industries and security related industries. However, technology transfer is possible where investment is not allowed.

Industries established with the foreign participation are treated at par with those established by Nepalese nationals. Thus, apart from the concessions and incentives provided by Industrial Enterprises Act, 1992 the Foreign Investment and Technology Transfer Act, 1992 provides the following additional incentives.

- All forms of foreign investment (equity, loan, dividends, interest and other earnings thereof) can be repatriated in foreign currency.
- Earnings made in lieu of technology transfer can be repatriated in foreign currency, as per the Agreement held between the concerned parties.
- Depending upon the situation, foreign investors and their dependents or representatives (potential or actual investor) are eligible for residential, business, and non-tourist visa.

2.3.3 Telecommunication Act, 1997

In order to improve accessibility of reliable telecom services to general public, in urban as well as in rural areas, it induced competition breaking the state monopoly.

2.4 Organisations to Promote S&T Capacity Building

There are many organizations operating in government, non-government and private sectors that are involved in R&D, and some or other forms of technology transfer and development.

Most of these organisations are involved in skill development training for cottage and micro-enterprises level. However, some organisations such as Nepal Academy of Science and Technology (NAST), Research Centre for Applied Science and Technology (RECAST), and Nepal Agricultural Research Council (NARC) seem to have developed some R& D capabilities. These organizations are said to be functioning with severe constraints such as inadequate budgetary support and ambiguous national priority for science and technological R&D (Gyawali, 2005). Brief introduction of the relevant organisations and their areas of activities are described in the following paragraphs.

2.4.1 Ministry of Environment, Science & Technology (MoEST)

MoEST is the apex body within the Government in S&T development. While the ministry announced IT Policy, 2000 it revised National S& T Policy in the year 2005. Although the ministry is executing some foreign assistance projects in the field of science and technology, it does not possess technological infrastructure to enhance capability for technological innovation (Gyawali, 2005).

The IT Policy has constituted The National Information Technology Development Council (NITDC) under the chairmanship of the Prime Minister. NITDC reviews and revises information technology policy, appraises annual progress and solves problems. Policy also proposes to set up the National Information Technology Centre (NITC) to act as the secretariat of the National Information Technology Coordination Committee (NITDC). NITC envisages to undertake various activities such as establishment of 'information data bank' together with other promotional and R&D function.

2.4.2 Nepal Academy of Science and Technology (NAST)

NAST (formerly called Royal Nepal Academy of Science and Technology- RONAST) was established in 1982 as an autonomous body to promote the science and technology. It is the national S&T apex body and hence advises the government on the matters pertaining to the furtherance of S&T in the country. It aims to improve and promote the indigenous technologies, encourage research in S&T, share the scientific knowledge and experience amongst the scientists and technologists, and identify and facilitate to transfer appropriate technology.

NAST has been undertaking research works in the field of biotechnology, natural products, environment, scientific instrumentation, radiation monitoring, alternate energy, high altitude etc. In collaboration with national and international agencies, it is providing some fellowship and research grants to individual and institution in addition to the support services like Central Research Laboratory, Instrumentation Centre, Radiation Monitoring Unit, Computer Unit, Library and Documentation Centre, Electronic Database and Information Centre (NAST, 2006).

In spite of having a number of scientists and technical experts in different scientific disciplines, NAST has been facing financial constraint to launch substantial effort to promote S& T. It is occasionally involved in small donor supported projects in the field of alternative energy and other technology development such as solar photo-voltaic pump and lighting system; biomass briquette technology from solid fuel; river boat (used in Ghatbesi, Trisuli

River). NAST has not been able to draw the interest in it from business community. It could be partly because it has not performed to its expectations, as its findings or outcomes have not been translated into the action or reached the shop floor (NAST, 2006).

2.4.3 Ministry of Industry, Commerce and Supplies (MOICS)

MOICS, along with the departments and agencies under it, is engaged in the productivity improvement, and administration and promotion of technology transfer process in the industries. Some of the activities being undertaken by them are briefly discussed herein:

- In the past government, mainly MOICS, was involved in establishing the industries, most of which were financed through bilateral and international aid and/or loans. The technologies transferred were mainly in the form of turnkey plants. However, since the beginning of 1990 government emphasised on the private sector led growth and accordingly many industries, small, medium, and large have been established with foreign collaboration in the private sector.

- MOICS, with the financial and technical support of UNIDO, Denmark, and Finland and also on its own, continues to take initiatives in implementing the Cleaner Production (CP), Energy Efficiency (EE), Eco-labelling, Environmental Management Systems (EMS), and EQMS (Environment and Quality management Systems) to enhance the industrial productivity and assist them in complying with the environmental emissions standards.

