Developing Technological Capabilities in Small and Medium-sized Enterprises: An Examination of SME Policies and the Role of Support Agencies in Sri Lanka

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Table of Contents

List of Tables

List of Figures

List of Maps

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Chapter 1

Introduction

1.1 Background

This research investigates technological progress and innovation performance in small and medium-sized enterprises (SMEs) operating as home-based enterprises and in commercial locations in Sri Lanka. The analysis presented in this thesis focuses on the effectiveness of existing policies and institutions designed to support SME performance, and interrogates new approaches concerning how technological knowledge is transformed into products and services that reap economic benefits.

It is widely accepted that SMEs have an essential role to play in the process of economic development in advanced and developing countries alike where SMEs make up over 95 percent of total enterprises and account for 40-80 percent of jobs (see for example, Birch, 1987: Storey, 1984: OECD, 1996). In recent years, SMEs have been seen as an engine of industrial growth and their contribution to overall economic development is widely recognised. Further, their role in innovation that induces economic upturns has also been examined vigorously in policy and academic literature (Aoyama, 1999). The debate on the role of the SMEs in creating employment and poverty alleviation in developing countries has been a central issue among development economists; evidently, this has been further endorsed by international agencies such as World Bank/IMF and UN agencies as a development strategy for developing countries for achieving host of social, economic and political objectives of national development.

There seems a renewed interest on SMEs as drivers of technology development and innovation. As literature suggests, the role of SMEs as innovators depends on interaction between the external knowledge base and expertise within the SMEs that could enhance the technological and innovation capabilities of SMEs (see for example Malecki, 1998: Rothwell et al., 2000). An analysis of technology and innovation policies in the US, the European Union and UK suggests that facilitating technological change and innovation through interaction between the external knowledge base and SMEs has been recognised as an important component of state intervention. In recent years, similar intervention policies are being pursued in developing countries in different ways as a tool for building domestic technological capacity. Whether such interventions help developing countries to catch up with the developed countries is a matter of concern. This research furthers this discussion by focusing on role of SMEs in the context of one developing country – Sri Lanka - and the way in which the state intervenes in enterprise development and technology and innovation.

1.2 Rationale and approach, research objectives, research questions and methodology

1.2.1 Rationale and approach

In recent years, the academic and policy literature has contributed to a more profound understanding of SMEs, technology and innovation. However, very little has been written on Sri Lanka with respect to SME development and technology and innovation, and the way in which Sri Lankan SMEs exploit technology in order to enhance their technological capabilities and improve performance. The most comprehensive academic piece of work in this area is Wignaraja's (1998) study on Sri Lanka's economic liberalisation and industrial policies and their impact on the technology capabilities of export oriented larger firms. Wignaraja (1998) argued that, as a late industrialising economy, Sri Lanka requires systematic government support and the creation of new institutions for technological learning to remedy market imperfections. Wignaraja's research, however, considered only large enterprises, viewing technology and research and development (R&D) as an essential component for their export competitiveness. In this thesis, I extend Wignaraja's research by demonstrating that effective SME and technology policies and an appropriate institutional framework are major determinants of technology and innovation capability building, not only in export oriented larger enterprises but also in SMEs. This research attempts to make a significant extension to Wignaraja's work in which I argue that SMEs play a vital role in Sri Lanka's economic development therefore enhancement of technological capabilities undoubtedly contribute to the higher economic performance of SMEs. In addition to the macro-level determinants of technological activity, I argue that it is also important to explore a range of macro and micro-level factors, including sectoral, owner/manager characteristics and accessibility to support services.

SMEs represent a broad base of enterprises operating in the Sri Lankan economy. SMEs are generally defined as those employing between 10 and 249 employees (see Chapter 2), however, in Sri Lanka this standard definition is not widely recognised at both policy level and business support institution level. Therefore, for this research, this definition is extended to include all enterprises below and above the defined cut-off points, with only exception being the enterprises employing up to 249 employees are considered for quantitative analysis across all sectors and geographical locations (excluding North and East provinces affected by the on-going conflict). There is a rationale for this approach of using the term 'SMEs' in a broader context. In Sri Lanka, no standard definition is used to classify enterprises and the definitions that are being used do not correspond to the international definitions (i.e EU). Thus, small enterprises of all descriptions (single-owned, home-based and craft, formal and informal) are regarded as important contributors to employment (they account for over 70 per cent of employment in the private sector) and worthy of greater attention from the state. In addition, the business and technology support system in Sri Lanka involves a large number of public and private sector institutions operating since the 1950s. These institutions receive substantial public investment and are expected to play a major role in the development of enterprises; they are also under public scrutiny as to how well they perform their functions. Based on my past experience of working with enterprises in Sri Lanka, I argue that what matters for the existence, survival and growth of enterprises is an effective policy intervention_at macro and micro level and a strong business support structure that can meet the needs of enterprise.

1.2.2 Research objectives and questions

This research critically examines the strategic focus of appropriate policies, institutional support and the use of external support by SMEs. In doing so two important actors come in to play. The primary actors, SMEs, are defined as those business units employing fewer than 250 employees emphasising enterprises whose products and/or services depend largely on the application of either new technology, or an innovative application of existing technology. The secondary actors are external support agencies, specifically public or non-profit agencies delivering business support services primarily for small and medium-sized enterprises (SMEs) with the aim of enhancing their technological capabilities. The main questions that will be addressed in this research are three-fold. First, how has Sri Lanka's political economy shaped the development of SMEs? Second, how effective are Sri Lanka's SME policies, most specifically those relating to science and technology and institutional support for enhancing technological capabilities? Third, how do owner/managers' and firm level characteristics influence the technology capabilities of SMEs in Sri Lanka?

Overall, this research will make three important contributions. First, through a review of existing literature supported by an in-depth empirical investigation, it aims to provide a better understanding of the SMEs in Sri Lanka and the historical, cultural and economic factors that shape the nature and structure of SMEs. Second, it will attempt to draw on current good practice (policies and strategies) and lessons for Sri Lanka to help SMEs overcome internal and external failures and thus improve their innovation performance. Third, this research will contribute to filling the gap that exists between SME policies and research especially in the Sri Lankan context while laying the groundwork for further research. Therefore, the research I have undertaken is vitally important to not only researchers but also policy makers and providers of SME support, particularly in Sri Lanka. In doing so, backed up by a well structured rationale and approach and guided by a conceptual and theoretical framework, this research aims to investigate and evaluate the policy framework, and support strategies for overall SME development with more emphasis on firm-level technology acquisition, adoption and innovative behaviour.

1.2.3 Research method

Due to the nature of the subject matter, this research utilises methods and techniques from the social sciences and draws primarily upon a mixture of theoretical and empirical evidences, with less concern for sophisticated statistics. Although the field of SME research has grown tremendously in recent times, the very complexity of SMEs makes research difficult (see for example, Curran and Blackburn, 2001). A large part of this research therefore involves policy analysis which can be described as 'research for action' (see for example, Storey, 1994: Gibb, 1980 and 2000) which is 'grounded' in the experience of entrepreneurs and their SMEs. A number of researchers cited in this research argue that research on SME support services should emphasise the way in which support agencies 'add value' to clients and to the economy. Wood (1994) argued that the measure of 'effectiveness of the external support' relies upon the new knowledge gained by the enterprise as a whole (including owner/manager and/or employees), new techniques and methods adopted, strategic change (technological and managerial), information added and contacts made (suppliers/customers) etc.

This research aims to achieve the research goals set out above through a mixture of qualitative and quantitative analysis: a review of academic and policy literature and an evidence-based research. The methodology adopted in this research comprises conceptually distinct but interlinked components. The qualitative approach is organised by three key activities.

The first part of the analysis is desk-based research which encompasses a literature review, an exploration of theoretical approaches and empirical studies of the technology and innovation performance of enterprises. The research explores the rationale for state intervention in supporting enterprises, particularly micro, small and medium firms with a specific focus on developing countries. The literature review draws on 'good practice' technology policies and strategies and considers their applicability for a country like Sri Lanka. An important aspect of the literature review is the evaluation of Sri Lanka's historical evolution, political economy and how this has shaped SME development, technology and innovation capabilities. This will be further examined through an assessment of the effectiveness of SMEs and technology policies and strategies using a conceptual framework developed from the theoretical and empirical evidence deriving from the literature review.

The second part of the research involves quantitative and qualitative analysis of 90 enterprises that responded to my survey of 600 service and manufacturing enterprises in six provinces in Sri Lanka. The aim of this analysis is to examine the technology and innovation performance of enterprises; linkages with external support systems and the extent to which owner/manager and firm level characteristics influence their technological and innovation performance. The rationale for sample selection is the economic importance of the sector and the sector's level of technological need, integration and diversity. Such technological needs vary by sectors and size of enterprises and thus my selection of SMEs was not limited to technologically sophisticated sectors but also included sectors that are technologically less sophisticated. My experience of working in the field of business support was very useful in many ways especially designing questionnaires, sample selection, and data collection method and accessing relevant public databases.

The third part of the research involved case study analyses of (1) a specific SME support intervention and (2) two case studies of specific firms. The case study of the support intervention uses the coconut fibre industry to demonstrate the need for state intervention in supporting enterprises in economically important sectors that are facing the challenges of trade liberalisation and globalisation. As a senior member of the business support organisation (Industrial Services Bureau) that initiated this support intervention, I incorporate my personal experience into this case study analysis. The company case studies have been chosen based on firm's technology intensity, entrepreneurs' ability to harness new technology to the benefit of the firm and the way policy and support environment affect firm performance. The uniqueness of the case study firms is that both owner managers are quite different from the rest of the sample and share similar characteristics, such as persistence, motivation, desire to learn, ability to take risks and have a goal oriented approach to problems. I also had the opportunity to work with them closely that gave me an opportunity to observe the progression of their enterprises.

In order to achieve the research objectives set out in this chapter, I draw on my personal experience as an enterprise development practitioner and working with international donor agencies, researchers and practitioners. In the past fifteen years, having worked in the enterprise development field in Sri Lanka and other countries in the region and in the UK, I have witnessed the problems and constraints in technological progression that are encountered by enterprises of all sizes. In addition, I have experienced and observed the way policy-making machinery and support agencies operate in these countries. This research is, therefore, an attempt to provide an in-depth perspective on the relationship between the technological progression of enterprises and the policy and support system combining personal experience and detailed theoretical and empirical analysis.

1.3 Chapter layout

Chapter 1 provides an overview of the research, an introduction to the topic; outlines research objectives and the questions that are addressed.

Drawing on relevant literature, **Chapter 2** summarises the theoretical foundations of this research. It also focuses on how technology policies and institutional infrastructure shape SMEs' technological capabilities and their subsequent growth capacities. This Chapter draws upon the work carried out by Wignaraja (1998) on Sri Lanka's trade liberalisation and industrial policy and their impact on the technology capabilities of export oriented larger firms. Extending Wignaraja's research, this Chapter emphasises that technology policies and an appropriate institutional framework act as major determinants of technology capacity building not only in export oriented larger enterprises but also in SMEs. A key objective of the chapter is to highlight lessons Sri Lanka can learn from good practice elsewhere.

Chapter 3 presents an analysis of Sri Lanka's social, political and economic history, its industrialisation and technological capabilities, and how these factors influenced the evolution of the industrial sector and its economic performance. The main focus of this chapter is the successes and failures of industrialisation and how social, political and historical factors have influenced the performance of enterprises.

Chapter 4 examines the role of SMEs in Sri Lanka in the context of this industrial history. It analyses the policy environment, technology and innovation support services, and their relevance for building technology and innovation capabilities of SMEs. The main argument of this chapter is that industrialisation process in Sri Lanka particularly during the import substitution period has largely favoured state-owned enterprises and subsequent export oriented industrialisation period favoured large industries and foreign investors. This policy bias towards large, state-owned and foreign enterprises has virtually kept SMEs out of the public policy agenda. Further, factors such as policy inconsistency, lack of political commitment, weak institutional structures together with cultural, political and economic factors have hindered the development of an entrepreneurial culture. This chapter sets the background for the empirical analysis highlighting key issues related to the political economy of Sri Lanka and the way in which industrialisation; SME policies and support infrastructure have facilitated the growth of the SMEs.

Chapter 5 presents the first set of findings of the empirical investigation which is structured around the notion that SMEs' technological capabilities, macro-economic conditions, direct interventions and assistance by the government in inputs and outputs markets (environmental potentialities), and owner-manager and firm level characteristics (human potentialities) determine the technological capabilities of SMEs. This chapter presents a comprehensive analysis of technological capabilities of both manufacturing and service SMEs focussing on the patterns and determinants of technological activities and the nature of technological and innovation efforts being undertaken by enterprises. The empirical investigation draws upon the results of face-to-face interviews to provide additional details on the nature of technology and innovation related activities by firms. This allows greater qualitative understanding which cannot be captured fully in the quantitative analysis.

Chapter 6 presents a second set of findings from the empirical investigation through a case study analysis based on a specific support intervention by the Industrial Services Bureau of North Western province, targeting enterprises in the Coconut fibre industry sector which is considered as a 'declining industry sector'. This case study illustrates the way in which local initiatives fill policy and support gaps in an environment where conflicting policy interests exist. This case study also discusses a number of positive and negative aspects of this intervention and examines the way in which business/technology support can support enterprises in declining industry sectors through a well-defined, targeted and coordinated intervention.

Chapter 7 presents the third set of findings through two case studies of individual enterprises that discuss the viewpoints of entrepreneurs on issues and challenges they face as a whole, especially their views on technology development and innovation as a means of achieving business growth and improving competitiveness. These case studies illustrate and provide some concrete evidence of what encourages entrepreneurs or firms to innovate and strengthen their technology capabilities and illustrates how they perceive external interventions as being appropriate and effective instruments in meeting SME needs.

Finally, **Chapter 8** concludes the thesis by bringing together theoretical and empirical perspectives emerging from the research study and suggests where further research might be directed. Further, the conclusion outlines some recommendations and lessons learned from good practices that would be useful for policy makers and practitioners in Sri Lanka.

Chapter 2

A Review of Literature: SME Development and Technology Policies, and Support Services

2.1 Introduction

This chapter focuses on how technology policies and institutional infrastructure shape SMEs' technological capabilities and their subsequent growth capacities. A key objective of the chapter is, however, not to present a 'recipe' or 'prescription' for problems that Sri Lankan SMEs may encounter but to highlight 'good practices' that can be easily adopted in Sri Lanka.

Although there is a large body of academic and policy literature on SMEs, technology and innovation, very little has been written on Sri Lanka. An exception to this, a study by Wignaraja (1998) on Sri Lanka's trade liberalisation and industrial policy and their impact on technology capabilities, focuses on larger export oriented larger firms. Wignaraja (1998) argued that as a late industrialising economy, Sri Lanka requires systematic government support and the creation of new institutions for technological learning to remedy market imperfections. In this chapter, I explore Wignaraja's contention that effective technology policies and an appropriate institutional framework are prerequisites for technology capability building in small and medium-sized firms. In analysing the contribution SMEs might make, macro and micro-level factors that include entrepreneurs' and firm level characteristics and the accessibility of business support services needs to be investigated. In this review of academic and policy literature, I explore the basis of their coverage, suitability and applicability in the context of the study on technology development of SMEs in Sri Lanka. Greatest attention has been given to the literature that focuses on contemporary technology and innovation strategies. In what follows, I focus on literatures that assess the role of state intervention in the enterprise support services.

The notion that SMEs have an essential role to play in the process of economic and social development is now widely accepted (Storey, 1993a and 1994: Bolton, 1971). SMEs make up over 90 percent of enterprises in the world and account for between 50 to 60 percent of employment (UNIDO, 2002) hence, in developing and advanced countries alike, policy makers have long advocated that SMEs are a particularly effective vehicle for creating employment. According to the Observatory of European SMEs[1], in 2002, more than 99 percent of enterprises were SMEs and these provided more than two thirds of private sector jobs in the European Union. The Bolton Committee also describes a 'seed bed function' wherein SMEs provide the base for the creation of new enterprises (Bolton, 1971). SMEs constitute the bulk of enterprises in all economies in the world while making a major contribution to private sector output and employment. Evidently, other than employment creation, SMEs are important players in many ways as they provide social and economic benefits[2] (Tolentino, 1995). SMEs role in technological innovation which is at the heart of wealth creation has been widely recognised (see for example, Storey, 1984; Malecki, 1997; Soete, 1999; OECD, 1997). SMEs have been responsible for 50 percent of all innovations and 95 percent of all radical innovations[3] since the Second World War (Tomecko, 1996). It is therefore perhaps understandable that SME development is accorded top priority for governments in developing as well as developed economies (Tomecko, 1996).

The technological environment within which enterprises operate is recognised as a major determinant of their formation, exit, growth and survival

[1] http://europa.eu.int/comm/enterprise/library/enterprise-europe/news-updates/enterprise-policy/20020503.htm

[2] Other benefits of SMEs include: Employment creation at low capital cost; Supplying goods and services to the economy; Improving forward and backward linkages between economically, socially and geographically diverse sectors; Creating opportunity for developing and adapting appropriate technology; Providing an excellent breeding ground for entrepreneurial and management talent; Developing a pool of skilled and semi-skilled workers; Acting as ancillaries to large-scale enterprises; Filling market niches which are not profitable for large enterprises; Lend themselves to development policies favouring decentralisation and rural development; Alleviate the negative consequences of structural adjustment programmes (Tolentino, 1994; UNIDO, 1995a&b).

[3] Radical innovations are ideas not earlier known or used, driven to market success. E.g. the microcomputer, the pacemaker, overnight express packages, fast food, oral contraceptives and the X-ray machine.

(Agarwal, 1998). In other words, acquisition and adoption of new technology is seen as the most important means to improve enterprises' competitiveness locally, nationally and internationally. To make this case I draw on lessons from European countries and newly industrialised countries that reveal technological advancement and innovation have changed the way enterprises operate, regardless of the level of economic development. Further, such technological advancements themselves stimulate changes in the policy and institutional structures delivering improved economic competitiveness, for example, by demanding good technical support agencies in standards, quality, skills, training and research and development (Lall, 2003).

Wiganaraja (1998) compared Sri Lanka's technological capabilities and export competitiveness against East Asian newly industrialised countries (NICs) and suggested that technological development and innovations are the key factors determining Sri Lanka's economic development (also see Jenkins, 1992). On the contrary, there are arguments suggesting that most developing countries (including Sri Lanka) are not at the 'frontier' of innovation, therefore, they have to depend on foreign (or imported) technology that needs substantial knowledge and skills to be adapted locally. However, according to the United Nations Human Development Indicators and World Bank Social Indicators of Development, over the past two decades, a remarkable achievement can be observed in most parts of the developing world in terms of technological growth. Efficient application of imported technology enables SMEs in developing countries to expand their own technology base which would possibly, local conditions permitting, lead to 'home grown' technological innovations.

Due to the limitations of policy and scholarly literature and reliable data, it can be difficult to arrive at any conclusive or definitive explanation on the economic performance of enterprises in Sri Lanka. The bulk of the literature was published after 1977 and is focused mostly on economic liberalisation and its impact on industrialisation and export performance (see for example, Abeyratne, 1987 and 1989: Athukorale, 1997: Athukorale and Jayasuriya, 1996: Athukorale and Rajapathirana, 2000: Edwards, 2000:

Kelegama, 1990 and 1993; and Vidanapathirana, 1993) and technology and export performance (Wignaraja, 1998). This seam in the literature critically examines the growth of the manufacturing sector under a liberalised policy framework and its contribution to GDP but there is little focus on the implications for SMEs. There is relatively little academic literature available concerned with SMEs in Sri Lanka, however, there are a number of notable contributions that include, for example, SME trends and patterns (Bandaranayake and Fernando, 1989), SME experience of government initiatives for the development of small scale industries (Wicramasinghe, 1993), small and medium industries and their contribution to regional development (Laksman, 1994) and liberalisation policies and their impact on small and medium industries (Project-SMED, 1999). This piece of research can be considered as an attempt to fill the knowledge gap on technology and innovation capabilities of SMEs in Sri Lanka.

This chapter therefore focuses on the technological and innovation capabilities and performance of SMEs emphasising what enterprises actually do technologically with the right knowledge, skills and equipment that facilitate the process of technological capability building. The chapter is organised in four main sections. The first section examines the general characteristics and definitions of SMEs and 'enterprise specific' and external factors that determine technological capabilities in SMEs. The second section briefly analyses the role of the state in supporting SMEs taking into consideration SMEs' contribution to national economic development. The third section investigates the role of technology within a broader context of overall economic development and more importantly, why technology is important for SME performance. The final section examines SME policies, strategies, and the role of support agencies in fostering technological progress of SMEs and lessons for Sri Lanka.

2.2 Characteristics of firms, firm level factors and determinants of technological capabilities and innovation

The objective of this section is to distinguish characteristics of firms, firm level technology and innovation strategies identified in various academic and policy literature. This will be useful to form a framework for the empirical study in analysing the sample SMEs. As there may be several factors determining technological capabilities of SMEs, this section will only attempt to analyse the factors internal to SMEs.

2.2.1 Characteristics and definitions of SMEs

SMEs are not a homogeneous group; each is different and has special characteristics (Burns, 1996). Being dynamic, SMEs tend to have the ability to respond quickly to external changes but this ability of course depends on their size and the environment in which they operate. Generally, the management function of SMEs is independent while ownership and an individual or a small group provides inputs such as capital (Bridge et al. 1998). Unlike large enterprises, the growth of SMEs is more likely to be incremental than steady, but the growth of most SMEs is slow (Bridge et al. 1998). Reid and Jacobson (1998) point out that SMEs operate under severe resource constraints. The problems SMEs encounter related to finance are a universal phenomenon that has captured the attention of policy makers and academic researchers alike for decades. For example, the Bolton Commission (UK) reported that SMEs found accessing financial markets too costly due to high transaction cost (Bolton, 1971) while another study observed that 'SME finance is a resource that is uneven and uncertain in its supply' (Pollard, 2003:437) with high risks for lenders (Brian et al., 2005). Another characteristic of SMEs is their limited product range wherein they tend to have a single product and single buyer compared to larger enterprises, leaving them more vulnerable to changes in demand (Storey, 1993).

SMEs are in a constant state of flux; new firms are being created (new starts or enterprise births) while others are closing. At the same time, some existing firms are expanding and others are contracting in size. The literature suggests that a significant number of new business start-ups do not survive during this early period (see for example Storey, 1994; Smallbone and North, 1996), therefore, the early stage of an enterprise, particularly the first couple of years can be crucial. One of the significant features of SMEs is that their flexibility and ability to dominate niche markets means that they are able to survive in situations of fluctuating demands (see for example Piore and Sable, 1984). There are arguments suggesting that certain characteristics put large enterprises in a better position than smaller enterprises especially technology development and innovation, and vice versa.

In recent years, measuring the economic performance of enterprises has been vigorously debated in both academic and economic literature. Since the 1970s, various theories of firms' growth and performance have surfaced focusing on fundamental issues of the 'existence and evolutionary dynamics' of firms (Autio and Garnsey, 1997) and these theoretical approaches seek to identify performance differences among enterprises in similar and different circumstances and environments. Therefore, understanding the growth and performance of enterprises requires knowledge of firms' life-cycle and stages of growth. Greiner's Five-Stage Model (1972), for example, is a well-known business growth model while another famous model introduced by Churchill and Lewis (1983) also found five-stages of growth: existence, survival, success, take-off and resource maturity. This model was revised in 1994 and the new model allows six stages of growth. Gray (1993) also shares a similar view to Churchill and Lewis, but uses five stages of growth of an enterprise introducing 'professionalism' and 'transformation' replacing 'take-off' and 'maturity'. More recently, new growth models of technology-based enterprises have emerged and, as Autio and Garnsey (1997) suggested, new technology-based firms are likely to evolve and grow in an innovation network or within a production chain. All these theoretical models argue that firms' growth is characterised by different transition stages.

Although the economic definition of SMEs, to a certain extent, is universally harmonised, statistical definitions are arbitrary and vary significantly depending on the stage of economic development and economic structures in a particular country. In most definitions, the distinguishing feature is the size of an enterprise determined by employment while turnover of capital is used concurrently. Table 2.1 illustrates various definitions adapted in selected countries and it appears that most countries have identified employment as a key indicator to determine a scale for definitions. For the purpose of this research, the standard definition adapted by EU is used as it makes easier to assess good practice policies in the UK/EU which can be useful to a country like Sri Lanka.

Table 2.1: Definitions of SMEs

Country/Region	**Criteria**		**Micro**	**Small**	**Medium**	**Large**
European Union	Employment		0-9	10-49	50-249	250>
• United Kingdom	Employment		0-9	10-49	50-249	250>
USA	Employment			<500		500>
Japan	Employment	Manufacturing	<300			
		Wholesale	<100			
		Retail	50			
	Assets	Manufacturing	100 mn. Yen			
		Wholesale	30 mn. Yen			
		Retail	50 mn. Yen			
Taiwan	Employment		<500			500>
Philippines	Employment		0-9	10-99	100-199	200>
	Assets		<1,500,000	1.5 m-15 m. Pesos	15 m-60 m Pesos	60 m Pesos
Thailand	Employment			0-50	51-200	201>
	Assets			<20 m Bht	20-100 m Bht	100 m Bht

Source: Websites- US Small Business Administration http://www.sba.gov; EC DG Enterprise http://www.europa.eu.int/comm/enterprise/index_en.htm; Department of Trade and Industry http://www.dti.gov.uk; http://www.UNIDO.org; http://www.ADB.org; http://www.APEC.org

2.2.2 The characteristics formal and informal sector in Sri Lanka

The characteristics of enterprises based on their structure, activities and the nature of the 'economy' they operate have been discussed extensively in academic and policy literature. Sri Lankan enterprises are distinguished as formal or informal enterprises based on their legal form, whether they are registered or unregistered, organized or unorganised, and regulated or unregulated enterprises (Narayana, 2006). The formal sector, as it implies, needs little detailed explanation but the informal sector is complicated as it differs greatly across and within countries and regions. Generally, the informal sector encompasses many economic activities that are often overlooked in economic statistics: all sorts of manufacturing and service activities typically carried out by small business units, family-based / home based units that are established, owned and operated by one, or a few individuals. The enterprises in the informal sector are characterised as those started and maintained with limited capital, and are often beyond the reach of formal financial mechanisms. Such firms are often labour–intensive producers of low-quality and relatively cheap goods and services, inefficient and operated with limited infrastructure facilities. The key features of the informal economy broadly defined, include, its significance and permanence, the continuum of employment relations within it and its segmented structure but there is often a widespread misconception that the informal economy is somehow illegal or is the equivalent of the underground, or even criminal, economy (Chen, 2007).

The so-called informal sector plays a significant role in employment, income generation and economic and social development in Sri Lanka. Sandaratne (2002) defines Sri Lanka's informal economy as those individuals or groups of individuals engaged as self-employed, whether in labour services, trade, crafts or small manufactures, home-based enterprises (HBEs) whether employing only family labour or a small group of persons producing such items as garments. Although in some developing countries the informal sector is treated as being 'outside the law', in Sri Lanka, informal enterprises are often assisted and encouraged by the government. Many informal economic activities have deep social roots (Sandaratne, 2002) and are embedded into the production system. Therefore, any policy intervention whether it is macro-economic, industrial, or SME-oriented, needs to take into account the contribution of the informal sector. Service enterprises such as informal lenders, brokers and various types of intermediaries are also in the informal economy. Moreover, the dominance of informal sector activities in urban areas has been rising in the past 25 years ever since liberalisation policies were introduced leaving the rural informal sector in total disarray. This is quite significant in the rural areas where traditional sectors remained strong such as coconut and rubber based industries, arts and crafts, jewellery, handloom, textiles, and off-farm agriculture-based activities.

Given the importance of the informal sector in Sri Lanka and the strength of my personal contacts that grant me access to such firms, the empirical work reported draws on a sample for firms which includes both 'formal' and 'informal' enterprises. The case study on the coconut fibre industry sector in Chapter 6 illustrates the rise and fall of the informal sector in rural North Western province of Sri Lanka. One of the interesting features of Sri Lanka's informal sector is its role as the seedbed for most formal enterprises. The enterprises in the informal sector play a significant role in the supply chain in Sri Lanka and therefore the support interventions targeting formal enterprises undoubtedly have trickle-down effects on the informal sector enterprises. Indeed one of the major findings of the research (presented in chapters 5-7) concerns the similar experiences of innovation in formal and informal firms alike. As such, my research problematises the distinction between 'formal' and 'informal' enterprises and questions its utility in the context of the Sri Lankan economy.

2.2.3 Factors influencing technological capabilities and innovation at firm level

Technology and technological capability for innovation are important elements in the long-term success of many enterprises (Grindley, 1993:37). Essentially, the interplay between technology resources and the environment can happen only in firms (Georghiou et al. 1986), where technology becomes the principal means for firms to compete (Malecki, 1997). Three factors contribute to the success of technological innovations in SMEs. First, the relevance of technology in the firm; second, the integration of technology (which means the ability to match technology effectively to user needs); third, the appropriateness of technology and the capacity of the firm to capture the benefits of technology (Swann, 1993). According to Gueirrie (1997), there are three key requirements firms must fulfil in order to be technologically competitive: interaction with external research and technology support systems; technically trained personnel (technologically trained graduates and other technically skilled workers); and finance (investment in R&D, machinery and buildings, equipment, training etc.). Arnold and Thuriaux (1997) refer to a model developed by Dodgson and Bessant (1996) which describes the characteristics of technological capability at firm level. According to this model, the technological base, both tangible assets and intangible assets[4], determines technological performance. To enhance the technological competency of a firm requires intangible and tangible assets as well as innovative capabilities (Arnold and Thuriaux, 1997). Technology development and innovation in a firm largely depends on its organisational characteristics (firm size and firm age), number of products, production relations, markets (Malecki, 1997) and more importantly entrepreneurial ability (Shan, 1994) innovative behaviour (Karlsson and Olsson, 1996) and characteristics of entrepreneur (Schumpeter, 1939). In addition, firms need to have proper organisational arrangements which generate an appropriate commercial know-how through the application of technological expertise (Kay and Willman, 1993:25). Among the other factors that may influence strategic actions towards achieving a high level of technological performance, the level and intensity of R&D and their objectives have been highlighted in literature (e.g. Malecki, 1997; Arnold and Thuriaux, 1997; Acs and Audretsch [eds.], 2005). Therefore, the need for external networks and their knowledge links is a vital factor, and not only in high technology sectors (Malecki, 1997)[5].

Atherton and Hannon (1997) indicated that the process of innovation, absorption and adaptation of new technology is not spontaneous but gradual and continual, and determined by a firm's existing capabilities typically knowledge, experience, know-how, technical expertise and competence. It is also essentially a strategic business decision, an outcome of a combination of factors such as a firm's characteristics, resources and linkages to external networks. These characteristics are obviously reflected by organisational culture, beliefs and values that are shared by people within the enterprises and managerial attitudes (Hoffman, 1993). On the other hand, the enterprises will be able to manage technologies successfully if they are viewed as central to

[4] Tangible assets are those internal to the firm such as new products, plants and equipment. Intangible assets include formal inputs for example Patents, Licenses, R&D, other IPR and training, and tacit knowledge as informal inputs.

[5] These theoretical assumptions will be further explored in Chapter 5 in the context of technological capabilities of Sri Lankan SMEs.

business and corporate planning (Martin, 1994). Other important conditions for technology management include a harmonious working relationship between owners and managers.

The emergence and importance of new technology-based enterprises (NTBEs) have been presented in many policy and academic reviews. There has been significant research on the evolution and growth of NTBEs in the developed countries, in the US and UK in particular, disproving the conventional wisdom that innovation, technological change and employment creation are beyond the capacity of small firms (see for example, Oakey, 1988; Oakey et al. 1997 and 1998; Acs, 1996, 1997 and 2000; Acs and Audretsch (eds), 2005). In the UK, for example, new technology firms have attracted special attention from the government following the success of the Cambridge High Technology Business Cluster known as the 'Cambridge Technopole' which was established in 1978 with 20 high technology-based firms and is now home to over 3,500 high technology-related firms employing around 50,000 people and making a contribution of £7.6bn (Gross Value Added) to the UK economy (Cambridge Technopole, 2004)[6]. One of the main characteristics of the development of high technology based firms was the locational advantages which have been responsible for drawing firms into clusters such as Silicon Valley (near the M4/M11 Corridors) and in Silicon Glen in Scotland (Cooper, 2000). In developed countries, technology-based enterprises are likely to be founded by scientists and engineers, also known as 'technical entrepreneurs' and this could perhaps be within a university spin-off or following employment in larger firms where they discover a new product or process (Oakey and Syed-Massoda, 1999). Table 2.2 illustrates some factors that have attributed to the growth of NTBEs.

[6] Cambridge Technopole Report Autumn 2004,
http://www.ifm.eng.cam.ac.uk/ctm/teg/cambridgetechnopole.html

Table 2.2: Factors influencing creation and survival of technology-based enterprises	
Internal factors	**External factors**
Characteristics of entrepreneur/owner-manager (technical entrepreneurship)	Sources of technical expertise and potential technological entrepreneurs (universities, R&D and technology support organisations)
Ability to forecast technological and market trends	Availability of business entrepreneurs and managers as well as skilled factory and office workers
Skills and knowledge, human resource (for R&D highly skilled engineers and scientists)	Networks for obtaining the required human, technical and business assistance resources
Type of customers and suppliers	Infrastructure facilities (lands, buildings etc.) with the required support services in an attractive environment
Profitability	Financial assistance
Investment capability	A favourable business climate
Source: External factors - Abetti (1992) quoted in Sanches and Perez (1997) Internal factors - Van Dijk et al. (1997): Karlsson and Olsson (1998)	

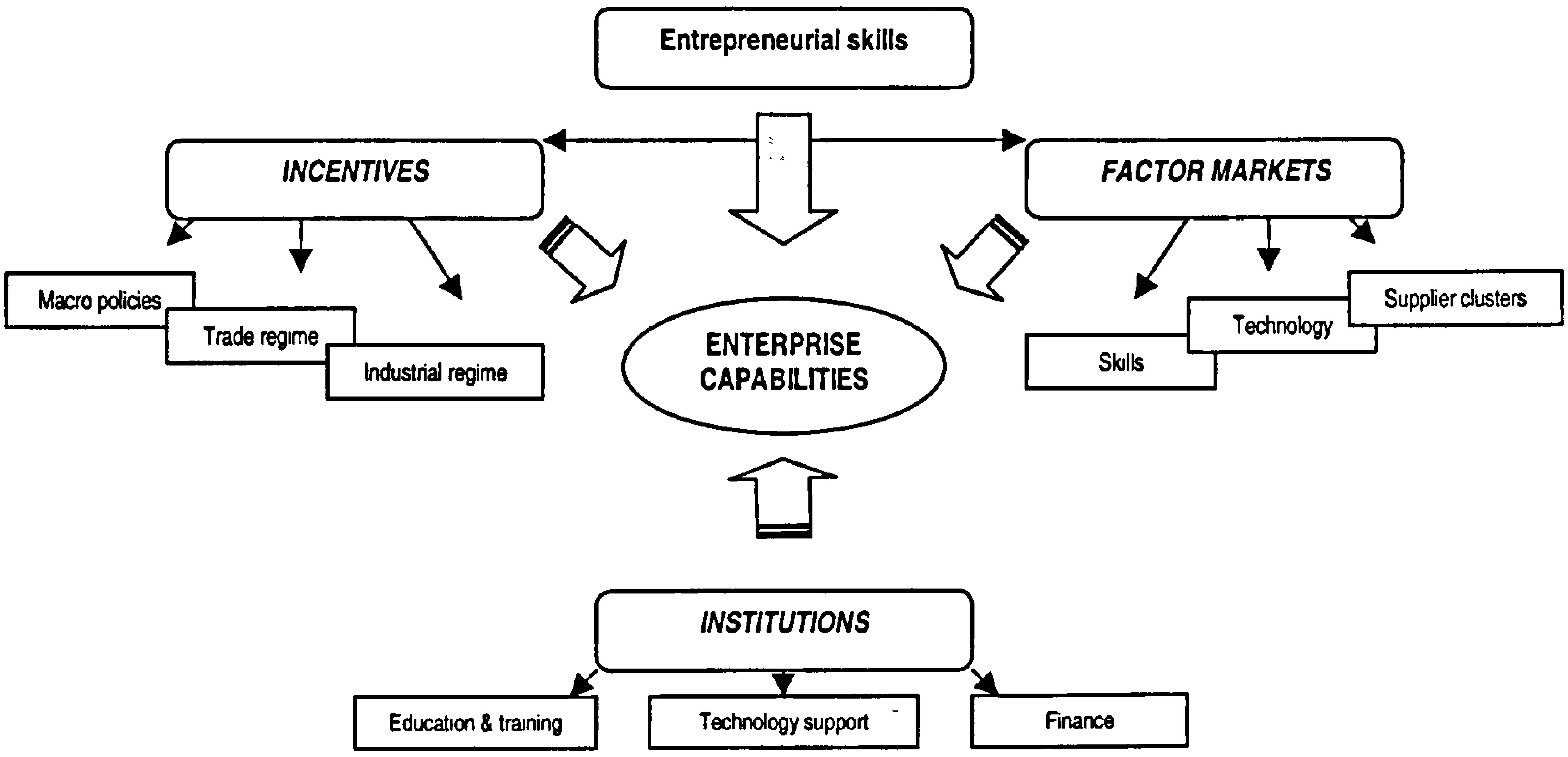
It can be seen from the literature review that there are a number of strategic options available for owner-managers to improve their internal environment at enterprise level. Among these, the following firm-level strategies will be taken as the framework for empirical study to analyse technology trends in SMEs in the survey sample. These include:

- Benchmarking and learning from good practice of other firms
- Technology assessment
- Strategy development
- Keep updated with technological change by accessing technology information sources
- Adoption of new technology
- Innovative activities
- Training and skills upgrading
- Technology learning and sharing
- Networking and collaborations
- Improving existing facilities (both technical and non-technical), and
- Improving work methods and practices.

One of the main objectives of this research is to identify the factors determining technology and innovation in SMEs in Sri Lanka. In order to assess this, it is important to understand the theoretical rationale explaining such determinants. One such theory is 'technology-push' and 'demand-pull' linear models which describe technological innovation within a firm as drivers of a simple linear process (McLoughlin, 1999). Generally, technology-push implies identifying an interesting technology, making a product and then searching for a marketplace while demand-pull involves identifying a market need and then developing a new product to meet that need. As Gomulka (1990:44) suggests, 'technology-push' forces enterprises to adopt new technology in order to remain competitive. However, Clark and Guy (1997) argue that over the past three decades EU policies for science, technology and industries have discredited linear models and instead have recognised the 'developments inside innovation systems' (innovations and national innovation systems) as critical elements for SME growth and competitiveness of national economies.

In line with the above theoretical explanations, a number of models have been developed describing external factors that determine enterprise technological capabilities (see for example McLaughlin, 1999; Clark and Guy, 1997: Lall, 2001). Among these theoretical models, the one proposed by Lall (2001) can be considered as an approach more closely aligned with the objectives of this research because of its simplicity, object oriented nature and macro and micro focus (see Figure 2.1). This framework ideally matches with the nature and characteristics of Sri Lanka's macro and micro economic policy environment and enterprise support framework. Therefore, this approach will be used for the empirical analysis. As illustrated in the diagram (Figure 2.1), internal factors (entrepreneurial skills) as well as external factors (incentives, factor markets and institutions) considerably affect the enterprise's decision and subsequent actions to invest in developing technological capabilities. This framework provides some useful fundamentals as a rationale for policy intervention but requires good understanding of firm level responsiveness towards new technology while considering the dynamics of the macro-economic environment.

Figure 2.1: External factors determining SMEs technological capabilities



Source: Lall (2001)

2.2.4 Technology related problems and constraints of SMEs

Although SMEs make an important contribution to economic growth, it is argued that policy biases and the regulatory environment place a heavy burden on them. In addition, certain internal characteristics (enterprise and entrepreneur) may also inhibit the transition of enterprises from small into medium and large size, particularly those which show signs of innovative potential or which operate in high-technology areas (Barber et al. 1989). SMEs face a multitude of barriers for technology and innovation, for example, shallow technological level, limited product range, poor quality products, very old and or inappropriate equipment and processes, lack of technical know-how; limited capital availability and a shortage of trained personnel.

Arguably, not all enterprises adopt new technology, processes and work methods, largely because of unfavourable macro and micro economic environments that pose significant threats to firms. This can be considered as the main impediment that keeps smaller enterprises from acquiring new technology. For example, market uncertainty and greater vulnerability to external shocks (Shan, 1994) may inhibit their technological capabilities. Sri Lanka provides a good example of how macro-economic changes affect SMEs, particularly their struggle against cheap imports as a result of an unregulated market. Since Sri Lanka opened up its economy in 1977, import and export controls have been relaxed, and most trade protections are now non-existent. The country's transition from an inward-oriented economy to outward-oriented economy (or import substitution industrialisation to export oriented industrialisation) has provided both opportunities as well as threats to SMEs particularly those producing goods and services for the domestic market. This is a common scenario in Sri Lanka especially considering the technological constraints of traditional and local raw materials based enterprises that had benefited from the absence of competition from imported goods during the 'import substitution regime'. Some SMEs in certain regulated sectors benefited from these monopolistic market situations. At the same time, a volatile macro-economic environment, policy uncertainties and policy biases towards foreign investment and large enterprises have less favoured the 'domestic entrepreneurs'. However, adopting outward economic policy has paid some dividends in some sectors of the economy. Wignaraja (1998:237) praises Sri Lanka's efforts in achieving NICs (define 'NIC's) status but highlighted some shortcomings of policy implementation stating:

> *"Sri Lanka deserves credit for adopting outward-oriented trade policies in 1977 but much still remains to be done with regard to industrial technology development if the country is to attain its ambition of becoming NICs in the early part of the twentieth-century."*

The role of the state in supporting SMEs can be explained by a number of factors such as creating an environment conducive for SMEs to operate freely without any bureaucratic hindrance and creating a synergy between and among policies, institutions and support services. Wignaraja (1998) citing OECD (1992), Stiglitz (1996) and Westphal et al. (1986) stated that setting appropriate policies can be viewed as a crucial function of governments. He viewed industrial policy as the key instrument that should promote overall industrial development (including SMEs) and competitiveness which includes functional and selective interventions in industrial investment, production, competition, regulation, ownership, technology and skills. These interventions could combine protection, promotion and various forms of support.

There are numerous arguments in for and against state policy interventions. The traditional base for policy interventions is centred on the notion of market failures or distorted markets. It is the way in which policy interventions can correct market failures which become the central purpose of the policy intervention (Metcalfe, 1994). State intervention in the development of SMEs has been critical in numerous contexts, contra neoclassical economic theory[7] that privileges the notion of 'free' markets. The neo-classical economic doctrine encourages developing countries to follow a rapid development path allowing a market-price system while emphasising building comparative advantages through foreign direct investments and the export of primary products. Largely, the arguments on economic development swing between neo-liberalism and structuralism. The *Structuralist*[8] approach puts less faith in free markets as the driver of dynamic competitiveness and more in the ability of governments to mount interventions effectively (Lall, 2003). There is, however, a widely held acceptance of the major role for 'intentional development', including intervention by state and actions by international development agencies (World Bank/IMF) combining state and market (Thomas, 2000).

There are still development economists who believe that, if policies are set correctly to allow free markets and competition to flourish, good entrepreneurs who manage their small businesses efficiently will become competitive and will not have the need for any special help or support

[7] Neoclassical economics is conventionally dated from William Stanley Jevons' Theory of Political Economy (1871), Carl Menger's Principles of Economics (1871), and Leon Walras's Elements of Pure Economics. These three economists said to have promulgated the marginal utility revolution, or Neoclassical Revolution. Neoclassical theories strongly advocate "free" enterprise," "free" competition, reducing public expenditure in 'non essential services', devaluing or disregarding the concept of public goods, deregulation and privatisation, and basically restricting state intervention.

[8] Structuralist theory, usually synonymous with 'development economics' developed as an alternative to orthodox theory emerged as an alternative economic structure of the underdeveloped countries. The main feature of structuralist theory is the sceptism about the beneficial effects of the free market (Jenkyns, 1992).

programmes (Levitsky, 1996). Storey (1994) pointed out that some economists who favour market approaches argue free markets provide optimal numbers of firms and these firms will be created where there is opportunity for profits. Similarly, firms will disappear where demands for products have declined. Further, Storey questions why governments subsidise the formation of new firms and likewise most arguments based on the notion of 'no policy' argue that if the business community is effectively re-creating and growing itself through the movement of capital and other resources, then no action is required (Rosa and Scott, 1997). Ser (1998) has a different view on this and argues that SME development is a by-product of economic development and not the key objective. However, the job creation ability of small firms is a compelling argument for supporting SMEs (see for example, Birch, 1987). Based on this notion developed countries (EU countries and USA) have increased their public spending and allocation of resources for the development of SMEs through the provision of grants, institutional support, and regulations to protect domestic enterprises[9]. In addition, state intervention in industrial development has been proved to be very successful in a number of East Asian economies, particularly Japan, Taiwan, South Korea, Malaysia and Indonesia (Jenkins, 1992; Hewitt et al. 1992).

2.2.5 Effects of social capital on enterprises, technology and innovation: developing country perspective

In recent years research on the way in which social capital influences entrepreneurship and enterprise performance has been widely discussed in the context of both developed and developing countries. These studies seek to examine how social capital influences the ways in which entrepreneurs establish contacts and relationships with social networks. Most definitions see social capital as being 'networks'; Putnam defines social capital as "those features of social organisation, such as networks of individuals or households, and the associated norms and values that creates externalities for the

[9] See for example Directory of Measures in favour of entrepreneurship and competitiveness 2001 published by Enterprise and Industry Directorate, European Union, http://europa.eu.int/comm/enterprise_policy/best-directory/en/individual_measures.htm#promotion

community as a whole" (Putnam, 1993 cited in Grootaert et.al, 2002). In a nutshell, social capital is treated as a set of social networks and institutions within a given economy that shape individuals' interactions. It is argued that networks influence a firm's growth (or entrepreneurial venture) as they provide access to a variety of resources held by other actors that the entrepreneurs do not possess themselves (Shaw, 1997 and others cited in Neergard and Madsen, 2004). These networks of actors such as individuals, business networks and support networks possess tangible and non-tangible goods and services, and tacit and explicit knowledge and skills for entrepreneurial progress, particularly in environments where such resources are scarce. Essentially, knowledge is considered as part of networks and communities, therefore, social capital becomes a fundamental component in understanding product and service innovation in firms. Neergard and Madsen (2004) suggest that the purposes of an entrepreneur's networking activities were primarily directed at market-related aspects such as identification of customers and new partners or to technical issues such as solving actual problems, obtaining advice and improving technical knowledge (p113).

Dakhi and Clercq (2004) also found that the diversity of business and social circles to which one belongs (e.g. clubs, charitable organizations, and business associations) provides the opportunity to access multiple domains that may provide unique sources for information, funding, and political support, among other desirable resources that increase the propensity for innovation. The social capital based on networks, status, personal ties, and referrals can be beneficial to entrepreneurs and those entrepreneurs possessing high levels of social capital are more likely to receive external support such as funds from venture capitalists than other entrepreneurs (Baron and Markman, 2000).

Prior research has examined the positive effects of social capital on innovation and found that a 'high level of trust' is an important element for innovation through interactions between individuals within an organization but also through inter-organizational co-operation (Dakhli and Clercq, 2004). As Dosi (1988) argued the development and adoption of new processes and products within a country is the result of the interaction between capabilities that are specific to each firm and industry. A study by Neergard and Madsen (2004) found that entrepreneurs in technology intensive sectors were far more likely to be in networks compared to those in service sectors (sales, marketing and ICT). Landry et al (2001) suggest that social capital helps to reduce information analysis and the cost of research, decision-making, implementation and follow-up.

Social capital, and how it impacts on firms' technology and innovation capabilities, is an important element in enhancing state intervention. In Sri Lanka, for example, technology learning and sharing have been quite significant in agriculture, rural industries (e.g. coconut industry, rubber processing, textile and handloom) and craft industries (e.g. jewellery, handicrafts, blacksmithy). The collective actions within and between groups of different social status within the 'traditional' and 'non-traditional' industry sectors are relatively strong. I argue that this foundation of social capital in Sri Lankan society has contributed to the sustainability of enterprises and provided a shield to protect SMEs from internal and external economic shocks. Any policy directed towards enterprises and especially technology and innovation needs to consider these social interactions in the design of appropriate interventions. This realisation informs my choice of a case study methodology, as it is only through qualitative research that these kinds of social relations can be explored.

2.3 SMEs in the context of economic development in Sri Lanka

Sri Lanka has undergone a wide range of reforms in the past 50 years but the major reforms took place after 1997 when the World Bank and International Monetary Fund assisted Structural Adjustment Programmes (SAP) and the Stabilization Programmes took the central stage which aimed to address a number of factors affecting economic growth. These programmes came along with conditional financial support, known as the Structural Adjustment Facility (SAF) from the IMF and Economic Restructuring Credit from the World Bank. The reforms attached to this included restructuring of the government budget, public enterprise reforms, monetary policy and financial sector reforms, poverty alleviation and human resource development. Interestingly, evidence from various studies by the World Bank and IMF in poor countries have begun to realise that 'strong neoclassical' non-interventionist approaches have not really worked well in most situations. Joseph Stiglitz[10] argues that considering the magnitude of problems related to economic development of developing countries there is an important role for governments to play in solving unemployment problems, maintaining an equal income distribution and supply of public goods. This is evident in the way in which Asian NICs achieved their growth through strong government intervention in industrial policy and protection. In the case of Sri Lanka, the question arises whether the neoclassical model of economic development is a good thing or a bad thing [see for example, Lakshman (1997)[11]; Dunham and Athukorale[12] (undated)].

There is a widely accepted notion among Sri Lankan policy makers that a certain degree of state intervention is necessary and the country needs to adopt an economic policy based on a 'mixed economy[13]' or 'moderate neo-classical model' which has been the central feature of policy agenda of successive governments since 1990. By and large, considering the peculiarity in the growth pattern of SMEs in Sri Lanka, I argue that SMEs have not really

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[10] Joseph Stiglitz, Nobel Price winner for Economics in 2001 and Chief Economist of the World Bank/IMF, strongly criticised the World Bank and IMF for imposing neoclassical economic model in developing countries. Source: http://www.newecon.org/Stilgitz-Jan000.html#ref

[11] Lakshman argues that Sri Lanka's uneven economic development is the result of the 'wrong' economic policy postures and management practices of different post-independence regimes.

[12] Dunham and Athukorale (Undated) critically examined the economic reforms and socio-political trends in Sri Lanka and stated that there is no doubt that much has been achieved in terms of opening up the economy, stimulating entrepreneurial activity and promoting export growth. They argued that liberalisation was a major explanatory factor in the socio-political downturn since mid 80's, reflecting not only the particular way in which reforms were implemented but specific characteristics of the Sri Lankan social, institutional and political setting.

[13] The United States is said to have a mixed economy because privately owned businesses and government both play important roles (US Department of State, World Wide Web, accessed on 10 June 2005).

benefited from much-lauded free market policies (see Chapter 3 and 4). As such, there is a strong justification for an important role for the government to implement policies that address current and future challenges and promote the growth of enterprises[14].

Like many other developing countries, Sri Lanka is characterised by a relatively under-developed and small domestic market with a few key players, a very low technology base, relatively poor and limited innovative capabilities, and heavy reliance on imported technology. In fact, the government has acknowledged in policy statements that government intervention in social and economic development is essential given the nature of challenges and constraints the economy is facing (for example, Sri Lanka's Presidential Policy Statement, 1996; SME policy of Sri Lanka, 2002; Sri Lanka Poverty Reduction Strategy Paper by IMF, 2002).

The poverty alleviation strategy specifically argues that government intervention through a variety of public programmes and services is essential to raise the standard of living of a quarter of the population who live below the poverty line. Improving economic conditions through income generation and creating employment opportunities especially in rural areas have been given prominence in the poverty alleviation programme. Employment generation as a whole has been a bigger challenge for the government because the role of the state as a main employment provider has been eroded in the economic reforms backed by the World Bank and IMF. The privatisation of state enterprises has led to the loss of thousands of jobs especially in state owned manufacturing enterprises in textiles, mining, ceramics, sugar refineries, cement and tyres and so forth (see for example Joshi, 2000). Evidently, the government had not given much consideration to the redeployment of redundant workers into productive paid employment or self employment (see for example, Ranaraja, 2001).

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[14] A discussion on the growth of SMEs in the post economic liberalisation period is given in Chapter 4.

Another factor is a widening regional gap where, apart from Western and Central provinces, the other seven provinces are experiencing severe growth constraints as a result of lack of resources, high unemployment and poverty. The realisation now is that supporting the development of enterprises as an integral approach to poverty alleviation alone validates the role for the state in supporting SMEs[15]. On the other hand, export promotion being a constant endeavour of Sri Lanka's economic development, transforming enterprises from 'local' to 'export oriented' requires a high degree of state support. These include financial support, skills and training, market development to technology development and innovation without which competing in the export market would be a huge challenge for export-oriented enterprises. This was one of the primary objectives of the new industrial policy announced in 1978 and acquired a significant place in the export strategy. Considering these factors, I argue that the rationale for state intervention policies needs to be fundamentally reconsidered by recognising the historical and political context of Sri Lanka as well as world economic trends.

2.4 Policies and strategies for SME development and lessons for Sri Lanka

In spite of various theoretical arguments by those who advocate the 'free market', it is now widely accepted that the state plays a crucial role in creating an enabling policy framework and a conducive environment for SMEs. This is considered as very important for Sri Lanka where SMEs face enormous challenges in the face of globalisation and rapid advancement of technology (see for example Lall, 2001 and 2003; Carlsson and Jacobson, 1997; Malecki, 1997; Edquist, 1997; Hewitt et al, 1992). At the same time, the coherence between macro-economic and micro policies favouring SMEs is essential because macro-economic instability not only affects SMEs but can also destroy the impact of SME development efforts. The lessons from countries in the EU, the UK in particular, suggest that SME policy interventions cannot operate in isolation but need to be interlinked with other

[15] See for example, SME policy White Paper, 2002, Government of Sri Lanka.

socio-economic policies (e.g. education and skills, trade and industry, science and technology, and regional economic development etc.).

The past three decades witnessed a growing worldwide action in policy making for SME development and a large number of 'success stories' can be drawn upon. It has emerged from the literature survey that learning lessons from good practice elsewhere is key to successful policymaking and implementation where countries can learn from each other through bilateral and multilateral means. The *SME Charter of the European Union* and the *Bologna Charter on SME Policies of the Organisation for Economic Cooperation and Development (OECD)* can be cited as examples that illustrate the importance of knowledge sharing. One of the main objectives of this research is to identify policies and practices of SME development, technology and innovation, and investigate what Sri Lanka can learn from good practices elsewhere. A crucial aspect of development of developing countries is to learn from the experience of others (Khor and Lin, 2001).

It should be noted, however, that transferring policies from one setting to another is not easy because institutional, cultural, economic and political differences within and between countries can make policy transferability difficult. In the first place, there seems a need to distinguish what is meant by transferability and what are the preconditions and mechanisms involved in this process. Does transferability mean direct and wholesale adoption of policies and/or institutional structures? Or does it involve adaptation to suit local circumstances and institutional requirements? Considering the nature of Sri Lanka's policy environment and socio-cultural characteristics, I argue that policies relevant to SMEs should only be adopted if the domestic policy and institutional structure is able to implement them effectively. However, even in the absence of appropriate policies or an unhelpful institutional environment, there is an advantage for a 'late comer' like Sri Lanka to learn what has worked and what has not worked in other countries.

Court and Yanagihara (2000) pointed out that there is a temporal and strategic dimension to the question of the transferability of policies and institutional lessons for improving external performance – i.e. concerning the nature of "globalisation". First, the extent of globalisation is likely to be different now than in the past and second, it seems that the pace of globalisation has accelerated therefore the relevance of past experiences needs to be examined in this context. As Stone argued (citing Wolman, 1992:44), policy transfer is not an independent process but is part of the wider policy process and shaped by such a process (Stone, 2000). Further, policy transfer involves primarily the state, international organisations (e.g. World bank, IMF, UN and bilateral and multilateral agencies), with key actors being bureaucrats and politicians, and non-state entities in particular, knowledge-based actors involved in the export of ideas. The participation of SMEs as well as business support institutions is vital to the effectiveness of policies. In the empirical work that follows, however, I demonstrate that SMEs play an insignificant role in the development and implementation of policy in Sri Lanka. Although I argue in this research, that Sri Lanka can learn from 'good practices' elsewhere, this does not necessarily equate to copying it; instead, it is important to learn from others' experiences in the context of applicability and usefulness in Sri Lanka. Based on this rationale, for the purpose of this research relevant policies and practices of EU countries are scrutinized[16] to understand the way in which policies are developed and implemented at national and regional levels.

2.4.1 SME policies

There seems a renewed interest amongst policy researchers and practitioners in the effectiveness of SME policy interventions (see for example, Barkham, 1995; Blackburn, 1996; Storey, 1994; Oakey, 1999; Small Business Research Initiative of Small Business Service http://www.sbri.org.uk). Storey (1993) suggests that SME policy interventions have to be studied carefully in order to identify whether the interventions rectify market failures. Similarly, the costs and benefits of interventions need to be assessed against each policy

[16] For example The European Commission's Enterprise policy, 'Lisbon Strategy', the United Kingdom's Competitiveness White Paper 'Our Competitive Future: Building the Knowledge Driven Economy', 1998; White Paper Excellence and Opportunity - A Science and Innovation Policy for the 21st Century, 2000; White Paper on Enterprise, Skills and Innovation, 2001.

objective and target (Storey, 1994). Generally, SME policies are influenced by macro and micro policies and are dependent upon the political and economic structure in a particular country (Tolentino, 1995). On the other hand, the nature and characteristics of enterprises and complexity of socio-economic and political environment generally determine the levels of complexity of support systems[17].

An examination of public policy interventions for SMEs reveals that the focus has been mainly on employment creation, problems, and constraints. The analysis of aforesaid policy initiatives indicates that justification for policy support for SMEs is not merely based on the employment creation but also their role as a source of innovation. Bannock and Peacock (1989) argue that small firms deserve support from the governments, not to gain advantage over other enterprises, but to address the size disadvantages and to counteract adverse effects of other government policies. The support schemes that are targeting specific requirements of firms are likely to be more effective than blanket forms of assistance (North and Smallbone, 1996).

A policy paper published by OECD (2000a) advocates that SME policy should be designed to maximise economic growth. It further emphasised that in order to encourage more innovative behaviour, governments should promote training and familiarisation with entrepreneurship and ensure that SMEs have easy access to information, new technology and innovations. Andersson (2000) points out that much of the government support provided to SMEs has ignored such issues and the policies in the past often served to protect them from normal business pressure and made them dependent on government programmes. According to Storey (1994), SME policy interventions affect four levels in the economic environment: the enterprise level (changes in the activities and behaviour of an enterprise and its owner manager and in the performance of the enterprise that may have resulted from these changes in practice); the meso level (changes in the capacity and

[17] This, to a certain extent, can be considered as a valid argument in relation to the macro-economic environment and SME development in Sri Lanka and this particular aspect will be further discussed in the subsequent chapters.

performance of meso-level institutions); beyond enterprise level (wider changes in society, especially at the household level); and the macro level (changes to the policy and regulatory environment).

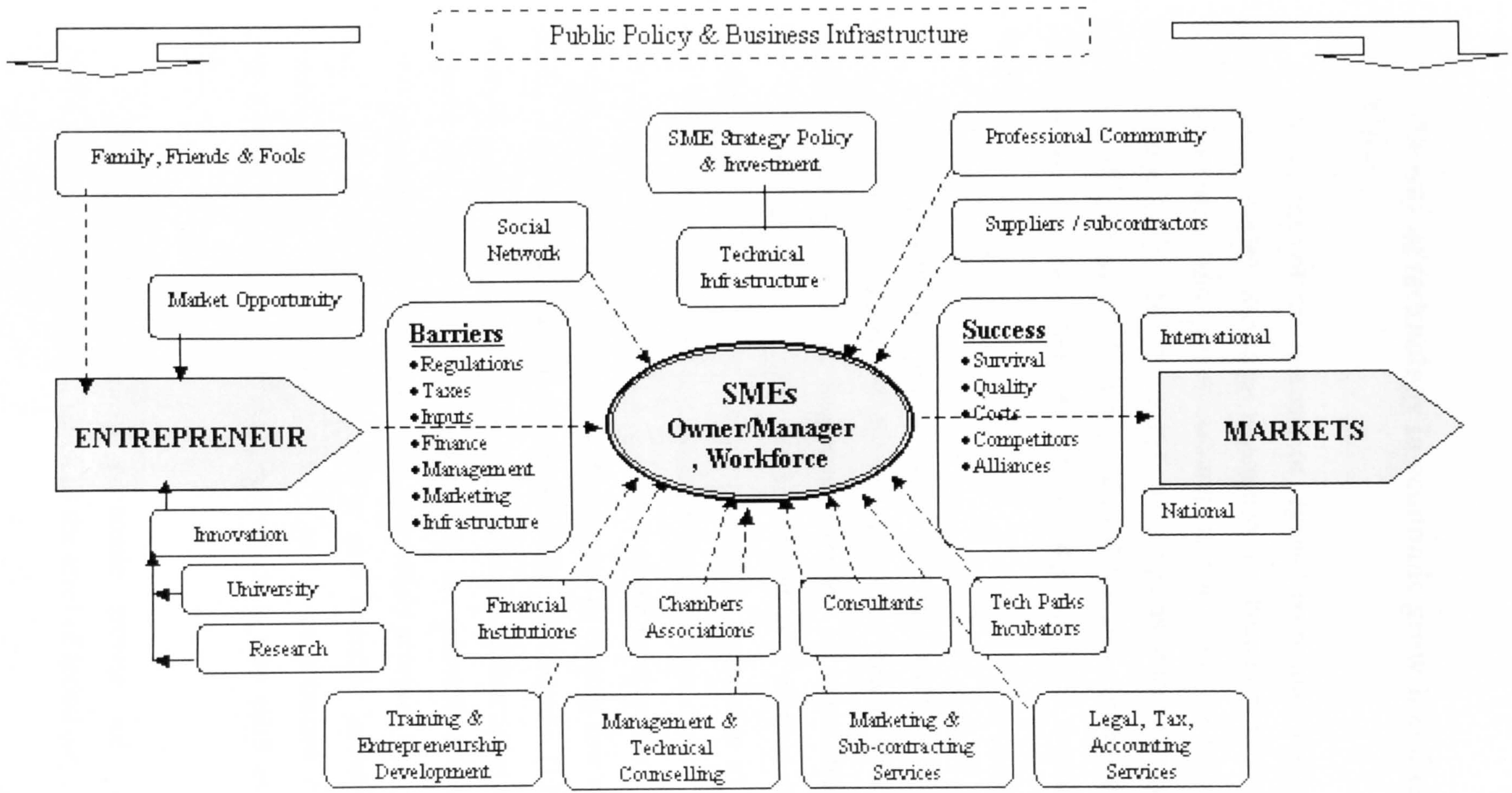
In order to ensure the effectiveness of SME policies, there is a need for constant evaluation (Blackburn and Jennings, 1996) and such evaluations need to focus on developing more effective guidelines for targeting support services by enabling specific packages of services, designed to meet particular needs and the potential of firms in different sectors (Smallbone et al., 1992). Another important need is for the evaluation of policy support through development of appropriate methods using data sets for tracking job and firm dynamics, with close collaboration between those developing data, analysts, and policy makers (OECD, 1996). Taking into consideration the different growth stages of SMEs and support requirements at different stages, Table 2.3 provides some guidelines for a systematic approach to policy design while Figure 2.2 illustrates the ideal SME support system, a framework of dynamic forces of supply and demand. As Figure 2.2 demonstrates, the external environment of SMEs seems to be extremely complex with a large number of actors, both regulators and facilitators directly and indirectly networked with SMEs. The support services (or networks) generally offer services required at different stages, for example, start-up support and support for mature enterprises which enable SMEs to perform better while overcoming barriers and constraints. These two models (Table 2.3 and Fig. 2.2) provide a conceptual framework that can be used as a guide for policy design for Sri Lanka where there is no appropriate system of SME intervention.

Table 2.3: A taxonomy of SME support initiatives

Stage of Business	Policy Field or Need	Instrument
Enterprise Culture	A positive, encouraging and supportive environment	Community programmes Capacity-building Role models Enterprise in education
Pre-start	Ideas	Spin-off ideas Technology transfer Ideas generation workshops and publications
	Small business know-how	Small business skills training Training of trainers
	Know-how networks	Networking advice Network access points-for business and technical advice
	Counselling	Pre-start counselling
Start-up (Internal needs)	Finance	Grants, loans, loan guarantee schemes
	Market expertise	Training provisions
	Management expertise (employment relations, legal etc.)	Training, advice, counselling Mentors
Start-up (External needs)	Customers	Purchasing initiatives
	Suppliers	Local sourcing initiatives Trade directories
	General business advice/consultancy-business	Business expertise Coordinating of third-party provision Training and counselling
	Technical advice/consultancy	Technical advice, research
	Networks	Business clubs Export clubs
	Business information	Information centres Databases, online information portals Publications
	Premises	Managed workspaces Business incubators Business /science parks
Established	Ideas	Ideas generation workshops Spin-off ideas Technology transfer programmes
	Specialist assistance (including investment)	Expertise services from banks, accountants, solicitors
Growth	Market opportunities including exports	Trade missions Market visits Export development advisers Export credit insurance Market information (trends, contacts etc.)
	Product development	Technical advice/support for product development
	Management skills	Salary support Subsidised staff attachment/staff training programmes
	Finance	Loans, grants
Decline	Confidence	Mentors
	Customers	Marketing advice, contacts
	Finance	Grants, venture capital
	Strategic review and planning	Advice and guidance
Termination	Legal and other advice	Provision of advice and counselling
Other dimensions	Business sector	Sectoral initiatives, including sector-based training
	Business support environment	Information and education
All	Information on small business needs and behaviour	Research coordination Research databases Research centres

Source: Bridge et al.(1998)

Figure 2.2: Ideal SME support system



Source: (Lalkaka, 1997)

2.5 The role of technology in economic growth and technology policy

The success of any national or regional economies strongly relies on their ability to create enterprises which become 'bearers of new technologies' through developing and commercialising those technologies themselves or by linking in some way with the international suppliers of technology (Smith and Edquist, 1997: Talaly et al., 1997). Most definitions commonly share four fundamental elements, they are: knowledge, people, organisation, and environment.

Broadly speaking, innovation is an application of technological, scientific and managerial knowledge and skills (or a combination of these) for the development of products, processes or services for commercial and social use[18]. Technological innovation can be defined as a method or process of producing new knowledge or combining existing knowledge in new ways – and of transforming this into economically significant products and processes. Ergas (1987) defines innovation as a process which involves the use of human, technical and financial resources for the purpose of finding new ways of doing things that may be technically successful while McLoughlin (1999:33) views this as a process that links between organisations and functional areas such as research and development and marketing to the scientific and technological community outside of the organisation. It is widely accepted that technological innovations derive from existing and/or new scientific knowledge (see for example Howitz, 1983: Edquist, 1997) and a combination of needs and technological means to meet that need which is new (Hill and Utterback, 1979).

Arguably, high rates of economic growth are supported by technological innovations and therefore the level of technological innovation

[18] Generally, product innovation is defined as the design, creation and introduction of new products and/or services into the market while process innovation is defined as design, modification and implementation of new production methods.

in an economy reflects not only technological progress but also a country's competitive position[19].

The literature has argued that technology plays a leading role in economic development (see Malecki, 1997: Schumpeter, 1931: Porter, 1990; Gomulka, 1990) especially in the western world where technological change played a major role in the economic upsurge (Hill and Utterback, 1979). Malecki (1997) argued technology is central to economic change by creating new skills and new knowledge. The way in which technology can stimulate economic development in developing countries has been debated in these literatures. Among them Porter's (1990) four stage model of national economic development[20] suggests, developing countries need to bring new technology into all production sectors in the economy including agriculture. In addition, technologies also need to meet the needs of individual adopters if they are to be successful. An examination of the level of Sri Lanka's technology dependence shows that there is certainly a mismatch between supply of technology and technology adoption and absorption in local conditions. The importance of technology democracy especially in developing countries is highlighted by Schomberg (1999). He notes that technologies only work for people if they are allowed to play an integral part in the development and application of any new or existing technology. Tom Wakefield (2004) stated:

> *"There is an emerging consensus among many concerned individuals and organisations that a better balance needs urgently to be achieved between the advantages of many new products and technologies and the insights that women and men bring though their existing know-how. The basic claim of the new consensus is that technologies only work for people if these people are allowed to*

[19] In general, the indicators used to measure the innovation performance of a country include: inputs to the process of technological innovation (e.g. research and development budget or number of scientists working); intermediate outputs (e.g. number of patents awarded; number of technical papers published; number of new chemical entities synthesised); performance of a product or process (e.g. speed, durability or cost); amounts of various inputs required to produce product (e.g. hours of labour; barrels of oil; value of capital equipment) (Hill and Utterback, 1979).

[20] Porter's four stages of economic development are: i. Factor-driven development based on basic factors of production. ii.Investment driven development. iii.Innovation driven development (new technology to compete globally). iv.Wealth driven development (Porter, 1990).

play an integral part in the development and application of any new or existing technology." (Wakefield, 2004)

Wakefield (2004) further elaborates on people's participation in technology development and argued that 'such processes should not only draw on their existing knowledge and practices, but also their assessment of particular circumstances in which the technology might be used'. The paper further argued that the power to generate and apply new knowledge has increasingly become an affair of the state and large corporations. This argument is particularly pertinent to technology development and innovation in Sri Lanka, where new technology is seemingly adopted without considering traditional (or indigenous) knowledge and without adequate technical analysis (see for example Gunasena, 2003 and Dassanayake, 2003). This is the very reason why this research is trying to establish that proper facilitation of domestic SMEs through a well-structured support intervention is crucial in technology development and innovation.

The general understanding of technology policy is that it aims to facilitate all phases of the process of development, adoption, diffusion and application of technologies and stimulate technology and information flow between firms and other institutions (Clark and Guy, 1997). The whole discussion on policies and interventions would be futile without considering the interdependence of science policy and technology policy whilst some argue that science deals with fundamentals or principles while technology is more to do with applications (e.g. Dasguptha, 1987). Fundamentally, SMEs as well as larger enterprises may not make the full use of the science base unless they establish good interaction with universities and research centres while scanning the science base constantly (Guerrieri and Tylecote, 1997). In practice, technology policy is part of macro-economic policies and specific policies that envisage enterprise growth and performance. What constitutes technology and innovation policies may vary with the economic status of nations and their economic and political affiliations internationally. Dalum (1992 cited in Carlsson and Jacobsson, 1997) argued that policy interventions, both direct and indirect[21] should be oriented primarily at shaping the overall structure of production whilst improving the functions of existing technological systems and enhancing the creation of new systems (Carlsson and Stankeinsicz, 1992 cited in Edquist, 1997). In addition, such policy interventions need to identify new technological opportunities at an early stage and raise awareness among industry, academia, science and technology institutions and elsewhere (Carlsson and Jacobson, 1997). The policy framework for science, technology and innovation in any given country consists of various forms of government interventions or measures and programmes, laws, regulations and institutions which are meant for creating supportive conditions for science and technology development. The East Asian NICs provide good examples of state-led technology development and innovation which provide ample lessons for developing countries. Kim and Ma (1996:116) emphasised the important role played by East Asian governments:

> *"Developing countries cannot take advantage of the technological knowledge accumulated by advanced countries unless they develop the technological competence to select, absorb, adapt and improve imported technologies. Such a capacity has externalities, that is, its social benefits far exceed the private benefits. Therefore, the role of state in facilitating the process of acquiring technological competence is crucial."*

Innovation policy, at a conceptual level, began to emerge primarily in the 1980s particularly in Europe, where research and technology development and innovation policies were considered as not just instruments but more wide ranging policy objectives (Mistelka et al., 2001). The OECD and the European Commission played a central role in developing and incorporating innovation policies as part and parcel of national economic policies. This is where the State has a role to play by creating an environment that encourages technological growth.

[21] Technology policies have two specific areas of interest of government interventions: direct policies which target specific institutions responsible for technological change; and indirect policies which broadly focus on he business environment (Coombs et al. 1987).

2.5.1 Supporting technology growth

Whether it is foreign technology or home grown technology, technological development has to be part of a national technological system. Carlsson and Stankiensicz (1995 cited in Edquist, 1997) view a national technological system as being a network of agents interacting in a specific economic/industrial area under a particular institutional infrastructure or set of infrastructures. As such, a country's technology system can directly influence the competitiveness and competition of firms at regional and national levels (Malecki, 1997). The notion of a National System of Innovation (NSI) surfaced in Schumpeter's (1934) earlier work on innovation and entrepreneurship and provides an excellent way of thinking about national innovativeness. Yamada (2002:3) defines a national system of innovation as "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technologies". Supporting this argument, Hill and Utterback (1979) argue that the successful innovation process is determined by both the organisation and the environment in which they operate. Furthermore, the institutional level practices, habits and norms influence the local and national innovation systems (Edquist and Johnson, 1997). Edquist (1997) emphasises that support institutions are crucial for the innovation process. Therefore, in the 'systems of innovation approach' institutions are central in all versions of it. Each organisation has a specific but complimentary role in the innovation system although the role organisations and institutions in both the public private sector in innovation system vary depending on the country's economic and geographical context.

Smith and Edquist (1997) argued, for example, that education and training policies are considered key factors shaping technological change. Generally, institutions or knowledge infrastructures can be defined as networks of science and technology organisations and institutional structures, including Intellectual Property regimes and public programmes, universities and corporate laboratories. These elements either individually or collectively produce both generic and tacit[22] knowledge essential for a nation's technological paradigm. Smith and Edquist, (1997) also suggested that technological competencies are decided by the level of learning, and the educated and skilled labour force will essentially enhance the capabilities of enterprises to absorb new technologies. The literature often cites technological learning between institutions, firms and individuals as the key to technological development. Investment and performance relating to research and development e.g. patents per capita; investment in highly-skilled human capital (researchers and PhDs); the capacity and quality of education systems (education spending and life-long learning); purchase of new capital equipment that may contain new technology; and the modernisation of public services (e-government) have been highlighted by the EU as the key aspects of successful innovation systems (European-Commission, 2004).

'Knowledge' is seen as a fundamental element that has a significant bearing on technological innovations. Dasgupta and Stoneman (1987) highlight the importance of knowledge as a key feature of the economics of technology policy. Evidence from advanced countries reveals that technological knowledge is primarily generated by formal education (for example universities), public research and development and technology institutions and private research laboratories. These institutions consider generating and using new knowledge as an input for their main activity which is embodied in products and working practices or techniques (Coombs et al., 1987). Arguably, the provision of science and technology human capital, which embodies a pool of trained and highly qualified graduates, may provide a supply of human resource to enterprises that significantly contribute to the upgrading of technological capacity at the enterprise level. But in reality, not all enterprises are able to build their human resource base through hiring qualified scientists and engineers and other technically skilled labour. The shortage of skills and recruitment problems experienced by SMEs is often highlighted in academic literature (e.g. Foley et al. 1993) which argues that

[22] The formal or generic knowledge is defined as codified, scientific or engineering knowledge while 'private knowledge' is embodied in skilled personnel and/or technical routines (Smith and Edquist, 1997).

recruiting workers with appropriate and adequate skills reduces firm's training cost.

In practice, enterprises tend to make investments in acquiring new technology and know-how that may well elevate their competitive position in local, national and international markets. However, the level of investment may vary depending on the firm's size, sector, types of products and services and the nature of market firm operating. In theory, not all enterprises may fuel technological advancement, however, some do while securing their position in the market with the help of public support initiatives. These initiatives are expected to provide enterprises with vital complementary resources such as skills, information and specialised technical services etc.

In order to be competitive in local and global markets, especially in a technology driven society, SMEs are in need of information that is not available within the general education system, for example, information about R&D, new technology (or foreign technology), machinery and equipment, technological processes, and best business practices (Headrick, 1998 cited in Malecki, 1997:274). The UK government has justified its rationale for science and technology policies based on the argument that they intended to 'modify' the private industry activities rather than substitute them (Coombs et al. 1987). One important lesson that can be learnt from UK policies is that public funded schemes which aim at skill upgrading such as training voucher schemes, Knowledge Transfer Partnership (KTP) programmes and Investors in People Standards (IIP)[23] have a positive impact on technology and knowledge transfer in SMEs (see for example During et al, 2000; Oakey, 1999)

The member countries of EU have adopted a number of policy initiatives towards supporting SMEs which include, among other things, hidden subsidies and concessions for the promotion of technology and innovation activities. For instance, the Science and Technology policy in

[23] The IIP scheme encourages UK companies to improve training as a method of improving in areas such as ICT skills.

European Union has focussed on knowledge infrastructure and the creation of support institutions for research and technological development (RTD), innovation transfer, and training and education. Further, the institutional building process in Europe has been an outcome of very diverse social, political, and economic processes (Soete and Weel, 1999).

2.5.2 Modernisation through capacity development

In the past several decades, a central focus of economic development literature has been the idea of development through modernisation 'following in the footsteps of the West'. Thus modernisation theory assumes that 'progress' involves the shift from micro and small to large firms and that the existence of large firms is a positive development indicator. One particular element of this notion of modernisation is technological. Allen et.al (2000) citing Smelser (1968) pointed out that modernisation theory equates technology with 'development' and views this process as involving: "the change from simple and traditionalised techniques towards the application of scientific knowledge". This research suggests that in the context of a developing economy like Sri Lanka, such assumptions are problematic. For many of the SMEs studied, for example, expanding the size of the enterprise is not an important objective or an indicator of 'success' or 'development'. This argument will be explored in my case study of the coconut fibre industry in chapter 6.

2.5.3 Supporting technology based SMEs

The role business and technology support institutions and support networks play in enhancing technological capabilities has been debated in a number of academic literatures (e.g. Edquist, 1997; Malecki, 1997; Lall, 2000: Oakey, 1999: Rothwell, 1982). These literatures have recognised that external actors, by enhancing technological capabilities of SMEs, can be especially important in developing economies (see for example Malecki, 1997 and Goldman et al., 1997). In the modern 'network age', nurturing technological creativity and access to global technologies requires flexible, competitive, dynamic economic environments and public and private sector institutes to facilitate this process (Desai et al., 2002). To varying degrees, the service provisions for SMEs in most countries are found to be extremely complex. Many are aimed at macro-economic issues SMEs are facing, although issues internal to SMEs too need to be addressed (e.g. provisions of finance, technical, managerial and marketing advice and human resource development). In general, business and technology support institutions, among other things, provide services to improve efficiency and productivity of SMEs through better management techniques and to upgrade technology and skills; enabling them to increase their production capabilities, improve their delivery and distribution systems, expand new markets new product lines or move into new lines of business and acquire new processes and technology (Theochrides and Tolentino, 1998).

What makes business support services effective and attractive to potential users has been discussed by Malecki (1997 citing Gibb and Johanisson, 1993) who suggests that support institutions should be entrepreneurial and flexible in order to respond to varying needs of business environments. Also, they have to be industry-specific and locationally specific. Studies done by the ESRC Centre at Cambridge[24] on business support by Business Link suggest that the effectiveness of SMEs support initiatives depends on the relationship between the support organisations and recipients. Bridge et al. (1998) point out an important issue as to who is the most effective support provider and suggest that support services run by business organisations seemed to be more effective than government owned institutions because of their ability to build relations with a wider businesses community. In many situations, relationships between government agencies and businesses may be less harmonious and are often characterised by mistrust in case sensitive information gets into the hands of regulatory authorities. Goldman et al. (1997) refer to the World Bank study which concluded that technology support institutions must have a service orientation, know their clients, their

[24] See for example, the study on the Market for External Business Advice Services in Britain; Supply of Business Advice and Client Impact, by ESRC Centre for Business Research, University of Cambridge.

needs, capabilities, strengths and weaknesses, be focused, and orient their organisation and activities accordingly. As such, considering the current and future trends in the local, regional, national and global economies, the new role for support institutions should be viewed in the context of a knowledge-based economy where institutional boundaries spread beyond the local and national to the international level creating and facilitating knowledge networks that support domestic technological innovations.

Although support institutions have clearly helped the evolution of the technologically driven knowledge economy, there is clearly a structural problem in the framework where institutions are operating. Studies by the World Bank, United Nations Industrial Development Organisation (UNIDO), World Association of Industrial and Technology Research Organisations (WAITRO) and others (e.g. Lall, 2000: Lalkaka 1997, 1999: Romijn, 1998: Malecki, 1997) have referred to institutional infrastructure in developing countries as weak and lacking effectiveness due to, among other things, budget constraints and difficulties recruiting and retaining talented and capable staff. Similar characteristics can be identified with regard to business support infrastructure in Sri Lanka (see Chapter 4 and Chapter 6).

One of the important lessons Sri Lanka can learn from the experience from developed countries is that many commercially successful technology-based innovations derive from public funded research in science and technology and much of the research and development is conducted as part of government programmes. In certain cases, the research was abandoned by the market as a result of diminishing user demand (OECD, 2004). This approach is well suited in environments where SMEs' technological strength has become an important determinant of their competitiveness. The enterprises tend to become more dependent on external knowledge than ever before; therefore, public funded technology support institutions and research centres are at the 'cutting edge of the search for new knowledge' (OECD, 2004:20).

2.7 Summary

There seems to be a consensus in the large body of literature reviewed in this chapter that technology and technological capability are important determinants of SME competitiveness. However, appropriate policy instruments must be designed and applied to be able to achieve higher performance (see for example Barber and White, 1987; Malecki, 1997). This literature review has demonstrated that, in many countries, state intervention has played a crucial role in formulating different elements of technology policy. Moreover, the literature reviewed suggests that policy and institutional support for technology capacity building extends well beyond the argument of the 'market failure' approach, in that states are involved in a whole range of activities in the areas of science, technology, innovation, skills provision, training and the provision of dedicated technology support infrastructure. As demonstrated by newly industrialised/industrialising countries (NICs) (e.g. South Korea, Taiwan, Malaysia) effective and timely state intervention has been very decisive to the technological development these countries achieved in 1970s and 1980s. In recent times, many developing countries (especially Sri Lanka, Vietnam, Thailand, Bangladesh to name a few) have been seen emulating the success of NICs.

A key question for Sri Lanka (and other developing economies) concerns whether, and to what extent 'successful' policy experiences in advanced capitalist economies are transferable to the Sri Lankan context. In this chapter, I have focused on a range of theoretical approaches that, in different ways, highlight the context-dependent specificity of economic development. Literatures on social capital stress the importance of social networks and culture and the way in which networks influence firms' growth (or entrepreneurial venture) as they provide access to a variety of resources held by other actors that the entrepreneurs do not possess themselves. Lall's (2001) model stresses the importance of both macro and microeconomic considerations and literatures on national systems of innovation point to the importance of national institutional and political structures. These literatures are significant for this research because they hint at some of the difficulties likely to be faced in implementing good practice from elsewhere. They also suggest – contra modernisation theory - that it is imperative to understand the specific economic, political and cultural context in which policies are to be implemented. As Coombs, et al. (1987) argued, policy interventions ought to be designed and implemented in such a way as to influence the ability and willingness of enterprises to innovate.

What are the possibilities of replicating success stories and how can they benefit Sri Lanka? The answers emerging from this literature review suggest that new strategies should include a mix of local knowledge and good practice from elsewhere to address both 'inherited' technological problems as well as support innovative and new technology-based enterprises. A close relationship between technology support institutions and SMEs could facilitate the technological needs of SMEs while preventing the creation of 'hothouse' technologies with little industrial and commercial use (Lall, 2000).

The success of technology development in countries like US, UK, Germany in the West and Japan, South Korea and Taiwan in East Asia highlights that technologies have to be developed in close collaboration with the prospective users, institutes and producers and give users significant control over the development process as well as the ownership of the technology (Romijn, 1998). Karlsson and Olson (1998) argue that technological building (i.e. product innovation) is generally stimulated by technology-push but in some cases by market-pull factors (or demand-pull).

Technology capability building in SMEs is, however, not something that can be achieved overnight. It is a systematic and 'constant replenishment' process that may take a long time (Kay and Willman, 1993). At the same time, the decision of SMEs to innovate and enhance their technological capabilities is greatly influenced by the external economic environment, factor markets and technology and innovation infrastructures. Drawing lessons from the literature on both developed and developing countries, it seems that building technological competency or capability in a country like Sri Lanka requires appropriate interventions (policies and strategies) that address the learning capabilities of SMEs and their skills and knowledge needs. In addition, such interventions must be sensitive to domestic social, economical and cultural influences that shape firms' social capital.

Wignaraja (1998) emphasises that Sri Lanka needs to deploy adequate measures urgently to stimulate in-house technological activities and improve production efficiency in firms and suggests a range of policy actions (both macro and micro level) such as skills development, tax incentives and grants assistance. Wignaraja stated:

> *"The government of Sri Lanka needs to address deficiencies in the incentive structure as well as supply-side influences if it wishes to broaden and deepen its manufactured export base from its present narrow specialisation in simple, low skill products"* (Wignaraja, 1998:237).

In what follows, I explore in much greater detail the specificity of Sri Lanka's economic context that has shaped the development of its SMEs. Chapter 3 analyses Sri Lanka's social, political, economic and cultural attributes, as these are important for understanding how Sri Lanka's technology and innovation capabilities are shaped.

Chapter 3

Sri Lanka: An Overview of Socio-economic and Political Context, Industrialisation and Technological Performance

3.1 Introduction

This chapter presents an analysis of Sri Lanka's social, political and economic history, the process of industrialisation, technological capabilities and how these factors influenced the evolution of the industrial sector and its contribution to overall economic performance.

This chapter is organised into three main sections. The first section introduces the country and its political economy. The second section examines the economic liberalisation and industrialisation. The third section analyses the technological performance and capabilities at the national level.

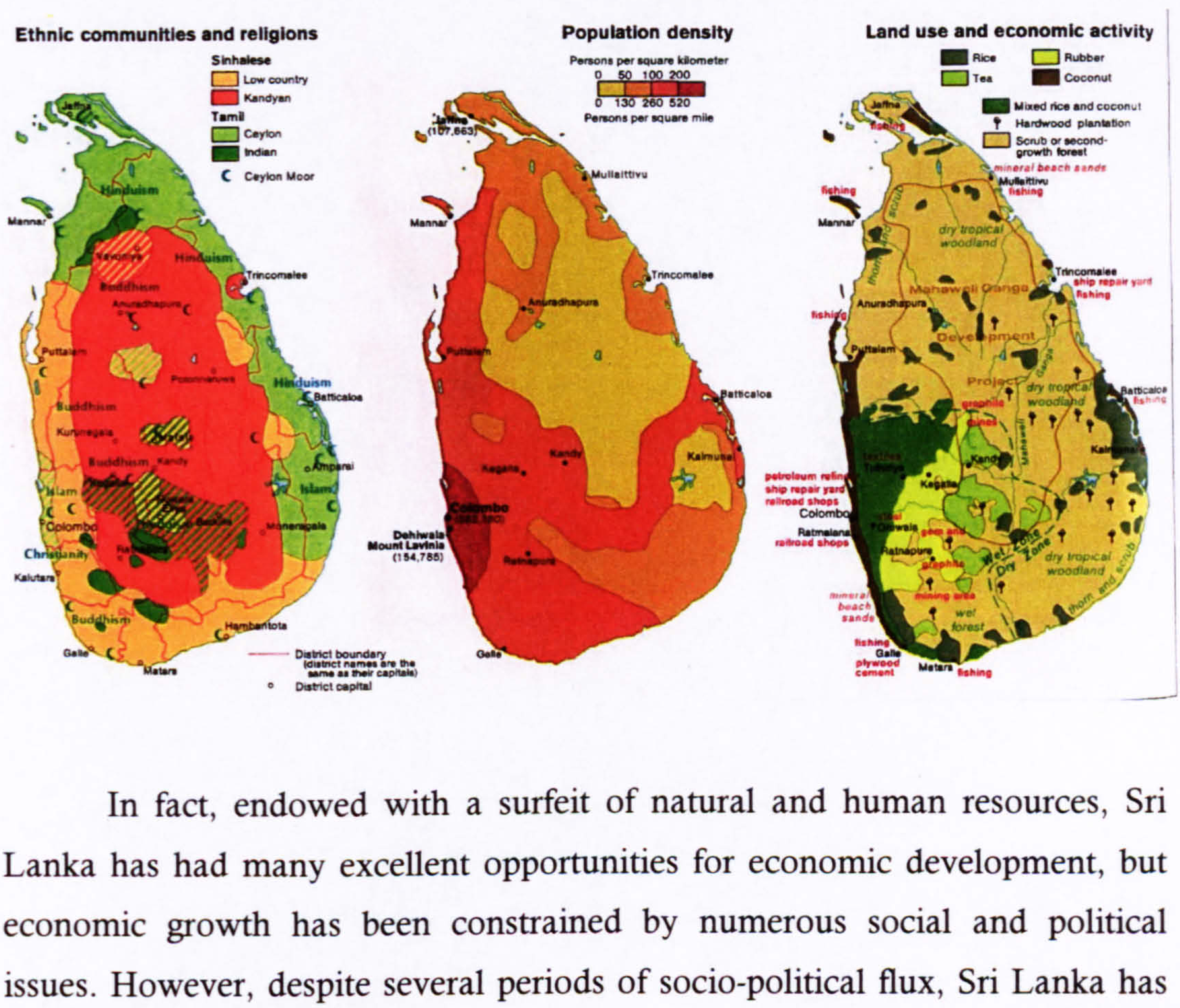
The primary focus of this chapter is to draw upon the success and failures of industrialisation and to evaluate how if at all social, political and historical factors have influenced industrialisation and the performance of SMEs. The arguments for technology capability building at the national level and its implications for SMEs have highlighted that technological progression is an evolutionary process and technological capabilities are key determinants of a nation's economic progress and competitiveness (see for example, Schumpeter 1934; Malecki 1997; Porter 1990; Porter and Stern 2004).