- Department of Cottage and Small Industries (DCSI) offers its services to potential and existing cottage and small entrepreneurs. It provides short-term and long-term technical skill training to around 10,000 trainees every year. It also undertakes entrepreneurship and business development training. It provides industrial consultancy services, for free, in the preparation of project profiles and exploring the potential of establishing the industries based on local resources. DCSI is also running sector specific projects such as Leather Product Promotion Project, Ceramic Promotion Project, Ready Made Garments, and Nepali Paper Project.

  DCSI's activities are complimented by the Cottage and Small Industries Development Board (CSIDB). Together they have network all over the country. Apart from skill training, they also undertake other industrial promotion activities such as organising industrial exhibitions and exposure visits, making radio programme for creating awareness and so on. They have, however, adopted 'supply driven approach' in conducting the skill training programs and are also seriously handicapped by inadequate programme for regular upgrading of their trainers. They also lack financial resources to fund for technology support programmes, updating information base and disseminating the information to the entrepreneurs.

  Recently, DCSI has initiated the 'Business Incubation Centre' to help the techno entrepreneurs to launch their own projects. Physical infrastructures have already been created and recruitment of suitable personnel is underway. Since the program is in its early stage of development, it would be premature to judge its performance.

- Department of Industries (DOI) is responsible in administering the foreign investment and technology transfer activities in Nepal. In addition, it grants various incentives and concessions to the medium and large industries as per the FITTA, 1992 and IEA, 1992.

- Nepal Bureau of Standard and Metrology (NBSM) provides support to entrepreneurs to acquire quality and environmental certifications. NBSM is the national focal point in the field of all ISO related activities. It has regularly been conducting workshop and awareness training on ISO.

- Industrial Enterprise Development Institute (IEDI) was established in 1996, an offshoot of Germany assisted Small Business Promotion Project (SBPP). It targets existing and potential micro and small entrepreneurs in all areas of manufacturing, processing and service oriented businesses. The approach, pioneered and developed in Nepal, is being marketed abroad by GTZ under the name of CEFE (Creation of Enterprises, Formation of Entrepreneurs) in over 70 countries in Asia, Africa and South America.

  Technology Transfer and Development Project (TTDP) was initiated by MOICS in 1996 with the objective of providing services to the industrial sector in technology-related field. However, due to lack of necessary budget, human resources and infrastructure it was merged with the Industrial Enterprise Development Institute (IEDI) in 2002. Since then it has conducted some awareness workshops, and a technical need assessment study of small and micro-enterprises in the food industry sector in the Kathmandu valley.

  As a successor to SBPP, IEDI has adopted the unique approaches developed by the project in its business development services. IEDI now plays the role of supporting institutional development of intermediary organizations. For this it carries out research and development, testing and dissemination of demand-based programmes of business development services suitable to the different regions in Nepal. The Institute has a network and working relations with several national and international organizations.

- In Nepalese context, enterprises established in 1960s and 1970s in the industrial estates, which were established under the aegis of MOICS, can be considered as 'first generation business incubation model' (Nepal and Karki, 2002).

2.4.4 Universities

Educational institutions, especially Tribhuvan University (TU), are also involved in the development and expansion of science and technology. Various institutes under it are conducting the basic research mainly in the fields of forestry, horticulture, agriculture, engineering and medicine. Research Centre for Applied Science and Technology (RECAST) is its premiere research institute.

RECAST was established in the year 1976 and is operating under the Tribhuvan University. It was created primarily with a view of applying academic or scientific findings to increase the efficiency of production of goods and services. The main objectives of RECAST are:

- To undertake research in identification, development, utilization and dissemination of indigenous technology
- To identify exogenous technologies appropriate to Nepal and explore their technical aspects of technology transfer and application
- To undertake researches in basic and applied sciences.

RECAST conducts research projects, offers expertise and consultancy services, and provides instrumental and analytical services in its laboratories. It organizes national and international workshops and seminars. It provides its laboratory facilities to graduate and postgraduate students from the Central Departments of TU for dissertation and research purposes.

RECAST has been conducting R&D activities in areas such as: energy (solar, biomass, biofuel and improved cooking stoves), natural products, food technology, biotechnology, medicinal chemistry, environment, solid waste management, construction and building materials including low cost housing, natural dye and agro-based technology. It has fairly developed physical facilities (laboratories) such as chemical, instrumentation, construction and building materials, natural dyes and dyeing, fibre testing, food technology, biotechnology, and natural resources.