In line with this conceptual approach, this chapter also analyses Sri Lanka's technological performance at the national level and the way in which it has shaped industrialisation and SME development.

3.2 Background and historical context[24]

Sri Lanka is a small country with a land area of 65,610 sq. km (25,332 sq. miles). About half the size of England, Sri Lanka is located near the southern tip of India and is blessed with a tropical climate, abundant mineral reserves and excellent soil and growing conditions (see Figure 3.1). With an estimated population of 19 million and population density of about 300 per sq. km., the per capita income was US$870 in 2001.

Figure 3.1: Demography and economic activity (Source: Google images)

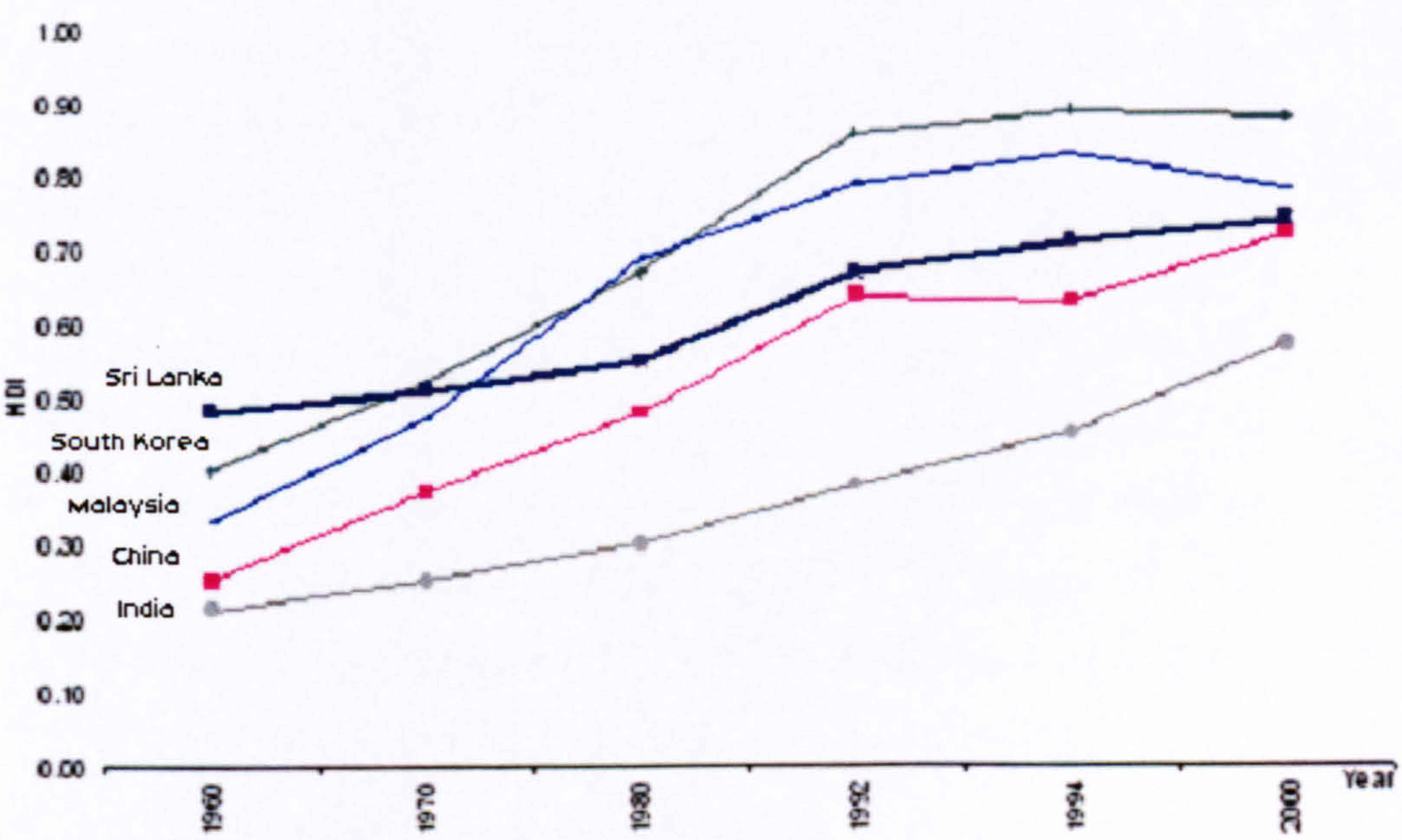


In fact, endowed with a surfeit of natural and human resources, Sri Lanka has had many excellent opportunities for economic development, but economic growth has been constrained by numerous social and political issues. However, despite several periods of socio-political flux, Sri Lanka has achieved high levels of social welfare. The country has been particularly successful in servicing basic human needs as demonstrated by the country's performance against a range of social indicators such as life expectancy, literacy, education and health (Figure 3.2) which shows that Sri Lanka has

[24] The materials for this section were drawn from a number internet sources: http://www.country-data.com/frd/cs/lktoc.html#lk0128; http://www.lankalibrary.com/

outperformed many developing countries in Asia, sub-Saharan Africa and South America. Sri Lanka has attained a remarkable level of human development during the past few decades and it ranks highest among developing countries particularly in South Asia. Sound policies and the commitment of government have placed the country's social indicators on a par with advanced economies (World Bank, 2002). The comprehensive education system from primary level to university has produced one of the best-educated populations in Asia. The literacy rate stands at around 92 percent the highest among South Asian nations. Housing and public amenities have raised the living standards of urban and rural population alike. The politicians and officials strive to meet the needs of people through a form of welfare socialism that provides a system of support on a par with developed countries.

Figure 3.2: Human Development Index (HDI) in selected countries in Asia



Source: Lankshman (eds) 1997: Human Development Report 2002

Although Sri Lanka has achieved a relatively high human development index (HDI) and rapid economic development, poverty has remained one of the major policy concerns. While the incidence of poverty has reduced over the past four decades, 22 percent of the households still live below the poverty line (World Bank, 2002). Since 1930s addressing social inequalities and poverty reduction have always been at the top of the government's policy agenda and have acquired a significant place in socio-economic development policies. However, their performance in reducing poverty is below expectations. Evidently, the progress in this area has been constrained by several factors such as inefficiency in implementing 'pro-poor' economic policies, occasional lapses in managing poverty reduction programmes by the public sector and terrorism (World Bank, 2000).

The country is a multi-ethnic society predominantly dominated by majority Sinhalese (74 percent) and other ethnic groups which include Tamils (18 percent), Muslims (7 percent), Eurasians and other minority groups (1 percent) (Sri Lanka Census and Statistics, 2003). Sri Lanka has a history spread over 2500 years where Buddhism plays a leading role in the country[26]. Both Sinhalese and Tamil are official languages while English is widely used in administration, business and education. Since the arrival of first ruler *King Vijaya* 2500 years ago, about 123 kings and queens have ruled Sri Lanka. The colonial period which followed, commencing with the arrival of the Portuguese in 1505 who were succeeded by the Dutch in 1656 and then by the British in 1796 prevailed until the island gained independence in 1948. During this period the old feudal agrarian system was transformed into a mainly export oriented system of economy. Thus, the impact of European dominance on Sri Lanka's political, social and cultural structure cannot be over-stated. The wealth and social well being arising from the post independent economic system have created a wider class system that goes beyond the boundaries of caste, religion and language. Today, the society has transformed into a multi-cultural and multi-ethnic while retaining its own characteristics.

Despite the increased public investment and reorientation of government policies towards socio-economic progress, Sri Lanka continues to face serious structural problems. Of the 19 million people, about 17.5 million live in seven of the country's nine provinces, and one-fifth to one-third of the

[26] Buddhism is the predominant religion and foundation of the Sri Lankan socio-cultural and education development and is embedded into the daily lives of people and politics. Tamils and Muslims practise Hindu and Islam religions respectively. Christianity (Roman Catholic) religion is practised by Eurasians, Burghers and a small number of Sinhalese and Tamils.

population (3-5 million) is categorized as poor based on a lower poverty line (ADB, 2002). Nevertheless, without addressing the factors behind the persistence of poverty, for example, boosting capital formation, accelerating economic growth and rapid creation of job opportunities, social inclusion, and improvement of living standards, poverty will continue to be a major socio-economic issue in the country.

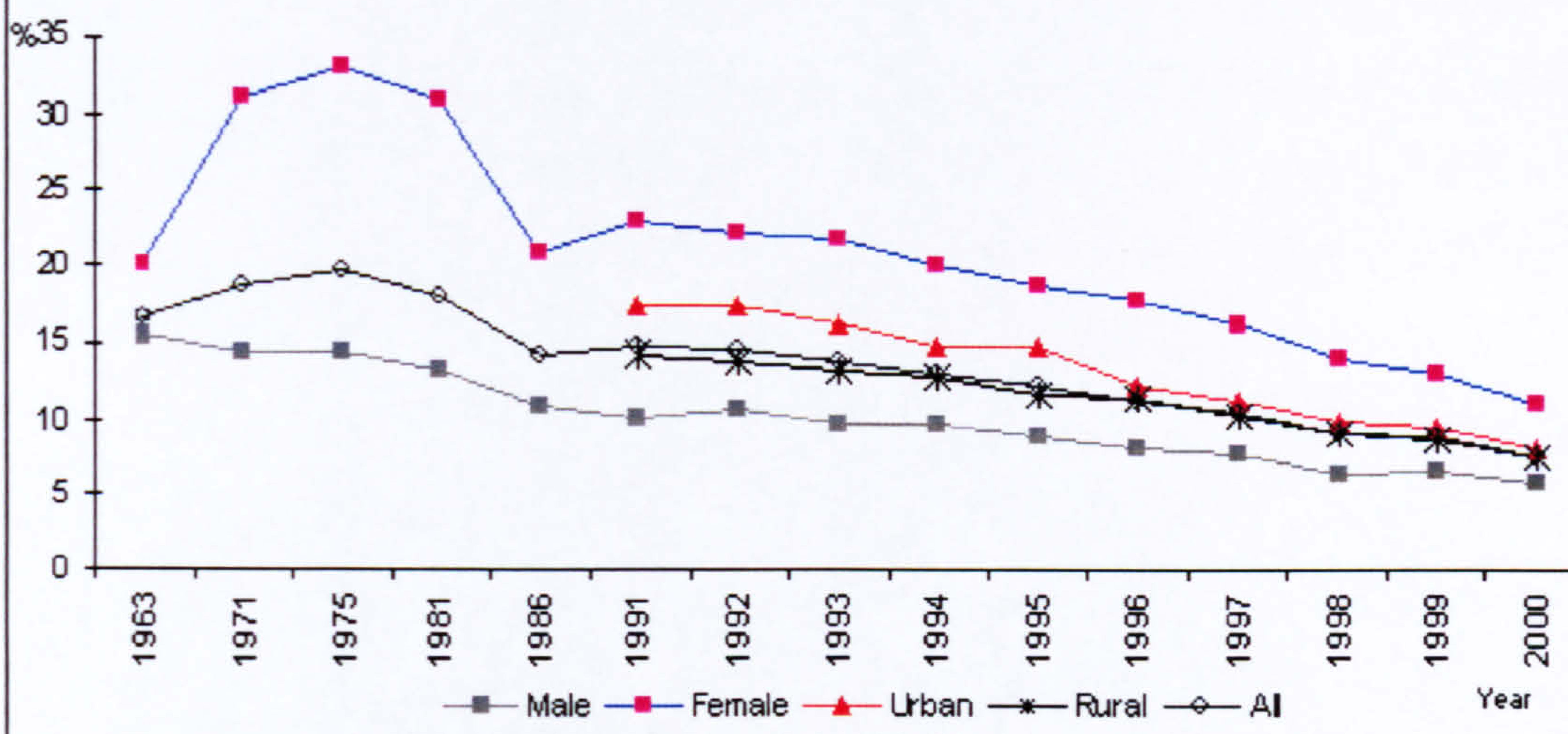
The growth of the labour force in the past fifty years in Sri Lanka reflects the net effect of the different facets of population growth. Unemployment[27] (and under-employment) is relatively high and less than a quarter of the population is estimated at living below the poverty line while education and health are eroding given the country's epidemiological transition and the rising expectations of its' population (World Bank, 1998:9). Extensive unemployment is a primary factor of poverty but under-employment is also found among the population who live below the poverty line.

Up until the 1950s, the country had not felt the existence of unemployment as a problem. Unemployment reached peak levels in the mid 1970s, averaging 18.7 percent in 1971 and rose to 24 percent in 1973. By 1976, the total number of unemployed reached 1 million. The most disturbing feature of this problem has been its concentration among younger age groups between 15 to 24 years (Kiribanda, 1997). The Socio Economic Survey of 1999 reveals that the unemployment rates among youths in the age group 15-19 years and 20-24 years averaged 21.3 percent and 40.8 percent respectively in the past 10 years. During the early years of liberalisation (1971-1981), employment in agriculture declined from 50.1 percent to 45.5 percent. Unemployment rates are higher for women than for men, highest in the urban sector, and lowest in the estate sector and the education levels for young women are higher in the urban sector. A noteworthy observation from the graph presented below (Figure3.3) is the reduction in the unemployment rate from 14.7 percent in 1991 to 7.6 percent in 2000. This has been almost wholly

[27] Definition of Unemployed: 'A person who had no employment for a period of twenty six weeks or more during the period of twelve months preceding the Quarterly Labour Force Survey.'

due to government policy on reducing unemployment through industrialisation and development of enterprises (Central Bank, 1999).

Figure 3.3: Unemployment by age, sex and sectors



Source: Department of Census and Statistics, 2001

Although the relative importance of both industry and the service sector has increased, the agriculture sector still dominates the economy as the main source of income. However, employment in agriculture has decreased from 52.9 percent in 1953 to 36 percent in 2000 while employment in industry and service has increased in the same period (see Table 3.1). Since liberalisation was introduced in late 1970s, employment opportunities for women (both urban and rural), in labour intensive manufacturing activities have increased rapidly resulting in an increase of participation rates. Changes in the economic structure, for example, expansion of the service sector largely occupied by teaching, health care, clerical and finance related jobs provided more opportunities for women (Kiribanda, 1997).

Table 3.1: Employment by sectors (%)						
	1946	1953	1981	1990	1996	2000
Agriculture	53	53	46	47	38	36
Mining & quarrying	0	1	1	1	2	1
Manufacturing	9	10	10	13	14	17
Construction	1	2	3	4	6	6
Services	37	34	40	35	40	40
Total	100	100	100	100	100	100
Source: Department of Census and Statistics, Sri Lanka						

3.3 Political economy of Sri Lanka

The political and economic environment in Sri Lanka is unique, embedded within a rich culture, traditions and shadows of feudalism and colonialism. An independent country since 1948, Sri Lanka has endured three constitutional changes and is now a unitary state under an Executive President who is the head of the state with sovereignty exercised through a parliament of elected representatives. At the time of gaining independence in 1948, Sri Lanka was regarded as one of Asia's most promising new nations. Concerned by low productivity and even more rapid population growth, according to Snodgrass (1998) many observers took a more modest view expressing reservations about the capacity of Sri Lanka's existing economic structure to support the growing population while maintaining current standards of living.

Although annual economic growth increased at an average of 2.8 percent since independence, a figure that might be considered only moderate in comparison with the performance of many of the East Asian nations, it has surpassed growth rates of other countries which have adopted populist and nationalistic approaches. It should be noted that Sri Lanka has pursued similar policies at different periods of its recent history, particularly between 1957-65 and 1970-77 during the pro-socialists Sri Lanka Freedom Party (SLFP) regime led by the *Bandaranayake* family. It was during 1965-70 and 1977-83 when free market policies were pursued, that Sri Lanka attained high rates of economic growth. Sri Lanka was the earliest among the four main South Asian countries namely, India, Pakistan, Bangladesh and Nepal, to begin the process of policy reform under the pro-capitalists United National Party (UNP) government in the late 1970s. The economic data suggests that since transformation from an inward-oriented system to a free market economy that took place in 1977, the GDP has grown at an average of 4-5 percent per year. At present, Sri Lanka is one of the most open economies in the developing world.

Since independence, the country's politics (and thus economic policy) have been mainly influenced by two political parties. The pro-capitalist United National Party (UNP) governments adopted non-interventionist policies and the pro-socialist Sri Lanka Freedom Party (SLFP) governments were responsible for the implementation of 'forced' import substitution economic strategy (Athukorale and Jayasuriya, 1996). The pro-socialists SLFP led governments during late 1950s, early 1960s and in the 1970s invested large sums in social welfare programmes and nationalised many profit-making private enterprises including foreign owned companies (banking, trade, industry and agriculture) turning them into less efficient entities (Athukorale and Jayasuriya, 1996:3). In contrast, the UNP government endeavoured to introduce economic liberalisation during its term (1965-70) but was only able to implement these reforms fully when the party returned to power in 1977.

Snodgrass (1998) has observed that inappropriate economic policies and the ongoing armed conflict are the two major constraints on Sri Lanka's economic development. The former has been addressed by successive governments that are seeking to emulate the East-Asian model although the latter still persists. The country has not fully utilised the benefits of trade and investment liberalisation for industrial and overall economic growth and this attracts widespread agreement largely attributed to the absence of a supporting set of macro-economic policies and an attractive investment climate (Athukorale and Jayasuriya, 1996:28). However, Sri Lanka has been cited as a model example of a country that has achieved relatively equitable income distribution and higher levels of social welfare through people-centred development (Snodgrass, 1998). Over the years, since independence in particular, the country has been an experimental ground for a series of economic policies based on a wide range of economic ideologies which were closely guided by socio-economic developments in the domestic and international landscape (Lakshman, 1997:5).

Sri Lanka's political and economic history is illustrated below with reference to four major periods: pre-colonial (before 1505), colonial (1505-1948), post-independence (1948-1977) and post-liberalisation (after 1977).

3.3.1 Some highlights of the economic development in the pre-independence period

Before 1948, the economy was based on agriculture; mainly rice cultivation, subsidiary crops and animal husbandry which largely determined the social structure. Although there has not been much written on Sri Lanka's economy, there is a wealth of historical evidence to suggest that Sri Lanka was a strong agricultural economy governed by a feudal system. Historical chronicles indicates that foreign trade was of increasing importance to the Singhalese kings and by the 14th Century, the country had established trade links with foreign traders, particularly Arabs. Among other things, cinnamon was in great demand by Europeans, and became a prime export commodity.

As the Portuguese expanded their interests into the Asian region, they established themselves on the island in 1505 and were more interested in trade, an activity already dominated by the Moors (Arab Muslims). The Dutch in 1658 after taking political control of the island proceeded to monopolise trade. At first, it was limited to cinnamon, gems and elephant tusks but later extended to other goods. By the 18th Century, the British rulers had developed Sri Lanka's economy that was capable of supporting the burgeoning population. Roads, railways, schools, hospitals, hydroelectric projects, and large well-operated agricultural plantations provided the infrastructure for a viable national economy. In 1892, the Colebrook-Cameron[28] reforms had an

[28] In 1829, the British Colonial Office sent a Royal Commission of Eastern Inquiry--the Colebrooke-Cameron Commission--to assess the administration of the island.

immediate impact on the economic development of the island by advocating a laissez-faire[29] economy.

The greater availability of capital and the increase in export trade brought the rudiments of capitalist organisation to the country. The Ceylon Bank opened in 1841 to finance the rapid expansion of tea and coffee plantations, while the plantation system continued to transform the island's economy. However, the expansion of the plantation-based economy was achieved at the expense of the traditional agriculture sector[30]. By the end of the century, tea, rubber and coconut production on the island had become the most economically important crops in the economy.

3.3.2 Post-independence period (mixed economy) (1948-1977)

The post-independence era can be considered as a period that witnessed mixed results economically, socio-culturally and politically. Although the people of Sri Lanka have enjoyed a democratic tradition as well as quality of life and gained political independence, many writers on Sri Lankan affairs (see for example Kelegama 1993: Athukorale 1996: and Lakshman, 1997) argue that its economic dependence is typical of an 'underdeveloped country portrayed by structuralist and the dependency theory'[31](Lakshman, 1997:6). Sri Lanka adopted a multi-party system similar to 'Westminster Parliamentary system'. Since the first parliamentary election held in 1948, the political power switched between the pro-capitalist United National Party (UNP) and the pro-nationalist non-Marxist Sri Lanka Freedom Party (SLFP) led by the

[29] According to "Laissez Faire" policy, the state has only a minimal role to play mainly: a) provision of social/public goods and merit goods, including protection of society from external aggression of maintenance of law and order and b) infrastructure services and institution building necessary for the working of the market economy (Lakshman, 1997).

[30] The colonial predilection for commercial crops over subsistence crops was later considered by Sri Lankan nationalists to be one of the unfortunate legacies of European domination. Other issues, notably the British policy of selling state land to planters for conversion into plantations, were equally controversial, even though some members of the indigenous population participated in all stages of plantation agriculture (Source: http://www.lankalibrary.com).

[31] Dependency is an historical condition which shapes a certain structure of the world economy such that it favours some countries to the detriment of others and limits the development possibilities of the subordinate economies (Dos Santos, 1968).

Bandaranayake family. The first post-independent elected government led by UNP established a solid foundation for rapid economic growth by introducing several new 'market friendly' initiatives but when the power changed hands to SLFP, the policy focus changed towards giving more prominence to the public sector. The welfare programmes were broadened to include pension schemes, medical care as well as food and fuel subsidies. Restrictions were imposed on foreign investments and economically important industries while a number of private-owned banks and insurance companies were nationalised. Under the land reform scheme, the plantations owned by British companies were nationalised and redistributed among landless people. However, global international politics had a strong influence on Sri Lanka's internal politics. One example is, during the UNP regime in the early 1950s, the Soviet Union was angered by the government's pro-western attitude and repeatedly blocked Sri Lanka's application to join the United Nations (Sri Lanka was later admitted in 1955) (Snodgrass, 1998). On the other hand, the pro-socialist policies of Mrs. Bandaranayake's government agitated most western capitalist countries including the United States (Lakshman, 1997). This government nationalised foreign oil companies, Shell, Esso and Caltex and signed agreements to import oil from the Soviet Union, Romania, and other countries who were not traditional trading partners. In 1963, the United States withheld aid to Sri Lanka in retaliation to the government's controversial moves.

The UNP regained power at the 1965 election, began to restore the declining national economy by implementing liberal trade and fiscal policies, and lifted most of the economic barriers and restrictions imposed by the previous government. Most western countries commended the liberal approach of the new government and as a result, a donor consortium was established to support the country. Many of the social welfare schemes were cut down and these approaches were particularly attractive to not only the donors but also local private enterprises.

The new coalition government led by SLFP and its pro-socialist allies (the Communist Party and Socialists Party) elected in 1970 followed an inward oriented strategy and re-imposed fiscal and monetary restrictions and re-established social welfare schemes. The new government adopted socialist and populist policies where the public sector played a significant role in creating employment and transferring resources to people. However, the government's strict controls, poor economic policies and particularly food rationing system brought a lot of hardships to the public and as a result, this government was defeated convincingly by the UNP at the election held in 1977. The economic consequences of reverting to the inward oriented economic policy were severe and reflected by the poor economic performance. According to Lakshman (1997), the welfare policies of the government had serious consequences both internally and externally. With the adoption of new constitution in 1972, Sri Lanka became a Republic and ceased the formal relationship with the British Monarch.

It emerged from the examination of the evolution of socio-economic policies during post independence era that these policies had largely focussed on the local economic issues such as achieving social equality, equal distribution of wealth and resources, and improving the agricultural economy without giving much attention to the global economic trends. By the early 1960s, Sri Lanka's economy was on par with most countries in the region and the per capita income fared relatively well. Nevertheless, Sri Lanka had fallen far behind many of the countries in South East Asia, South Korea, Malaysia and Thailand in particular. For example, between 1961 and 1990, the economic growth averaged around 4 percent, well below South Korea (8.7 percent), Malaysia (6.5 percent) and Thailand (7.6 percent) (IMF, 1996). Such fluctuations are reflective of the inconsistencies observed in the policies pursued by different post-independence governments with their differing ideologies.

The pre-independence economic policies continued into the early 1960s with primary agricultural products such as tea, rubber and coconut becoming an important sector in the economy. The plantation industry remained the government's main source of revenue that helped finance other sectors, particularly social welfare services (Wignaraja, 1998). A neutral foreign trade policy was adopted that allowed import of certain food and manufactured goods while some quantitative restrictions and low import tariffs were also imposed. In the 1950s, the economy was more or less 'open' – with relaxed fiscal and monetary regulations (Pieris, 1997).

With the change of government in the late 1950s, the economic policies shifted towards import substitution industrialisation favouring a bigger role for the public sector and limiting private sector initiatives with strict import quotas and tariffs. Despite this change, certain local industries began to flourish while intense protective measures prevailed during the import substitution-led 'closed economy'. However, certain trade restrictions brought new investments in import substitution industries (Waidyanatha, 2001). The government established institutions to promote local industries and exports even though some restrictions, for example import of raw materials, machinery and equipment discouraged local entrepreneurship. The absence of competition from imports largely prompted a decline in the quality of goods produced by local enterprises; however, customers had no alternative but to buy these inferior goods. The public sector institutions monopolised almost all imports. Another setback for local enterprises was the government's decision to nationalise private sector manufacturing enterprises, plantations, banks and insurance companies. During this period, the state owned enterprises as well as nationalised private enterprises performed poorly with big losses mainly due to political interference, weak management, low level of technology, and labour unrest[32]. Because of the weak economic management and governance under the inward-oriented economic regime, the country was progressing poorly and 1971 saw the lowest recorded economic growth in the history of Sri Lanka (0.2 percent). By the mid 1970s, Sri Lanka was one of the most regulated countries outside the centrally planned countries (Athukorale and Jayasuriya, 1996:4). As a consequence of the shifts in economic policy between 1950 and 1977, the economy became increasingly centralised with increased role for the public sector and rigid administrative controls. The government attempted to achieve its social objectives through

[32] Although few enterprises, export of refined petroleum products in particular, were able to reach higher standards, while most institutions were heavy financial burdens to the government (Waidyanatha, 2001).

uncompromising measures such as official pricing, rationing, and distribution of policies (IMF, 1996).

3.3.3 After 1977 – The new political and economic era

Following the landmark election in the history of Sri Lanka, the new government elected in 1977 amended the constitution transforming the system of governance from a 'Westminster Parliamentary system' to an 'Executive Presidential system' (similar to the French system of governance). The new UNP government abolished trade, fiscal and monetary restrictions imposed by the previous government and declared that the country would follow outward oriented economic policies. The prospects for the country's economic development had begun to materialise as the donor countries and international lending agencies endorsed the government's positive approach to the economic recovery. The government embarked on a massive public investment programme and two major development programmes are worthy of note. The Greater Colombo Economic Commission (GCEC) promoted foreign direct investment and managed export-processing zones and the *Mahaweli* river-basin development programme transformed the dry zone into the most productive agricultural area. However, President Jayawardene's dream of making Sri Lanka into another Singapore was becoming unrealistic and unachievable as the economic development activities were severely affected by escalating violence inflicted by Tamil 'Tiger' terrorists (LTTE)[33]. Mr. Jayawardene completed his two terms as the President and in 1989 allowed his Prime Minister, Mr. Premadasa to take the control of government.

Mr. Premadasa had a different approach to the revival of the sluggish economy. He strongly believed in interventionist policies and implemented 'pro-poor' programmes throughout the country while continuing with the open

[33] The Liberation Tigers of Tamil Eelam (LTTE) have been fighting for a separate state in the North and East since 1983. The conflict has made hundreds of thousand of people homeless and another 60,000 lost their lives. The damage caused to state properties is enormous. The country's economy has been affected as a result of the war in the north. Successive governments have voiced the need for political settlement over the past 20 years but any political settlement seems far away without strong commitment from both parties and support from the Western governments.

economic policies already in place since 1977. The Premadasa government's main development programmes focussed on poverty alleviation, housing, free uniforms and books for school children, privatisation of public enterprises[34], and regional industrialisation with special provisions for labour intensive manufacturing enterprises (e.g. garment industries in rural areas). Dunham and Kelegama (1997) argue that Premadasa regime (1989-93) was characterised by a strong political leadership with sound decision making, strategic thinking and was one which was possessed of a determination to achieve things that were crucial to the implementation of the economic reform process. In 1993, Mr. Premadasa was assassinated by Tamil Terrorists at a May Day Rally in Colombo and his deputy Mr. Wijetunge the Prime Minister was appointed as the caretaker president.

In 1994, the political power changed hands again when the People's Alliance (PA) led by Sri Lanka Freedom Party (SLFP) defeated the UNP government at the parliamentary elections. Mrs. Chandrika Bandaranayake Kumaranatunge, the daughter of former Prime Ministers Mr. S.W.R.D. Bandaranayake and Mrs. Sirima Bandaranayake, became the Prime Minister and became the President few months later. In the first couple of years, the new government was confronted by the escalation of terrorist activities. Although fighting was generally restricted to the North and, to a lesser extent the Eastern part of the country, the situation elsewhere in the country was normal. However, the government had to invest heavily on strengthening the military by recruiting more soldiers and procuring military hardware to counter the growing terrorism.

An analysis of Central Bank statistics suggests that Sri Lanka's Economic performance and the government's management of the economy was disappointing during this period and it appears that the government was more concerned with its own political survival than dealing with real issues. Although free market policies were maintained, the government pledged to restore the social welfare system merely to satisfy its left wing political allies.

[34] President Premadasa used his own term '*peoplisation*' instead of 'privatisation' as a shield to protect from public criticisms.

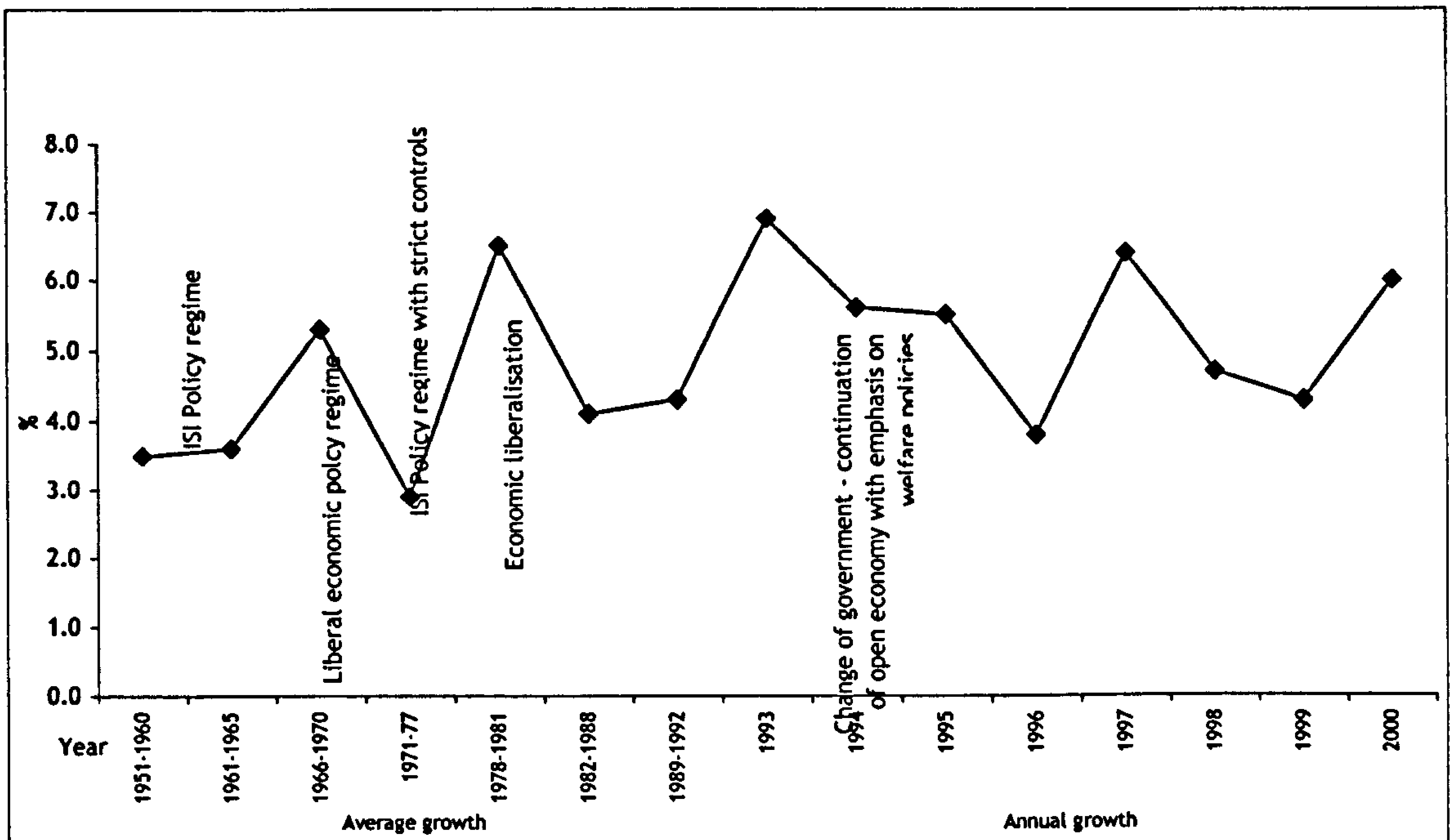
This appeared to be more of a strategic issue than a genuine policy commitment. The most damaging thing on the part of this government was its inability to manage the economy and contain terrorism which seriously affected the government's popularity. Towards the end of 2000, the government called a snap election. The United National Party led by Mr. Ranil Wickramasinghe and its allies won the election with a reasonable majority promising a comprehensive economic recovery and a lasting solution to the ethnic conflict. The new government and Tamil Tigers signed a peace accord, backed by the international community and monitored by the Norwegians, which aimed to find a lasting political solution to the ongoing conflict. The government pledged to revive the economy and restore ties with the international donors. However, the UNP government lasted only two years and was defeated again at a snap election held in 2004 by the People's Alliance led by Mrs. Kumaranatunge.

3.4 Economic liberalisation and industrialisation of Sri Lanka

In 1977, the newly elected United National Party government initiated comprehensive economic reforms, reversing the policies of the two previous decades, transforming an inward looking socialist system to an outward oriented market economy. The liberalisation prompted a major reorientation of the Sri Lankan economy that was bound, at some point, to encounter difficulties of governance (Dunham and Kelegma, 1997:180). For the first time since independence, Sri Lanka adopted a development strategy emphasising export-led industrialisation and greater use of the market mechanism to allocate resources (Wignaraja, 1998:55-56). The UNP government implemented several reforms through a programme of structural adjustment including trade liberalisation, privatisation, devaluation and the promotion of exports and foreign direct investment (FDI). The policies were designed and implemented to facilitate the restructuring of the agricultural sector, to intensify industrial production, increase employment, increase domestic savings and investment, and improve Sri Lanka's balance of payments in the medium term (CBSL, 1998). It also included ambitious financial reforms in government budgetary policies, interest rates, foreign exchange control measures, development of a stock market and so forth. These new policies and development strategies also heralded a reduction of the government's involvement in production of goods and services and the promotion of the private sector as the engine of economic growth. A number of different incentive schemes were implemented to stimulate foreign investment and resulted in the establishment of three major export-processing zones (EPZs) in the country. These developments also enabled a withdrawal or reduction of subsidies for both consumption and production.

Since liberalisation policies were introduced, the GDP growth which had been about 3 percent during 1971-77, grew at a moderate rate of 4-5 percent in the subsequent years as agricultural and industrial production responded to improved policies and reforms (see Figure 3.4). At the same time, inflation rose from 6 percent in 1971-77 to 16 percent in the subsequent three years. Since 1980, the structure of production in Sri Lanka has been relatively stable where agriculture accounted for 26 percent of GDP in 1990. Plantation crops, tea rubber coconut accounted for a quarter of agricultural production while paddy and other crops were grown mainly for domestic consumption. The industrial sector's share of GDP rose from 20 percent from 1960s to 25 percent in 1990. The main contributing factor for this increase was the rapid development of export-oriented industries such as textile and garments (IMF, 1996).

Figure 3.4: Average GDP growth (%)



Source: Central Bank of Sri Lanka

As illustrated in Figure 3.4 the post-liberalisation period records an impressive rate of economic growth. For example, the average growth rate of manufacturing stood at modest 5.7 percent, matched that of the rest of South Asia (6.0 percent) and outstripped sub-Saharan Africa (3.4 percent), Latin America and the Caribbean (1.5 percent) (Wignaraja, 1998:57). However, the growth was significantly less than East Asian countries whose annual growth rate was observed at 9.4 percent in the 1980s. By implementing 'open' economic policies, the government hoped to replicate the development achieved by these East Asian Newly Industrialised Countries (NICs) namely South Korea, Taiwan, Hong Kong and Singapore. The economic reforms were mostly centred on private sector-led activity, but the public sector comprising of central and provincial governments, public enterprises, and variety of public institutions, yet retained its central position in the economy.

Although the Government of Sri Lanka was committed to its economic liberalisation process which received high praises from the international donor community, the conflict in the North and political unrest in the South weakened the government's capacity to fully implement economic reforms. One of the major constraints was the rising military expenditure. In 1988, the government implemented a 'second wave liberalisation and adjustment package' under the Structural Adjustment Programme (SAP)[35] which IMF advocated promoting development that would mean a reduction of the size and role of government (Waidyanatha, 2001:4), fiscal and monetary reforms, and three high profile economic objectives (export promotion, privatisation and poverty alleviation) (Dunham and Kelegama, 1997). Despite the lack of transparency in many areas of the government, subsequent governments continued the free market-based economic policies and the business climate became increasingly private sector friendly (Dunham and Kelegama, 1997:186).

Sri Lanka is often considered in economic literature (e.g. World Bank/IMF) as an excellent example of a developing country that successfully adopted export-led industrialisation sparked by a switch from import substitution to outward looking economic strategies in 1977 (Lall, 1998). As a result of these policy changes the structure of industry and exports was further transformed, industrial production increased, and the export base diversified from primary products to manufacturing. The average annual growth rate of manufacturing fell from about 6 percent during 1965-69 to 3 percent in 1970-76 but significantly recovered following the economic reforms were introduced. After 1977, traditional agricultural products such as tea, rubber and coconut along with new generation labour-intensive industries continued to dominate Sri Lankan exports, while inefficient, protected, industries began to diminish (Athukorale and Jayasuriya, 1996:19).

Since 1983 the armed conflict in Sri Lanka has had serious consequences for the growth of the economy. Research by the Institute of Policy Studies (IPS Sri Lanka) estimated that the cost of the war during 1984-1996 to amount to approximately 170 percent of Sri Lanka's total GDP in 1996 (Arunatilake et al., 2000). The government's defence expenditure

[35] The theory behind SAP was Adam Smith's classical economic doctrine of 'laissez faire', prescribed to Third World countries. The aim of SAP was to address deteriorating external payments, rising inflation, privatisation of state enterprises, the reductions and simplification of tariff structure and removal of exchange controls and to encourage flexible exchange rate management and lower fiscal deficit (Athukorale and Jayasuriya, 1996:9).

increased from 1.3 percent of GDP in 1980 to 4-6 percent of GDP in 2000 (CBSL, 2001). The war also adversely affected the levels of foreign direct investment and tourist arrivals. The World Bank estimated the foregone foreign investment between 1984 and 1996 amounted to be around 71 percent of GDP in 1996. The human cost of the war also cannot be underestimated. Nearly 60,000 people have lost their lives while another 700,000 have been displaced of which 170,000 are living in government welfare centres.

3.4.1 Industrialisation of Sri Lanka

The contribution of the industrial sector to national prosperity and economic development in terms of share of Gross Domestic Product (GDP) varies from country to country[36]. In this context, the characteristics of industrialisation in Sri Lanka allow us to query whether the country's industrial development process is driven by appropriate economic principles or political beliefs of the government of the day. Lakshman (1997) argued that due to unprecedented political factors, coupled with various endogenous as well as exogenous economic factors, implementation of different industrialisation strategies took place late in Sri Lanka compared to Asian NICs in spite of Sri Lanka being the 'pathfinder' in the region in this regard[37]. The disposition of industrial policies varied depending on the economic principles of the government in power (Vidanapathirana, 1993). The historical evolution of industrialisation in Sri Lanka suggests that party politics and individual political interests have been more of a deciding factor than macro-economic determinants.

The macro-economic reforms of 1977 placed foreign investment high in its agenda which significantly changed the industrial structure of Sri Lanka fostering increased rates of activity in the private sector and industrial

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[36] According to the UNIDO definition 'industrialised' countries are those whose industrial sector produces more than 30 percent or more of their GNP (Gross National Product). The countries that produce less than 30 percent of their GNP in the industrial sector are defined as 'industrialising' countries. It is difficult to define Industrialisation or measure its bearing on economic growth because of its complexity although one may argue simply that industrial growth is a prerequisite for development.

[37] Lee Kwan Yu, the former Prime Minister of Singapore once said when he visited Sri Lanka in 1950s that he wanted Singapore to be like Sri Lanka.

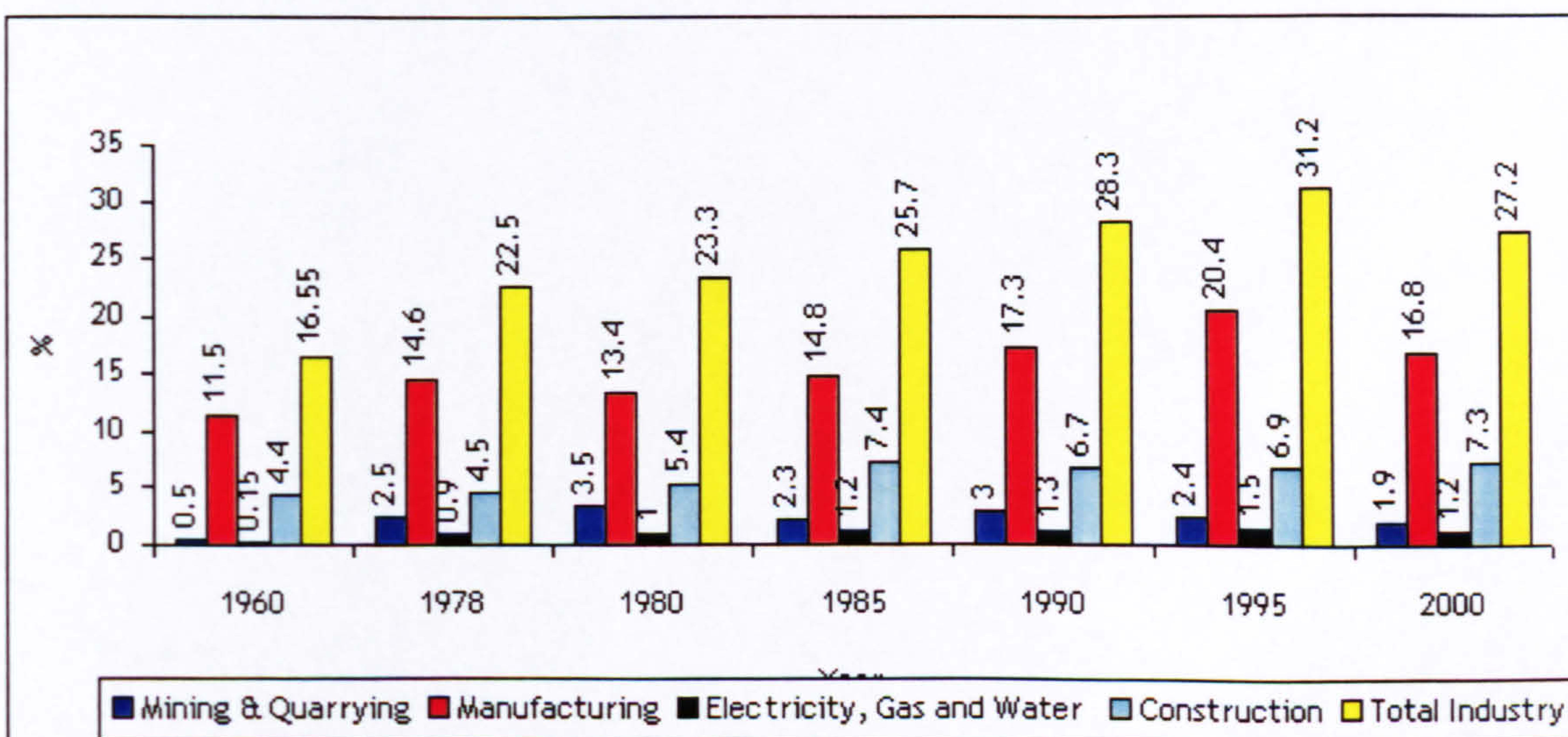
modernisation. Successful export-led growth in some countries (e.g. East Asian NICs) can be viewed by the factors that allow market forces operating freely in the economy with minimum government intervention (both factor markets and product markets) and Sri Lanka's industrial policies are said to be set within this framework. However, based on the evidence from literature on Sri Lanka, I argue that the role public sector played in 'putting appropriate institutional foundations for market developments' within the context of private sector-led growth was inadequate or insufficient. Even to date, the public sector still dominates and monopolises the economically strategic sectors (e.g. banking, insurance, ports, transportation and utilities). In view of Sri Lanka's increasing competitiveness in the world market, recent changes in industrial structure have resulted in a shift towards labour intensive industries creating much needed employment opportunities. Over the past fifty years Sri Lanka's industrialisation has undergone radical changes and it is therefore evident that the policy environment has been the crucial factor that has influenced the pace, structure and efficiency of Sri Lanka's industrialisation process (Vidanapathirana, 1993).

The industrial sector, manufacturing sector in particular, has been the major driving force behind Sri Lanka's economic development and main contributing factor in solving Sri Lanka's unemployment problem. The manufacturing sector accounted for 16.6 percent of employment in the industrial sector. The manufacturing sector severely constrained by the scarcity of inputs during the Import Substitution Industrialisation (ISI) regimes (1961-1965 and 1970-1977), responded positively to the new economic freedoms that emerged in the wake of the liberalisation policies or Export Oriented Industrialisation (EOI) introduced in 1977. The sudden industrial resurgence was attributed mainly to the removal of trade barriers that made raw materials, machinery, accessories, and other inputs available to industries that are crucial to manufacturing growth. In the macro context, Sri Lanka's industrial sector consists of mining and quarrying, manufacturing and services (electricity, gas and water) (according to the UN classification). The statistical data presented in this section is based on the Annual Reports of the Central Bank, Statistical

Abstracts and the Annual Survey of Industries produced by the Department of Census and Statistics (DCS).

It can be seen in Figure 3.5 that the composition of the industrial sector has been quite responsive to policy shifts (or policy surprises) and the subsequent response of entrepreneurs. The industrial sector has shown a considerable expansion between 1978 and 2000, increasing its share of national output from 16.6 percent to 27.3 percent which suggests that the post liberalisation period was favourable for manufacturing activities. Whilst electricity, gas and water achieved a steady growth, mining and quarrying began to decline since 1980s. Poor management and lack of commercial orientation of state owned mining enterprises are often cited by international monetary agencies (World Bank/IMF and ADB) as an explanation for their relatively slow growth. The construction sector achieved its highest growth rates in the mid 1980s and early 1990s, mainly attributed to the heavy public investment in physical infrastructure development.

Figure 3.5: Structure of the industrial sector
(Share of output as % of total industry output)

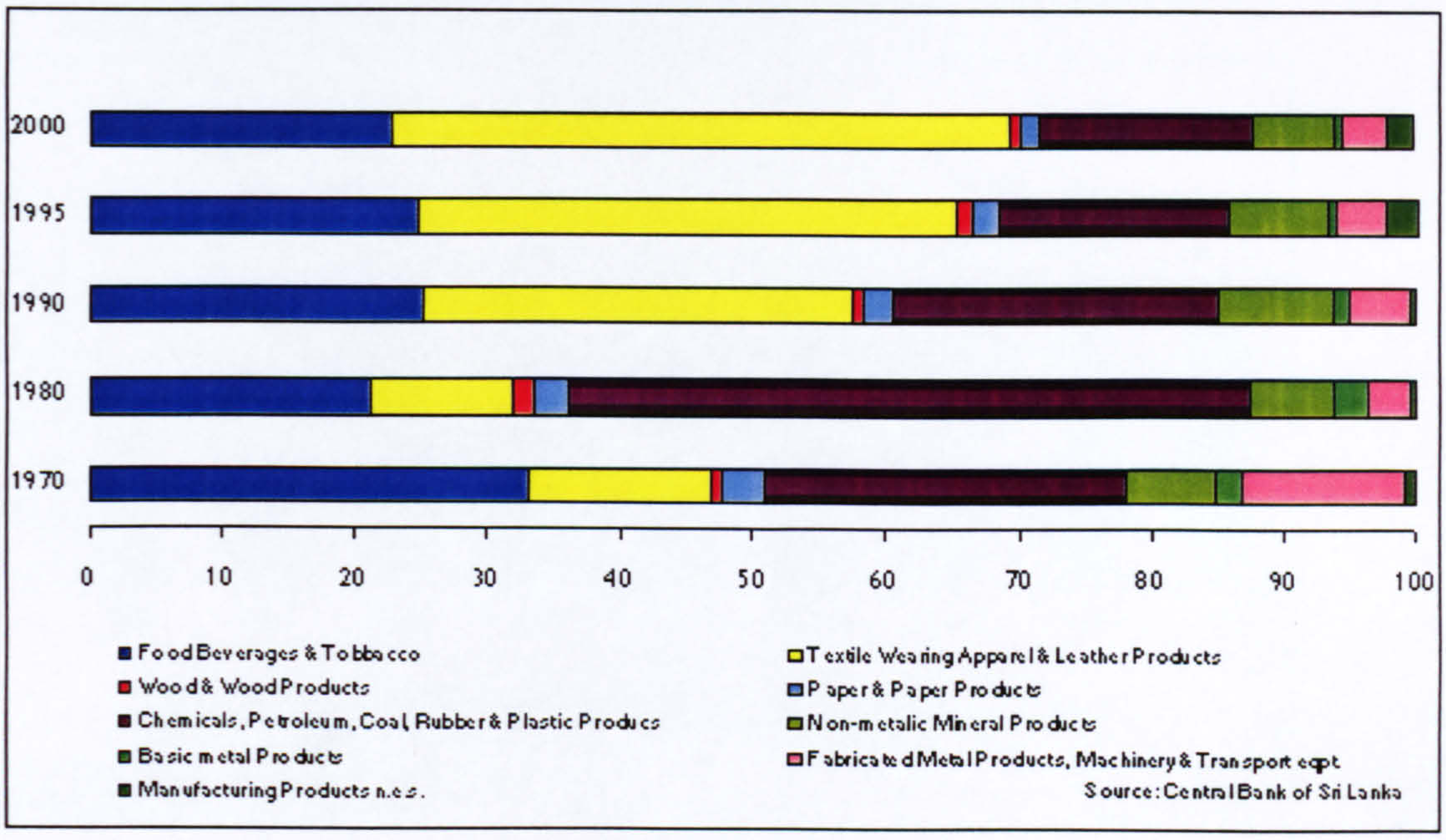


Source: Central Bank of Sri Lanka, Annual Reports (various issues)

In the past, Sri Lanka's industrial activities were primarily based on plantation agriculture (e.g. tea, rubber, and coconut) the primary source of raw materials for a large number of small and medium-sized enterprises. Tea has been the major plantation export crop since around 1860. The average annual growth of the industrial sector increased from 3.4 percent during 1950-1977 period to 6.6 percent in the period after 1977. The composition of industrial production has changed remarkably since the 1970s. The share of textile and apparel sector which was only about 13.7 percent in 1971 increased to 46.6 percent in 2000, overriding chemical, petroleum and rubber and food and beverages sectors (see Figure 3.6) (CBSL, 2001). Athukorale and Jayasuriya (1996) argued that it is the industrial restructuring programme that came along with the liberalisation contributed to the growth of export-oriented production in the manufacturing sector.

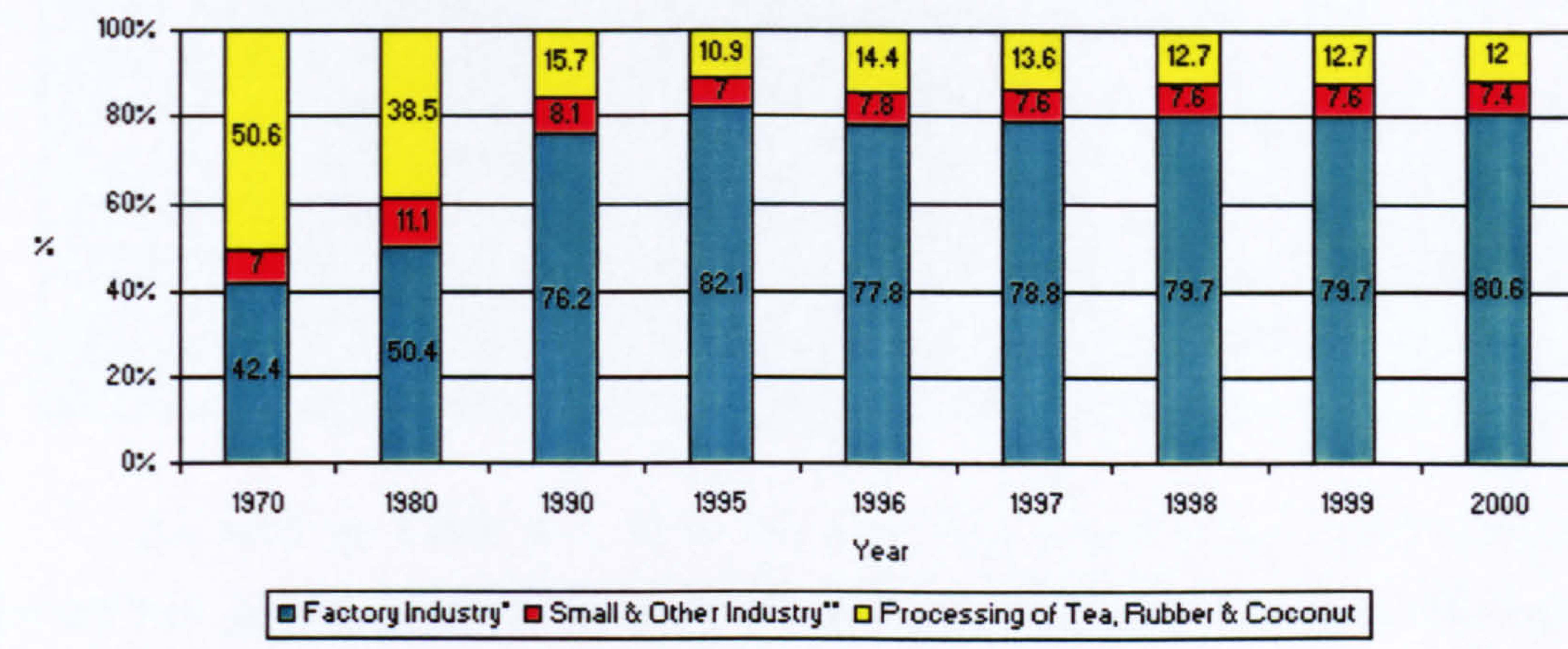
After 1977, there was a significant increase in external aid flows and foreign direct investment (FDI). Development priorities for the improvement of physical infrastructure, for example, several hydro power plants to increase the supply of electricity, a modernised telephone system, a transport system, development of road air and sea networks, were regarded foremost by the government. A UNIDO report also shows that Sri Lanka's Manufacturing Value Added (MVA) has increased from US$804 million in 1985 to US$2,338 millions in 1998 although MVA was only 3.6 percent compared to India (6.5 percent), Thailand (11.3 percent) and Malaysia (16.4 percent). About 84 percent of MVA in 1998 came from low technology and resource based industry (UNIDO, 2003). These figures show how 'light' the country's industrial structure is in terms of technological intensity (Wignaraja, 1998). One of the weaknesses of Sri Lanka's manufacturing is the low value addition which may limit the deepening of industrial structure; perhaps the policy makers need to assess the existing policy environment, identify gaps and create new policies to diversify Sri Lanka's industrial bases (Wignaraja, 1998). According to Lall et.al (1996), Sri Lanka's industrial sector in absolute terms is relatively small and is moving towards low skill equilibrium rather than consolidating on high skills activities.

Figure 3.6: Composition of industrial production (%)



The structure of the manufacturing sector in Sri Lanka is usually described according to the size and nature of industrial units (e.g. tree crop processing industries, factory industries and small industries). According to the data presented in Figure 3.7, the share of factory industries grew from 42.4 percent in 1970 to 80.6 percent in 2000. Small industries have recorded a marginal growth between 1970 and 1990, while their contribution has remained at about 7.5 percent between 1990 and 2000. The output of small industries in relation to the GDP was relatively low (1.5 percent), a fact that amply demonstrates how Sri Lanka is consolidating its industrial base in the non-agricultural, factory-based activities. The Figure 3.7 also shows the declining primary and secondary agricultural-based industry.

Figure 3.7: Composition of the manufacturing sector (as % of total manufacturing output)



Source:Central Bank of Sri Lanka, Annual Reports (various issues)
Notes: *Over 25 Employees ** 5 to 25 employees

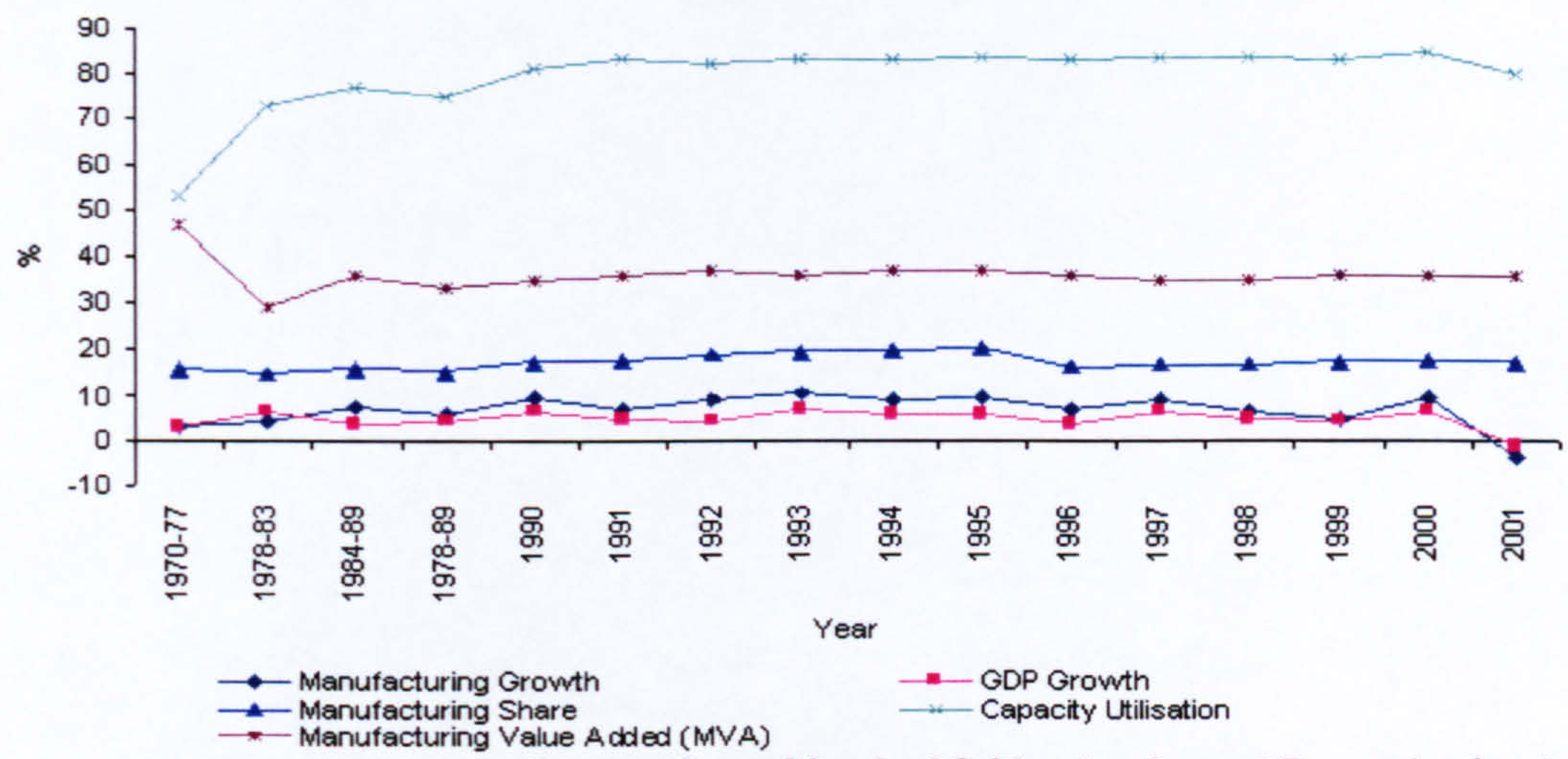
The performance of the manufacturing sector has been largely dependent upon policy changes moving from a strict state controlled regime (1970-77) to a liberal economic regime (1977 onwards). The Table 3.1 shows the structure of the industrial sector and as data illustrates food, beverages and tobacco activities dominated the industrial output in the 1960s and accounted for more than half of manufacturing output subsequently had fallen to less than 25 percent by the year 2000. This dramatic fall was a result of declining agricultural output which fell from 38 percent to 20 percent in the corresponding period. One reason for this decline has been the policy bias against the agriculture sector mainly through removal of import restrictions for primary agricultural products and restrictions for subsidies formally granted for major crops (e.g. paddy, minor export crops - cloves, cinnamon, cardamom and pepper, plantation crops, vegetables and fruit crops) facing stiff competition from imported goods. These policies pose serious consequences for the growth of the food and beverage sector because of the shortage of locally produced raw materials.

Table 3.2: Structure of industrial sector (Share of output as % of total)							
	1960	**1978**	**1980**	**1985**	**1990**	**1995**	**2000**
Food beverages and tobacco	56.8	29.5	21.3	27.1	25.3	23.8	22.8
Textile, wearing apparel etc.	8.1	11.4	10.5	24.6	32.2	43.1	46.6
Wood and wood products	0.7	1.4	1.6	1.8	0.8	0.8	0.6
Paper and paper products	4.1	4.2	2.6	3.1	2.2	2.0	1.4
Chemical, petroleum etc.	12.2	37.0	51.4	33.9	24.4	16.6	16.1
Non metallic mineral products	5.4	6.7	6.3	4.8	8.7	7.2	6.1
Basic metal products	0.0	2.5	2.6	0.3	1.2	0.7	0.7
Fabricated metal products	2.4	6.7	3.4	4.1	4.8	3.4	3.4
Other manufactured products	0.5	0.6	0.3	0.3	0.3	2.3	2.1
Manufacturing (% of GDP)	11.5	14.6	13.4	14.8	17.3	20.4	16.8
Source: Central Bank of Sri Lanka, Annual Reports, various issues							

As seen in Table 3.2, over the past four decades the manufacturing sector has grown at an average of 4.7 percent annually. Between 1960 and 1977, its average growth was 3.4 percent and almost doubled (6.6 percent) after 1977 which highlights the difference between two contrasting economic policy regimes. The share of chemicals and petroleum products grew from 12.2 percent to 51.4 percent through the 1960s to 1980s. By 1980, this sector became the largest category and more than doubled the size of the food and beverages sector. In the eighties the increased inflow of foreign direct investments (FDI) and the establishment of export processing zones (EPZs) saw the textile and apparel sector expanding rapidly and by 2000, this sector accounted for nearly half the manufacturing output.

During the period between 1970 and 2001, the industrial sector has undergone dramatic transformations alongside the changing political and economic environment. As Figure 3.8 illustrates, the contribution of the manufacturing sector to total output, export earnings and new employment opportunities have proved to be an important element in Sri Lanka's economic development. The economic liberalisation prompted further rapid growth and the manufacturing sector continued to expand for a period of 25 years. The average growth of the manufacturing sector which was around 3.0 percent during 1970-77, increased to 5.5 percent during the period 1977-89. The highest rate of growth in the post-1977 period (10.5 percent) was observed in 1993. The period between 1990-94 was the most conducive to economic development where high growth rates were achieved in GDP (5.5 percent) and all other economic sectors[38]. The manufacturing sector's share of national output remained steady at around 17 percent throughout the entire post-liberalisation period. The GDP growth in 2001 was the lowest rate ever recorded in the post-independent Sri Lanka (-1.4 percent), while the manufacturing sector too displayed a negative growth (-3.9 percent) in the same year.

Figure 3.8: Growth of Manufacturing Sector between 1970 and 2001



Source: Central bank of Sri Lanka, Annual Report (various)

3.4.2 Foreign Direct Investment (FDI) and export promotion in industrialisation

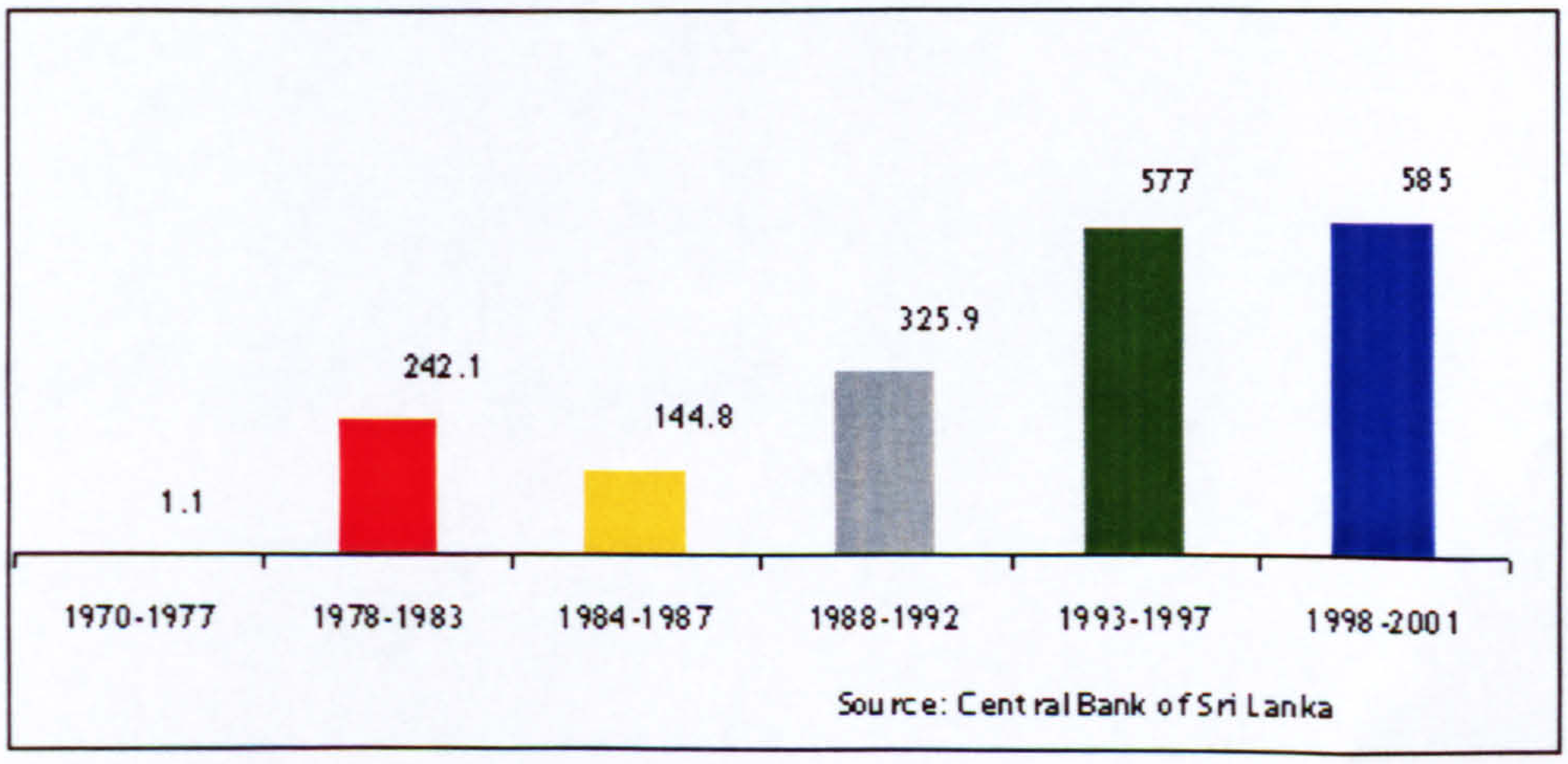
The need of promoting FDI as an efficient means of transferring new technologies, skills, capital and access to overseas markets was recognised by the government elected in 1977 (Wignaraja, 1998) and in 1978, two major institutes, the Greater Colombo Economic Commission (GCEC) and Foreign Investment Advisory Committee (FIAC) were established. In 1989, FIAC was merged with the GCEC now known as Board of Investment (BOI). The GCEC initially established two export-processing zones (EPZs) near Colombo, and a range of incentives were offered to foreign investors to set-up ventures. Investment Protection Agreements, Double Taxation Relief

[38] This was mainly attributed to the political leadership of Mr. Premadasa.

Agreements with major investment countries were critical to restoring investor confidence within and beyond Sri Lanka's borders. The FDIs were further guaranteed by Article 157 of the Constitution of Sri Lanka (Athukorale, 1997:397).

Since 1977, there has been a significant increase of FDI into the country. During the period between 1980 and 1983, the total flow of FDI had increased from US$ 44 million to 64 million (70 percent) (see Figure 3.9). Due to unsettled political and economic environment the FDI trends (inflow) have never been consistent. In addition, the opening up of economies in the neighbouring countries, such as India, Bangladesh, and Vietnam has also precipitated a drop in the rate of FDI inflows. In spite of these challenges, Sri Lanka still remains attractive to FDI by virtue of its relative labour costs, unutilised apparel and garment quotas in the western markets (under the Multi-Fibre Agreement [MFA]), natural resource base, good growth prospects and competitive incentive regime (Wignaraja, 1998). The country is renowned for its relatively cheap and young labour force, particularly women, that is attractive to labour intensive, low skilled-based manufacturing activities (e.g. garments, jewellery and diamonds) more than innovative and technology-based investments which require additional factor inputs.

Figure 3.9: Net foreign direct investment (FDI) flows in Sri Lanka 1970-2001 (US$mn)



While Wignaraja (1998) has noted that the country has been successful in attracting export oriented FDI into simple low skilled activities and has contributed to export growth. Many economists argue that Sri Lanka has been a recipient of 'foot loose' industries (see Atapattu, 1997: Wignaraja, 1998: Kelegama, 1993: Lakshman, 1994 and 1997). The Table 3.3 presents data on inflow of FDI and activities in different sectors. As can be seen from the data, a high concentration of FDI is found to be in the textile and apparel sector with an increase of 42 to 439 enterprises between 1984 and 2000, making up approximately 50 percent of the total enterprises in the manufacturing sector. The sectors with a high level of technology such as fabricated metal products (4 percent) and non-metallic mineral products (6 percent) have attracted less FDI even in 2000. Domestic investment in food and beverage sector seemed to be much greater than the foreign component (68 percent in 2000) indicating that this sector is becoming very attractive to local investors. Another reason is varied incentives offered to local entrepreneurs investing in this sector. The data on FDI inflows also suggests that over 35 percent of industries are in low technology labour intensive categories.

Table 3.2: Enterprises operating under the Board of Investment (between 1984 2000)

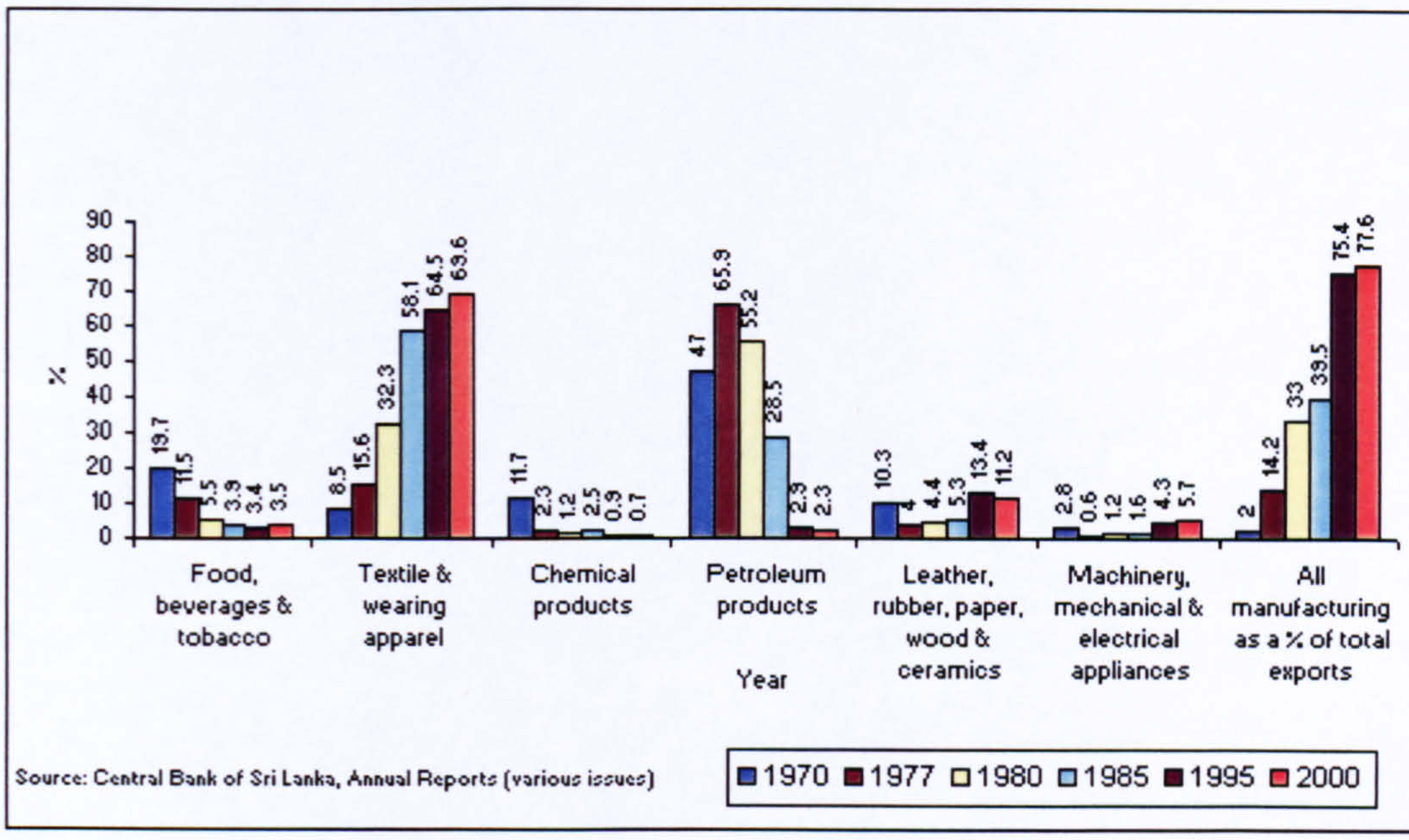
	1984			2000		
	Number of firms	Empl	Invest. (US$ Mn)	Number of firms	Empl.	Invest. (US$ Mn)
Food, Beverages and Tobacco	1	n/a	0.19	141	15,207	113.9
Textile, Wearing Apparel and Leather products	42	n/a	49.3	439	242,435	330.4
Wood and Wood Products	1	n/a	0.07	22	1,822	8.9
Paper and Paper Products	0	n/a	0	22	1,618	8.1
Chemical, Petroleum, Rubber and Plastic products	12	n/a	12.82	121	29,675	133.26
Non-metallic Mineral Products	13	n/a	23.29	61	13,061	71.18
Fabricated Metal Products	4	n/a	4.35	41	4,182	54.66
Manufactured Products (n.e.s.)	23	n/a	51.6	159	33,394	95.93
Total Manufacturing	96	n/a	141.6	1006	341,394	816.37

Source: Central Bank Annual Reports (Various issues)

Generally, the rationale for promoting FDI inflows is their contribution to the upgrading of technology, enhance management skills, and improve human capital. However, evidence from the patterns of FDI inflows shows that the so-called 'technology transfer' through FDI in Sri Lanka has been disappointing. The apparel and food and beverage sector cannot be treated as high-technology sectors per se because the apparel sector is considered as 'low technology' and heavily rely on low skilled female labour. The food and beverages sector is also characterised by a large number of fruit and food processing units that employ simple technologies. The data also reveals that FDI inflows into high technology intensive sectors are comparatively lower than other sectors. With regard to resource-based manufacturing, Athukorale (1997:405) argues that Sri Lanka's natural industrial mineral resources (e.g. phosphate, limestone, quartz and mica) continue to remain unexploited and a few other minerals (e.g. graphite and mineral sand) are under low-level commercial extraction (mostly raw or semi-finished forms).

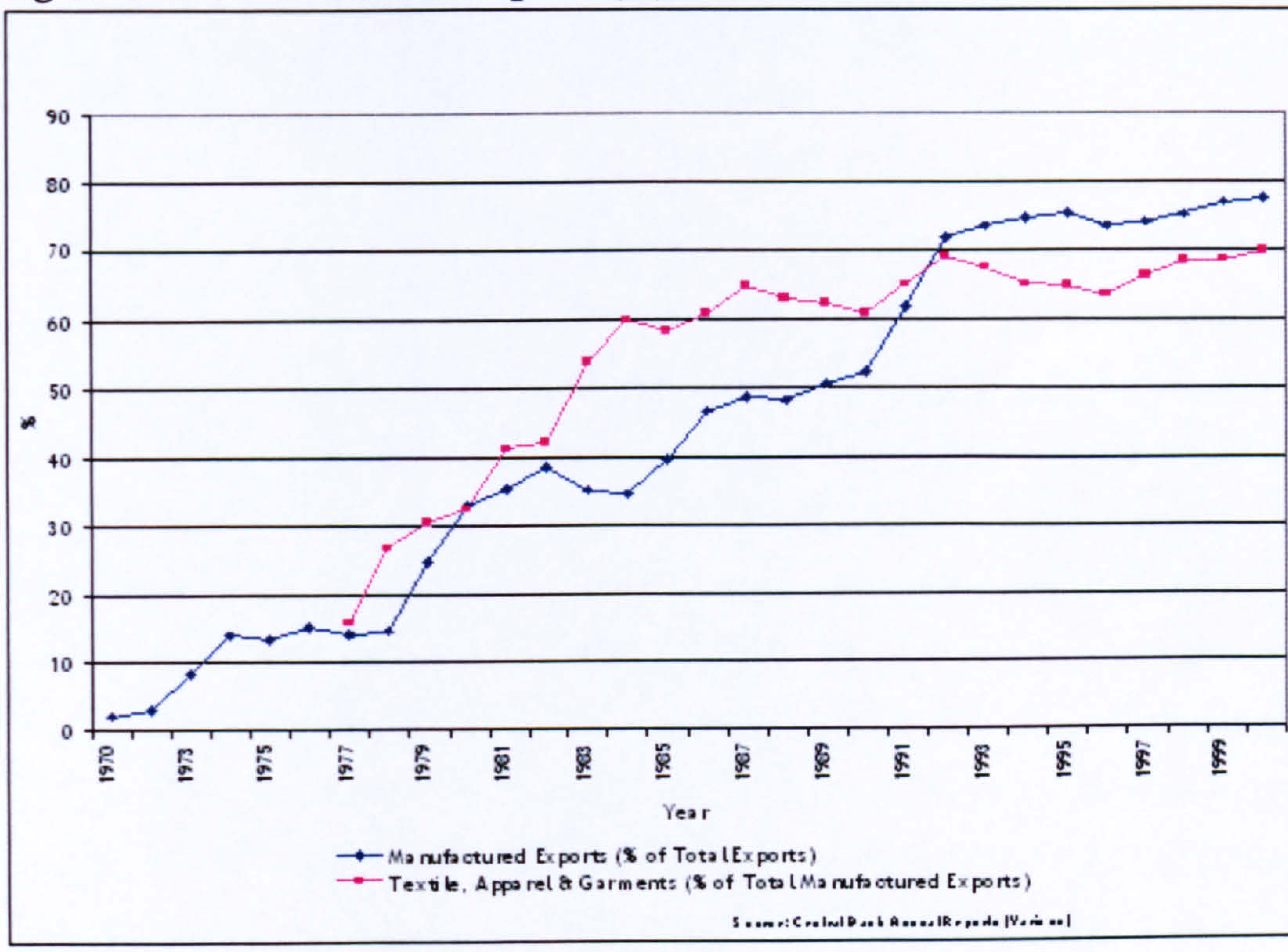
Export promotion has been an important component of industrial policy for several decades. However, the export sector has been substantially weakened due to excessive protection and highly overvalued exchange rates together with inefficient use of scarce resources (Abeyratne, 1997). Sri Lanka's exports are primarily based on three main commodity groups, namely agriculture exports, industrial exports and mineral exports. In that, export oriented enterprises play a dominant role particularly in more diverse and non-traditional exports. With the expansion of the manufactured export sector, after 1977 in particular, Sri Lanka has become one of the best performing manufactured exporting country among the less developed countries. The government offers a range of fiscal and financial incentives to encourage export-oriented enterprises through the Export Development Board (EDB). The manufactured exports grew rapidly after 1997, which shows the country has been moving away from the extreme dependence of plantation agriculture exports (tea, rubber and coconut) and by 2000, manufactured exports accounted for over three quarters of total exports. However, Kelegama (1992) argues that the impressive increase of manufactured exports was not based on a broad diversification of manufactured goods but rather on the exceptional performance of textile and apparel exports (see Figure 3.10) meaning that the export performance has not been uniform across other sectors

Figure 3.10: Manufactured exports (%) 1970-2000



Wignaraja (1998) argued that Sri Lanka's export base is characterised by low skill exports with simple labour skills and technologies and it dominates the exports at the expense of the high skills and technologies where low skilled exports increased and high skilled exports decreased between 1977 and 1992. High skilled exports have just begun to emerge and low skilled exports still dominate (Chandrasiri, 1999). The over reliance on the apparel sector seems to have visible impacts on the slow growth of other sectors. Some of the factors that made the apparel sector attractive include relatively low investment, availability of quotas, government incentives and abundance of unskilled and semi skilled labour. As a result, food, beverages and tobacco, and chemical products and petroleum have declined dramatically (see Figure 13). The apparel and garments sector originally grew on quotas in the USA and Europe. This can be considered as a good sign where producers will have to invest in new technologies and innovations in order to be competitive in non-quota markets. However, the lack of integration with the domestic supply-base has raised concerns over the future of this sector among policy makers and entrepreneurs themselves.

Figure 3.11: Manufactured exports (%) 1970-2000



3.5 Trends and patterns of Sri Lanka's technological performance and capabilities

3.5.1 Historical background

Historically, technology has been seen as tied closely to Sri Lanka's social, cultural economic development. Like many other South Asian cultures, Sri Lankans were renowned for knowledge of mathematics (e.g. astrology and trigonometry) and technological knowledge and skills especially in spinning and weaving technology, construction engineering (e.g. shrine holding Buddhist relics called *Stupas*, forts etc.), pottery, blacksmithy, irrigation technology and medicine (Ayurveda or herbal medicine) (Dassanayaka, 2003). Much of the technological advancement in the past five centuries or so was inherited from the colonial rulers (1505 to 1948). The British rulers (1796-1948) were more influential in transforming local technology through introducing western technology alongside commercial activities particularly in plantation industries (tea, rubber and coconut) and transportation (railway and shipping). The plantation industries can be considered as the main contributor to the evolution and diffusion of new technology that provided the foundation for the local manufacturing sector. Traditional technology was very much used in lower end production, particularly processing of coconut, coconut fibre, rubber, spices etc.

The British rule in Sri Lanka developed the country's infrastructure system such as, health, education, telecommunication, broadcasting, hydro-electricity generation, road networks, railway, ports and shipping and airports. In the industrial sector, establishment of several government owned factories such as coir (1937), steel-rolling (1937), plywood (1941), leather (1941), acetic acid (1942), paper (1942), glass (1944) and ceramics (1944) (Dissanayake, 2003) can be cited as pioneering 'technology-based ventures' at that time. New production methods combined with new technologies in plantation industries (tea, rubber and coconut) trickled down to other sectors of production. During their rule, the British also introduced many initiatives in relation to industrial science and technology such as technical education, university education, medical science, agriculture and plantation research (rice, tea, rubber and coconut).

3.5.2 Recent trends in Sri Lanka's technological progress

Up until 1977, the country's technological advancement as a whole had been slow as many important economic sectors that were in the hands of the government showed little progress economically and technologically. During this period, governments neither invested substantially in science and technology nor allowed the involvement of the private sector in major economic activities, large-scale manufacturing in particular. The trend and pattern of SME development during the pre-1977 period show that the manufacturing activities were largely restricted to low technology-based products. Since governments pursued import-substitution industrialisation, the focus was more on traditional and low technology based manufacturing without putting in much effort to introduce new technologies. On the other hand, since there were certain restrictions on imports, import of foreign technology was too costly for SMEs.

The post liberalisation period (after 1977) can be considered as the period that gave substantial recognition to science and technology while setting the foundation for absorption and diffusion of new technology. The policy reforms that allowed increased private sector participation have had positive effects on the growth of industrial sector. These measures greatly facilitated technology transfer to local industries particularly in the construction, electricity, telecommunication, information technology, apparel and garments, rubber and related products, and engineering sectors. However, Sri Lanka's technological performance is mostly attributed to diffusion of 'foreign technology' rather than 'home grown technology' and no visible interaction between foreign technology and local (or indigenous) technology could be observed. One of the reasons why there had been no apparent link between science & technology and industrial development could be the greater state involvement in manufacturing (e.g. tyres, cement, timber and wood, glass, ceramics and mineral sand). Many of these state owned enterprises were privatised in the 1980s and 1990s.

The dominance of state owned large scale manufacturing enterprise and capital industries had a significant impact on the economy in terms of employment creation and the supply of affordable products. However, the monopolistic nature of these enterprises prevented much needed investment in technology upgrading, innovation and R&D. Since the access to heavy industrial manufacturing was restricted by various hidden financial and non-financial barriers, the private sector, especially the manufacturing has shown a significant shift towards soft technology-based light manufacturing activities, export-oriented apparel and the garment industry in particular. The growth of services and trading in the past three decades also indicates the low level of technology absorption and slow progression. Promotion of inward investment has been one of the top priorities of economic development plans since 1977 and considered as a source of capital, new technology, management know-how, and new export markets. Although the foreign investments into the country during the last two decades have been very impressive, examining their nature and type of investments one can question whether foreign enterprises have actually created and strengthened linkages with domestic enterprises that would facilitate local technology development and strategic competitiveness. The UNIDO sponsored sub-contracting exchange has been able to increase the level of technology transfer to a certain extent through linkages in the apparel and garment sector which has relatively higher FDI content.

3.5.3 International comparison of Sri Lanka's technological performance

As argued in Chapter 2, the level of technological performance in a country depends on its economic activities. Several methods are used to assess the level of technological activities and technology performance in an economy. Science and technology Indicators and Revealed Technological Comparative Advantage Indicator (RTCA) (also known as Balassa indicator) can be cited as internationally accepted benchmarks that are being used to measure the technology activity in the economy (Guerrieri and Tylecote, 1997). In addition, several other indicators are also used in conjunction with the former to evaluate the technological performance of a country. The recent addition is the Technology Achievement Index (TAI) introduced in the UNDP Human Development Report 2001. The TAI describes a country's ability to create and diffuse technology and strengthen its skill base. This composite index measures a country's achievements, effort or inputs but not its potential. It is not a measure of which country is leading in global technology development, but focuses on how well the country as a whole is participating in creating and using technology. Table 3.4 describes the four interrelated measures used in TAI and Table 3.5 summarises most recent technology related data published in the Human Development Report-2004.

Table 3.4: The methodology used in Technology Achievement Indicators (TAI)		
Dimension	**Indicator**	**Source**
Creation of technology	Patents granted per capita Receipts of royalty and license fees from abroad per capita	World Intellectual Property Organisation (WIPO) World Bank
Diffusion of recent innovations	Internet hosts per capita High and medium technology exports as a share of exports	International Telecommunication Union UN Statistical Division
Diffusion of old innovations	Logarithm of telephones per capita (mainline and cellular combined) Logarithm of electricity consumption per capita	International Telecommunication Union World Bank
Human skills	Mean year of schooling Gross enrolment ratio at tertiary level in science, mathematics and engineering	Barro and Lee (2000) International Data on Educational Attainment UNESCO
Source: UNDP, 2001		

Table 3.5: Technology indicators of selected countries

Country	GDP (US$ billions)	Creation of Technology: Patents granted per million people (2000)	Creation of Technology: Receipts of royalty and license fees from abroad US$/person (2000)	Diffusion of recent innovations: Internet users per 1000 people	Diffusion of recent innovations: High technology exports (% of exports) (2002)	Telephones per 1000 (2002): Mainline	Telephones per 1000 (2002): Cellular	Human Skills: Tertiary students in science, maths and eng. (% of all tertiary students 1994-97)	Human Skills: R&D Personnel per million people (1990-2001)	R&D Expenditure % of GDP (1996-2002)
Developed countries										
United States	10,383	298	151.7	551.4	32	646	488	-	4099	2.8
Japan	3,993.4	884	81.8	448.9	24	558	637	23	5321	3.1
United Kingdom	1,566.3	71	130.4	423.1	31	591	841	29	2666	1.9
South Korea	476.7	490	17.4	551.9	32	489	679	34	2880	3.0
South America										
Mexico	637.2	1	0.5	98.5	21	147	255	31	225	0.4
Brazil	452.4	0	0.6	82.2	19	223	201	23	323	1.1
Argentina	102.0	4	0.5	112	7	219	178	30	684	0.4
CIS/Cenral & Eastern Europe										
Russian Fed.	346.5	99	1.0	40.9	13	242	120	49	3494	1.2
Hungary	65.8	18	35.3	157.6	25	361	676	32	1440	0.9
South & SE Asia										
India	510.2	0	-	15.9	5	40	12	25	157	-
Indonesia	172.9	0	-	37.7	16	37	55	28	130	-
Thailand	126.9	3	0.1	77.6	31	105	260	21	74	0.1
Malaysia	94.9	-	0.5	319.7	58	190	377	-	160	0.4
Pakistan	59.1	-	-	10.3	1	25	8	-	69	-
Bangladesh	47.6	-	-	1.5	-	5		-	51	-
Sri Lanka	16.6	0	-	10.6	1	47	49	29	191	0.2
Nepal	5.5	-	-	3.4	-	14	1	14	-	-
Sub-Saharan Africa										
Nigeria	43.5	-	-	3.5	-	5	13	41	15	-
Kenya	12.3	-	0.2	12.5	10	10	37	-	-	-
Ghana	6.2	0	-	7.8	3	13	21	-	-	-
Mozambique	3.6	0	0	2.7	3	5	14	46	-	-

Source: UNDP, Human Development Report, 2004

The data presented in Table 3.5 suggests that Sri Lanka's technological strengths are relatively weaker than those of similar economic growth in the developing world. For example, in terms of Internet penetration, Sri Lanka has performed moderately (10.6 users per 1000 people) compared to its neighbours, Pakistan (10.3), Nepal (3.4) and Bangladesh (1.5). This data provides a good indicator which suggests a swift diffusion of ICT was a result of country's rapidly growing telecommunication sector. According to the data presented, in 2002 one in twenty persons had telephones (mobile and landline).