RECAST conducts research projects as well as designs and fabricates prototypes for various agencies based on contract agreements. It also offers consultancy services in the areas of its expertise and provides various instrumental and analytical services in its laboratories. Although it is trying to commercialise its activities, there are few willing to pay for its services. Because of which it has not been able to expand its sphere of activities and create additional infrastructures for technology development and transfer. This has resulted into the frustration among the scientists as a result of which there is high incidence of brain drain and hence jeopardising the domestic capabilities in research, innovation and development of technology (Gyawali, 2005).

Apart from TU, Kathmandu University is also engaged in research and development activities in the field of science and technology. Recently, its mechanical engineering faculty applied for patent registration at the Department of Industries. However, its areas of research activities are not well documented.

2.4.5 Information Technology Park

IT Park is operating at Banepa, about 25 km east of Kathmandu, under the umbrella of the MoEST. The primary objective of developing the IT Park is to provide basic infrastructure so as to attract domestic and foreign investment firms in IT sector. Establishment of the Park is expected to generate income by exporting the software as well as by creating other IT related businesses. The Park is also envisaged to become an incubation centre in the field of IT-based business development. The Park has recently come into operation and it is rather too early to assess its performance.

Information Technology Park Development Committee functions as a separate body under the MoEST. It is entrusted to manage and coordinate parks to be built in various parts of the country and coordinate the construction and implementation of info-cities and info-villages.

2.4.6 Balaju Yantrashala (BYS) Pvt. Ltd.

BYS, a joint venture company of a Nepalese development bank and Swiss Government, was established in 1960 with an objective of attracting the private sector in the industrialization process. It is equipped with requisite machineries and tools together with other ancillary services units and skilled manpower. It is engaged in the hydropower technology, steel construction, machine construction, sheet metal products and repair and maintenance. It is, therefore, considered as a leading centre in the field of mechanical engineering.

2.4.7 Council for Technical Education and Vocational Training (CTEVT)

CTEVT was established to produce basic and middle level skilled manpower in the country. It formulates policies, ensures quality control, coordinates all the technical education and vocational training centres, and provides services to facilitate TEVT programmes in the preparation of basic and middle level skilled human resources. The current activities of CTEVT are as follows:

- Operation of twelve technical schools, two schools of health science, two rural training centres and one technical teachers training institute. These technical schools provide training in various areas such as agriculture, health, mechanical, construction, electrical, sanitation and tourism.
- Carrying out manpower needs assessment programmes.
- Granting recognition and accreditation to other TEVT programmes and institutions. CTEVT has already granted provisional affiliation to over 100 private institutions to operate TEVT programmes.
- Development of skills classifications, skills standards and conducting skill testing.
- Development of curriculum for long-term and short-term technical training programmes.

2.4.8 Government Research Centres

In the government sector research studies are being carried out mainly in the fields of agriculture, botany, mining, and pharmacy. National Herbarium and Botanical Laboratory, Forestry Research Centre, the Royal Drugs Laboratories, The Central Food Research Laboratory and others are engaged in the research on technology development. Established in the year 1990, Nepal Agricultural Research Council (NARC) has been conducting research on various aspects of agriculture. It has a pool of qualified agriculture scientists duly supported by physical resources. Apart from conducting basic research on cereal and cash crops, it is currently said to be engaged in supporting agro-based SMEs such as mushroom, bee-keeping, horticulture and so on.

However, the investment made by the government in creating the infrastructure and R&D is rather meagre, as shown in the Table 2.1. The fact that government expenditure on R& D is around 0.35% of GNP indicates that development of S& T is rather on lower priority. In comparison, in the year 2003 Germany spent 54.3 billion Euro on R & D, which is 2.55% of its GDP, while Sweden spent 4.27% and Japan 3.12% of their GDP (Stahlecker, 2006).

Table 2.1: Allocation of Budget by the Government on R& D in S&T

SN	Year	GNP -Million Rs	R&D -Million Rs	GNP -(%)	Remarks
1	1995/1996	254,349	686	0.270%	
2	1996/1997	204,899	655	0.320%	
3	1997/1998	214,939	703	0.327%	Projected
4	1998/1999	225,894	752	0.333%	Projected
5	1999/2000	236,771	801	0.338%	Projected
6	2000/2001	247,573	851	0.344%	Projected
7	2001/2002	258,306	901	0.349%	Projected

Source: N.K. Bista, State of Business and Technology Incubation in Nepal (2001) in Nepal and Karki, 2002.