In terms of the Technological Index, Sri Lanka's position stood at 35 although its Technology Transfer Index positioned at 18 (Table 3.6). Arguably, this may have attributed to FDI because as Table 3.6 shows, the countries favourable for FDI were rated higher (e.g. Thailand, Philippines, Vietnam, and Mauritius) whereas countries like India[39] ranked lower whose domestic technology capability has grown much stronger in the past several decades. Above all, although Sri Lanka's Technology Index is somewhat superior to many other countries in the region, the level of innovation and ICT penetration seem to be relatively weak. The Average Technology Effort Index for 1997-98, an indicator for science and technology status rates Sri Lanka as a Low Technology Performer and ranked 57 among 87 countries. As data shows, it appears that Sri Lanka's ability in the creation of technology has not been very impressive.

[39] Until recently, India followed a very restrictive approach towards FDI and foreign technology transfer.

Table 3.6: Technological progress of selected non-core Economies											
Country	**Technology Index**	**Non-core Rank**	**Country**	**Innovation Sub-index**	**Non-core Rank**	**Country**	**ICT Sub index**	**Non-core Rank**	**Country**	**Technology Transfer Index**	**Non-core Rank**
Estonia	5.68	1	Spain	4.48	1	Estonia	5.66	1	Malaysia	6.54	1
Malaysia	5.36	4	Estonia	3.94	3	Portugal	5.66	2	Estonia	5.98	4
Portugal	5.27	5	Argentina	2.61	6	Spain	5.62	3	P'pines	5.65	7
Spain	5.23	6	Portugal	3.58	7	Malaysia	5.18	9	Thailand	5.63	8
Poland	4.75	11	Poland	2.96	19	Poland	4.90	13	Mexico	5.50	9
Mexico	4.70	12	P'pines	2.80	21	Brazil	4.86	14	Mauritius	5.52	10
Mauritius	4.67	13	Thailand	2.77	23	Argentina	4.84	15	Portugal	5.26	13
Thailand	4.54	15	Brazil	2.66	25	Mauritius	4.77	17	Poland	5.15	15
P'pines	4.53	16	Malaysia	2.64	26	Mexico	4.60	22	Vietnam	5.12	16
Jamaica	4.43	19	Mexico	2.61	28	Jamaica	4.57	23	Sri Lanka	5.01	18
Argent.	4.33	24	Jamaica	2.29	34	Thailand	4.23	29	Jamaica	4.96	19
Brazil	4.33	25	India	2.16	37	P'pines	4.12	31	Spain	4.96	20
China	4.05	29	China	2.07	39	China	4.04	32	Indonesia	4.76	21
Sri Lanka	3.82	35	Indonesia	2.06	40	Indonesia	3.44	43	China	4.73	23
Indonesia	3.76	37	Sri Lanka	1.81	45	India	3.43	44	B'desh	4.41	26
Vietnam	3.56	41	Vietnam	1.77	48	Sri Lanka	3.42	45	Brazil	4.17	30
India	3.54	42	Mauritius	1.71	49	Vietnam	2.64	49	India	4.14	32
B'desh	2.63	50	B'desh	1.57	51	B'desh	1.96	51	Argentina	3.88	34

Source: Global Competitiveness Report, 2001

Note: The Global Competitiveness Report (2001), makes a distinction between "Core" and "Non-Core economies" for the purpose analysing competitiveness on the basis of technological progress of economies and is closely related to their relative capacities to innovate and to win new global markets for their technologically advanced products. The Report categorised Sri Lanka as a Non-core economy and comparing with world technological trends, Sri Lanka is considered as a 'technology laggard country".

A major constraint of analysing Sri Lanka's technological capabilities is the lack of reliable and up-to-date data. Among the existing data sources, the Science & Technology (S&T) indicators published in 1998 by National Science Foundation (NSF), based on a national survey conducted in 1996/97 are the most recently available data. In addition, World S&T data are published annually by UN (UNESCO S&T Statistics and Human Development Report), World Bank and the Global Competitiveness Report provide a broader picture of national science and technology capabilities. The UN, OECD and World Bank have introduced a set of internationally comparable indicators to define and quantify national S&T systems. Table 3.7 provides a summary of Research and Development (R&D) expenditure (GERD) for 30-year period between 1966 and 2000 and illustrates that GERD in absolute terms has increased significantly but in real terms, its ratio has been much less. The rate of growth of GERD has increased from 0.3 percent in 1966 to 18.3 percent in 1966.

Table 3.7: Research and Development (R&D) Expenditure				
Year	**GERD (US$ millions)**	**GERD as % of GDP**	**Total population**	**GERD per million population**
1966	n/a	0.3	11.5	1.7
1975	6.4	0.2	13.5	3.3
1984	9.7	0.18	15.6	16.5
1993	13.1	0.13	17.6	36.8
1996	23	0.18	18.3	77
2000	n/a	0.19	18.4	n/a

Source: NSF (1998) for 1966 to 1996. Data for 2000 is taken from Central Bank Annual Reports
Note: Three basic indicators used for measuring S&T used are: Total expenditure on Research and Development (R&D) measured by GERD (Gross Domestic Expenditure on Research and Development; Economically active science and technology personnel.
Intellectual Property (IP) data (e.g. Patent data).

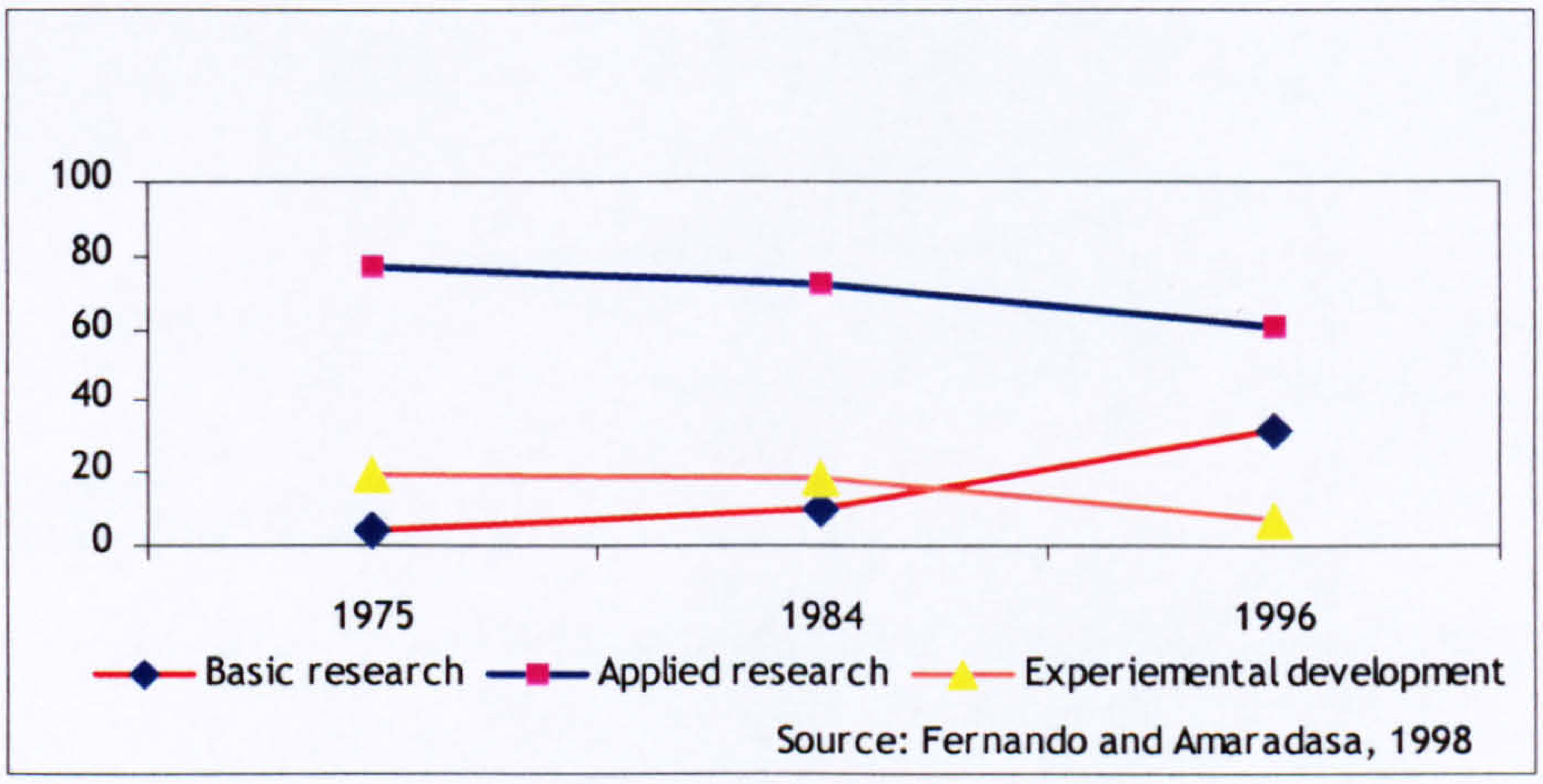
The type of research activities performed in Sri Lanka can be categorised into three areas: basic research, applied research, and experimental research (NSF, 1996). As Figure 3.12 shows the basic research component has increased eight times while the share of expenditure on applied research and experimental research has declined considerably. It can also be seen from the data that relatively little attention has been given to applied and experimental research. As reported by NSF[40], in 2000 public expenditure on S&T research amounted to around US$16,000 (SLRs. 1,492,610) of which 30 percent was spent on Natural sciences and 17 percent on Engineering and technology.

With regard to private sector R&D, Fernando and Amaradasa (1998) observed that many process and product developments are taking place at a small scale particularly in manufacturing export and non-traditional agriculture export firms. It needs mentioning that in the absence of reliable data, it is difficult to establish the actual contribution of private sector R&D (product and process development) to country's total R&D effort. Despite the fact that the development and application of science and technology for socio-economic development has featured prominently in national policies, Sri Lanka's technological progress indicates that the country's technological capabilities have not contributed adequately to the economic development. These arguments point to the widely held fact that technology learning or

[40] Source: http://www.nsf.ac.lk

knowledge transfer at both firm and individual level is the key to technological development.

Figure 3.12: R&D Expenditure by research activity



Another indicator being used to assess a country's technological capability is the technological basis of competitive advantage measured by share of technological categories in manufactured exports (or high technology exports). Based on the technology intensity the manufactured goods sector can be categorised into five groups: Resource-based; Labour-intensive; Scale-intensive; Differentiated and Science-based (Lall et al., 1996). Among these, Differentiated and Science-based sectors are considered key sectors in determining the technology intensity of the industrial sector. Table 3.8 (and Figure 3.13) presents data on high technology manufactured exports between 1999 and 2002 in sectors classified under Differentiated and Science-based categories.

As is evident from the data, manufactured exports grew by 38 percent between 1999 and 2002 although the share of high-technology based exports has declined from 7 percent to 5.2 percent in the same period. The high concentration of 'low skilled' or 'low-technology based' exports illustrates that the country favours low-waged and low skilled export oriented industries although a significant increase of Science-based goods can also be noticed. , For example, Computer equipment and Aircraft/Spacecraft/etc, grew from US$455,000 to US$44,222,000 and US$1,862'000 to US$89,522,000 respectively in the same period. In spite of these positive developments, the creation of technology and R&D in Sri Lanka has been relatively weak compared to other developing countries of similar economic growth.

Table 3.8: High-technology manufactured exports 1999-2002 (US$ '000)

Industry / product classification	1999	%	2001	%	2002	%
High-technology manufactured exports	202,088	7.0	254,173	5.5	246,633	5.2
• **Differentiated**[1]	99,015	3.4	93,772	2.0	85,718	1.8
• **Science-based**[2]	103,073	3.6	160,401	3.5	160,915	3.4
Other[3]	2,664,213	92.9	4,331,418	94.5	4,435,485	94.8
Total manufactured exports	2,866,301	100	4,585,591	100	4,682,118	100

Source: Analyses based on ITC data.

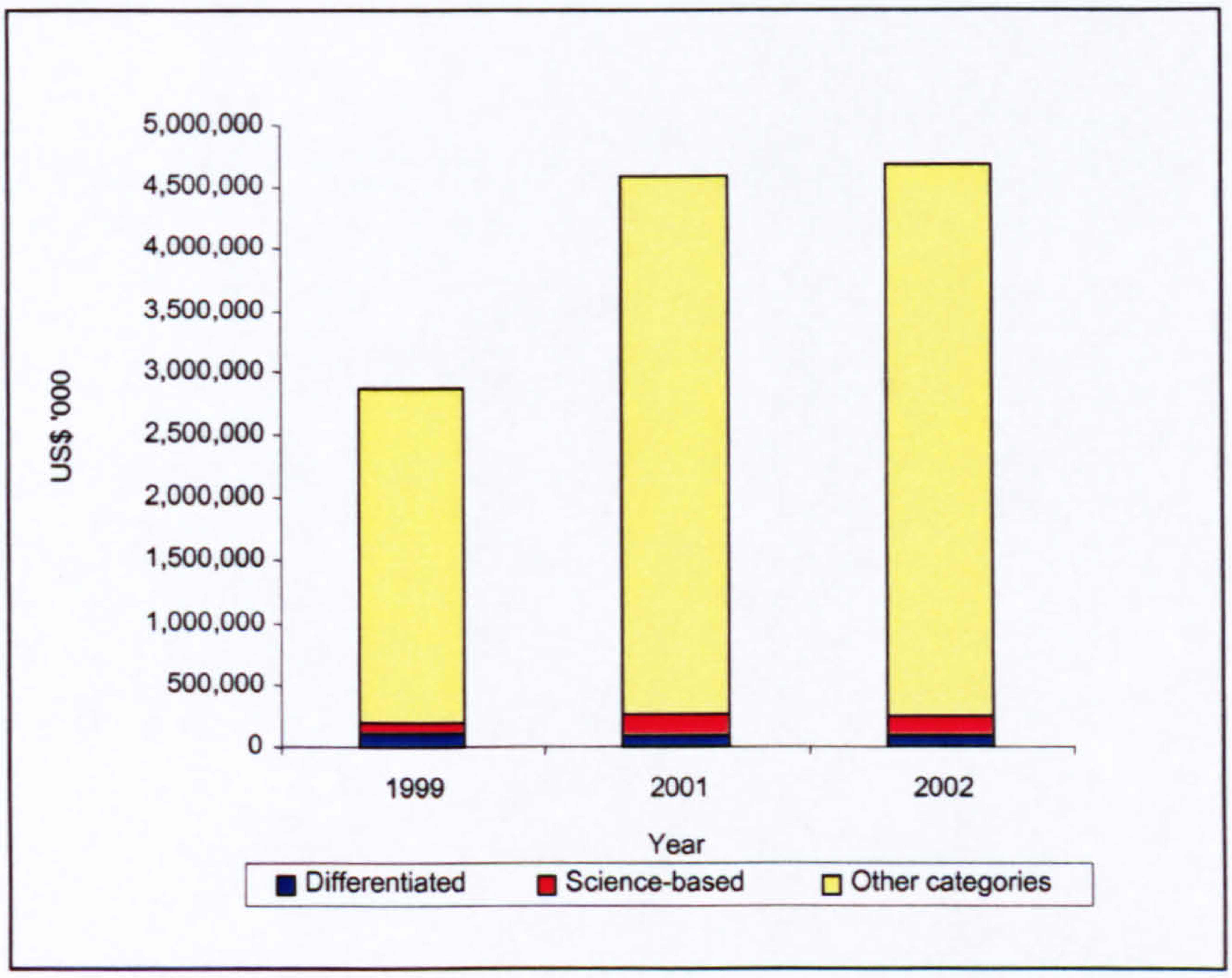
Note:

[1] Differentiated: Engines and turbines; Agricultural machinery and eqpt., Metal & woodworking machinery, Special industrial machinery & eqpt., Other machinery & eqpt., Electrical machinery, apparatus, appliances and supplies, Photographic and optical goods; Watches & clocks.

[2] Science-based (Other chemical products & pharmaceuticals; Office, computing and accounting machinery; Aircraft; professional, scientific, measuring and controlling eqpt., Biotechnology.

[3] Resource-based, Labour-intensive and Scale-intensive.

Figure 3.13: Sri Lanka's high-technology exports – 1992 to 2002



A view expressed often is that since Sri Lanka cannot produce much needed technology-based capital goods domestically; the country has to rely on imported capital goods to acquire advanced technology. It appears from the data presented in Table 3.9 that technology imports represent only about 10 percent of total imports of which majority were in the medium technology categories [Differentiated sector such as Rotating electric plants (SITC716), Telecommunication equipment (n.e.s) (SITC 764), Textile and leather machinery (SITC 724) and Electric circuit equipment (SITC 772)]. A few years ago, the government liberalised the telecommunication sector allowing more private sector telecommunication providers to operate and to provide both land and mobile communication services. In addition, the government privatised the main state owned telecommunication provider (Sri Lanka Telecom) and sold majority of its shares to a leading Japanese telecommunication firm. The high volume of textile machinery imports also reflects the country's concentration on apparel and garments sector. Overall, high import taxes and the low level of industrial activities in the capital goods sector may have contributed to the low level of high-technology imports. Under the foreign investment law, the export oriented capital goods manufactures are entitled to duty free import machinery and equipment although it is difficult to assess the effectiveness of such a scheme on the domestic technology performance due to a lack of data.

Table 3.9: Technology imports (Capital goods) 1999-2002 (US$ '000)

Section 7 of Standard International Trade Classification (SITC)	1999	%	2001	%	2002	%
Technology imports[1]	746,705	12.3	659,408	10.8	688,519	10.2
• Telecommunication eqpts.(nes)	123,029		49,275		61,140	
• Textile & leather machinery	67,729		76,417		53,977	
• Electrical circuit equipment	52,663		43,177		53,740	
• Rotating electrical plants	21,952		42,204		126,306	
Other imports	5,337,845	87.7	5,406,017	89.1	6,038,199	89.8
Total imports	6,086,549	100	6,067,426	100	6,728,720	100

Source: Analyses based on ITC data.
Note: [1] Excl. Consumer equipment (759, 76, 77) and transport items (78, 79)

3.5.4 The science and technology (S&T) human resource base

Although Sri Lanka's human development indicators are generally strong, the S&T statistics suggest that country's S&T human resource base is relatively weak. This could well be one of the key factors hindering country's capacity to use modern technology (ADB, 1997). If the country were to achieve higher technology progress and knowledge-based economy, the need for S&T personnel to undertake high quality scientific and technical research with extensive commercial applicability is vital. An example can be drawn from the Industrial Master Plan (2000) (also known as The Rainbow Plan) that pointed out that a shortage of designers and engineers is one of the major reasons for the low technology level of the manufacturing sector.

According to Sri Lanka's S&T indicators, there were 1379 R&D scientists and engineers (including social sciences) in 2000 of which nearly a fifth (244) of them were in engineering and technology. Between 1978 to 1996, the stock of scientists and engineers has increased although there was a slump during late 1980s and early 1990s. This could possibly relate to the closure of universities during the civil unrest between 1987 and 1989. In 1996, there were 8869 economically active scientists and engineers, almost doubled from 1985 (Silva and Amaradasa, 2000). As of 1990, 1904 persons were employed in the public sector and 1348 were in higher education. Of the total S&T personnel (4635), only about 9.8 percent (456) were employed in the private sector, a sharp decline from 724 in 1985. These observations clearly indicate a general decline in the S&T personnel in Sri Lanka and low level of S&T human resource capacity in the private sector.

In building a country's S&T human resource base, the tertiary education system plays a crucial role. As found in most countries, Sri Lanka's tertiary education comprises higher education and further education. The history of Higher Education in Sri Lanka spreads over a period of 115 years and currently there are 12 conventional universities and an Open University offering degree programmes at both undergraduate and postgraduate levels. The Ministry of Tertiary Education and Training oversees 37 specialized higher education institutions that provide technical and professional education.

Although this section does not deal with secondary education in Sri Lanka in relation to S&T, it should be noted that science education is an important element in the national education policy. A noteworthy observation is that education policy making in Sri Lanka has shown a marked change during the last two decades. While ensuring the continuity of education for all, the policy also shifted its focus towards contributing to the production of trainable youths who could become successful in any type of activity they selected for their future (Ginige, 2002). As a result of public criticisms about the country's education system's high academic bias, rigidity of curricula, and the widening mismatch between education and employment, new education reforms came into being in 1998.

Since there is limited research on Sri Lanka's S&T human resources, it is quite difficult to assess the true picture of the impact of S&T education on technology capability of the country. However, some ad-hoc studies undertaken by the government as well as donor agencies suggest that secondary education and tertiary education sectors produce a large number of technically qualified people who have contributed significantly to the technology building process. According to the Labour Force Survey, Technical and Associated professionals constituted 4.7 percent of the total employed of which majority had acquired recognised technical qualifications. Currently, about 20,000 students seek admission to technical courses at certificate and diploma level (National Institute of Education statistics, 2003).

A recent study by the National Science Foundation provides some interesting insights into university education in terms of its effectiveness, employability and destination of graduates. The study was undertaken in 2002 covering a sample of 1792 science, engineering and agriculture graduates who completed degrees from 12 universities in the years 2000 and 2001. According to this study, about 61 percent of graduates were employed and 30.5 percent were unemployed. As little as 2.2 percent were self-employed and another 3.6 percent were in further education. The study also revealed that there is a huge gender gap in terms of graduate employment where unemployment among female graduates (39.8 percent) was much higher compared to their male counterparts (23.6 percent). A significant number of graduates found employment in the private sector compared to the Government and the Semi-government sectors. Among the graduates, employment rates for engineering graduates were the highest (79.9 percent) while the lowest was for agriculture graduates (47.6 percent). It is by no accident that graduates specialised in textile and clothing technology showed a higher employability rate (93.8 percent) than science stream graduates given the high concentration of textile and apparel in the manufacturing sector that has created a considerable demand for technical and highly skilled jobs.

Among the science graduates, statistics and computer science graduates showed higher employment rates (almost 100 percent and 93.3 percent respectively). In agriculture, those specialised in agriculture extension recorded the highest employment rate (66.7 percent). Unemployment rates were very high among those graduated in mineral & mining engineering (20 percent), zoology (58.3 percent) and soil science (60 percent). Most interestingly, regardless of the field of study, graduates who have obtained first class degrees have shown the highest employment rate (75.8 percent). Three other interesting issues emerged from this study. First, the data shows that there are signs that unemployment of science and engineering graduates is decreasing while graduates taking up employments in the private sector is on he rise. Secondly, a higher percentage of graduates have pointed out that the lack of required experience and the lack of job opportunities in the areas related to their first degrees were cited as the main obstacles in finding suitable employment. Thirdly, the low rate of graduates taking up self-employment indicates that there is a lack of initiatives encouraging graduate entrepreneurship or lack of business opportunities. Recently, the government has implemented reforms to tertiary education and developed a long-term strategy as a response to critics that the tertiary education system is failing to provide skills required for Sri Lanka's development.

It was reported in several publications that the lack of qualified S&T personnel continued to be a main problem at national level (e.g. Amaradasa et al, 1998: Wignaraja, 1998). The absence of a 'science culture' and 'research culture' at school and university level is cited as one of the reasons for poor growth of science and technology. The recently formed School Science Forum initiated by the Sri Lanka Association for the Advancement of Science, and Asian Development Bank funded Science and Technology Personal Development Project put more emphasis on addressing challenges facing S&T education to keep abreast with global trends.

3.6 Summary

Although an examination of the effects of different policy regimes is beyond the scope of this chapter, an attempt was made to highlight some positive and negative aspects of different political and policy regimes that allow us to ascertain whether or not these regimes have contributed to the growth of the industrial sector and technology development. On the other hand, it is also impossible to argue that 'free market' policies have had positive impacts and that the ISI regime adversely affected the growth of manufacturing. There are arguments to support 'free market' policies, (advanced by those who mostly advocate neo-classical theory), i.e. that if a country adopted such policies its growth would be fast. It is widely known and accepted that the foundations for the growth of NICs that have industrialised rapidly is considerable state intervention and properly managed 'free market' principles.

Why Sri Lanka has not been able to achieve similar status even after 25 years of liberalisation puzzles many development economists. Politicians point their fingers at internal and external factors and cite the unrest in the North-East of the country as one of the principal factors inhibiting growth which has drained out large sums of public money. Although little has been written on Sri Lanka's technological performance and capabilities, it emerged from the above discussion that the economic development based on free market policies has not been adequately able to stimulate technological growth in the country, especially in SMEs.

The analysis of various technology related data presented above suggests that technological growth has not been very impressive compared to other countries with similar economic development. The above analyses also provide a good base for comparative purposes and show how far a country like Sri Lanka will have to move forward to become a technologically progressive country. Over the past three decades, a number of policy initiatives have been proposed but very little has actually been done to strengthen Sri Lanka's technological capabilities. The country is adequately resourced with physical infrastructure and educated and skilled people while geographically well placed with access to main international markets. Yet, Sri Lanka has been unable to take the best advantage of all the opportunities available largely due to the inefficiency of policy making, political instability and internal conflict. The aforesaid weaknesses in the technological development process undoubtedly present many challenges for both government and enterprises. Continuing along these lines, the next chapters (4 and 5) will discuss the policies and strategies for technology capacity building in SMEs.

Chapter 4

An Analysis of Policies, Strategies and Institutional Support in Sri Lanka for SMEs and their Technology Capacity Building

4.1 Introduction

The research questions that will be addressed in this Chapter are the impact of Sri Lanka's political economy on SMEs and how effective are SME policies, most specifically those relating to science and technology policies and institutional support for enhancing technological capabilities. In the previous chapter, the discussion was mainly focussed on Sri Lanka's political economy, macro-economic development, industrialisation and the country's technological progress and argued that Sri Lanka's political instability and policy inconsistency were manifest in the uneven economic development over the past 40 years. Extending the discussion, this chapter will examine the way in which SME policy is grounded within a social-cultural context, the role of SMEs in the context of industrialisation, policy environment and technology and innovation support services and their relevance for building technology and innovation capabilities of SMEs.

As in many developing countries, SME development in Sri Lanka has long been at the centre of economic development polices. However, it acquired particular significance in more recent times when in 2002 the government took an initiative to create a policy for the development of SMEs. In this chapter, I argue that the industrialisation process of Sri Lanka largely favoured state owned enterprises during the import substitution period and then large enterprises and foreign ventures in the export oriented industrialisation period, almost omitting SMEs from the public policy agenda. Further, policy inconsistency, lack of political commitment, weak institutional structures, together with cultural, political and economic factors to a greater extent have negatively impacted on the development of an entrepreneurial culture. This chapter is organised into three sections:

The role of SMEs as key actors in industrialisation,

The extent to which industrial policy has been biased against / in favour of SMEs, and

The functional aspects of SME policy and technology policy and the business support environment.

In order to facilitate the above discussion, this chapter is structured as follows. First, an analysis of the structure and nature of SMEs is presented highlighting the role of SMEs in industrialisation emphasising the size, and characteristics of SMEs and their growth performance within the overall industrial sector. Second, an analysis of industrial policies under two major periods; Import Substitution Industrialisation strategy (ISI) during the period until 1977, and Export Oriented Industrialisation strategy (EOI) after 1977, along with an analysis of the performance of SMEs within the overall industrial structure. Finally, this chapter provides an analysis of SME and technology policies and support infrastructure and the way in which these policies and support services have impacted upon technology capabilities of SMEs. This chapter sets the background for the empirical analysis highlighting key issues related to the political economy and policy framework of Sri Lanka and how these have affected the growth of SMEs.

4.2 The role of SMEs in industrialisation

This section examines the contribution of SMEs in the industrialisation process of Sri Lanka focusing on the nature and size of SMEs and their growth performance.

4.2.1 Definitions and size of SMEs in Sri Lanka

Although a standard definition of SMEs does not exist in Sri Lanka various definitions are adopted by respective agencies based on a number of factors primarily to fulfil regulatory, administrative, functional and statistical purposes (i.e. employment, assets, investment and turnover). Any effort to find the economic contribution of SMEs would have been hampered by a lack of systematic and in-depth analysis of their structure, agreed definitions, size and other vital statistics. While the coverage of existing literature has focussed on 'small and medium industry (SMI)', 'rural industry' or business units engaged in manufacturing it seems to have ignored the wider economic significance of business units in the service sector.

Table 4.1 illustrates the definitions commonly used by public sector agencies that are used for specific purposes. The SME Task Force provides a workable definition based on the asset value but the main problem of this definition is it needs to be revised from time to time to match the country's inflation rate. On the other hand, asset values vary greatly among enterprises and not all enterprises value and revalue their assets in the same manner. Although employment is widely used to define SMEs by size-class, the *SME White Paper* does not favour it due to the problems of the existing labour reporting system. Sri Lanka's business statistics system is extremely fragmented and structured only to meet regulatory and administrative requirements. Its main weakness is the absence of a uniform system of collection and dissemination. A host of government departments do collect business information yet there is no proper system of data sharing among agencies (see Table 4.2 for a summary of varied types of classifications currently being used and Table 4.3 for the agencies that are collecting enterprise data).

Table 4.1: SME definitions

Source	Micro	Small	Medium	Large
1984 Census of Industries	Less than 5 employees	5-19 employees	20-199 employees	Over 200 employees
Annual Survey of Industries		5-25 employees	Over 25	
SMEs Task Force (White Paper)		Asset value* not exceeding Rs. 20 millions	Asset value* not exceeding Rs. 50 millions	
2003 Census of Industries (proposed)	Less than 20 employees		Over 20 employees	

Notes: * Excluding land and buildings

Table 4.2: Different parameters used to classify enterprises

Agency/Ministry/ Department	Employmen t	Assets (SLRupees)	Investment (SLRupees)	Classification and coverage	Purpose	Remarks
Department of Census & Statistics	Less than 5 5 or more	N/a	N/a	Industry registered with Ministry of Industries.	Statistical purposes	No further classifications such as micro, small, medium and large.
Ministry of Finance	N/a	1 million or less		Small scale industry	Tax exemption purposes	Manufacturing units only.
Industrial Development Board	N/a	N/a	1 million or less	Small industry	-	Manufacturing units only.
Central Bank of Sri Lanka	N/a	N/a	N/a	Urban informal sector and rural cottage industries	National accounts purposes	No further classifications.
National Development Bank	N/a	Up to 8 millions	N/a	Small and medium industry	SMI Credit programme	N/a
Ministry of Rural Industries	Not more than 50 employees	Not exceeding 20 millions	N/a	Enterprises located outside the Municipal areas of Colombo, Kandy, Jaffna and Galle.	-	No further classification.

Notes: a: Cottage industry represents artisan and household-based activities. N/a=Not available Source: Analysis based on various government publications

Table 4.3: Sources of enterprise data

Institution	Level	Type of Data	Purpose
Company Registrar	National level	Details of the directors, company name, location, type of business. Financial reports need to be submitted annually.	Registration of Limited Liability Companies.
Ministry of Industries	National level	Details of the owner/s, business type, all corporate information.	Registration not compulsory. But need to register in order to apply for special incentives and grants.
Board of Investment	National level	All corporate information.	Businesses registered under BOI Law.
Export Development Board	National level	All corporate information.	Registration of exporting companies.
Business Registration Unit at District Secretariats	District level	Details of the owner/s, type of business, location, registered office, registered name.	Compulsory for businesses with a trading name. Sole proprietor or partnerships business name registration. The businesses must display the business name registration in the registered place in order to engage in business activities.
Local Government Agencies	Divisional level (lowest administrative unit)	Details of the owner, type of business, location, turnover	Compulsory for every business unit in the country. To license enterprises for the collection of business revenue in the local government areas. Every business must obtain revenue a license and renew it annually.

Source: Analysis based on various government publications

In Sri Lanka, the main agency dealing with statistics is the Department of Census and Statistics (DCS) which publishes enterprise statistics in the Annual Survey of Industries (ASI). It covers only a sample of industrial establishments drawn from private sector establishments with 5 or more persons engaged[41] registered with the Ministry of Industries, state owned industrial establishments and enterprises registered with the Board of Investment (BOI). The ASI produces statistics of a sample of 1300 industrial units that include employment, turnover and capital base, together with macro economic indicators such as structure and growth of the industrial sector. This sample is divided into two groups, units with 25 or more persons engaged and with 5-24 persons engaged, and further stratified according to geographical location, industrial activity and size class. The size class based on persons engaged is further classified into 5-9, 10-19, 20-39, 40-49, 100-499 and 500 and above. In addition to the ASI, the Ministry of Enterprise Development maintains a database of industrial statistics but it only contains data on enterprises registered with the Ministry. As there is no proper system of enterprise statistics, the United Nations Industrial Development Organisation (UNIDO) is currently assisting the Ministry of Enterprise Development to develop a system to collect, analyse and publish enterprise statistics (also known as National Industrial Statistics Programme). The Registrar of Companies and Export Development Board maintain their own business databases and now accessible online but only with limited search facilities.

4.2.2 Size, characteristics, structure and growth performance of SMEs within the overall industrial sector

Based on annual estimates, the Ministry of industrial Development reports that as of 2000, there were about 50,000 registered and 125,000 unregistered manufacturing enterprises of which some 400 large-scale, 25,000 small-scale and more than 100,000 micro enterprises spread across the economy. These units accounted for 30 percent of the manufacturing employment. In addition, currently Sri Lanka has around 26,000 incorporated

[41] This is a broader definition which involves the total number of persons who work in or for the establishment, including working proprietors, active partners, unpaid family workers, operatives and all other employees.

companies, an increase from 5000 in the mid 80's. Around 75 percent of the new entrants are small and medium-sized and majority are in the service sector (Registrar of Companies, 2004). According to the *White Paper* on SMEs, SMEs accounted for about 96 percent of industrial units, 36 percent of industrial employment, and 20 percent of value added. A recent study by the Asian Development Bank found that approximately 90 percent of the enterprises in rural and urban locations are SMEs and that they accounted for about 80 percent employment in the private sector (ADB 2003). However, their relative contributions to national employment, output and value-addition have not been adequately assessed; perhaps due to lack of data.

In Sri Lanka, the bulk of enterprises are small-scale production units in the informal sector and are spread across urban, rural and estate (plantation) locations in the country. Urban sector enterprises are predominant in secondary and tertiary type economic activities while rural and estate sector are active in primary and secondary activities (ADB, 2001). One of the characteristics of micro and small enterprises in Sri Lanka is their greater interaction with the informal sector particularly sourcing raw materials and marketing as they are not constrained by the rules and regulations that are applicable to the 'formal sector' (Chandrasiri, 1999).

In 1999, a survey by the Department of Census on enterprises with 25 or more employees reveals that the relative importance of SMEs has remained unchanged (in terms of numbers) but their economic contribution (employment and value addition) has declined overtime (see Table 4.4).

Table 4.4: Performance of SMEs between 1983 and 1996 (%)

	Establishments		Employment		Value added	
	1993	1996	1993	1996	1993	1996
Small	86.6	85.4	26.2	18.7	11.3	4.9
Medium	11.4	10.7	19.4	17.6	19.8	14.7
Large	2.0	3.9	51.4	63.7	68.9	80.4
All	100	100	100	100	100	100

Source: Department of Census and Statistics 1983 and unpublished data for 1996 quoted in the National Strategy for SME development in Sri Lanka, White Paper, 2002.

According to Sandaratne (1998), Sri Lanka's private sector is a heterogeneous collection of micro, small, medium and large enterprises that comprise individuals, groups and multinationals. Traditionally, private enterprises consist of artisans, craftsmen, traders, family-owned, and caste-based or occupation-based business activities. Historical evidence suggests that 'formal' business activities can only be traced back to the latter part of 1800 when the British authorities established a system for business registration and tax collection purposes. Although trading had taken place on a large scale, there was no substantial evidence of large-scale manufacturing activities. Apart from trading and agricultural activities, business activities were mostly confined to labour intensive traditional home-based activities such as handloom weaving, coconut fibre processing, mat weaving, handicrafts, brassware, pottery, blacksmithing etc.

In order to get a broader view of enterprises, a summary of 1983 Census of industries is given in Table 4.5 and Table 4.6. Although outdated, the data shows that the enterprises are mostly found in low technology intensive sectors[42] and among these sectors over one-third of all enterprises (33 percent) are operating in the food and beverages sector which accounted for 36 percent of total employment and 37.1 percent of the total manufacturing output. The share of output in the larger category was approximately six times (37 percent) that of the micro-category (6.6 percent).

The data suggests that, having accounted for over a quarter of all jobs in the manufacturing sector the contribution of the micro-enterprises in employment creation has been significant. Apparently, enterprise data as well as labour force data suggest that both large and small enterprises have not provided as many opportunities as possible for gainful employment for the expanding labour force. Interestingly, about 19,000 micro enterprises were in the labour intensive and low technology sectors such as small-scale handlooms, textile weaving, dressmaking and leather goods manufacturing. These activities have low barriers to entry for self-employment; more women

[42] E.g. food and beverages, agriculture-based processing, textile and garments, wood and wood products and to a lesser extent in chemicals, rubber and plastic and metal products.

in rural and sub-urban areas are likely to engage in these activities. During the import substitution period (before 1977) handloom and textile industries enjoyed good fortunes but as the economy was opened up, their survival was threatened by cheap imports as well as the booming apparel and garments sector.

Another important sector was fabricated metal which consisted approximately 5639 enterprises (5 percent of total enterprises) of which nearly 88 percent (about 5000) were micro enterprises; the majority were blacksmiths and small-scale engineering units operating as family businesses and self-employments. In recent years, more young people particularly those who have been trained under the government apprenticeship and technical training schemes have opted to become self-employed particularly in low technology sectors. This could be a contributing factor to an upsurge of self-employment/small business start-ups especially in engineering, vehicle repair and maintenance, construction and wood-based products sectors (GTZ-VTW Project, 1996). However, their low economic viability under present market conditions the survival of these enterprises has been of great concern, particularly to lending institutions.

Table 4.5: Structure of manufacturing enterprises

Industry sector	Number of enterprises and Share (%)			Employment and Share (%)			Output and Share (%)	
	Less than 5 empl.	Over 5 empl.	Total	Less than 5 empl.	Over 5 empl.	Total	Less than 5 empl.	Over 5 empl.
31. Food beverages and tobacco	27,358 (82.8%)	5,697 (17.2%)	33,055	56,778 (26.3%)	159,088 (73.7%)	215,866	12%	88%
32. Textile, wearing apparel, and leather products	19,123 (85.5%)	3,231 (14.5%)	22,354	39,686 (26.2%)	111,806 (73.8%)	151,492	6%	94%
33. Wood and wood products including furniture	10,572 (90.1%)	1,162 (9.9%)	11,689	22,215 (50.6%)	21,679 (49.4%)	43,894	20%	80%
34. Paper and paper products, printing and publishing	538 (60.4%)	352 (39.6%)	890	1,384 (9.6%)	13,049 (90.4%)	14,433	4%	96%
35. Chemical and chemical, petroleum, rubber and plastic	9,483 (91.2%)	911 (8.8%)	10,394	15,606 (22.4%)	54,098 (77.6%)	69,704	2%	98%
36. Non-metallic mineral products	9,010 (82.4%)	1,922 (17.6%)	10,932	23,500 (38.1%)	38,183 (61.9%)	61,683	7%	93%
37. Basic metal industries	289 (88.4%)	38 (11.6%)	327	683 (17.8%)	3,150 (82.2%)	3,833	6%	94%
38. Fabricated metal products and machinery & equipment	4,997 (88.6%)	642 (11.4%)	5,639	10,213 (35.9%)	18,270 (64.1%)	28,483	10%	90%
39. Other manufacturing	4,125 (93.5%)	285 (6.5%)	4,410	7,755 (67.9%)	3,661 (32.1%)	11,416	50%	50%
Total	85,450 (85.7%)	14,240 (14.3%)	99,690	177,820 (29.6%)	422,984 (70.4%)	600,804	13%	87%

Source: Department of Census and Statistics, 1984

Table 4.6: Sectoral share of manufacturing enterprises

Industry Sector	Establishments with less than 5 persons engaged			Establishments with 5 or more persons engaged			All		
	Share of Enterprises	Share of Persons	Share of output	Share of Enterprises	Share of Persons	Share of output	Share of Enterprises	Share of Persons	Share of output
31. Food beverages and tobacco	32%	32%	58%	40%	38%	35.4%	33%	36%	37.1%
32. Textile, wearing apparel, and leather products	22%	22%	8.5%	23%	26%	11.8%	22%	25%	11.5%
33. Wood and wood products including furniture	12%	12%	8.5%	8%	5%	3%	12%	7%	3.4%
34. Paper and paper products, printing and publishing	1%	1%	1.4%	2%	3%	3.1%	1%	2%	3%
35. Chemical and chemical, petroleum, rubber and plastic	11%	9%	6.6%	6%	13%	37%	10%	12%	34.6%
36. Non-metallic mineral products	11%	13%	5%	13%	9%	5.4%	11%	10%	5.4%
37. Basic metal industries	0%	0%	0.6%	0%	1%	0.8%	0%	1%	0.8%
38. Fabricated metal products and machinery & equipment	6%	6%	3.3%	5%	4%	2.7%	6%	5%	2.7%
39. Other manufacturing	5%	4%	8.1%	2%	1%	0.8%	4%	2%	1.3%
Total	100	100	100	100	100	100	100	100	100

Source: Department of Census and Statistics, 1984

The above analysis of the characteristics, nature and size of the enterprises in Sri Lankan economy suggests that both formal and informal sectors have equally contributed to the performance of enterprise sector. The informal sector enterprises particularly traditional and non-traditional home-based/cottage-based production units, agriculture based and off-farm activities, micro and small factory units, trading and distribution businesses have been playing a leading role in the economy. These informal activities laid the foundation for the emergence of 'formal private sector' in the post liberalisation economy of the country. The informal sector is still occupying a significant position in the urban and rural sector as a means poverty alleviation and employment creation. For some reason, public policies in Sri Lanka, especially industrial / SME policy and technology policy have failed to recognise their role in a broader context. As such, although the focus of this research is primarily on SMEs, the micro-enterprises in both formal and informal sector have been included in the empirical analysis in order to justify the need for appropriate policy intervention.

In the literature review, it was identified that an entrepreneurial culture is important for fostering potential entrepreneurs and an essential component for the growth of enterprises. A number of economic writers questioned whether Sri Lankan society is truly entrepreneurial (e.g. Ranasinghe, 1996) while the Industrialisation Master Plan of 1999 also raised this issue which identified a low level of entrepreneurship in Sri Lanka as one of the major problems for the development of SMEs. Evidently, there is no hard historical evidence to prove the existence of an indigenous entrepreneurial class (apart from relatively few family businesses) or a history of technological innovations in Sri Lanka.

One of the weaknesses of Sri Lankan society is (even now) the negative social perceptions and attitudes towards entrepreneurship that affect SME growth. Kelegama (1990) argues that the perception among the general public of entrepreneurs is not very encouraging where entrepreneurs are seen as 'uneducated' and 'school dropouts' who have no economic value. He further stated that surprisingly a majority of business owners wanted their children to choose a 'respectable' career path outside business such as doctor or engineer, a common trend in Sri Lankan society.

Observing the nature and patterns of the evolution of enterprises, there are also reasons to believe that the feudal system that existed for centuries followed by 400 years of colonial rule may have had a strong influence on the low level of entrepreneurial activity. The occupational based caste system turned out to be the foundation for the emergence of certain trade-based sectors that subsequently have developed into major business sectors (e.g. jewellery sector). In some cases, a caste position links with a specific occupation and such occupational skills have filtered down to succeeding generations.