2.4.9 Other S&T Related Organisations

Besides the aforesaid organizations, there are numbers of others working directly or indirectly in providing support to SMEs and conducting various types of research. Organizations such as Federation of Nepal Chamber of Commerce and Industries (FNCCI), Federation of Nepalese Cottage and Small Industries (FNCSI), Women Entrepreneurs' Association of Nepal (WEAN), and Association of Craft Producers, Nepal provide business services in order to help entrepreneurs expand their business and market, improve the efficiency and quality of product/services, diversify activities, and develop new products.

Similarly, the Intermediate Technology Development Group (ITDG), an international non-governmental organizations (INGO), is also engaged in the R&D. Its core areas of activities are: alternative energy, food industry and rural transportation sector. Furthermore, the Asia Network for Sustainable Agriculture and Bioresources (ANSAB), another INGO, is involved in the bio-resources conservation such as non-timber forest products-based enterprise promotion through dissemination of technical and market information to the small entrepreneurs.

The foregone discussions suggest that most of the aforementioned organizations that are said to be engaged in the promotion of science and technology in Nepal are primarily involved in skill development training programmes, and lack adequate physical infrastructure and human resources (technologists/scientists) for technology transfer (from abroad), adaptation and innovation. Against this backdrop, the next chapter will identify the key constraints that have inhibited the technological capacity building in Nepal and analyse the prospects for Nepalese SMEs in gaining the competitiveness with the help of some successful case studies.

3. Challenges, Opportunities and Best Practices

3.1 Introduction

Nepal has adopted liberal economic policy with 'open door policy' approach to attract foreign investment and has taken numerous steps to ensure safe investment in the country. Nepal is highly open and trade-dependent economy in South Asia. It's trade to GDP ratio is about 50

per cent, average tariff rate hovers around 14 per cent, and virtually non-existence quantitative restrictions regime (Shrestha, 2004:16).

Nepal has taken a number of initiatives to attract foreign investment and facilitate the process of technology transfer. Nepal is the member of Multilateral Investment Guarantee Agency (MIGA) & World Intellectual Property Organisation (WIPO). It has offered the foreign investors competitive incentive package with lowest corporate tax in the region. However, despite such efforts it has not been able to move forward in a desirable way. Foreign Investment in Nepal has made limited impact in enhancing the technological capability of the country (Chitrakar 2003:192). As of the year 2005, 0ut of 991 approved projects under foreign investment only 5 per cent of projects involve technology transfer (NPC, 2005:95).

Given its early stage of industrial development and open economy, Nepalese SMEs are finding difficulties in marketing their products in international markets (Pandey, 2004:12-3). Accession to WTO and thereby entry into world market means Nepalese industries must fulfill the higher quality and technical standards, that is permitted under Technical Barriers to Trade (TBT) Agreement and Agreement on sanitary and phytosanitary (SPS) measures, and bear higher costs due to Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement (Shrestha, 2004:15-28, Pandey 2004:51-72). It is, therefore, no wonder that bulk of Nepalese export comprises either unprocessed or semi-processed agriculture and forest based products or products employing low level of technology while importing finished products for domestic consumption (Pandey, 2004:12-3). Given the poor technological base and resource constraints, it is indeed very challenging to Nepalese SMEs to move into high value products.

Against this backdrop, this chapter will discuss the major challenges that SMEs in Nepal are facing in achieving competitiveness in international market. It subsequently explores the opportunities for Nepal by analysing and reviewing the successful case studies.

3.2 Key Challenges to SME Sector in Nepal

Nepal is exposed to volatility of international market due to limited products in export basket and dependency on few markets. While its major exports are carpets, textiles readymade garments and agriculture produces, its more than 80% of international trade is with India, Germany and Unites States (NPC, 2002:95; FNCCI, 2005: 53-5). With the abolition of textile quota regime to US market in 2005, Nepal faces serious problem in exporting its textile products. The East and South-East Asian experience has shown that although majorities of SMEs are finding difficulty in penetrating international markets those which have 'grown from small into efficient medium-sized firms' are doing better (Shrestha 2004:26-7). Shrestha (2004:27) further states that Nepal lacks such 'critical mass of such domestic enterprises'.

Based on studies and seminars conducted in the past, various writers: Manandhar and Ranjit (2003:126-8), Nepal and Karki (2002), Pandey (2004:7-14), Nepal *et al* (2003), Gyawali (2005) etc., have enumerated the following challenges that Nepalese industrial sector in general and SMEs in particular are facing in building national technological capability that have ultimately handicapped in enhancing the competitiveness in international market.