For centuries, family businesses played an important role in the economy and contributed to the evolution of an entrepreneurial society in Sri Lanka. Their function as a seedbed for potential entrepreneurship had a greater impact on the upward mobility of the 'urban business class' in the post-colonial society (Ranasinghe, 1996). Success stories of prominent family-owned businesses suggest that first generation owners (in the early 1900s) originated from the Southern region of the county and had left their homes with little more than courage and a determination to seek opportunities in up and coming commercial centres (e.g. Colombo, Galle, Kandy, Negambo and Panadura etc.). They had managed to find work mostly in trade and commercial activities which subsequently provided them with business basics enabling them to seize opportunities in the market and establish businesses (Ranasinghe, 1996). The historical records suggest that these businessmen had to undergo various obstacles particularly stiff competition from already established businesses owned by British, Indian, Pakistani and Farsi immigrants. On the positive side, during this period the growing plantation based economy contributed to stimulating domestic (or indigenous) entrepreneurial activities. A few family businesses which originated in the beginning of the 20th century have successfully branched out into new business ventures in recent years (e.g. E. Don Carolis (furniture), St. Anthony's Industries Group (engineering), M.D. Gunasena (printing & publishing) and

Maliban Biscuits (confectionary)). Several lessons can be learnt from this group of Sri Lankan entrepreneurs' whose achievements have been mostly attributed to their work style characterised by a strong work ethic, dedication to the task, long term business ambition, commitment to quality, personal attention to the customer and leadership (Ranasinghe, 1996).

Generally, Sri Lanka's SMEs are characterised by a weak capital base, extreme dependency on traditional sectors, use of indigenous technologies and low quality local products sold in primarily low-income consumer markets. Products are usually sold using informal marketing networks and personal contacts and thus many entrepreneurs are ill equipped to compete in the formal market. However, some positive signs can be observed with regard to changing production patterns where SMEs are moving away from traditional or 'basic consumer products' to a wide range of intermediary goods and capital goods. Fabricated metal, machinery and equipment, chemicals and plastics sectors are seen transforming with improved technology or becoming higher capital intensity (Dias, 1990). This also shows a major shift from traditional and non-farm agriculture-based to non-traditional activities that demand a high level of capital inputs, new technology and technical and managerial skills.

Numerous internal and external barriers inhibit this shift and there is consequently a need for greater policy attention to inspire SMEs to capture opportunities in the growing economy. As pointed out in Chapter 3, open economic policies have created both challenges and opportunities for SMEs. However, it appears that these very same policies put increasing pressure on SMEs to become important players in country's economic development. Endorsing the general view of SME contribution to the wider economy, a recent study by SMED argues that rising income levels through increased enterprise activities in both urban and rural poverty stricken areas will ease off the wealth concentration in and around major conurbations and growth centres, thus, reducing rural-urban and socio-political tensions (Project-SMED, 1999). On the other hand, there seems to be a widely held view that the promotion of SMEs in rural areas can help restrict migration of unemployed persons into urban areas to seek employment. As SMEs are more labour-intensive than larger firms the capital costs associated with the creation of jobs is much lower. For example, in 1983, an average cost for an enterprise to create one job was around Rs. 9,900 and it was about Rs. 34,800 in medium enterprise while it cost large industry approximately Rs. 66,700 (Bandaranayake and Fernando 1989). As Bandaranaike et.al (1998) noted, although Sri Lanka is predominantly an agricultural country, due to constraints on land for agriculture, the high cost of production and labour shortages in the agriculture sector leave little scope for agriculture expansion in rural areas. Thus, strengthening the SME base in predominantly rural agricultural areas will have to be the principal task for enhancing economic activities in such areas.

4.3 Industrial policy and its impact on SMEs

Sri Lanka's industrial sector is characterised by a large number of micro, small and medium-sized manufacturing and service enterprises. Therefore, it is useful to examine the overall industrial policy frameowrk and to see the extent to which these policies have contributed to the growth performance of SMEs. Recognising the importance of SMEs in industrialisation, the Ministry of Finance and Planning (1985) stated that:

> *"The small and medium industries sector provides a reservoir of vast potential for accelerating export-led industrial development. These (small and medium industries) can be linked vertically as a supply base for large industries."* (Cited in Kelegama, 1992:18).

Despite the fact that SMEs have featured prominently in the policy agenda in recent times, the National Strategy for SME Development (White Paper on SMEs, December 2002) identified a number of constraints faced by SMEs which industrialisation strategies did not seem to effectively address. Although the National Strategy has identified a set of important strategies, the implementation has been delayed due to the change of government in 2001 and 2004. This clearly shows the difficulties in implementing public policies without strong political commitment disproving the widely held belief that the government has genuine interest in is supporting domestic SMEs. The recently concluded study by the Asian Development Bank (ADB) on SME development in Sri Lanka has identified three principal constraints at the strategy and policy level. They are: absence of a coherent SMEs strategy or development plan, lack of private sector participation in policy formulation and administrative reforms, and lack of monitoring and evaluation capacity to measure policy impact and compile data to serve as a basis for future policy decisions (ADB, 2001).

As noted in the White Paper on SMEs published in 2002 a policy concern for SME development is a modern phenomenon:

> *"..there has been no deliberate policy effort to exploit the full development potential of SMEs. In fact, in the past policies and incentives for enterprise development have been biased towards large-scale enterprises and hence discriminatory against SMEs. It is a sector which needs to be carefully nurtured by providing institutional support, access to finance, business development services, and less regulatory oriented business environment."* (National Strategy for SME development in Sri Lanka - White Paper, December 2002)

The recent policy changes indicate that the government has realised developing the agriculture sector alone cannot solve the rising unemployment. Therefore, industrialisation strategies need to be focussed on the diversification of agriculture and export agriculture alongside export promotion as means of employment generation and increasing industrial production. The Industrial Promotion Act of 1990 provided wider statutory powers to promote industrial development for three institutions namely; Industrialisation Commission (IC), the Advisory Council for Industry (ACI), and the Regional Industrial Services Committees (RISC). The Act states:

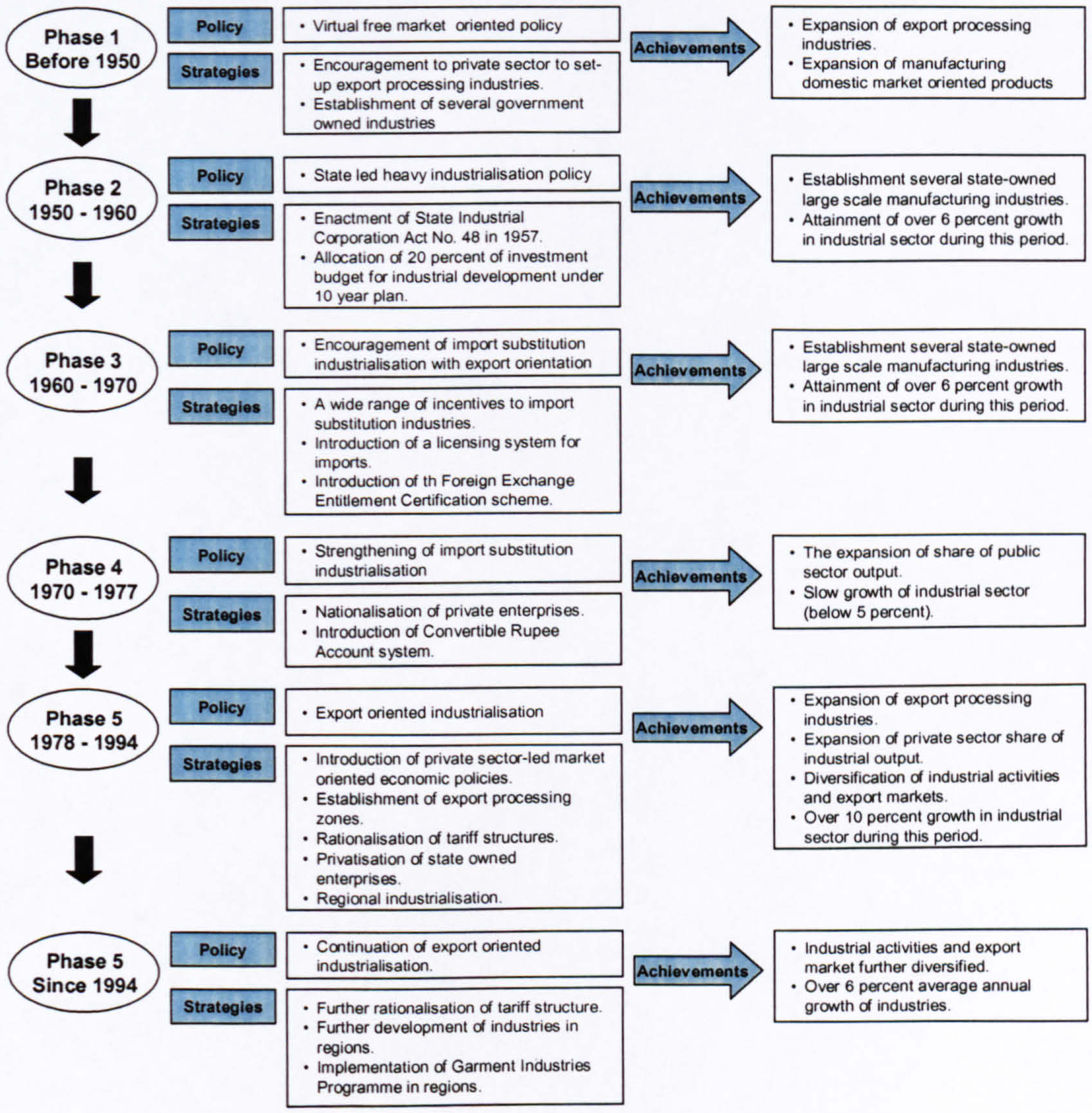
> *"...the government will assist the establishment of efficient small and medium scale industries which can be a vehicle for broad based industrialisation and growth..."* (Industrial Promotion Act, 1990).

Although industrial development policies are part of the macro-economic policy of a country, I argue that this was not the case in the light of Sri Lanka's approach to industrial development. Sri Lanka's industrial base, dominated by plantation industries, was inherited from colonial rule and maintained until the mid 1950s, without attempting to restructure the industrial sector on the merits of the country's competitiveness. The early period of modern industrialisation in Sri Lanka was oriented towards import substitution in which the public sector played a major role alongside a tightly controlled private sector. A review of industrial development in Sri Lanka suggests that trade and fiscal policies had considerable influence on industrialisation and overshadowed industrial development in both Import Substitution Industrialisation[43] (ISI) and Export Oriented Industrialisation (EOI) regimes. For example, post-independence governments largely focused on self-sufficiency in food production while paying less attention to industrial expansion on the basis that import substitution would lead to self-sufficiency and economic independence (Vidanapathirana, 1993:5). The rationale behind this ideology was to assign 'basic[44]' or economically important industries to the public sector and 'non-basic' industries to the private sector (Abeyratne 1997). In other words, the government owned and managed heavy industries while light industries were in the private sector.

Figure 4.1 illustrates the evolution of industrial development policies in independent Sri Lanka (since 1948).

[43] During the 1950s, 1960s, and 1970s, import substitution (ISI) was seen as the main strategy for industrial development.
[44] Basic industries included: power, steel, iron, cement, fertiliser, drugs and pharmaceuticals, cotton spinning, sugar, oils, and fats.

Figure 4.1: Industrial policies of Sri Lanka in the past fifty years



Source: Adapted from Lankatilleke and Abeykoon (2001)

4.3.1 Industrial policies between 1948 and 1977

The Six-Year Development Plan (1951-57) was the first of its kind in the post-independence era and was primarily concerned with improving national economic infrastructure. It gave way to greater emphasis on industrial development and allocated 5.5 percent of the total government budget to industry. However, in 1952 the World Bank's involvement in the country's economic affairs through its programme of assistance to restructure the economy discouraged the government from investing public funds in industry. The World Bank mission strongly emphasised that there was no need for state intervention to develop the industrial sector as Sri Lanka was then considered as more industrialised country than any other underdeveloped economies (Abeyratne, 1989). The World Bank recommended that policies must be reformulated to develop SMEs and to allow the private sector to take the leading role. Keeping in line with the recommendations made by the World Bank, in 1955 two specialist institutions were established to support private sector enterprises, namely the Ceylon Institute of Scientific and Industrial Research (CISIR) (to provide technical expertise and undertake industry oriented research) and the Development Finance Corporation of Ceylon (DFCC) (to provide finance).

The Ten-Year Development Plan (1959-68) placed a greater emphasis on industrial development under which 20 percent of the government budget was allocated to industrial development. Apart from the establishment of several large-scale state-owned industries with technical and financial support from the countries in the Socialist-bloc (Cuthbertson and Athukorala, 1991) an industrial estate on a 32-hectare site was established to accommodate over 100 small and medium-sized industrial units. This was the first industrial estate established in Sri Lanka with on-site facilities that included an R&D centre, a business advisory unit, welfare and other necessary facilities. The notion of 'supporting infant industry' (known as business incubation), which assumes that 'businesses need protection during the early stages of their development' was incorporated as a key element of the industrial strategy during this period (Vidanapathirana, 1993). During the 1960s, the government's industrialisation programme was severely undermined by the deterioration of foreign exchange reserves and this situation forced the government to reduce dependency on imported raw materials and to adopt import substitution policies (Lankatilleke, 1999). Such 'protectionist' policies were designed to preserve and support the domestic market through, among other things, raising import duties and imposing quantitative restrictions. As a result of these restrictions particularly on the import of industrial capital goods, the technological development and overall expansion of industries were adversely affected.

The new government elected in 1965 pursued moderate liberalisation and export promotion policies but the performance of exports was not very impressive as the quality of products was poor and did not meet the standards required to be internationally competitive (Abeyratne, 1997). The establishment of the Standards Bureau in 1965, followed by the Industrial Development Board in 1969, can be considered as an important policy decision to address some of these market/product deficiencies. The government of Mrs. Sirima Bandaranayake elected in 1970 brought back import substitution policies in view of protecting the domestic market, and stimulate rapid indigenous industrialisation (Vidanapathirana, 1993). The industrial policy of this government relied heavily on state led development through the development of state-owned enterprises and the promotion of import substitution industries.

While encouraging self-sufficiency of food, the Five Year Plan (1971-76)[45], emphasised the development of the manufacturing sector for both domestic and export markets and further expansion of public enterprises. Once again, government intervention through public investment including nationalisation in the strategically important industries became a major component of the industrialisation strategy (Abeyratne, 1997). Another observation is, due to constraints arising from the shortage of imported inputs such as machinery, spare parts and raw materials industries performed far below their potential during this period. Abeyratne (1997) argues that the evidence from the ISI regime in Sri Lanka proves that in a developing country where domestic industries are dependent upon imports cannot maintain their growth momentum without substantial earnings of foreign exchange. This argument is well supported by the literature on Sri Lanka's economic development which suggests that the ISI strategy has failed to achieve the country's anticipated economic development goals. The government's socialist ideologies based on self-reliance and protectionism also had negative effects on the growth of the manufacturing sector (see for example Athukorale et al,

[45] To facilitate implementation of the five-year development plan, the government set up a unit under the Ministry of Industries to monitor programme delivery. The increasing demand for finance prompted the establishment of the People's Bank the first native financial institution in Sri Lanka; solely to provide finance for SMEs those were denied access by commercial banks.

1991: Kelegama, 1993, 1992 and 1993: Lakshman, 1998). However, there were some positive effects of the inward-oriented regime, especially the expansion of small manufacturing base that produced simple products to the local markets (Wignaraja, 1998).

One of the shortcomings of ISI policies was inconsistency a consequence of the oscillating political interests of the two main political parties. As a result, inadequate domestic earnings, weak foreign exchange reserves and heavy government expenditure on welfare weakened the public investment capability to finance the industrial sector (Abeyratne, 1989). Another weakness of ISI policy was the low priority given to the export promotion as such, potential exporters were unable to exploit the growing export markets. The rationale for post-1977 economic policies was primarily based on the poor economic performance of the industrial sector in terms of slow growth output, low employment rates, poor quality products, high cost of production, over-reliance on domestic markets, and inadequate private investment. The question is whether the policy restructuring undertaken in the post-1977 government has actually helped solve macro and micro economic issues facing SMEs.

4.2.2 Industrial policies since 1977

The economic liberalisation introduced in 1977 can be considered as a complete departure from import substitution. The prime objectives of liberalisation policy were to allow the free movement of capital in a healthy competitive environment, to encourage higher private sector participation and reduce public sector dominance in industrial and commercial activities. The major mechanism used to achieve an export-oriented industrialisation was trade liberalisation (Abeyratne, 1997:384) which was primarily designed to restructure trade and industry under three major policy areas namely: promotion of foreign investment; export promotion; and privatisation of state owned enterprises[46].

[46] Privatisation of state owned enterprises (SOEs) was one of the key priority areas under the new industrial policy. By 2000, approximately 40 state manufacturing enterprises were

In addition, the 1977 reforms also aimed at infrastructure development through a massive public investment programme (e.g. hydro-electricity generation, establishment of Export Processing Zones, development of air and sea ports, and road network) the establishment of state institutions to support industries[47], encourage FDI and promote exports and labour market reforms. Notably, what was missing in the new economic strategy was a specific industrial strategy (Kelegama, 1993)[48] and it was only in 1987 that a specific industrial strategy was formulated. Even then, according to UNIDO, the 1987 industrial strategy did not provide adequate guidelines for industrial development in Sri Lanka (quoted in Edwards, 1992).

A policy document prepared by the National Planning Council in 1997 recommended greater state intervention to create and enhance technological capability, targeting economically important sectors and better co-ordination between public and private sector. In 1999, a new set of industrial policy guidelines were introduced by the Ministry of Industrial Development that recommended some novel approaches more suited to Sri Lanka's national and international economic standing[49]. Interestingly, none of these policy recommendations was initiated apart from the establishment of an Industrial Facilitation Forum (IFF) to address problems confronting entrepreneurs so that they would be able to enhance their productivity and competitiveness. The IFF was also expected to establish a continuing dialogue between private and public sectors with the aim of addressing bottlenecks and problems faced by the private sector (CBSL, 2002).

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privatised in sectors such as textile, ceramics and porcelain, steel, rubber processing & tyre, mining (graphite), cement, sugar, fertiliser, salt and fruit processing.

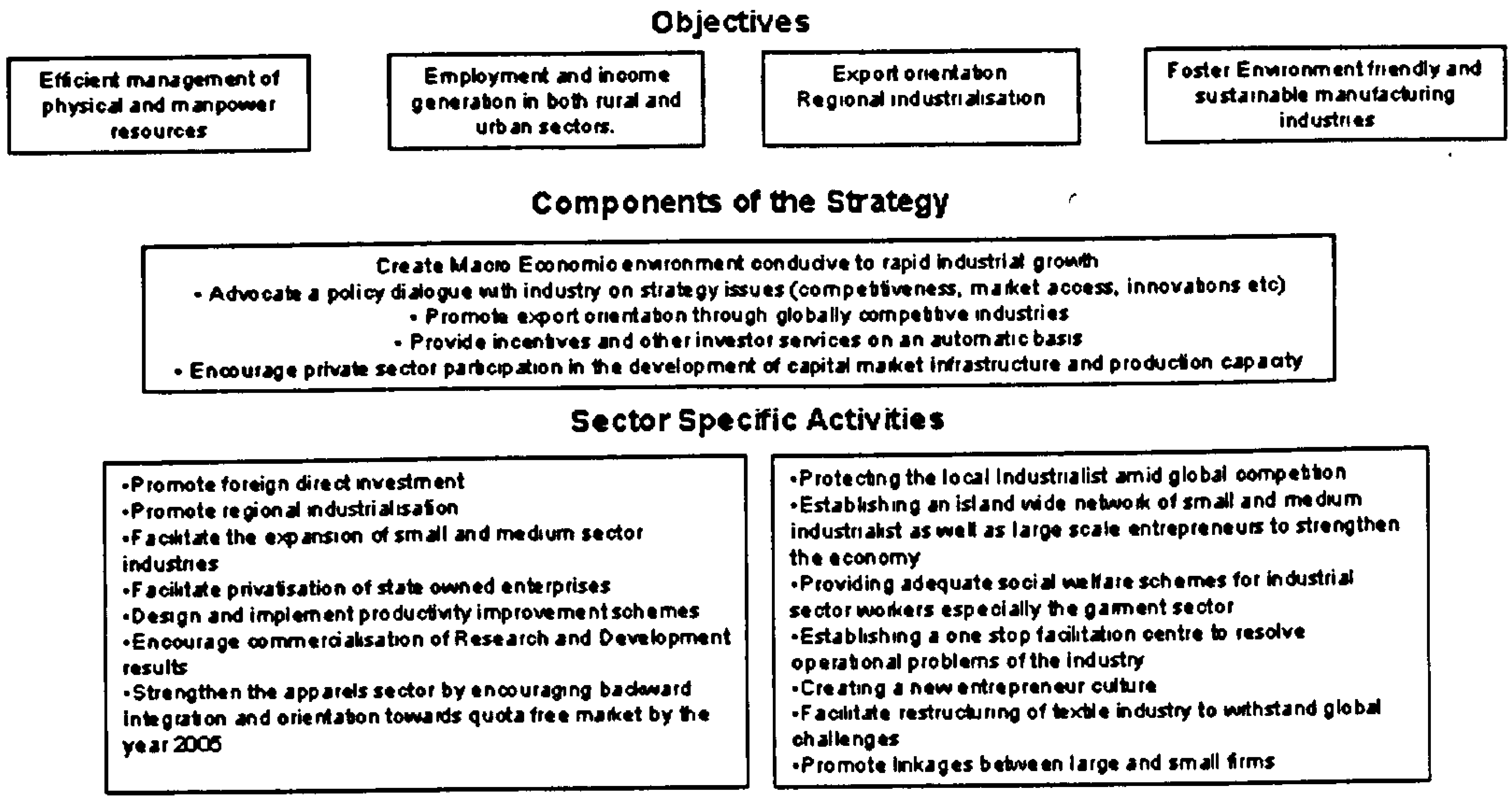
[47] The institutions established as part of industrial development programme were: The Clothing Industrial Training Institute; Textile Training and Service Centre (both in 1984); Rubber Products Development and Service Centre (in 1982); National Development Bank (NDB) to provide industrial finance; Export Development Board (EDB); Sri Lanka Export Credit Insurance Corporation (SLECIC) to support and provide re-finance for non-traditional exports; and the Sri Lanka Business Development Centre (SLBDC) to promote entrepreneurship development.

[48] Cuthbertson and Athukorale, 1991, Kelegama et.al., 1997 and 2000, Lakshman, 1997, and Wignaraja, 1998, also shared similar views.

[49] The industrial development plan prepared in 1999 focuses more on SME development.

The industrial policy of the new government elected in 2001 (see Figure 4.2) was somewhat ambitious in hindsight. While targeting higher industrial growth, a specific policy intervention for SME development was lacking. This particular issue will be discussed in detail in the following sections.

Figure 4.2: A summary of the new industrial policies announced by the Government in 2001



Source: Ministry of Industrial Development, GOSL (2002)

Following the introduction of liberalisation policies in 1977, critics of the effectiveness of industrial policies under the open economic regime have taken the central stage in the economic literature. Some argue that export-oriented industrialisation did not fulfil its objectives compared with the rate and scale of development achieved by the East Asian Newly Industrialised Economies (NICs) (see for example Kelegama, 1990 and 1993; Edwards, 1993; Athukorale, 1996; Athukorale and Jayasuriya, 1997). Although Sri Lanka followed a similar strategy to Newly Industrialised Countries (NICs), Wignaraja (1998) argued that Sri Lanka has not been able to fully capitalise on higher skill based industrial activities. It may be true that Sri Lanka could not achieve what NICs achieved in a similar period but the industrial growth achieved over the past 25 years is commendable in spite of the country's unfavourable political situation and vulnerability to external economic shocks. The industrial sector has responded positively to the new policies and showed better performance in some areas such as investment in new industry sectors, acquiring new skills and technological capabilities and generating employment opportunities.

4.3 SME technology policies and technology capacity building

4.3.1 SME policy

The development of a SME policy was primarily prompted following the study by the Asian Development Bank (ADB) on SME in Sri Lanka in the late 1990s which recommended a number of policy actions to support an enabling environment for SMEs. One of the recommendations by the ADB was to establish an SME Task Force which is now functioning under the Ministry of Enterprise Development. The first job of the Task Force was to draft a policy document (a White Paper) for SME development in consultation with business associations and chambers of commerce, academia, government agencies through public hearings and written submissions. The White Paper primarily addresses the concerns of SMEs within the national economy, and ways to make them 'globally competitive through an entrepreneurial culture committed to sustainable growth'. The SME policy is set within the notion that overall economic growth and poverty reduction could be achieved through well-planned policies and effective strategies that address the needs of SMEs. It focuses on key elements that are considered essential for SME growth, for instance, finance, development of physical infrastructure, technology support, regulatory framework, access to information and advice, access to markets, business support services, industrial relations and labour, linkage formation, and environmental issues. The White Paper also recommended the establishment of an SME Policy unit[50] and Deregulation Committee for identifying and implementing of further policy and institutional reforms needed to achieve competitiveness; promotion of ICT among SMEs; and business support facility to develop consulting and other support services to strengthen capacities in both SMEs and the banks. The SME Task Force has also emphasised the need for strong and effective institutional support for

[50] The absence of a central agency has been a great hindrance to implement SME development activities.

SMEs in Sri Lanka and it recommended the establishment of an SME Authority (SMEA), reform of existing institutions, inter-institutional co-ordination, and developing staff and institutional capacity. The SMEA would become the key body whose task would be to deliver national strategies for SME development and the focal point for institutional support. As can be seen from the experience of policy making in Sri Lanka, for the SME policy to be effective, it requires not only a strong political commitment and backing, but also needs a dynamic, robust and innovative institutional system.

To support the country's SME development efforts, in 2000 the ADB signed an agreement with the Government of Sri Lanka to provide a loan facility to assist in restructuring SME development activities. Under this agreement, US$6 million has been allocated to the Business Services Support Facility Programme towards strengthening SME capacities through development of the market for the provision of Business Development Service (BDS). The Sector Development Program (SDP) has been provided with US$20 million to facilitate greater competitiveness through regulatory reforms that will reduce regulatory barriers, lower transactions costs and improve public sector governance. This programme also aims to strengthen the enabling business environment, catalyse investment by improving SMEs access to finance through commercial channels, and enhance the capacity of BDS providers to deliver services efficiently and effectively to SMEs.

4.3.2 General SME support system and institutional infrastructure

Generally, the demand for business support services varies largely depending on a firm's stage of development (i.e. start-ups, expansion), size, sector and geographical location. The business support is generally available through a wide array of institutions from one-to-one general advice to more complex services such as R&D. Most firms receive some form of support during their lifetime but the majority value most highly the support they receive during the start-up phase. The current support system and institutional structure in Sri Lanka can be summarised as follows:

- Administrative and regulatory measures and registration and supervision of enterprises
- Specific support interventions (such as entrepreneurial development, provision of subsidised credit, technology support, assistance to procure raw materials and inputs, and product marketing)
- Export promotion
- Development of rural and cottage enterprises (handicrafts, agriculture based enterprises etc.).

Over the years, Sri Lanka's enterprise support service structure has improved considerably. According to a survey by the Ministry of Enterprise Development completed in 2001 there were over 290 business support providers in the country of which majority (over 124) was in the 'multi-support' category. Around 246 organisations provided business advice and 212 organisations offered business management and vocational training. Business support institutions in Sri Lanka are mostly funded through a multitude of international donors (e.g. World Bank and IMF, UNIDO, ILO, Asian Development Bank, JICA-Japan, GTZ-Germany, DFID/ODA-UK, SIDA - Sweden, NORAD-Norway and USAID-USA). However, in recent times, external funding from these donors has been gradually diminishing presenting new challenges for the government and service providers to identify alternative funding avenues and provide services on a commercial footing.

One noteworthy observation emerging from the analysis of Sri Lankan business support infrastructure is the complexity of SME support and its fragmented nature. The support system consists of a large number of public sector agencies spreading across six major central government ministries, eight Provincial Councils (regional governments) and a host of government departments. In addition, private sector organisations, local and international NGOs are and providing an array of business support. This illustrates the complexity of the current institutional set up which has obviously resulted in overlapping and duplicating of functions, undermining their effectiveness (and reputation) and created rivalry among institutions (Lakshman et al., 1994). On the other hand, every incumbent government's focus has been very much on creating new institutions rather than strengthening existing institutions and facilitating the delivery of targeted interventions (see for example Lakshman, 1994; Wignaraja, 1995). Due to these strategic and structural deficiencies, support institutions have been subject to constant criticism for their lack of effective coordination, inconsistency, lack of professionalism, and more importantly inefficiency in the use of financial, human and physical resources (Lakshman, 1995).

Most agencies providing general business support are functioning under the purview of the Ministry of Enterprise Development while technology and R&D institutes are operating under the Ministry of Science and Technology. The specialised agencies and research centres are operating under subject specific ministries but only a handful of agencies provide technology related services to enterprises on commercial basis. Apart from the regional business support agencies in the North Western and Central Provinces, virtually all enterprise support agencies are managed by the central government. Although enterprises in rural areas largely depend on government business support services, many support agencies do not view supporting these enterprise in rural locations is essential and cost-effective. .

One of the main constraints facing the public sector support providers is their relatively limited financial resources to provide enterprise support services where in recent times, the limited government budgetary provisions abridged programmes and services run by mainstream business support agencies. The cost of the ongoing conflict and limited donor support for public services has led the government to reduce budgetary allocations on subsidies and financing public sector support agencies and as a result, the quality and effectiveness of support seems to have been seriously affected. The Industrial Development Board (IDB), Small Enterprise Division (SED) and Department of Small Industries (DSI) are among the organisations that are most severely affected by funding constraints.

There is another move by the government that is to restructure government agencies to increase accountability, efficiency, and responsiveness. The Asian Development Bank is currently funding a programme of work that is aimed at restructuring the IDB which includes downsizing staff, programme development and the restructuring regional network with more emphasis on income generation. Endorsing the public perception that services provided by business support agencies do not reach small enterprises effectively, a recent study by the SME Task Force revealed that the business support system is supply driven and only a few support agencies deliver 'effective and valued' service. Further, this study stated that as service providers operate from major cities (mainly in Colombo) and prefer to serve larger enterprises, small enterprises often do not get enough support. Another survey by the Asian Development Bank (ADB, 2003) found that smaller enterprises used business support services less frequently than medium enterprises while those located outside Colombo generally depend on informal providers, family and friends.

Although the business support service structure has expanded over the years, it has not been able to provide adequate support to SMEs outwith major cities. For example, other than the Industrial Development Board, none of the support agencies operates an island-wide network. This causes a major problem for smaller enterprises in rural areas as they removed from mainstream business support and are thus more likely to get poor non-professional advice and guidance. Another finding of this study was that considering the growth and performance constraints of the enterprises in regions, there is a greater need for additional business support particularly in areas such as management training, help in preparing loan proposals, marketing and technology related services

One of the interesting findings of the survey by the ADB (ADB, 2003) is the negative perception of business owners about government sponsored business support programmes. Business owners often view these programmes, as not being useful and irrelevant to their individual needs, therefore, a need for a credible business support framework that caters to the real needs of SMEs is indisputable. The SME Task Force suggests that the government needs to move away from its traditional role as the direct supplier of business support and to assume the role of a facilitator while encouraging private sector service providers to enter into the business support market. Alternatively, business associations and trade chambers might be strengthened to fill gaps in the business support service market since they are better positioned i.e. are closer and therefore more able to support to enterprises. There remains, however, a number of over-riding concerns namely given their relatively weak institutional capacity and financial capacity, can the private sector provides such as business associations and chambers provide an efficient service and would there be a potential conflict between making profits and meeting public objectives?

A study by Fisher and Murphy (2002) found that trade associations and chambers in Sri Lanka have weak institutional capacity and only the old and well-established trade chambers are capable of delivering professional services (such as Ceylon Chamber of Commerce, Exporters Association, Federation of Chambers of Commerce and Industry and National Chamber of Commerce). Having worked closely with the Chambers of Commerce and business associations in Sri Lanka I have observed that these organisations are seriously constrained by a lack of professionally qualified staff. The newer and smaller trade associations with limited resources usually rely on external funding from foreign donors and volunteer experts or professionals to deliver business support services. Although SME development has been at the centre of economic development in the post independent Sri Lanka, one of the main issues emerging from the above analysis is that there is no lead agency similar to Small Business Administration in the US and Small Business Service in the UK with roles and responsibilities to coordinate public policy interventions and planning between the institutions.

The general business support services available for SMEs and support institutions are given in Annex A.

4.3.3 Science and technology (S&T) policies and their relevance to overall industrial / SME development

Sri Lanka's science and technology system has a long-standing history that dates back to late 1800s. The National Health Service and the Medical College were the first S&T intuitions established by the British rulers. Plantation and agricultural research also became a priority area[51] during this period. Having realised the importance of science and technology in economic development, successive governments established a number of institutions to facilitate the country's technology development. The establishment of the Ceylon Institute of Scientific and Industrial Research in 1955 (CISIR - now known as Industrial Technology Institute), the Industrial Development Board in 1965 followed by the National Engineering Research and Development Centre (NERDC) in 1966 can be cited as interventions that had a significant impact on the science and technology development in Sri Lanka. In 1995, the National Science Council came in to being whose primary task was to develop a workable science and technology policy and the Science and Technology Policy conference held in 1984 paved the way for all S&T agencies to work and agree on a national S&T policy. The outcome of this conference was the birth of the first science and technology policy document in December 1986.

Another significant move by the government was the appointment of the Presidential Task Force on Science and Technology Development in 1991 to examine the strengths and weaknesses of national S&T base and propose a new national S&T policy. The Task Force recommended a 'Ten Point S&T Policy framework' emphasising the use of science and technology as an integral part of achieving overall economic development; improving quality of life and poverty alleviation; self reliance in scientific and technological capabilities; support for the development of indigenous technology for rapid industrial development; science and technology education and the promotion of research and development likely to be of benefit to Sri Lanka (National

[51] The Tea Research Institute was founded in 1925.

Science Foundation, 2003[52]). These recommendations by far, can be considered as the most comprehensive and ambitious set of goals and actions designed to revive the S&T base in Sri Lanka. However, Lall et. al (1996) identified a number of weaknesses in the recommendations made by the Presidential Task Force particularly that there was insufficient emphasis on planning for and co-ordination and investment in S&T.

Lall et al (1996) also pointed out some fundamental issues the Task Force has neglected. These included: demoralisation of science and technology personnel which may eventually lead to brain-drain, weaknesses in the education system, lack of a goal-oriented approach in the S&T institutions, weak links with industry and inadequate mechanisms for the transfer of technology to industry, and lack of knowledge and appreciation of S&T among general public. None of these recommendations have been fully implemented however; the enactment of Science and Technology Development Act of 1994 and the subsequent adoption of the S&T policy in 1998 can be seen as important developments in addressing some of the issues pointed out by Lall (1996) through making science and technology a priority for national economic development.

As recommended by the Task Force, the National Science and Technology Commission (NASTEC) was established in 1998 with a view to coordinating S&T activities in Sri Lanka. Interestingly, it has taken nearly seven years for policy makers to implement recommendations by the Presidential Task Force and this shows the obvious lapses in the policy-making machinery.

There have been some important developments taking place within the S&T arena in recent years. One of them was the 'Science and Technology in National Development' conference organised by the NASTEC together with the Ministry of Science and Technology held in 2000 to draw-up an S&T action plan to strengthen the policy framework proposed by the Task Force.

[52]Source: S&T Management Information System, http://www.mis.nsf.ac.lk

This action plan entails eight sector plans that focus on agriculture, education, electronics and ICT, environment, health, industry, finance and general issues. The Industry Sector Action Plan proposed several initiatives targeting specific areas[53]. Although all these sectors have strong relevance to SME development, it appears that the sectoral plans have less focus on SMEs. On the other hand, an examination of the S&T policy and sector action plans suggests that the focus of policy is more on public sector scientific activity but less attention on fostering and stimulating technological innovations at enterprise level. This clearly reflects the inherent weaknesses on the part of successive governments that have failed to support the private sector and encourage scientific and technology activities.

In contrast, S&T policies in newly industrialising countries like South Korea, Malaysia, and Thailand have placed a great deal of emphasis on stimulating private sector technological developments and innovations. It is worthy of mention here that the Industrial Strategy announced in 1995 and White Paper on SME Development have also proposed science and technology action plans focussing on technology development in industries. The absence of an integrated national science and technology policy is clearly reflected in policy documents and the low level of national scientific and technological innovation output provides ample proof. It was pointed out earlier that S&T as a major contributor to national development was quite invisible in the national policy agenda. This was highlighted in a study by National Science Foundation that claimed that the rate at which science and technology efforts have been declining means that Sri Lanka's dream of becoming a newly industrialised country could not be realised (Amaradasa and De Silva, 2000).

A major structural deficiency of Sri Lanka's S&T infrastructure is the absence of an agency with authority to oversee national science and

[53] The sector action plan for the industrial sector comprises a range of activities such as industrial productivity enhancement, cluster development, linking science and technology with rural industries, strengthening public and private sector institutional partnerships, financial incentives for technology development in the private sector, strengthening linkages between academia and R&D centres and industries and stimulating IPR.

technology issues and it is not clear the extent to which NASTEC will be able to play this role. It is also not very clear whether NASTEC is vested with adequate powers and responsibilities to function as the lead agency for science and technology similar to that of Department for Trade and Industry[54] (DTI) or Office of Science and Technology (OST).

4.3.4 Technology support services for SMEs

Sri Lanka's national science and technology system[55] is extremely fragmented, characterised by a multitude of institutions and programmes spread across several ministries. Moreover, very little cooperation seems to exist between ministries and institutions. However, despite the fact that Sri Lanka's technological capability as a whole is relatively weak the objective of the technology support structure should be to strengthen technology capacity, create and diffuse scientific and technological knowledge. The crucial aspect is the enhanced interaction between enterprises and institutions and increased public investment in science and technology. The deciding factors of the level of interaction and S&T investment may vary greatly depending on the country's stage of economic development and the policy environment.

As discussed in the earlier section, the technology support system in Sri Lanka is reasonably developed but still requires further improvement to its standards, quality and delivery mechanism in order for it to play a full role in enhancing overall industrial, scientific and technological competitiveness (Lall et al, 1996). The 1995 Industrial Strategy pronounced that the country has not developed sufficient competitiveness in the technologically sophisticated and higher intellectual value added products that are important in world trade. As such, enterprises need substantial encouragement in terms of support and active facilitation to access technology and demand oriented skills

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[54] One of the central objectives of DTI is to make the most of the UK's science, engineering and technology skills and resources.

[55] Basically, the science and technology system in Sri Lanka can be classified under nine functional areas viz: Agriculture and forestry; Plantation industry (tea, rubber and coconut); Fisheries and aquatic resources; Industry; Education; Human resource development; Environment; Health; and Energy, power and construction.

development in order to enhance factor productivity. The subsequent Industrial Master Plan (also called The Rainbow Plan of 2000) strongly emphasised a new paradigm shift of industrial development in Sri Lanka that will stand on 'knowledge-based' and 'technology-intensive' industrial development, a shift from the 'resource-based' and 'labour intensive' approach.

The inherent weaknesses of Sri Lanka's technology support institutional infrastructure are clearly reflected by the dominance of a handful of state owned technology and R&D institutions with limited resources. In fact, there are growing concerns over their contribution to technology capability building in SMEs which was a major issue at the S&T policy conference held in 2001. Currently, there are 23 science and technology institutions in the country of which 17 are agriculture research centres (3), plantation crops (tea, rubber, coconut and sugar cane) and aquaculture (1). The Industrial technology Institute (ITI), National Engineering Research & Development Centre (NERD), and Arthur C. Clarke Centre for Modern Technologies are the only public sector agencies that undertake industry oriented R&D. The Sri Lanka Standards Institution (SLSI) provides technical assistance, advice and training on standardisation and quality assurance. Although the Industrial Development Board cannot be considered an R&D institution, it undertakes limited amount of basic R&D in areas such as food and beverages, light engineering, and construction.

Apart from the aforesaid 'mainstream' agencies, a host of other agencies also provide technical advice and information in their specialised fields. These include Inventors Commission (IPR), Clothing Industry Training Institute (apparel industry), Textile Training & Services Centre (textile), Gem & Jewellery Research and Training Institute, National Packaging Centre (packaging technology), National Aquatic Resource Agency (Aquaculture), National Building Research Organisation, and agriculture and plantation crops research centres (Tea, Rubber and Coconut), to name a few. Apart from the agriculture and plantation research centres, all other institutions are located in Colombo and none of these institutions operated branches or located outreach staff elsewhere in the country. The following sub-sections outline the main service provisions for SMEs.

4.3.4.1 Technology advice and information services

In theory, technology and R&D related information and advisory services are expected to support SMEs to innovate in order to lead to increasing SME competitiveness (Julien, 1994). In Sri Lanka, generally technology related advice and information are available through support agencies and on most occasions, banks and other government agencies refer owner/managers to service providers for necessary advice depend on the nature of requirement. Interestingly, the majority of entrepreneurs still prefer using informal sources to fulfil their information requirements such as family, friends, peers, suppliers, buyers etc. who play a major role as effective and reliable sources of information and advice.

Among the different types of service providers, the Industrial Development Board can be considered the main service provider with an island-wide coverage. In addition, the Industrial Services Bureau (ISB) in the North Western province provides technology support for SMEs, particularly those in economically important sectors in the province (e.g. agriculture/aquaculture, coconut and coconut processing, chemical and environment engineering, ICT, textile and garments, and power and energy). The Business Information Services (BIS), the providers of technology support services are currently operated by regional chambers provide advice and information to SMEs. The Industrial Technology Institute (ITI) operates a specialised technical advisory and information service at its main office in Colombo and its library and information service is one of the largest in the country. The Industrial Technology and Market Information Network (ITMIN Ltd.) provides information on a range of areas including technology transfer, electronic publishing, market surveys and investment opportunities and ICT training[56]. In most cases, basic technical advice and information are

[56] Sri Lanka: Establishment of the Industrial Technology and Market Information Network (success story), http://www.unido.org/doc/3625

free for enterprises but in some cases, fee-based advice is also available especially in more complex or specialist areas.

The key observation emerging from the analysis with respect to the current technology information and advisory system is the fact that services are quite substantive in terms of coverage and resourcefulness. However, it appears that services are not reaching those who need them most, especially the SMEs in regions. There seems a wide gap between providers and users where the latter appear to rely more on informal sources than formal. Although mainstream business support institutions are capable of handling large volume of requests for services, they seem to lack technical expertise and their capacity to meet complex needs is limited. This aspect surfaced in the survey as well as interviews with owner managers and is discussed in Chapter 5.

4.3.4.2 Technology transfer / diffusion and R&D support

Technology transfer is seen as an economic measure for furthering firm's commercial objectives (Dichter, 1988). It is a process by which existing technology is transferred or transformed to fulfil the user's needs (Krull, 1990) and may occur through different channels involving tangible (capital goods) or non-tangible (knowledge) (Hoekman and Maskas et al., 2004) also can be an output of public R&D programmes (Horwitz, 1983). Buckley (1997) proposed three types of technology transfer methods adopted by SMEs: small-scale technologies, labour intensive technologies and specialised high-technology know-how[57].

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[57] In general, technological knowledge transfer methods include, sale of machinery and equipment; sale of technology intensive products and processes; licensing and patents; foreign participation in the form of joint ventures; turnkey projects; and higher of trained personnel etc. In addition, scientific and technical publications, intellectual property publications (patent records etc.), and education and training and technical assistance programmes (Hill and Utterback, 1979). Technology transfer also viewed as effective methods of knowledge transfer, but mostly take place between R&D centres and large enterprises in the corporate sector.

One of the primary sources of technology transfer and diffusion in Sri Lanka has been through foreign technology sources (import of machinery and equipment) rather than from the domestic technology and R&D sources. Since outward oriented policies[58] (open economic policies) were pursued (after 1977), the importance of technology has increased and the inflow of foreign capital and technology has been speeding up[59]. As local technology is not developed sufficiently to meet growing SMEs needs, the SMEs invariably become highly dependent on foreign technology regardless of the high cost. However, there seems an upward trend in foreign technology collaborations through joint venture partnerships particularly in the engineering and high technology sectors. In most cases, the transfer of technology from foreign sources in the form of hard technology (machinery and equipment) and soft technology (know-how e.g. training and skills) and technical assistance e.g. after sales service) are part and parcel of buyer-seller agreement.

One of the notable observations with regard to technology diffusion is the reverse engineering or 'copying' a popular method of technology diffusion found in some East Asian countries (e.g. Japan, Taiwan and South Korea) that occurred in the 1970s has not seemingly taken place in Sri Lanka. This may be because of the import restrictions in the 1970s and supply of cheap machinery and equipment after the removal of restrictions in 1977. From these observations it can be concluded that what is missing in the support system in Sri Lanka is an appropriate system of domestic technology transfer that could both encourage local capital goods industry and diffusion of local technology as well as foreign technology more suited to local conditions.