1. Lack of domestic industrial skills
2. Lack of skills development opportunities especially in the field of technology acquisition and management

3. Traditional management and undeveloped entrepreneurial culture
4. Outdated production technology
5. Poor marketing skills
6. Inability to improve the quality and technical standards of the products
7. Lack of adequate infrastructures to source raw materials and spare parts from within the country
8. Inadequate development and access to information technology
9. Perverse protection to domestic capital goods (machineries and equipment) manufacturers
10. Lack of information network in identifying and selection of technology
11. Lack of technology assessment mechanism
12. Lack of knowledge on trend of technology change
13. Inadequate financial resources for the agencies involved in S&T development. In the year 2001/02, the investment made by government on R& D of S& T was estimated to be around 0.35% of GNP (Bista 2001 in Nepal and Karki, 2002).
14. Ineffective intellectual property (IP) protection laws
15. Organizations responsible for S& T development lack clear-cut mission and objectives resulting into wastage of limited resources. Poor coordination between them has led to duplication and overlapping of their activities.
16. Failure of existing institutions and organizations responsible for technology development and transfer to promote the commercially viable and production efficient technologies
17. Whatever limited research is done in the country is 'supply driven' rather than 'demand driven'. There is no linkage between industry, research institutions and educational institutes.
18. Non-existence or ineffective business and technology incubation centres.
19. Lack of awareness among the decision makers and business communities about such incubators. Resulting into lower priority e.g. IT Park initiated in 1996 but only physical infrastructure has been completed so far

The list of issues discussed above illustrates the fact that Nepal is seriously handicapped in enhancing the competitiveness of its industrial sector mainly because of difficulties involved in the process of technology transfer and due to absence of effective national innovation system (Manandhar and Ranjit, 2003:126-9, Gyawali, 2005). Agarwal (2006) and UNCTAD (2003:8) have identified key technological characteristics of SMEs operating in developing countries that are largely applicable to Nepal as well. They are summarized as under:

- SMEs are operating in low technology and resources based sectors
- Policies, incentives and mechanisms to promote SMEs are weak
- The S&T policies including NIS & SIS are almost non-existent
- National competitiveness is low
- Private R& D is low while public R& D system is weak
- Weak linkages with R& D and academics
- Weak S&T manpower, training and education system
- Innovativeness is low
- IPR culture is low
- Application of Information and Communication Technology (ICT) is weak
- Very weak or practically non existence of technology management, knowledge management and networking
- Very weak public-private partnership

- Technopreneurship is weak
- Government procurement policy does not provide specific incentives
- Weak political and societal commitment, including stable political regime

Countries that cater to low-technology market segment may stagnate over the years. This calls for continuous upgrading and deepening the knowledge on technology acquisition, absorption and diffusion (Huq, 2003:250-1)[1]. It is, however, a challenging task to many developing countries. Lall (2002 in UNCTAD, 2003:8) describes some important features of the capability-building process in developing countries, analysis of which reveals that the capacity building requires investment and conscious effort that extends well beyond the capacity of individual firms. Developing countries with 'weak enterprises, networks, markets, and institutions' face more difficulties in this process (UNCTAD, 2003:8). In this context, following section will analyse the Nepalese successful case studies.

3.3 Successful Case Studies

There is indeed a paucity of SMEs in Nepal that have successfully transferred, adapted and diffused the acquired technologies (Shrestha, 2004:21). However, Nepal has developed some level of technological capacity in technology development, transfer, and diffusion in the alternative energy sector such as bio-gas, solar power and micro-hydro power plants mainly through various foreign assistance projects (ITDG, 2003).

Another success story relates to design, manufacture and continuous improvement of mini and micro hydro turbine (cross-flow and Pelton turbines) and electrical (electronic load control device) and mechanical equipments (safety device) for hydropower projects (Shakya 2003:197-220). In order to provide necessary finance, impart technologies and supply skilled manpower to enhance the domestic capabilities, many domestic and foreign agencies were involved, namely, NIDC, ITDG, RECAST, UMN, SATA, SKAT, FAKT and USAID (Shakya 2003:216).

Successful case studies of Nepal would reveal that with the supportive role of government and international donor agencies Nepal is capable of devising innovation system that could enhance the competitiveness of SMEs even in this competitive age.

However, apart from the formal modes of technology transfer, technology transfer also takes place informally through books, journals, promotional literature and personal contacts. Since most of Nepalese industries, particularly small and cottage industries use Indian machinery and equipment; the informal mode of technology transfer is more prevalent among them. Therefore, it is rather difficult to assess the level and extent of informal technology transfer that is taking place in Nepal.

3.4 Opportunities to SME Sector in Nepal

Accession to WTO also implies that Nepal can take discreet measures to promote SMEs. It can extend protection to SMEs for their development and enhancing competitiveness through

[1] Absorption may be viewed as the initial process of technology assimilation when the users build up a thorough knowledge of the technology in question and develop capability in installing, maintaining, designing and manufacturing the equipment concerned, while diffusion denotes the final stage when the technology is adopted by others with the help of the original recipient.

selective measures. It can provide subsidies on research and also to remotely located enterprises and also invoke safeguard measures for the protection of SMEs (Shrestha, 2004:15-28 and Adhikari, 2004:77-94). It can apply such measures to labour-intensive manufacturing industries and agricultural products producers that have comparative advantage (Shrestha, 2004:16).

However, mere protection of industries will not yield desirable result unless suitable micro and macro-level economic and technological policies and support mechanisms are in place. They relate to 'industrial policies, macroeconomic conditions, location and resource endowments, human capital, technological effort, and the nature of factor markets and institutions' (UNCTAD, 2003:7-8). From developing countries' perspective, Agarwal (2006) lists the followings as the 'best practices' in enhancing the technological capabilities amongst SMEs to enhance competitiveness:

- Improving management practices
- Setting up of information sources and networks for technologies and world market potential, rules, etc.
- Strengthening technological and managerial capabilities of policy makers, intermediatory institutions, and public-private partnerships. Putting right people at right places
- Preparing SMEs for WTO business opportunities and from other international arrangements
- Evaluation of policies and mechanisms
- Changing mindset of entrepreneurs
- Encouraging intellectual property generation in academia and IPR education in SMEs
- Encouraging ICT applications

With this background information, next chapter will dwell upon the need to take the national initiatives for the technological capacity building in Nepal.

4. Future Plan and Prospects

4.1 Introduction

The successful case studies of Nepal have demonstrated that Nepal requires foreign support in technology promotion. It is, however, argued that such dependence on imported technology and support is unlikely to lead to technological innovation in the long run (Huq, 2003:247-246, Chitrakar, 2003:179-193). It is said that market failure and externalities occurs during the process of technology development requiring government intervention (Huq, 2003:153; (ITDG, 2000:5). FITTA 1992 is mainly geared to promote foreign investment rather than technology transfer and development (Nepal and Karki, 2002). Hence there is a strong need for the formulation of technology policy and its effective implementation that reaches to various spheres of government's policy, plans, and activities (Huq, 2003:247-246, Manandhar and Ranjit, 2003:119-29, Gyawali, 2005; Dhoubhadel, 2005).

On the other hand, Nepal's entry into regional and multilateral trading arrangements has created challenges and opportunities that has prompted it to review prevailing 'production

dynamics and enterprise development' strategies (Shrestha 2004:24). In this context the focus of government should be directed to increase productivity, competitiveness, and explore the new business opportunities with the help of new technological developments available in international arena. This calls for the initiation of a number of policy and support mechanisms directed to technological up-gradation and creation of a pool of skilled workforce (Pandey, 2004:12, Shakya, 2003:217).

This chapter identifies the necessary government interventions and collective effort of the stakeholders required to enhance the national technological capability that leads to national innovation. Subsequently, it suggests the supportive strategies to promote competitiveness of Nepalese SMEs to withstand in the competitive world market.

4.2 National Initiatives Required to Build Technological Capability

Since there is a strong need to acquire and utilise scientific knowledge and technology for the overall development of the country, Nepal must show strong commitment in developing S&T by declaring S&T sector as its priority area (Dhoubhadel, 2005). UNCTAD (2003:21, 35) has unequivocally emphasised the need for formulating the technology policy to enhance the competitiveness in the international market. It states that:

> Technology policy in developing countries should be seen as an *inherent part of industrial development policy*. It includes the elements of technology policy in the narrow sense – stimulating R&D, building technology support institutions, supporting small and medium-sized enterprises (SMEs) and so on – but it goes beyond into providing the setting in which industrial firms operate, seek technology and learn how to use and improve it.

Such technology policy must ensure successful technology transfer, promote innovation, and enhance the indigenous technological capability in the long run (Huq, 2003:172). Such 'national innovation system' encompasses, among others, creation of R&D facilities, development of products and efficient production processes, and strengthening the currently operating organizations and mechanisms at national/regional and also at industry level (Nepal and Karki, 2002; Gyawali, 2005). The organisations may include 'universities, research centres, government, financial and industrial houses' and may also involve 'technical, commercial, legal, developmental, social, financial, and regulatory mechanisms' (Gyawali, 2005). Mohan (2006) terms it as 'eco-system approach' for the development of SMEs.

UNCTAD (2003:35), however, cautions while making such interventions by the government in two ways. Firstly, there is a need on strengthening government capabilities in terms of 'skills, information, autonomy and honesty' to implement the policies geared for enhancing technological capability. Otherwise, it would result into 'government failure'. Secondly, government should play a role of facilitator in correcting the institutional and market failures to achieve international competitiveness rather than replacing markets.