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[58] It must be stated that before 1977 there had been significantly a higher level of technology sophistication through transfer of technology from socialist countries who provided both technology and equity partnerships to state enterprises (Marga, 1975).

[59] Those critical about technology transfer argue its is not as easy as one assumes that developing countries can simply import and apply technical knowledge from outside by obtaining machinery and equipment. Equally, to use new technology enterprises require new skills and the ability to learn and develop new skills (Lall, 2000 cited in Desai, Fukuda-Parr et al. (2002).

This section presents an analysis of technology transfer/diffusion by the main technology and R&D support institutions in Sri Lanka which helps understand the strengths and weaknesses of the existing system of technology support. My main argument is that mainstream technology support providers are adequately resourced and well positioned to respond to SME needs but have not been able to deliver what was a priori expected from them in terms of an across-the-board improvement in technology and innovation.

The Industrial technology Institute (ITI) is one of the key technology support institutions which says that its technology transfer has always been 'non-exclusive' with ITI having the right to transfer the process to more than one SME (Pieris, 2000). That means ITI expects that their technological innovations would benefit a wider audience. However, an examination of ITI technology and innovation related activities suggests that ITI has commercialised R&D quite successfully but their focus has been predominantly on the low-technology innovations (see Table 4.7). The analysis also reveals that ITI is quite strong in R&D in food and beverages (e.g. secondary processing of rice, grains, fruits and vegetables produced locally). The ITI believes that these products are 'very good substitutes to the imported products' (in the case of Baby Rusk) (Pieris, 2000) but my argument is, these products cannot compete with imported food products, unless the quality, quantity and price are matched or superior.

Table 4.7: Technology know-how developed and transferred by Industrial Technology Institute to SMEs		
Sector[1] and Products/processes[1]	**Low technology content (LT); Medium or high technology content (HT)[2]**	**Innovative or novel product/process, or further development of existing product/process[2]**
Food & beverages		
Baby Rusk	LT	Further development
Bakery products	LT	Further development
Coconut based food products	LT	Further development
Coconut wine	LT	Further development
Dehydrated fruits & veg.	LT	Further development
Instant hoppers and dosai (pan cake) mix	LT	Further development
Flavoured instant noodles	LT	Further development
Wood & wood products		
Products from jack fruit	LT	Further development
Treated rubber wood	LT	Further development
Treated bamboo	LT	Further development
Paper products	LT	Further development
Chemical products		
Handmade paper and boards	LT	Further development
Antiseptic lotion	LT	Further development
Rubber seed oil alkyd resin	HT	Further development
Herbal shampoo	LT	Further development
Herbal toothpaste	LT	Innovative/novel
Mosquito repellent	LT	Further development
Non-metallic mineral products: School chalk	LT	Further development
Notes: [1]Source: Peiris (2000): [2]Own analysis		

Table 4.8 provides a summary of ITI's product innovations since its inception and as may be observed from the data 47 patents have been awarded of which 24 were in food and beverages sector. The data also suggests that ITI was very active during the 1955-77 period (pre-liberalisation) with 29 patents, however, only 19 patents have been granted after 1977. This can be attributed to the fact that ITI had a relatively high level of state support and less competition before 1977 when the government was actively encouraging domestic industry and local technology development.

Table 4.8: Patents granted to ITI (former CISIR) 1955 -2001		
Sector	**1955-76**	**1977-2001**
Food / beverages	13	11
Rubber	3	3
Wood	1	0
Light engineering	3	3
Chemicals	9	2
Total	29	19
Source: Lall et.al (1996) 1995-74 data Data for 1995-2001 calculated based on Patent Office records		

Based on the analysis given in Table 4.7 and 4.8, I argue that ITI has not exploited its expertise fully and it's R&D and innovations are more likely to be 'basic product developments' with low technology content. Considering the current demand and supply for similar products in the Sri Lankan market, I argue that the products developed by ITI have limited economic viability and market potential, therefore it is difficult to judge them as being 'pioneering' or 'innovative'.

The National Engineering Research and Development Centre (NERD) follows a technology transfer method that is similar to ITI but with more emphasis on engineering, construction and energy sectors. According to NERD, the basis for selection of R&D projects is their direct or secondary impact on people's standards of living while ensuring the optimum utilization of human and material resources of the country (NERD Centre, 2003). The NERD has acquired 12 Patents between 1995 and 2001 and developed 39 new technology profiles (project reports) of which majority of them are considered to be 'low cost' construction methods and energy systems. However, these new technologies developed by NERD could be viewed as timely and important in the context of rising energy and construction costs in Sri Lanka. A new R&D centre named 'Centre for Manufacturing Excellence' has been established recently at the main site of NERD in order to strengthen linkages with SMEs and to fulfil industrial needs.

The Industrial Development Board's R&D capacity is relatively lower than ITI and NERD centre; however, it is much stronger in technical advisory service. In terms of new technology innovations, so far it has managed to secure only one Patent for inventing a method for coconut water preservation.

The above analysis suggests that technology spill-overs by technology support agencies through R&D are mostly confined to low value added and product sectors with low technology content whereas there are other public and private sector agencies that undertake this type of basic R&D and 'appropriate technology[60]' projects. Therefore R&D institutes need to engage in a more meaningful and productive research and technology development in order to generate domestic technological innovations and make sure that they realize their full potential in order to address complex needs of enterprises.

Recent years have witnessed some improvements in private sector oriented R&D especially in export sectors (e.g. coconut and coconut fibre, rubber, jewellery and tea) owing to increasing demand in the export market. Much of the technology developments in these sectors are led by the private sector while the Export Development Board also plays a supportive role working in partnership with private sector and public sector R&D centres. Considering the potential of the coconut and coconut fibre sector, a dedicated technology support institute is badly needed for the development of the coconut industry in Sri Lanka (Rosairo, et al, 2004). The Industrial Services Bureau of North Western province (ISB) has fulfilled this need to a greater extent by pioneering a programme that aimed at technology capacity building in SMEs in the coconut sector and this programme is illustrated through a case study in Chapter 6.

As highlighted in the previous chapter, foreign direct investment (FDI) plays a significant role in Sri Lanka in transferring technology to domestic enterprises through supply chain/subcontracting linkages[61]. Largely FDI has significantly contributed to the diffusion of new technologies, new production and work methods and management techniques through linkages in construction, apparel and garments, electrical, electronic and ICT sectors. These linkages have also contributed to the emergence of a new breed of 'growth oriented' enterprises in the above sectors. However, such linkages are absent or minimal in the traditional industry sectors such as rubber and rubber

[60] Appropriate technology works from the bottom up; it is a genuine grassroots solution to economic needs. (Source: http://www.gdrc.org/techtran/appro-tech.html)

[61] Benefits of FDI linkages to host countries are: capital inflows (foreign exchange), technology transfer, skills and knowledge spillovers, human capital development, potential benefits to small businesses through backward and forward supply chain linkages.

processing, gem and jewellery and food processing and can be seen as a weakness in the FDI policy.

4.3.4.3 Standardisation, quality control, testing and laboratory services

Standards and quality improvements are increasingly becoming important business strategies while quality and standards systems[62] provide greater value addition for SMEs. Although the standardisation and quality control have featured in policy documents for over 40 years it came into effect as a regulation or legal requirement only in 1984, about 20 years after the establishment of Sri Lanka Standard Institution (SLSI). Since then, the SLSI has been providing a variety of services ranging from policy formulation (e.g. setting national standards) to enterprise services (e.g. SLS product certification, ISO and HACCP system certifications, product testing, import export inspections and laboratory accreditation).

With over 100 scientists and engineers, the institution has established over 1250 Standards pertaining to products, commodities, materials, processes and practices and are intended for voluntary adoption but some Standards have been made compulsory for certain products[63]. The benefits of enforcing Standards will have direct spill-overs on SMEs that strengthen markets and the supplier base and is more crucial for exporting companies. However, a number of owner/managers interviewed for this research expressed the opinion that Standards do not necessarily give them any greater advantage especially in a market where customers are more price-conscious than quality conscious. They also pointed out that SLSI Standards are not mandatory and violation of Standards requirements that caused problems to consumers have rarely led to litigation. According to SLSI, the system certifications such as ISO and HACCP seem to have received a good response from all quarters of the business community. A study by Fonseka (1999) reveals that multinational

[62] Such as certification, accreditation, standardization, quality marks and labels.

[63] E.g. Razor Blades; Asbestos Cement Sheets; Chemical & Cosmetic products (8 product categories); and Food products (21 product categories)

companies, companies with foreign partnerships and export markets are more likely to obtain ISO certification and HACCP.

While a majority of SMEs have realised the usefulness of such systems some perceive them as barriers simply because of the complex nature of certification processes as well as the high cost of certification. The main problems are high registration fees, training of staff and monitoring. Similarly, lack of expertise or the high cost of hiring consultants affects firms badly even though they are willing to obtain certifications (Wignaraja, 1998). Consequently, there are serious concerns over the inability of SMEs in Sri Lanka conforming standards and certification that put them at an unfair disadvantage making them uncompetitive. Therefore, the agencies implementing and monitoring standards and certification need to adopt strategies and support services that address firm level constraints. In order to encourage SMEs to acquire standards and quality certifications, the SLSI has initiated the National Quality Award Scheme to recognise enterprises achieving high standards and quality performance.

4.3.4.4 Promotion of inter-firm linkages, networks and technology sharing

The experience of UK and EU countries suggests that enterprise networks can be considered as an important strategy for technology capacity building and innovation. Considering the limited resources and technical expertise, SMEs can benefit from such networks and linkages more than larger enterprises. Examples from Emilia-Romagna in Italy reveal that public policy can play a vital role in stimulating inter-firm linkages which have benefited a large number of trained entrepreneurs, particularly in metalworking and mechanical engineering sector (Vossen, 1998). The evidence from SMEs networks in Scotland suggests that scale economies of SMEs can be achieved through promotion of networks between the firms themselves and the support institutions (Whittan and Kirk, 1993). Dodgson (1993) pointed out that the advantages of inter-firm collaborations between large firms and small firms can assist both partners to overcome their 'innovatory disadvantages', and help

SMEs to learn from each other by exchanging and sharing experiences, more importantly to diffuse and/or transfer technology (Brycham, 1999). As such, these evidences suggest that strengthening SME networks has become an important aspect in the EU-wide SME policies.

An analysis of existing enterprise networks in Sri Lanka suggests that technology learning through such networks appeared to be relatively underdeveloped. One reason could be that both SMEs and larger enterprises are operating independently of each other therefore inter-linkages among enterprises are extremely weak. On the positive side, a large number of functional informal networks can be found mostly around plantation industries (e.g. tea, coconut and rubber), jewellery and craft sector, and apparel and garments sectors. Characteristically, these networks by far, operating as supply channels but technology sharing, learning and transfer seem to be lacking or very weak in these networks. In recent times, formal networks between enterprises are been persistently promoted by support agencies and through donor funded programmes. However, majority of owner/managers interviewed for this research preferred informal networks (or personal) as against formal, simply because they are flexible and easy to manage. The establishment of formal enterprise networks and supporting inter-firm linkages can be beneficial to SMEs in Sri Lanka especially in sectors that are economically important (e.g. apparel and garments, and coconut and coconut fibre) and sectors that have potential to grow (e.g. gem and jewellery, rubber products, engineering, and ICT).

4.5.4.5 University-industry linkages

The universities are considered as institutions with a vast pool of knowledge and expertise that can be brought together for the benefit of SMEs. The role of universities goes beyond being a knowledge centre. It has a new role as a breeding ground for entrepreneurial activities, especially innovative and technology-based enterprises. There is a widely held notion that the state has an important role in supporting academic science and technology activities as firms are unlikely to invest in 'scientific research' at socially optimal levels

(Barber and White, 1987). Looking at the higher education system in Sri Lanka over the past 50 years, universities and further education institutions have played a vital role in the national development. However, considering the capacity and resourcefulness, the contribution of higher education institutes in the private sector development especially through linkages with industry and industry-oriented research is questionable (see for example NASTEC, 2002).

In recent years, there has been a growing pressure from the private sector as well as international donors on the government to put more emphasis on reviewing HE policies to make them more private sector friendly and development of linkages between universities and SMEs. Amaradasa (2004) and Wignaraja (1998) found that university-industry relationships are relatively underdeveloped while the main weaknesses identified were lack of appropriate policies and systems to support and strengthen relationships, lack of facilities/programmes for industries, inadequate laboratory facilities and services, and funding constraints. These weaknesses have also been observed in the Industrial Master Plan 2000 which stated:

> *"...in order to pursue on 'knowledge-based' industrial development in Sri Lanka, there is big need for the promotion of industry-academic partnerships."*

Some encouraging trends in university-industry linkages have been observed more recently and some examples can be cited here to substantiate this claim. The National Engineering Design Centre; Agri-Business Centre (ABC), Agro Enterprise Development & Information Service Centre (AgEDIS), and Protected Agricultural Entrepreneurs Industrial Association based at the University of Peradeniya, University-Industry Interaction Cell (UIIC) Cell based at the University of Moratuwa are some of recently established centres that closely work with the private sector enterprises.

4.5.4.6 Intellectual Property Rights (IPR) and related activities

There is no shortage of literature on IPR affirming its role in the technology development and innovation[64]. In Sri Lanka Intellectual Property Rights are protected and governed by the Intellectual Property Act of 1979 and subsequent amendments of 1980, 1983, 1990, 1997, 2000 and 2003. Sri Lanka is also a member of the World Intellectual property Organisation (WIPO) and signatory to number of international and bi-lateral treaties including TRIPS[65] (Trade Related Intellectual Property Rights). The National Intellectual Property Office (NIPO) manages the affairs of IPR and all patents, designs and trademarks must be registered with NIPO. Although there are laws and regulations to protect IPR, infringement is very common in Sri Lanka mainly because of the lack of public awareness on IPR and weak enforcement of IPR laws[66].

The NIPO statistics provides a good indicator to determine Sri Lanka's progress of Intellectual property rights. In 2002, 85 percent Patent applications (Resident), 6 percent Trademarks and 54 percent Industrial designs applications were granted (NIPO, 2002). A study on trends and patterns of patents by Amaradasa and Silva (2000) found a significant annual growth in number of patents granted. One forth of the granted patents was from the corporate sector which provides an ideal measure of a low level of innovativeness of Sri Lankan enterprises. The chart below (Figure 4.3) shows that the average success rate of patent applications stood at 65 percent during the ten-year period between 1980 and 1989 and then rose to 80 percent

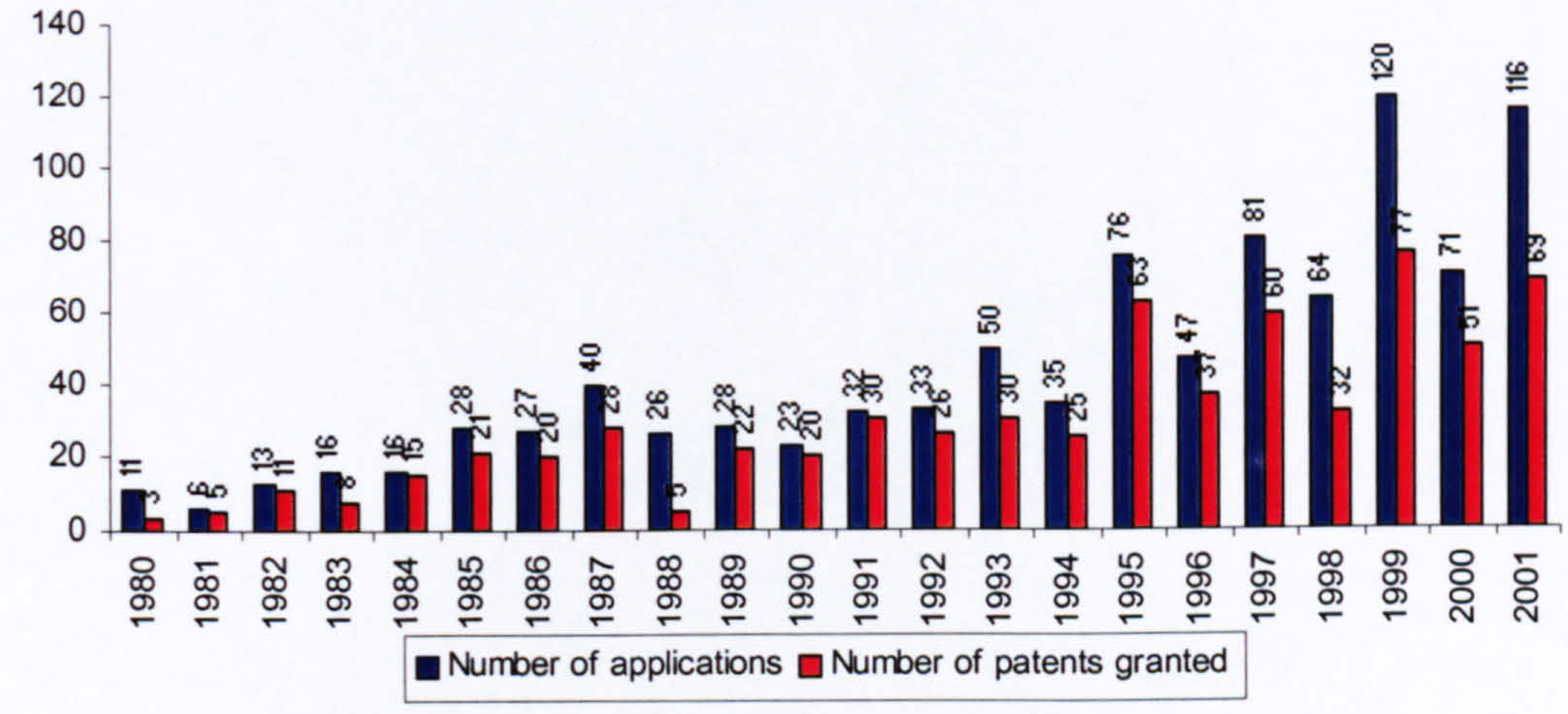
[64] Generally, Intellectual property (IPR) refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce. Intellectual property is divided into two categories: Industrial property, which includes Inventions (patents), trademarks, industrial designs, and geographic indications of source; and Copyright, which includes literary and artistic works and architectural designs (Source: World Intellectual property Organisation (WIPO) http://www.wipo.org). The most common form of protecting intellectual property is a patent which is granted for a certain period of time (maximum of 20 years) allowing the patent holder to exploit it commercially.

[65] The Trade Related Intellectual Property Rights (TRIPS) agreement, a part of GATT/WTO[65] which came into effect recently which covers plant and animals resources is considered as a serious threat to local resources, indigenous knowledge.

[66] Source: http://www.emich.edu/ict_usa/SriLanka.htm

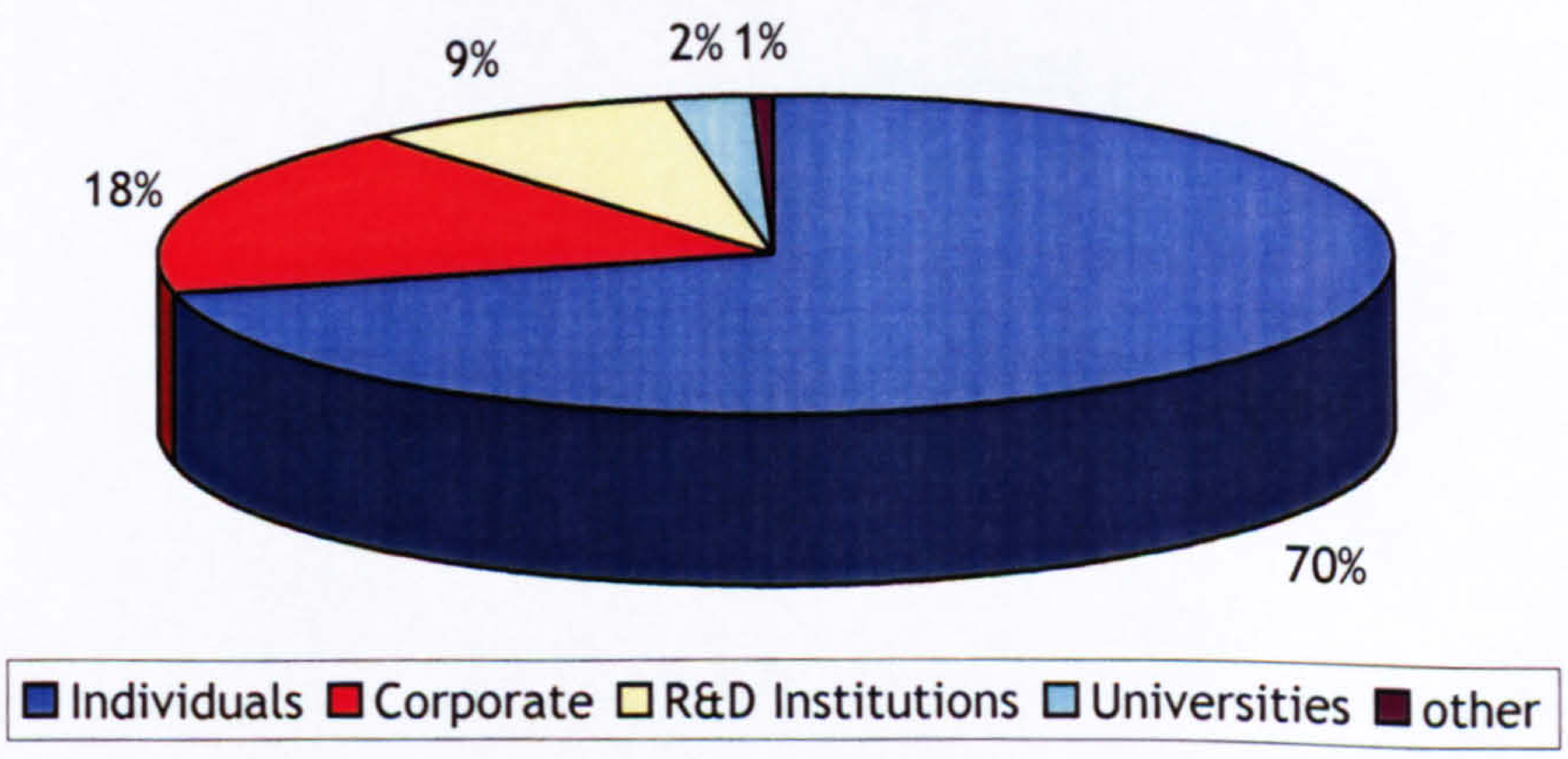
between 1990 and 2001. Between 1995 and 2001, 71 percent of the 400 patents granted were awarded to individual applicants and the corporate sector accounted for 18 percent followed by R&D institutions (8 percent) and Universities (2 percent) (see Figure 4.4).

Figure 4.3: Patent registration in Sri Lanka - 1998 to 2001



Source: Data for 1980-1998: Amaradasa and Silva (2002) Data for 1999-2001: Own analysis based on Patent Records

Figure 4.4: Patents granted by ownership – 1995-2001



Source: Own analysis based on Patent Records

4.4.4.7 Financial assistance for technology and innovation

Financing technology development and innovation is often seen by entrepreneurs as a risky affair because of the unforeseeable returns associated with it. Generally, SMEs in Sri Lanka rely on bank finance for the acquisition of new technology but rarely obtain finance for innovative and technology development projects (e.g. R&D, product and process development, and quality and standards improvement) because of the difficulties in assessing their financial viability. During the survey, the owner managers interviewed indicated that bankers and venture capitalists are not generally prepared to share the risk associated with research-based projects. One of the reasons they pointed out was the lack of technical knowledge and expertise of lenders to assess such projects. On the other hand, meeting high collateral requirements is another constraint as 'technological knowledge' deriving from R&D related activities (intangible assets) are not considered as a viable collateral by lenders.

Apart from the 'Technology Transfer Fund' managed by the National Development Bank (NDB) no specific financial assistance or grants scheme for R&D projects is currently available. The NDB provides eligible SMEs low-interest loans to purchase quality control equipment, meet the cost of training of staff and consultancy services[67]. There are non-financial incentives schemes being offered by Board of Investment (BOI) and Export Development Board (EDB)[68] for engineering, ICT and export-oriented agriculture based SMEs although these schemes are extremely complex and hardly convincing. The research grants scheme managed by the National Science Foundation of Sri Lanka (NSF) provides financial assistance for universities and research centres to conduct science and technology research which has commercial which has commercial application. Under this scheme, financial grants are provided for joint research projects between industry and university/state sector research organisations. The functional aspects and the progress of this scheme were not available at the time of writing this Chapter.

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[67] Source:http://www.ndb.org/news/strong.html -18/11/2003

[68] See Annex C for current framework of incentives available for SMEs.

4.5 Summary

Although SME development was identified as a priority area by every government that came into power, there has been no effective SME and technology policy. In spite of the varied types of independent SME support initiatives run by a host of institutions, their effectiveness and efficiency remain doubtful. Based on the analysis presented in this chapter, I would argue that the absence of a clear cut policy and a mechanism to coordinate activities can lead to duplication of programmes and loss of efficiency. A need for an institution to take charge of small business development in Sri Lanka similar to Small Business Administration (SBA) in the US and Small Business Service (SBS) in the UK is extremely pronounced. On the positive side, the new SME policy announced recently (in 2002) has proposed a coordination body. A similar recommendation was also made in the Industrial Development Master Plan in 1999 emphasising on unifying all policy-making institutions under one agency (Industrial Policy Council (IPC)) and also a dedicated institution called the Small and Medium Industry Development Corporation (SMIDEC) to take charge of SME development activities. Unfortunately, none of these recommendations have been materialised in a meaningful manner which characterises the lack of policy coherence, consensus and inconsistency and changing government priorities.

This chapter highlighted the trends and patterns of industrial development, policies and support framework and their effectiveness on SME development, technology and innovation in particular, and the position of SMEs within the overall industrial sector. An important observation emerged from this analysis is the policy inconsistency as result of the political and economic instability. As argued by Silva (1977: 131 cited in Abeyratne, 1989) one of the reasons could be the political independence of Sri Lanka did not bring about any drastic changes on the political front nor the political leadership felt the need for an economic structural change. Whilst the policy measures may not have led to the formation of a stronger domestic industrial class and industrial sector, some specific policy measures may have left to weaken them (Abeyratne, 1999:69). On the other hand, SMEs have not had their fair share compared to the larger enterprises during when 'closed' and 'open' economic policies were pursued. Although the post liberalisation regime has offered a variety of opportunities for SMEs, the policy bias towards foreign investment and larger 'export oriented' enterprises (e.g. apparel and garments) have deterred SMEs to a certain extent taking full advantage of the liberal economic climate. The political and economic consequences alone cannot be held responsible for all these ills. I also argue that the lack of an entrepreneurial culture coupled with the absence of an effective and appropriate support environment should be blamed for the poor performance SMEs. The existence of an entrepreneurial culture too is equally important where entrepreneurs are respected and well supported.

Although little has been written on Sri Lanka's technological performance and capabilities, from the above discussion it has emerged that Sri Lanka's economic development based on free market policies has not adequately responded to innovations and technological growth in the country, especially in SMEs. Various indicators suggest that technological growth has not been very impressive compared to other developing countries with similar economic status.

Over the past three decades, a number of policy initiatives focussing on strengthening technological capabilities have been proposed but very little has actually been achieved. This chapter highlighted that the science and technology infrastructure has not been consistent with the SME development and unable to match the increase in demand nor stimulate technological innovations and manufacturing excellence in SMEs. A report by UNIDO (1986 cited in Kelegama, 1990) stressed that there is a greater scope for technical assistance in the field of production support facilities such as quality, testing, design, packaging, however these major non-price determinants of competitiveness are currently insufficiently developed. The analysis presented in this chapter demonstrated that such determinants have not improved much in the past 20 years. In a small developing country like Sri Lanka, shortage of science and technology personnel and limited financial resources to achieve a high level of performance in scientific and technological research and innovation seem to be far from reality. It also appears that policy makers and science and technology community believe that local R&D and technology development should focus more on the ways of using local raw materials for industrial, development of import substitute products and development of appropriate technology. While not disputing the importance of this focus, I argue that technology developments and innovations should be market oriented and need to keep abreast with the global trends.

This chapter also argued that there is no easily identifiable technology diffusion and transfer strategy in Sri Lanka neither a visible interaction between science and technology community and SMEs and these institutions are concentrating on basic research rather than on applied research to solve technology and innovation related problems and constraints of SMEs (see for example Kelegama, 1990, Weiss, 1998: Piyadasa, 1990 cited in Kelegama, 1990). A study by NASTEC also found inadequate interactions within and between institutions as an inherent weakness of R&D institutions in Sri Lanka (NASTEC, 2000). As Dias (1990) reported, the country's financial instability such as devaluation of Rupees, high interest rates and inflation has raised the transfer cost of technology. The analysis of the existing support system suggests that the common limitation of the technology support services has been the weak institutional capacity to meet a diverse spectrum of business requirements and provide solutions that is cost effective, while being robust and performing to high standards. The service providers lack timeliness, market orientation and collaboration with SMEs. As Pieris (2000) pointed out, technology support infrastructure must be more demand oriented in catering technology intensive enterprises and the government policy must be reoriented towards allocation of additional resources to R&D and technology support institutions (e.g. financial resources to subsidise R&D).

Another weakness identified in this analysis is the lack of innovating thinking, novel approaches and new institutional structures in the policy formulation and implementation. Some of these interventions such as business incubators, science parks, university-industry networks, and clusters have been very successful in both developed and some developing countries and could be adapted to local conditions to foster and stimulate knowledge based/technology based enterprises. The modalities of technology capacity building in SMEs vary depend on the size of enterprises and sectors in which they operate. However, creating an innovative R&D culture and appropriate support initiatives can boost not only technology capabilities of SMEs that would undoubtedly lead to higher technological performance and innovations.

Chapter 5

Investigating the Effectiveness of Business and Technology Support for the Technology Performance of SMEs: Rationale, Methodology and Findings

PART 1: The rationale, methodology and the sample dataset

5.1 The rationale

The need for a well-defined policy and a technology and innovation support framework in Sri Lanka has been the main focus of attention in policy and academic circles over the past two or three decades. There is a wealth of literature that asserts that technological change in SMEs is a result of entrepreneurial dynamism (individual and organisational) and external interventions. This empirical investigation draws substantially from the literature review (Chapter 2) on the relevant theories of entrepreneurship, technological change, technology and innovation, and policy analysis. Further, this empirical analysis draws on the review of the SME sector and policy environment in Sri Lanka discussed in Chapter 3 and 4. In line with these theoretical approaches the basis for this research is drawn from Wignaraja (1998) who argued that technological capabilities are determined by access to certain factor inputs such as capital, labour, skills, economies of scale and technology and appropriate policy support and interventions that assist firms to overcome market failures in technological development and innovation.

The analysis of literature presented in Chapter 3 and 4 clearly suggests that domestic technological activity in Sri Lanka is sparse and a number of reasons have been identified as being potential contributing factors. Drawing on the literature review and Wignaraja's contention that industrial technology development is crucial for the competitiveness of large and export oriented enterprises, this empirical investigation is based on the notion that environmental potentialities (e.g. macro-economic conditions, direct interventions and assistance by the government in factor markets) and human potentialities (characteristics of owner/managers and enterprises) influence the level of technological capabilities of SMEs[69].

5.2 Methodology

The objective of this investigation is to undertake a comprehensive analysis of technological capabilities of both manufacturing and service SMEs focussing on the patterns and determinants of technological activities and the nature of technological efforts being undertaken by enterprises. This investigation is a systematic attempt to assess the technological competencies of SMEs in Sri Lanka and to gain a better understanding of the role played by business and technology support services in enhancing technological performance and the innovativeness of SMEs. Primarily four key factors have been identified in the literature review as significantly influencing the technological capabilities of SMEs:

- Technology and innovation activities
- Characteristics of owner/manager and firm-level, especially skills and attitudes and characteristics of the firm
- Impact of business and technology support services and networks, and
- Internal and external barriers and constraints.

In this research, three empirical research methods are applied in order to respond to normative questions about what factors influence the technological capabilities of SMEs. These research methods include: an analysis of quantitative and qualitative data collected from a sample of 90 SMEs in Sri Lanka; case study analysis of two enterprises and a business support agency (Industrial Services Bureau of North Western Province). The qualitative data from sample companies is derived from written and verbal

[69] See for example Tolentino (1994)

responses to open ended questions. Of the 90 respondent firms, the data of 15 firms was collected in the course of visits to firms and face-to-face interviews with owner/managers. The verbal responses to open ended questions, prompts and probes were recorded during the interviews and translated verbatim where appropriate into English and are presented as quotes in this Chapter. The face-to-face interviews provide an additional layer that could not possibly be gathered in the quantitative analysis.

The rationale for the selection of the two enterprise case studies presented in Chapter 7 is these firms' high level of innovation, their technology content, size and regional representation. Materials for the case studies derive from the information provided by owner/managers in the structured questionnaire and face-to-face and telephone interviews using a semi-structured questionnaire. The telephone interviews were recorded and the transcripts were translated into English. These two case studies present an analysis of determinants of firms' technology and innovation activities, barriers and linkages with external support services.

The materials for the case study concerned with the business support agency (Industrial Services Bureau of North Western Province (ISB)) derive from internal records, statistics, reports and interviews with ISB staff and also my own experience as the deputy head of ISB working on the programme discussed in the case study.

5.3 The survey sample and data set

The quantitative and qualitative data for this study was derived from a randomly selected sample of enterprises constructed using published and unpublished sources; the data was collected from the postal survey and face-to-face interviews carried out in 2002 and 2003 (Please see Annex B for the questionnaire)[70]. The following sources were used to construct the sample frame:

[70] Conducting surveys involving SMEs, more importantly identifying a survey sample and data collection can be a formidable challenge in conducting SME research in like Sri Lanka where

- Sri Lanka Export Directory (online) – export oriented enterprises located in Western province, Central Province, North Western Province and Southern Province
- Enterprises supported by Industrial Services Bureau of North Western Province
- Members directory of Central Province Chamber of Commerce and Industry
- Members directory of Sabaragamuwa Chamber of Commerce and Industry.

As argued in Chapter 2, Sri Lankan enterprises can be distinguished as 'formal' or 'informal' enterprises based on their legal form. According to the western notion, informal firms are those marginalized from the formal economy. However, this contention is simply not valid in the case of Sri Lanka for the reason that the so-called formal and informal enterprises (by legal definition) play an equal role in the economy. Therefore, the difference between formal and informal firms in Sri Lanka does not seem to be a significant issue for the SME policy and support measures. In terms of business support, the agencies simply ignore 'the formal and informal' debate' as it is completely irrelevant and do not recognise it as an important determinant to the delivery of business support. On the other hand, entrepreneurs/owner managers have no idea whatsoever about the informal and formal division. The importance of the informal and formal enterprises in Sri Lanka and the strength of my personal contacts with such firms have been the salient reason for the selection of my sample frame which includes both formal and informal sector firms.

In order to ensure a balanced geographical representation, a sample of 600 SMEs was stratified according to the size (up to 250 employees) and

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there is no easily accessible small business data. Another problem is the negative attitude of owner/managers towards surveys as there is a general belief among owner/managers that giving out information about businesses would expose their true status and government authorities (e.g. taxman and labour authorities etc.) would use these information against them. This could be the reason for absence or rarity of SME research in Sri Lanka.

territorial area representing five of the nine provinces[71]. With the exception of the Western province, North Western and Central provinces are relatively developed and the rest (Southern and *Sabaragamuwa*) are considered as backward regions (see Map 1 for spatial distribution of SMEs).

Produced in both Sinhalese and English, the questionnaire was designed to capture information on the characteristics of the entrepreneur and firm (profiles), technology and innovation activities, ICT penetration, problems and constraints of technology development, use of external business support and external support needs. The questionnaire was piloted before it was despatched to 600 plus SMEs. The response rate of around 15 percent was achieved mainly by virtue of personal contacts; follow up by telephone and personal visits to enterprises. 70 questionnaires were returned undelivered because of business relocation, closure of the business or incomplete addresses. Of the 105 returned questionnaires, 90 were selected for analysis and the rest disregarded because they were either incomplete or found to be from large enterprises (more than 250 employees).

The Table 5.1 presents the composition of the sample according to the size based on number of employees (micro – 0 to 9 employees, small – 10 to 49 employees and medium – 50 to 249 employees) and type (manufacturing and services). The sample of 90 enterprises is made up of 47 small (52.2 percent), 35 medium (38.9 percent) and 8 micro (8.9 percent) enterprises, and 94 percent (85) are manufacturing. As shown in the Table (5.1), the average number of employees in micro enterprises was 6, while the averages for small and medium enterprises were 25 and 135 respectively. About 95 percent of the respondents were manufacturing businesses[72].

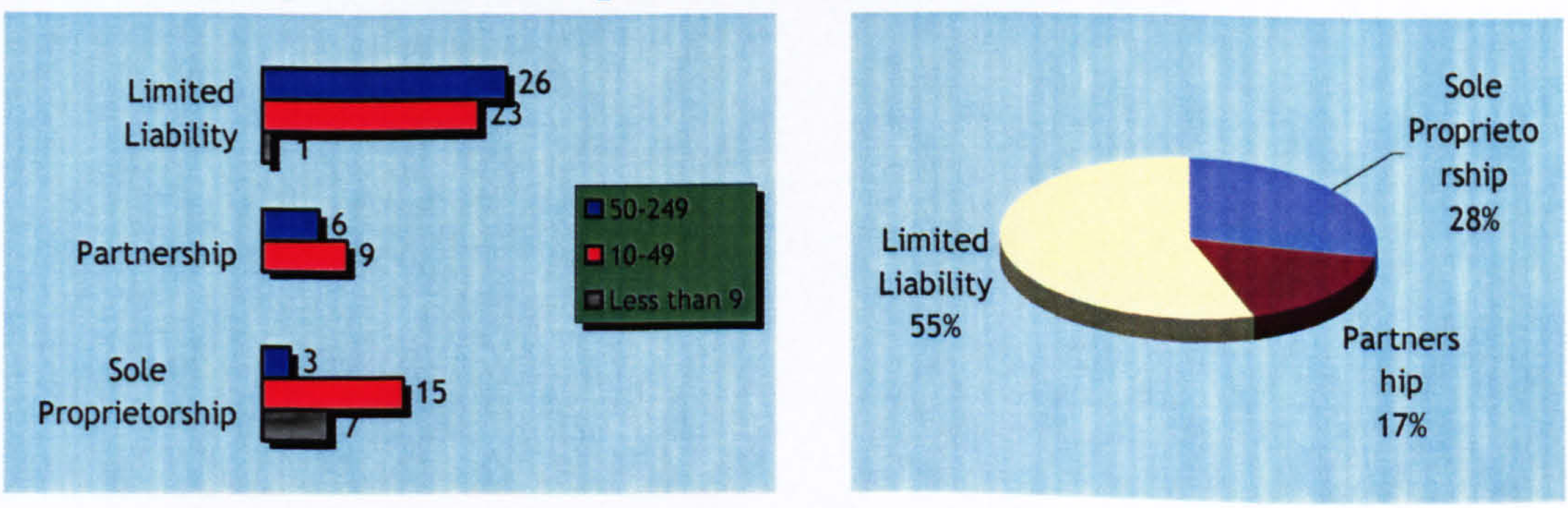
[71] North and East provinces were left out as travelling to these provinces is risky. North Central and Uva provinces are predominantly agricultural areas and business activities are relatively limited.

[72] Since this investigation put more emphasis on production and process technology and innovation, sample selection may have been biased in favour of manufacturing.

Table 5.1: Characteristics of respondent SMEs (n=90)				
	Size band (based on employment in 2002)			
	Micro Less than 9	Small 10-49	Medium 50-249	Total
Manufacturing	7	45	33	85 (94%)
Services	1	2	2	5 (6%)
Total	*8 (8.9%)*	*47 (52.2%)*	*35 (38.9)*	*90 (100%)*
Average employees	6	25	135	66

About 55 percent of the firms in the sample were Limited liability companies whilst Partnerships and Sole proprietorships accounted for 16.7 percent (15) and 27.8 percent (25) respectively (see Figure 5.1). There were thirteen (14.4 percent) Board of Investment (BOI) approved firms[73] of which 5 were foreign joint venture firms. About 23 percent (21) were exporting companies with another 23 enterprises identified themselves as 'indirect' exporters. One third of responding enterprises (34.4 percent) operate as family businesses, of which 16 were small and 13 were medium-sized enterprises. This shows that family businesses still figure prominently in the SMEs sector. One observation made in this analysis is that the legal status of respondent firms has no relevance to the way they function as nearly half of the respondents operate semi-formal or informal basis depending on the location (mostly rural) and sector (type of products and services).

Figure 5.1: Legal status of respondent firms



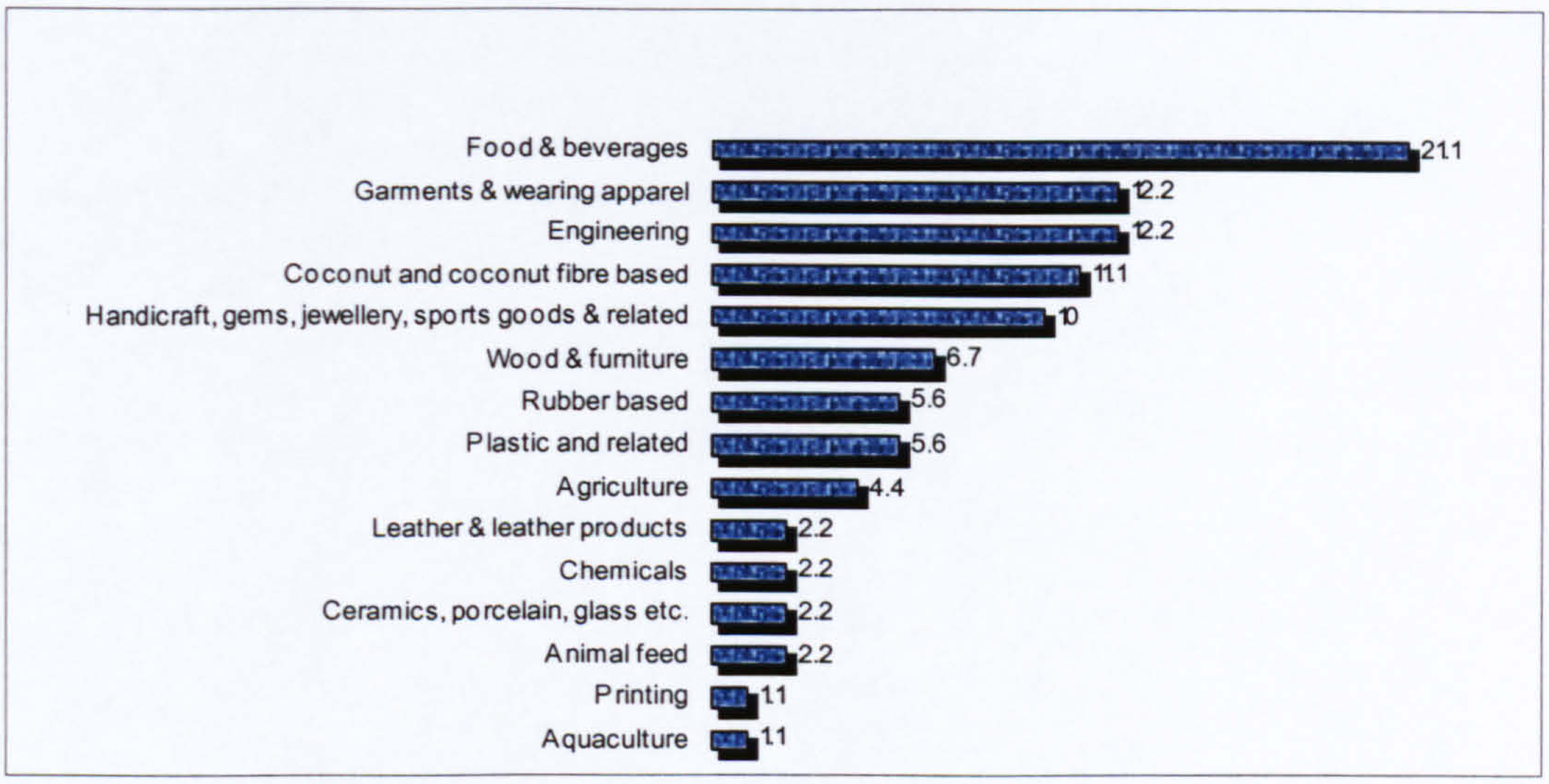
In terms of geographical representation, 41 enterprises were from Central province (45.6 percent), 29 from North Western province (32.2

[73] These companies qualify for various fiscal and financial incentives entitled under BOI Law.

percent), 10 from Western provinces (11.1 percent), 8 from Sabaragamuwa province (8.9 percent) and 2 from Southern province (2.2 percent).