However, Kim (2006) suggests going beyond the formulation of such policy and emphasizes on formulating an 'innovation cluster policy' that is consistent and system-oriented. This essentially implies a 'comprehensive policy combining technology, industry and regional

development policies'. He argues that such policy would act as 'an engine for strengthening competitiveness of the region and the whole country'. This concept appears attractive and needs to explore further.

4.3 Policy and Strategies to Enhance SME Competitiveness

- Ensure smooth implementation of those policies and provisions, which particularly relate to the development of SMEs (Pandey, 2004:8).

- Target genuine SMEs, which should be categorized based on sales volume rather than investment on fixed asset (Pandey, 2005:3).

- Industrial and economic policies must encompass the export oriented SMEs development strategies (Shrestha, 2004:26).

- Identify products that have comparative and competitive advantage and use discreet trade remedy measures and subsidies, which are compatible to WTO provisions, to ensure successful technology transfer and upgradation to protect SMEs producing them (Pandey, 2004:7-14; Shrestha, 2004:27).

- Develop the guidelines, based on the broader technology policy, to screen the technology transfer agreements.

- SMEs must be facilitated on the product development and production by initiating 'special mechanisms like strategic alliance and networking between SMEs and large firms, and promotion and establishment of export trading houses and free trade and export processing zones' (Pandey, 2004:10; Shrestha, 2004:26; Kim, 2006).

  Development of the clusters with a well-knit network would encompass various activities that foster the innovation. Such cluster would extend services on 'joint technology development, technology transfer, consultancy on legal, business plan, technological designing, patent filing, marketing, incubating, recruiting, testing facilities' and so on (Kim, 2006).

- Take the initiatives and necessary measures to attract the investment and technology transfer to abate the greenhouse gases through the Clean Development Mechanism (CDM) under the Kyoto Protocol.

- Mobilise the multilateral and bi-lateral donor agencies and domestic and international non-governmental organisation in the field of skill development and establishment of technology development and transfer institutions (ITDG, 2002).

- Improve infrastructural and institutional facilities to comply with Technical Regulations and Standards (TRS) under the WTO regime (Pandey, 2004:51-72; Agarwal, 2006).

- Formulate the strategies to increase the inter-firm dependence, such as subcontracting, between the SMEs and large firms and joint venture companies to

ensure smooth supply of inputs to SMEs and their access to international market (Shrestha, 2004:26; Pandey, 2005:3-4).

- Provide the encouragement to innovation oriented SMEs, to develop their technological capability, through incentives and support mechanisms (Agarwal, 2006)

- Target the technical skill and entrepreneurship skill development training to those SMEs that have comparative advantage (Pandey, 2005:4).

- Business incubation and technology parks should be created, at centre as well as in different parts of the country, and their effective functioning should be ensured (Nepal and Kakri, 2002; Pandey 2005, 4; Stahlecker, 2006).

  The technology business incubator provide 'advisory training and information services, management and marketing support, linkages to research faculty and facilities, access to capital, thereby greatly enhancing the chances of success of the early stage technopreneur' (Lalkaka 1996 in Nepal and Karki, 2002). However, establishing such incubator would require many inputs and infrastructures such as 'investment funds for seed capital, technological laboratory acting as a source of innovations and the incubator facility located next to the laboratory (Gyawali, 2005).

- Provide the forum to acquire necessary information and skills in terms of product development, product standards, process development, potential market, product branding etc. by regularly organizing the fairs, exhibitions etc (Pandey, 2005:4).

- Establish the 'technology service clinics' and 'consultancy clinics' at clusters or in the vicinity of the industries to provide technical assistance on various facets of industrial units establishment and operation (Agarwal, 2006).

- Maintain information and data bank on technology, market, human resources, successful case studies and best practices etc. and make them easily available to SMEs, policy makers and other relevant stakeholders (UNESCAP, 2006).

- Make arrangement for 'loan insurance' directed to SMEs (Pandey, 2005:4).

- Target genuine SMEs, which should be categorized based on sales volume rather than investment on fixed asset (Pandey, 2005:3).

- Create innovative financing mechanisms such as 'technology fund', in order to facilitate the new technology acquisition, adaptation and diffusion (Pandey, 2005:4; Agarwal, 2006; Wei, 2006).

- Encourage the financial institutions to invest some portion of their lending as 'venture capitals' that is easily accessible to technology intensive SMEs (Pandey, 2005:4;Stahlecker, 2006).

- Provide the incentives (such as tax relief on income tax, skill development activities, exemption on import duties on equipment etc.), to domestic firms to increase their

share of investment in R&D and devise the modalities for public-private cooperation (UNCTAD, 2003:26; Agarwal, 2006).

- Increase the budget outlay for R& D activities, which currently stands at about 0.34% of GNP, to at least 1% and set the research priorities (Gyawali, 2005; Stahlecker, 2006).).

- Take appropriate measures to retain the talented brains and young scientists in the country (Gyawali, 2005).

- Provide incentives to enhance the linkages between research institutions, universities, academia and industries so as to facilitate the 'demand driven' research activities leading to sharing of knowledge and experience (Gyawali, 2005).

- Facilitate the commercialisation of developed technology (Wei, 2006).

- Science and engineering education should be expanded at the tertiary level to produce to ensure adequate supply of mid-level engineers in production sites (Choi, 2006).

- Encourage the e-learning process at all levels and forms of educations (ESCAP, 2006).

- Provide large-scale vocational training to produce skilled manpower in private sector (Choi, 2006)

- Provide necessary financial, technical and capacity building assistances to the sick SMEs (Adhikari, 2004: 78).

- Mobilising the regional and international support in the process of technology transfer and diffusion pursuant to the Millennium Development Goals and the Articles 66.2 of TRIPS Agreement (NPC, 2002:95). Such support could be in the form of joint research, exchange visits of scientists and technologists, information sharing, training of manpower, access to research facilities, networking research programs, establishing centres of excellence, participation in technological exhibitions, and so on.

- Utilise the services provided by national, regional, and international agencies such as UN-ESCAP, APCTT, APO, UNCTAD, WIPO INSME (in Italy) etc. in the technology acquisition, and transfer process (UNESCAP, 2006; Zengpei, 2006).

- Prepare the inventory of domestically available R&D expertise and instrumentation and disseminate them (Gyawali, 2005).

- Sensitise the SMEs on IPR issues (Agarwal, 2006).

- Encourage the industrial association's more proactive in the technological capacity building process (Agarwal, 2006).

- Strengthen the IPR regime and make the system transparent and attractive for providing the incentives to the domestic inventions and innovations that enhance the SME competitiveness (Wei, 2006).

- Provide support to patenting activities (Stahlecker, 2006).

- Take necessary safeguard measures to protect traditional knowledge, skill, problem solving ability and biodiversity (Gyawali, 2005).

- Formulate the policies that promote competition and fair play (Agarwal, 2006).

- Organise the demonstrations of practical implementation of technologies (Agarwal, 2006).

- Develop methodologies to measure progress in the implementation of innovation programs for SMEs (Wei, 2006).

5. Conclusions

SMEs have contributed significantly to the national development and distribution of income. Although the share of manufacturing sector is around 8 per cent of national GDP, SMEs' contribution is almost half. SMEs in Nepal are the largest employer outside the agricultural sector. While they constitute over 96 per cent in numbers and provide employment to over 77 per cent of industrial workforce, they employ less than 30 per cent of capital. However, Nepal's accession into the multilateral and regional trading arrangements has brought with it both opportunities and challenges for its industrial sector in general and SMEs in particular.

The international competitiveness of majority of SMEs is seriously impaired by their disadvantageous economies of scale, lower technology level, limited domestic technological capacity, and limited access to financial and other input resources. Nepal is seriously handicapped in enhancing the competitiveness of its industrial sector mainly because of difficulties involved in the process of technology transfer and due to absence of effective national innovation system

There are numerous policy documents devoted to the development of science and technology in the country embodied in the constitution, plan documents, broader national policies, sectoral policies, and so on. Similarly, there are many institutional provisions and organisational set-ups dedicated to technological capacity building. However, they are operating in limited areas, engaged in 'supply driven' activities that are not linked to their goals, and their activities uncoordinated leading to 'reinventing the wheel' and wastage of precious little resources. They are also plagued with numerous handicaps such as limited resources, lack of clear vision and objectives, poor incentives and limited domestic and international linkages. Therefore, the reasonable starting point to move forward would be to specify, monitor and coordinate the works of different organizations involved in science and technology in the public sector.

Enhancing technological capacity building requires investment and conscious effort that extends well beyond the capacity of individual firms. It is, therefore, necessary to overcome

market failures related to technology acquisition, adaptation and diffusion. Therefore, government must intervene by formulating the appropriate science and technology policies to enhance the domestic technology capacity to promote the innovation.

Formulation of policy alone will not be sufficient in promoting the national innovation systems. It needs to be followed up with clear strategies and implemented with due vigour. Strategies should be specifically targeted to SMEs with clear competitive potential and comparative strength.

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