Based on the products or services, the sample is classified using three-digit International Standard Industry Classification (ISIC) and presented in Figure 5.2 (see Annex C for a detailed breakdown of the sample firms by sector). As can be seen from the chart (5.2), the majority of firms were in Food & beverages sector (21.1 percent or 19 enterprises) followed by Garments & wearing apparel (12.2 percent or 11 enterprises) Engineering (2.2 percent or 11 enterprises) and Coconut and coconut fibre based sector (11.1 percent or 10 enterprises). All coconut-based enterprises were located in the North Western province while the majority of enterprises in the Food & beverages were from the Central province. This underlines the fact that the availability of raw materials has been one of the main determinants of choice of location for enterprises studied. For example, following the recent boom in demand for coconut fibre products, there has been a marked increase in business start-ups in the coconut and coconut fibre industry in the North Western province. Another significant trend observed in the course of this research is the relocation of enterprises in secondary fibre processing from other provinces to the North Western province where the coconut is grown (especially from the Western province). Similarly, a relatively higher level of fruit and vegetable production in the Central province in recent years has created opportunities for agriculture-based start-ups within the province.

Figure 5.2: Survey sample by major activity/product sector (%)



After considering various theories on business life cycle (e.g. Churchill and Lewis, 1983: Kazanjin, 1988: and various others) the sample was categorised into four different age groups by the year the business was established (Table 5.2). Of the 90 respondents, 88 had reported the year of start and as Table (22) shows the majority of firms were in the 3 to 10 years age bracket (34.1 percent) while the 11-20 year old age group represented 29.5 percent followed by the 'over 20 yrs' group (25 percent). About 11.4 percent of enterprises were aged less than 3 years.

Table 5.2: Age classification of respondent enterprises (n=88)

Age group	Classification	Number of enterprises	%	Mean age (Years)
Less than 3 yrs	Start-up/Young	10	11.2	1.7
3-10 yrs	Growth	30	33.7	6.8
11-20 yrs	Maturity	26	29.2	13.9
Over 20 yrs	Decline/renewal	23	25.9	31.5
Total		**89**	**100.0**	

5.3.1 Some observations on the employment and financial growth performance of sample firms

This section examines the growth performance of respondent SMEs in terms of employment, turnover and value of exports for the four-year period between 1998 and 2002. As Table 5.3 illustrates, of the 90 firms, 77 firms aged 4 years or older accounted for a total of 4505 jobs created in 1998 and 5251 in 2002, an increase of 16 percent within four years. There seems a significant increase of employment in all three occupational categories where the share of manual workers has increased by 30 percent in the same period. This indicates that the respondent firms were highly labour intensive with higher proportions of semi or low skilled workers. Although the number of managerial workers had increased substantially during this period, their share of total workers was as low as 7-8 percent. The low proportion of managerial workers may be attributed to the informal management style of most small and medium-sized owner/manager run businesses. Overall, the employment creation ability by sample firms has been significantly higher in the four-year period analysed.

Table 5.3: Occupational structure of employees

	1998	2002	Growth %
Total employees (n=77)	**4505**	**5251**	**16%**
Mean	**59**	**68**	
Managerial/supervisory (n=68 and n=72)	312	426	36%
Mean	*5*	*6*	-
As % of total employees	7%	8%	-
Technical (n=61 and n=64)	240	252	5%
Mean	*4*	*4*	-
As % of total employees	5%	8%	-
Manual (n=71 and n=72)	3430	4444	29%
Mean	*48*	*61*	-
As % of total employees	76%	85%	-

A closer look on the data in Table 5.3 reveals that 34 firms (47 percent) had more than doubled their managerial staff in four years and one half of them were small-sized enterprises (size band 10-49 employees). This can be viewed as an indication that small-sized enterprises' extending their managerial competencies by employing skilled managers. One of the most notable findings is, however, the low rate of graduate employment reflected in the firms surveyed (Table 5.4). The average number of graduates was as low as 0.69 in 1998 but slightly improved in 2002 averaging 1.3 still considerably low. The share of graduates relative to the total workforce was just over 1 percent. In contrast, the share of employees with further education and vocational qualification was relatively higher signifying the firms' preference for workers with specific skills. As discussed in Chapter 4, the above analysis asserts the high level of graduate unemployment and the low proportion graduate employees in the private sector in Sri Lanka, a matter that has to be dealt seriously by the policy makers.

Table 5.4: Education and skills of employees

	1998	% of all employ.	2002	% of all employ.
Higher education qualif. (n=55 and n=57)	38	1.2%	74	1.4%
Mean	0.69		1.3	
Further education qualif.(n=60 and n=63)	277	6%	316	6%
Mean	4.6		5.0	
Vocational qualif. (n=63 and n=65)	458	10%	818	16%
Mean	7.0		13.0	

5.3.1.2 Financial performance

About half of the sample provided financial information for both 1998 and 2002. An analysis in terms of reported growth shows that there were 7 negative growth firms, 4 'zero' growth firms and 32 'marginal growth' firms (growth between 1 and 99 percent) and 11 high growth firms (growth more than doubled). The average financial growth of the whole sample was 97 percent.

5.3.1.3 Growth performance by sector

The Table 5.5 illustrates the financial performance of respondent firms by sector. As is evident from the data, firms in the Wood and wood product sector recorded high levels of growth with respect to their turnover (as high as 400 percent) with the majority being furniture manufacturers. The turnover of firms in the Food and beverages and Handicrafts sector grew at a modest rate at around 80 percent and 57 percent respectively. Interestingly the growth rates in 'high technology' sectors such as engineering, chemical, rubber and plastics were fairly low, between 20 to 50 percent. The Garments and wearing apparel sector has achieved only about 30 percent growth which suggests that there are a large number of smaller firms in this sector operating in a highly competitive and limited domestic market. The export performance also suggests a mixed picture with traditional export products such as Coconut and coconut-based products showing a decline (negative growth).

Table 5.5: Sector financial performance

Sector	Average Turnover growth (%)	Average Export growth (%)
Wood & wood products	421.03 (n=6)	
Food & beverages	80.83 (n=13)	200.00 (n=3)
Handicrafts, gems & jewellery	57.02 (n=5)	25.70 (n=3)
Rubber based	50.54 (n=4)	21.05 (n=1)
Agriculture	47.25 (n=3)	22.22 (n=1)
Engineering	25.53 (n=4)	-
Garments & wearing apparel	27.75 (n=6)	0.79 (n=4)
Plastics & related	21.38 (n=3)	25.56 (n=2)
Coconut and coconut products	18.85 (n=4)	-9.05 (n=3)
Animal feed	-41.05 (n=2)	-

Note: Only the sectors with more than 2 firms were analysed.

The results of the analysis of both financial and employment growth performance (Table 5.6) suggest that firms in the Wood & furniture sector performed strongly compared to other sectors whilst Coconut and coconut fibre products, and Food and beverages which rely on local raw materials performed particularly poorly despite being identified as sectors with higher growth potential by the Ministry of Industries and Enterprise Development.

Table 5.6: Firms' growth performance in main product sectors

Sector	Variables	Mean	Median	Std. Deviation
Wood & furniture	Employment growth % (n=6)	93.6	90.3	111
	Turnover growth % (n=6)	*421*	*208.3*	*574.5*
Engineering	Employment growth % (n=9)	80.5	44.4	106.6
	Turnover growth % (n=4)	*25.5*	*14.5*	*32.4*
Food & beverages	Employment growth % (n=18)	58.2	29.3	97.8
	Turnover growth % (n=13)	*80.8*	*50*	*108.9*
Coconut & coconut fibre products	Employment growth % (n=8)	2.9	0.6	29.8
	Turnover growth % (n=4)	*18.8*	*31*	*72.3*
Apparel & garments	Employment growth % (n=9)	1.6	1.2	26.6
	Turnover growth % (n=6)	*27.8*	*31.7*	*24.8*

PART 2: Empirical findings

5.4 Introduction

In line with the three research questions outlined in section 1.2 (and 5.2), the findings from the analysis of 90 returned questionnaires and interviews are presented in this section based on four quantitative and qualitative content analyses. They are:

Technology and innovation performance of respondent SMEs,

Relationship between firm level characteristics SMEs technology and innovation capabilities,

Relationship between technological and innovation capabilities and accessing external support,

Barriers to technology and innovation capability.

The evidence from the quantitative and qualitative analyses is supported by three case study analyses and the first, a case study of business and technology support for SMEs in Coconut fibre industry sector in the North Western province is given in Chapter 6. This case study outlines a number of issues surrounding the coconut fibre sector and support interventions for enterprises in this sector; and compares and contrasts national and regional SME support policies. Second, two company case studies are presented in Chapter 7 to illustrate the determinants of the firms' technology performance, barriers to technology capability building and innovation and their perceptions of external support.

The empirical findings presented in this chapter derive from both quantitative and qualitative analysis and thus represent a mixed method approach. This approach entails constructing statistical interpretations and conceptual explorations supported by qualitative explanations. The quantitative information on the firm and owner manager characteristics, technology activity, access and delivery of external support service, barriers and constraints to technology and innovation were analysed using SPSS.

5.4.1 An analysis of technology and innovation performance of respondent SMEs

This section investigates technology and innovation strategies of respondent firms based on the notion that new technology presents SMEs with new opportunities that may well lead to better performance in the short and long-term. The primary focus of this analysis is the technology and innovation capabilities of respondent firms and to establish whether the characteristics of firms (size, sector, ownership, and location) and their linkages to business support networks have any impact on the firms' technology and innovation performance.

As highlighted in Chapter 2, the innovativeness or innovative behaviour of SMEs is characterised by frequent and extensive technological and / or managerial innovations. Technology development and innovation in a firm largely depends on its organisational characteristics (firm size and firm age), number of products, production relations, markets (Malecki, 1997) and more importantly entrepreneurial ability (Shan, 1994) innovative behaviour (Karlsson and Olsson, 1996) and characteristics of the entrepreneur (Schumpeter, 1939).

This section constructs a methodological framework for cross-sectional estimations with technology and innovative activities as the independent variable and, firm-level characteristics and linkages with external support networks as dependent variables. The latter will help identify the factors determining firms' technology intensity and innovativeness.

In order to establish and measure technology and innovation capabilities and performance, the responses are categorised into four broader 'conceptual measures': firm's strategies of technology adoption and technological capacity building labelled as 'Technology adoption and capacity building' (TECHCAP); innovative activities labelled as 'Technological innovativeness' (TECHINNO); intensity of firm's innovativeness in terms of 'Radical innovations' (RADINN) and 'Incremental innovations' (INCINN) and firm's managerial innovation (innovative work practices and methods) labelled as 'Management innovations' (MGTINN).

5.4.1.1 Technology adoption and capacity building of respondent firms

In this section, the responses to six specific questions on technology adoption and technology activity are analysed to elicit factors that are more likely to influence firms' technology capacity. Almost all owners/managers interviewed indicated that they consider the adoption of new technology, product and process innovation as being key business strategies that are key to ensuring their firm's competitiveness. However, the survey findings indicated that firms often constrained by a number of internal and external factors that inhibit firms' technology performance and innovation and these factors are discussed in the following sections.

The technology development strategies and activities of firms surveyed are given in Table 5.7. The analysis shows, 82.2 percent (74) of responding firms cited acquisition of *'hard technology'* e.g. new machinery and equipment, as being the most common technology strategy. Interestingly, small firms are more likely to acquire new machinery or external technology (48.6 percent) compared to other firms in the sample. The new technology in the form of 'hard technology' is typically foreign[74], and imported from countries such as India, China, Taiwan, Singapore, and Malaysia renowned for cheaper technology solutions than those of European or US origin. In Sri Lanka, there are a small number of machinery and equipment manufacturers especially in food/fruit processing, coconut oil milling, grain processing, and construction industry. However, when asked about the local / domestic technology, the respondents said they preferred imported machinery and equipment because the domestic technology is 'less sophisticated' and good for simple operations' and raised concerns about their reliability and efficiency.

[74] This is largely due to the absence or weak capital goods manufacturing sector in Sri Lanka which is still in 'infant' stages simply because of the lack of infrastructure, skills and low domestic demand.

Table 5.7: Technology development strategies by respondent firms (by individual activity)					
Variable ID	Description of activity	Number of respondents			
		All (n=90)	Micro (n=8)	Small (n=47)	Medium (n=35)
tech_new1	Acquisition of new machinery/new external technology	74 (82.2%)	7 (88%)	36 (77%)	31 (89%)
tec_trn1	Technical skills development	64 (71.1%)	5 (63%)	31 (66%)	28 (80%)
tec_jntt	Joint technology development with customers / suppliers / support agencies	49 (54.4%)	2 (25%)	28 (60%)	19 (54%)
It1_2002	Adoption of ICT	61 (67.8%)	3 (38%)	30 (64%)	28 (80%)
te_tesha	Technology sharing with foreign/local firms	40(44.4%)	3 (38%)	24 (51%)	24 (51%)

Acquisition of 'soft technology' through training and skills development is another common strategy adopted by SMEs. Slightly over two thirds of respondent firms have indicated that technical skills development is as equally important for firms' technology capacity as '*hard technology*'. The analysis also shows that the firm's size is an important determinant and indicates that medium-sized enterprises are more likely to provide technology related training and skills for workers as a method of building the firms' technology capacity. Notably, some owner/managers preferred 'on the job training' as it helps '*mould workers*' to the firms' needs as well as the firms' working practices. This method seems to be more effective than recruiting trained or qualified technical persons which could be a costly affair for smaller firms. Evidently, there are two 'hidden reasons' as to why owner managers preferred this method, first the cost for providing 'own training' is relatively low and trainees would get only a training allowance while on the training. The other reason is freedom to 'hire and fire' trainees without following cumbersome procedures and retain only the best and loyal workers in the firm. The owner/managers indicated that the apprenticeship-training scheme run by NAITA[75] is the main source where most trainees are recruited appeared to be very useful for firms to identify and train young workers for technical jobs.

[75] National Apprenticeship and Industrial Training Authority

The study also examined SMEs engagement in technology and innovation activities involving external partners. For this analysis, external parties imply among other things, research and technology support agencies, customers, buyers and suppliers. It was found that slightly over a half of respondent firms (54.4 percent) have engaged in joint technology development activities of which about 42 percent have had such projects with customers[76], buyers or suppliers. A lesser number of respondent firms (31 percent) with R&D and technology support institutions. Among them, joint venture companies, exporting firms, engineering and chemical products manufacturing firms were more likely to have joint projects with R&D institutions. These evidences envisage the notion that technology development and innovation in firms are supposedly driven by market factors (or 'demand-pull'). The sectoral analysis suggests that firms in Food and beverages, Coconut based products and Chemical products sectors have shown a greater propensity to undertake joint projects with external support agencies.

The Industrial Technology Institute, Industrial Development Board and Coconut Development Authority were cited as the principal technology and R&D support providers which respondent firms had accessed for their technology support needs. About 44.4 percent of respondents have had technology sharing arrangements with large-scale (or corporate) local or foreign firms and about one half of them were exporting firms. This indicates that in most cases technology and quality related initiatives originate from principal overseas partners which are then passed down to local manufacturers usually under a technology sharing agreement. This is very much apparent in exporting firms in Apparel and garment, Food and beverages and Coconut fibre manufacturing sectors.

Despite the current policy interest and debates surrounding the benefits of the 'digital economy', the progress made by Sri Lankan firms has been very limited in integrating ICT in businesses operations. As per the information

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[76] Customers imply those in the upper end of the supply chain, usually, large distribution firms or exporters.

provided by sample firms, 68 percent of them are said to be using computers mainly for basic office functions and E-mail/internet for 'recreational' purposes. Only a small proportion of firms used ICT for commercial use such as buying and selling on the internet and more sophisticated purposes such as CAD/CAM (about 7 firms) and office networking etc..

The results of the analysis of 'Technology capacity' (TECHCAP)' measured by *Technology Capacity Index* are presented in Table 5.8. The Technology Capacity Index calculated by weighting five main technology adoption strategies (listed in Table 5.7) is applied to assess the level and intensity of technology activity in sample firms. The highest level -*Index '5'* signifies adoption of all five strategies and means that the firm is highly technologically active or demonstrates higher technology capacity. The lowest level -*Index '1'* represents the adoption of one strategy or demonstrates low level of technology activity. It should be noted that firms' strategies or activities are not ranked by any order of importance. As seen in Table 5.8, about a quarter of firms (24.4 percent) have undertaken all five activities and another 20 percent (18 firms) have undertaken 4 activities. These 40 firms (44.4 percent) can be considered as '*highly technologically oriented*' firms or firms with '*higher technology capacity*'. About 27 percent of respondent firms fall into the '*average technology capacity*' category and 22 firms (24.4 percent) with can be considered as firms with '*low technology capacity*'. There were three firms which had not engaged with any type of technology activity. These results explain that a higher proportion of respondents firms (72 percent) have undertaken at least three technology capacity building activities therefore can be considered as firms with higher technology orientation.

Table 5.8: Technology capacity (TECHCAP) of respondent firms

Technology Capacity Index	All (n=90)	Micro (n=8)	Small (n=47)	Medium (n=35)
5	22 (24.4%)	1 (12.5%)	10(21.3%)	11 (31.4%)
4	18 (20%)	1 (12.5%)	8 (17%)	9 (25.7%)
3	25 (27.8%)	1 (12.5%)	15 (31.9%)	9 (25.7%)
2	9 (10%)	2 (25%)	6 (12.8%)	1 (2.9%)
1	13 (14.4%)	2 (25%)	6 (12.8%)	5 (14.3%)
None	3 (3.3%)	1 (12.5%)	2 (4.3%)	-

The next analysis performed was an assessment of the level and intensity of technology deployment (or technology capacity) by firms in different size classes. As the data suggests, medium-sized enterprises are more likely to be highly technologically active or have achieved higher technology capacity compared to firms in other size classes. Another observation made related to the age of firms when they are becoming more technologically active. The firms in 3-10 years age bracket (growth firms) have displayed a higher propensity to be 'technologically active' mainly through acquisition of new machinery and equipment (hard technology). However, a number of owner/managers interviewed stated that the capacity utilisation of plants and machinery was considerably low where in most cases machinery and equipment left idling mainly due to low demand, low supply of raw materials and shortage of skilled workers. This was more apparent in firms in Desiccated coconut, Coconut fibre, Plastic goods, and Food and beverages sub-sectors. An owner of a small leather manufacturing enterprise stated that:

> *"I have been running this small leather footwear enterprise since 1980. When I started, I did not have much money but I was equipped just with my experience, knowledge and determination. By 2003, I developed my business into a profit-making venture and already had 53 employees. However, over the past two years things started getting worse due number of problems owing to marketing, internal management problems, lack of support from banks etc. Now my business operates with only at 10% capacity level with only 8 employees. This is the time I desperately need support from the government or support service to bring back my business into good shape."*
>
> -A quote from the face-to-face interview of a leather footwear manufacturer at Galagedara, Central Province (Small-sized enterprise, Male, Age 45 years)

This brings into question whether owner/managers technology investment decisions are taken with adequate assessment of firms technology requirements, market realities and within the context of firms' long-term strategies.

5.4.1.2 Technological innovations and innovation capacity of firms

This section analyses the innovative behaviour of firms. In the survey, respondents were requested to indicate firms' innovation strategies and activities, and their importance to firms' technological competencies. The innovation related activities are categories based on their level radicalness (products and services new to the firm and market) and incremental innovations (changes to existing products and processes). The analysis of 'radical' innovations is presented in Tables 5.9 and 'incremental' innovations in Table 5.10. In addition, firms' engagement in research and development activities as well as Intellectual Property is also presented in this section.

Table 5.9: Radical innovations by respondent firms (by size) (RADINN)

Variable ID	Description of activity	Number of respondents			
		All (n=90)	Micro (n=8)	Small (n=47)	Medium (n=35)
te_nuprd	Introduced new products	68 (75.6%)	5 (62.5%)	38 (80.9%)	25 (71.4%)
te_nupro	Introduce new production process	65 (72.2%)	5 (62.5%)	35 (74.5%)	25 (71.4%)
Highly innovative	Firms engaged in both types	56 (62.2%)	4	31	21
Moderately innovative	Firms engaged in one type	21 (23.3%)	2	11	8
Non innovative	None	13 (14.4%)	2	5	6

As illustrated by the data (Table 5.9), a larger proportion of firms have exhibited a higher level of innovation performance where 75 percent firms have engaged in new product development while 72 percent have introduced new production processes. This shows that firms have realised the importance of being innovative in order to be competitive in national and international markets. Notably, a higher proportion of small-sized enterprises (80 percent) have been actively involved in 'radical innovations' with 80 percent in new product development and 74 percent in new process development. It can also be observed that majority of firms (62 percent) have engaged in both product and process innovation and these firms can be identified as 'highly innovative'. Just over a half of them were small-sized firms (10-49 size band). However, large variations of firms' innovative outcomes have been observed where the innovativeness of firms can vary by sector and type of products being produced. Evidently, the nature of the market in which firms operate could strongly influence the 'radicalness' of a firm's innovations. Most firms view innovation as integral to the development and competitiveness of their businesses; however innovation efforts are often inhibited by various uncertainties in product markets and factor markets, and a lack of support and internal resource constraints.

The adoption of incremental innovations by respondent firms is analysed and presented in Table 5.10. As the data illustrates, the intensity of incremental innovations in respondents firms is significant. About 90 percent of firms have '*Made changes to existing products*' and another 85 percent '*Made changes to production processes.* About 80 percent of the firms have made incremental changes to both products and processes half of which were small-sized enterprises. Again, it would appear that small-sized firms demonstrated the higher level of innovativeness. During the interviews, a number of owner/managers of small-sized firms indicated that they recognise the importance of continual development of products and processes to meet constantly changing market needs.

Table 5.10: Incremental innovations by respondent firms (by size) (INCINN)

Description of activity		Number of respondents			
		All (n=90)	**Micro (n=8)**	**Small (n=47)**	**Medium (n=35)**
te_chprd	Incremental changes to existing products	81 (90%)	7 (87.5%)	44 (93.6%)	30 (85.7%)
tec_chpro	Incremental changes to existing processes	77 (85.6%)	7 (87.5%)	39 (83%)	31 (88.6%)
	Firms engaged in both activities	72 (80%)	6	39	27
	Firms engaged in single activity	14 (15.6%)	2	5	7
	None	4 (4.4%)	-	3	1

As highlighted in Chapter 2, in order to be technologically competitive firms must invest in R&D (see for example Gueirrie, 1997). Therefore, in order to assess the importance of R&D for firms' technology and innovative strategy, the R&D activities of respondent firms were examined. Over 72 percent of firms reported that some form of R&D has taken place at different levels and different scales depending on the firms' requirements. Endorsing the fact that small-sized enterprises in the sample were more innovative, the analysis revealed that 77 percent of small firms (36 firms) had undertaken R&D projects, followed by 71 percent of medium-sized and 50 percent micro firms. However, such data must be viewed and analysed cautiously because of the ambiguity of each respondent firm's differing understanding of R&D. Thus, considering the nature of the firms surveyed, R&D outcomes reported may have been either overstated or understated and therefore should only be taken as indicative but not as conclusive.

Table 5.11: R&D by respondent firms (by size)

	R&D expenditure 1998	R&D expenditure 2002	R&D Growth (All) %	R&D Growth *Zero or negative growth*	R&D Growth *1-99%*	R&D Growth *Over 100%%*	R&D expenditure in 1998 as % of Turnover	R&D expenditure in 2002 as % of Turnover
Cases	45	53	36	13	9	10		
Mean	Rs. 572,455	Rs. 509,889	190.0	-26.69	46.5	635.3	3.1	4.4
Median	Rs. 100,000	Rs. 200,000	50.00	-8.33	50.0	265.2	1.6	1.8

The only way the R&D performance could be assessed is by comparing firms' R&D expenditure (Table 5.11). The analysis shows that slightly more than half the sample (48 firms) claimed to have R&D budgets for the period surveyed and therefore, the level of R&D intensity of these firms was likely to be higher than the rest of the sample firms. The data also illustrates that 36 percent of the sample firms have increased their annual R&D budget; 10of these firms had doubled their R&D budget during the survey period. Another interesting finding is that the average share of R&D investment has increased from 3.1 percent in 1998 to 4.4 percent which demonstrates increased R&D activity by firms. It also appears that young (less than 3 years old) and growing (3-10 years) firms are more likely to have higher R&D budgets than mature firms. The relative expenditure on R&D as a proportion of turnover of young firms in 2002 was as high as 6 percent, growth firms averaged 4.6 percent, mature firms averaged 3.6 and declining/static firms averaged 4.3 percent. The R&D expenditure of firms in all growth stages seems to be considerably higher which might be linked to higher levels of product development and diversification. Interestingly, no association could be established between entrepreneurs' characteristics especially educational levels and age, and R&D engagement.

Further analysis of R&D data suggests that only 5 firms had in-house R&D facilities while another 8 had in-house testing facilities (laboratory). The firms in Coconut based (desiccated coconut and coconut fibre related products) and the Food and beverages sectors are more likely to have in-house testing facilities, as it is a pre-requisite for Standards certification as well as export certification requirements. The firms in Food and beverages, Wood & furniture and Engineering have spent substantial amounts of investment on R&D compared to other sectors while exporters are more likely to have higher R&D budgets relative to their turnover. One-third of exporters have shown a substantial increase in R&D expenditure during the period surveyed.

The data on Intellectual property (IP) related activities such as Patents, Trademarks, and Copyrights undertaken by the firms were collected in the survey and the findings are summarised in Table 5.12. As the data suggests, about 52 percent of firms reported to have engaged in one or more IP activities of which 23 firms (25.5 percent) had been granted Patents. Evidently, small-sized firms demonstrated relatively higher levels of innovativeness (16 firms) than medium-sized firms (7 firms). The Patent performances of different product sectors seem to be skewed towards knowledge-based and high technology sectors such as engineering while low technology based sectors too have shown some positive performance (5 wooden toys and sports goods manufacturing firms have acquired patents). Three firms in Food and beverages sector have also been awarded patents for organic tea, organic spices and herbal beverage products.

Table 5.12: Other innovative activities by respondent firms (by size) (OTHERINN)					
Variable ID	Description of activity	Number of respondents			
		All (n=90)	Micro (n=8)	Small (n=47)	Medium (n=35)
tec_rnd1	Research and development	65 (72.2%)	4 (50%)	36 (77%)	25 (71%)
te_paten	IPR-Patents	23 (25.5%)	-	16 (34%)	7 (20%)

Based on the information provided by firms surveyed about the activities related to innovative activities, the degree of firms' innovativeness was analysed and presented in Table 5.13. The analysis was performed using the cumulative number of reported *'innovative activities'* and categorised into three levels; *'Highly innovative'* – firms engaged in all six activities, *'Innovative'* – 4 to 5 activities and *'Lowly innovative'* - 3 activities or less. As the data demonstrates, nearly a one-fifth of the sample (18.9 percent) falls in to *'Highly innovative'* category of which 12 firms were small-sized firms (size group 10-49). About 52 percent of respondent firms can be classified as *'Innovative'* and higher proportion of them were medium-sized firms.

Table 5.13: Innovation outcome (INNOUT) (by size)				
	Size band (based on 2002)			Total
	Less than 9	10-49	50-249	
Highly Innovative	-	12	5	17 (18.9%)
Innovative	5	23	20	47 (52.2%)
Lowly innovative	3	12	10	26 (28.9%)
Total	8	47	35	90 (100%)

Highly innovative = Firms engaged in all innovative activities (6 activities)
Averagely Innovative = Firms engaged in up to 5 innovative activities
Lowly innovative = Firms engaged in 3 or less innovative activities

The Table 5.14 provides an analysis of firms' innovativeness by different product sectors. This analysis is based on the 3 'innovativeness categories' presented in Table 5.13 and the sectors are ranked by Mean averages of innovative activities undertaken by firms. The mean averages can be compared to evaluate the relative importance of individual innovative performance measures. This assessment may not give an accurate picture of the innovativeness of firms because no rating was assigned to each innovation activity. However, this analysis can be used to determine the overall level of innovative capacity of different product sectors.

Table 5.14: Innovation outcome by sector (INNOUT)	Highly innovative	Innovative	Lowly innovative	Mean level of innovation outcome	Total firms
Wood & wood products	2 (33.3%)	4 (66.7%)	0	5.1	6
Engineering	5 (45.5%)	4 (36.3%)	2 (18.2%)	4.7	11
Plastics & related	2 (40%)	2 (40%)	1 (20%)	4.6	5
Food & beverages	3 (15.8%)	12 (63.2%)	4 (21%)	4.3	19
Handicrafts, gems, jewellery	2 (22.3%)	3 (33.3%)	4 (44.4%)	4.0	9
Garments & wearing apparel	0	7 (63.6%)	4 (36.4%)	3.7	11
Coconut & coconut products	2 (20%)	3 (30%)	5 (50%)	3.6	10
Rubber based	0	3 (60%)	2 (40%)	3.6	5

Highly innovative = Firms engaged in all innovative activities (6 activities)
Innovative = Firms engaged in up to 5 innovative activities
Lowly innovative = Firms engaged in up to 3 innovative activities

The analysis demonstrates that Wood and wood products sector consists of a higher proportion of SMEs undertaking an average of 5 innovative activities (5.1 Mean level or average) followed by Engineering sector with just 4 activities (4.7 Mean level) (45.5 percent firms). Considering the characteristics of firms in the Engineering sector, the majority are machinery and equipment fabricators and require high level of technological competencies. The analysis also indicates that the innovativeness of firms in the Food and beverages sector seem to be relatively low compared to other sectors considering the technology development and innovation that are being taken place in this sector. As can be seen from the data that Food and beverages sector is characterised by a large number of food and fruit processing firms which are required by law to maintain and duly respect food safety parameters quality standards. One of the notable findings of this analysis is the poor innovation performance of Coconut products and rubber based products sectors although they have greater potential to perform well considering the increasing demand for natural products in the export market. The scope for technological innovations in the Apparel and garment sector appeared to be very limited because of the fact that innovations such as new designs (design innovations) are mostly done by foreign partners or buyers/investors leaving little or no room for domestic manufacturers to engage in innovative activities. However, a certain amount of managerial innovations is taking place in this sector through application of new work methods and quality assurance schemes, etc. The respondents in all sectors indicated that although they were fully aware of the potential for innovation through new product development, lack of R&D support, high costs, and more importantly, a lack of expertise inhibits innovation.

5.4.1.3 Management innovation of respondent firms

In the survey, the firms were also asked to identify innovative management practices being undertaken, for example, work methods, productivity improvements, quality standards and environmentally friendly work practices. These methods can be considered as factors influencing the facilitation of technology adoption and innovation. About fifteen types of innovative management practices were included in the questionnaire; the six most important practices have been considered for analysis (Table 5.15). As can be seen from the data, slightly over 64 percent of the respondent firms have established new management structures and about 66.7 percent have implemented new marketing strategies. Compared to medium-sized firms, smaller firms are more likely to have a new marketing strategy which suggests that there is a string link between marketing and technological innovations. Another contributing factor to this development has been the application of new management practices or innovative work methods by firms. Over 87 percent of respondents are said to have undertaken quality improvements and another 50 percent have implemented '5 S' the Japanese system of work improvement. Only 19 respondents have applied for Sri Lanka Standards Quality Certification (SLS) and 9 have been awarded the said accreditation. Four firms have received the International Standard Organisation (ISO) certification. A rigorous awareness campaign by the Sri Lanka Standards Institution may have contributed to the higher level of quality consciousness in respondent firms. The analysis also suggests that only a few firms have invested in quality and productivity improvements as a means of retaining their position in the marketplace. Another important aspect that emerged in this study is the growing concern about environmental issues among entrepreneurs. The analysis demonstrates that a higher proportion of respondent firms (82.2 percent) have applied pollution control and waste management methods in their respective work places. About 66 percent respondents indicated that energy management techniques have benefit their firms to minimise unnecessary wastage and considered as very attractive solutions to reducing rising energy cost.

Table 5.15: Management innovations by respondent firms (by size) (MGTINN)					
Variable ID	Description of activity	Number of respondents			
		All (n=90)	Micro (n=8)	Small (n=47)	Medium (n=35)
te_numgt	New management structure	58 (64.4%)	2 (25%)	27 (57.4%)	20 (57.1%)
te_numkt	New marketing strategy	60 (66.7%)	4 (50%)	35 (74.5%)	21 (21%)
tec_qiml	Quality improvements	79 (87.8%)	6 (75%)	41 (87.2%)	32 (91.4%)
tec_5'S'1	5 'S' work method	45 (50%)	5 (62.5%)	21 (44.7%)	19 (54.3%)
tec_poll	Pollution control/waste management	74 (82.2%)	6 (75%)	35 (74.5%)	33 (94.3%)
tec_enrl	Energy management	66 (66%)	4 (50%)	30 (63.8%)	26 (74.3%)

5.4.2 Relationship between firm level characteristics and technology and innovation capabilities of SMEs

This section examines whether there is any relationship between firms' characteristics and technology and innovation capabilities of respondent firms. The analysis follows three steps:

- Owner/manager characteristics such as age, experience, business training and higher academic qualifications.
- Characteristics of enterprises such as age, size (in terms of number of employees), market orientation (e.g. export, local/national), and ownership type (e.g. joint ventures).
- Industry/product sector orientation.

5.4.2.1 Owner/manager characteristics and technology and innovation performance of the firm

As discussed in Chapter 2, the characteristics of the entrepreneur are important factors in determining firm's growth. They are likely to affect the firm's strategies, uptake of new technology and innovative behaviour. This section examines the relevance of these arguments to the sample firms, and analysis was undertaken to test these arguments and the results are presented in Table 5.16. As the data suggests about 68 percent of respondents (61 persons) were key founders in their business or directly involved in the establishment of their businesses. About 72 percent of them (44) were sole owners and directly involved in strategic decision-making and day-to-day business operations. One of the interesting findings was the age of entrepreneurs at business start up where about 67 percent (41) of firms in the sample were founded by young entrepreneurs aged below 30 years. The medium-sized firms were likely to be owned/managed by those in older age group (46 and above) age bracket while a larger proportion of small firms were also likely to be owned/managed by those in 31-45 age group. This shows that firms' growth is strongly linked with the age of entrepreneurs And the analysis suggests that firms established by young entrepreneurs have shown relatively higher employment and financial growth performance compared to those established by founders over 30 years of age. As Table 5.16 shows, the mean age of entrepreneurs at initial start-up was 23.4 years (median age is 20) while it was 30 years (median 27 years) for entrepreneurs owning firms with 'average growth'.

Table 5.16: Firm growth and age of entrepreneurs at the startup

	Fast growth (100% or more turnover growth)		**Average growth (1-99% turnover growth)**		**Decline/Static (O% or negative turnover growth)**	
	n=19 By empl.	**n=9 By turnover**	**n=19 By empl.**	**n=27 By turnover**	**n=19 By empl.**	**n=10 By turnover**
Mean age	23	24	30	29	32	30
Median age	20	24	27	27	29	27

The general level of educational attainment of entrepreneurs/respondents appeared to be considerably high with 61 percent (55) having tertiary level qualifications (further or higher educational); 13 of which had qualifications at degree level. Around 21 percent (19) of respondents have professional qualifications. It was also found that about 34 respondents have specialised in science, engineering and technology fields and another 27 respondents have specialised in management related subjects. With regard business training, half of the respondents (48 percent) indicated that they had undergone some form of pre-business start-up training which shows that start-up training is clearly not a prerequisite for business start up particularly recognised or valued as a pre-requisite to start a business.

As discussed in Chapter 2, the owner/manager or 'entrepreneur' is considered to be the key person in a successful business. Based on this argument, a number of statistical tests was carried out using key variables related to the profiles of owner managers to analyse whether individual characteristics of entrepreneurs such as age, experience, business training and higher academic qualifications have any influence on firms' technology and innovation capabilities and firms' performance. This analysis was carried out by comparing statistical means of relevant independent variables such as Technology Capacity Index (TECHCAP) and Innovation outcome (INNOUT), and dependent variables, e.g. firm's ownership, age, education and training of owner/managers the relationship between technology performance and owner/manager characteristics. The results are presented in Table 5.17.

Table 5.17: Comparison of Means of Technology capacity (TECHCAP) and Innovation outcome, and owner/manager characteristics

	Key Founder		Had business startup training		Education background - Management		Education background [a]	
	Yes	No	Yes	No	Yes	No	Yes	No
Technology capacity (TECHCAP)	3.1	3.3	3.2	3.2	3.8	3.0	3.2	3.0
Innovation outcome (INNOUT)	4.3	3.8	4.1	4.7	3.0	4.4	4.4	6

<u>*Technology capacity index*</u>
5-4 = Higher Technology capacity
3 = Average Technology capacity
2-1 = Low technology capacity
0 = None

<u>*Innovation outcome index*</u>
6 = Highly Innovative
5-4 = Average-Innovative
3-1 = Low-Innovative

Note: (a) Science, Engineering & Technology education

Overall, there seems to be no apparent link between the characteristics of owner/managers and technology performance (or capabilities) and innovativeness. However, it should be noted that among the different characteristics selected for analysis, the entrepreneurs with a management background have demonstrated relatively higher technological performance. However, no significant differences could be established between the two groups (Yes and No) in terms of firms' technology performance and innovativeness. Interestingly, the analysis does not find any evidence suggesting a positive relationship between education in science, technology and engineering field and firms' technology performance and innovativeness which has been a key focus in much of the literature concerned with technology and innovation[77].

5.4.2.2 Firms' characteristics and technology capability and innovativeness

By comparing the statistical Means[78] of relevant variables, the technology capability and innovativeness of firms in different growth stages was analysed and presented in Table 5.18. It appears that, to some extent, technology activities of firms vary depending on their age. It can be observed from the data that 'young firms' are more likely to be 'innovative' particularly in product development whereas growth and mature firms are more likely to adopt process innovations. With regard to mature and static or declining firms, technology development is relatively lower than young and growth firms although a certain amount of innovation may have occurred at some stage in the firms life cycle. Declining/renewal firms were also observed as having a lower propensity to take up technology and innovation oriented projects. The analysis provides little or no evidence to establish a substantial link between technology and innovation performance, and age of firms due to small sample size.

[77] See for example Sir Gareth Robert's Report on SET for success: The supply of people with science, technology, engineering and mathematics skills.

[78] Mean comparison is useful in order to establish if the mean of two groups differ systematically. In this analysis, the average innovativeness or technology capacity of specific group of firms can be established.

Table 5.18: Technology capacity and innovativeness by firms in different stages			
		Tech. capacity	**Innovativeness**
Start-up/Young stage (Less than 3 yrs)	Mean	3.3	4.4
	N	10	10
Growth stage (3-10 yrs)	Mean	3.4	4.1
	N	30	30
Maturity stage (11-20 yrs)	Mean	3.1	4.5
	N	26	26
Decline/Renewal stage (Over 20 yrs)	Mean	3.1	3.9
	N	24	24

Technology capacity index
5-4 = Higher Technology capacity
3 = Average Technology capacity
2-1 = Low technology capacity
0 = None

Innovation outcome index
6 = Highly Innovative
5-4 = Average-Innovative
3-1 = Low-Innovative

The Table 5.19 summarises technology and innovation capacity of respondents firms by major product sectors. Only the sectors with more than five firms were considered for analysis and these sectors were categorised into three different groups based on the level and intensity of technology in respective sector. This analysis will help to identify the better performing sectors in terms of technology adoption, innovativeness and market competitiveness. Amongst all sectors, Rubber based products sector and Plastic and related products sector have demonstrated relatively greater 'technology' performance.

Table 5.19: Technology sophistication by sectors (% of firms in respective sectors)								
Sector		Variable					Average technology activity
		New technology	Technical skills and training	Joint technology develop.	Technology sharing	Adoption of ICT	
High-technology sectors							
Rubber based (tyre & latex manufacturing)	(n=5)	100	100	60	40	100	4.0
Engineering	(n=11)	81.8	81.8	72.7	45.5	81.8	3.6
Medium technology sectors							
Plastic and related	(n=5)	100	100	100	80	80	4.6
Garments & wearing apparel	(n=11)	81.8	72.7	36.3	63.6	72.7	3.2
Coconut and coconut fibre based	(n=10)	90	40	50	40	70	2.9
Food & beverages	(n=19)	68.4	63.2	42.1	42.1	52.6	2.6
Low-technology sectors							
Handicraft, gems, jewellery, sports goods & related	(n=9)	77.8	77.8	55.5	44.4	77.8	3.3
Wood & furniture	(n=6)	83.3	83.3	66.6	50	16.6	3.0

A comparison of the average level of technology content of different sectors suggests that technology performance differs widely in proportion to the magnitude of a sectors international competitiveness. This is clearly endorsed by the evidence gathered from face-to-face interviews with selected owner/managers in tyre manufacturing, latex rubber products for export, and household plastic goods manufacturing which indicate that higher technology and/or innovation performance are clearly associated with firms' strategies to address competitiveness (e.g. product diversification and production capacity building). The data indicates that Coconut and coconut-based products, Engineering, Food and beverages, Garments and wearing sectors that are considered as economically important have not fully exploited new technological advances.

It emerged from the survey that technology deployment in the Food and beverage sector appeared to be relatively low compared to other sectors in the 'medium technology category'. The sectoral trends suggest that the abundance of raw materials and relatively low investment have attracted new entrepreneurs into Food and beverages sector[79] in recent times. One of the interesting observations made during a visit to an enterprise manufacturing desiccated coconut and coconut fibre, was that the technology being used was between 40-50 years old. Indeed, old machinery and equipment is still utilised by most enterprises. The owner manager of the enterprise was careful to explain that while the machinery and equipment employed in the firm may be less sophisticated than new machinery it was nevertheless much easier to maintain.

With regard to Apparel and garments related enterprises, the arguments by Knutsen (2004) seem to be still valid considering the data presented in Table 5.19. Knutsen suggested that there is some element of technology transfer in the Apparel and garments in Sri Lanka with access to new designs and patterns, and quality control. Another important aspect that emerged from this research is the limited training opportunities available for workers in Apparel sector especially in quality control applications. In practice, production lines in garments factories are very intense and work to tight supply schedules. Evidently controllers are usually charged with pinpointing mistakes but educating workers on how to correct mistakes is an activity that rarely takes place. The degree of technology sophistication in handicrafts, gems and jewellery and sports goods sector seems to be rather modest, however, the need for new technology solutions and product innovations has been identified as crucial.

5.4.3 External business and technology support and their impact on firms' technology capacity and innovativeness

This is one of the most important parts of this research which investigates the impact of external support on firms' technology and innovation performances, and whether or not there is a positive relationship between external support and technological and innovation capabilities. The rationale for this analysis is that enterprises accessing external support are

[79] Processing of grains, spices, fruits, and bakery and confectionery are the main product lines which can be produced with minimum technology intensive methods

more likely to demonstrate higher levels of technology and innovation performance. This analysis examines three aspects related to business and technology support. First, demand-side factors (e.g. access and use of different types of support by SMEs); second, supply-side factors and institutional dynamics of support services; and third, perception of enterprises on quality and effectiveness of services. Drawing on relevant literature discussed in Chapter 2, I argue that the principal aim of business support services should be to strengthen the capabilities of enterprises by improving efficiency and productivity enabling them to enhance production capabilities, new product lines, new markets or new business opportunities. The following analyses will help ascertain whether or not the use of external support appropriate and influenced the technology performance of the firms surveyed.

5.4.3.1 Demand-side factors: Access and/or use of business and technology support and relationship with technology and innovation performance

Based on the currently available business and technology support by public and private sector agencies, the Table 5.20 presents an analysis on the use of general and technology support by respondent firms. The respondents were asked to indicate which of the 12 types of support services their firms have accessed and received services. As the data indicates, 'Technical training and research and development' were the most demanded service (47.8 percent), followed by 'Quality improvement' (41.1 percent) and 'Technology transfer' by just over a quarter of firms. Only 8 firms have accessed Intellectual Property related support services. Compared to the higher level of technology and innovation activities undertaken by the firms in the cohort, the analysis found that firms have not used outside technology support. For example, there were 65 firms engaged in R&D but only 36 of them have accessed external R&D support. Similar patterns can be observed with firms that have used external support for technical training and skills development (43 out of 64 firms), new technology transfer (25 out of 74 firms) and intellectual property (8 out of 23 firms), but only a fraction of firms have utilised external technology support. On the contrary, a higher proportion of enterprises have approached external technical support for highly specialised areas such as energy management and environmental management. On average, small-sized enterprises are more likely to use external business and technology support compared to micro and medium-sized enterprises.

The analysis also reveals that majority of firms have used general business support (78.9 percent) more often such as financial assistance (72.2 percent), business advice and business information (64.4 per cent). Generally, these types of services consisted both technical and non-technical elements.

Table 5.20: Access and use of business and technology support by respondent firms by size class

Type of business support	Number of enterprises and %				
	Total		Micro Less than 10	Small 10-49	Medium 50-249
	n=90		n=8	n=47	n=35
Technology support					
Technical training and skills	43	47.8	1 (12.5%)	21 (44.6%)	21 (60%)
Research and development/ product and process development	43	47.8	1 (12.5%)	22 (46.8%)	20 (57.1%)
Quality improvements	37	41.1	2 (25%)	21 (44.6%)	14 (40%)
Environmental management	28	31.1	1 (12.5%)	13 (27.6%)	14 (40%)
Technology transfer	25	27.8	1 (12.5%)	12 (25.5%)	12 (34.2%)
Energy management	20	22.2	0	9 (19.1%)	11 (31.4%)
Intellectual property efforts (IPR)	8	8.9	0	5 (10.6%)	3 (8.6%)
General business support					
Finance	71	78.9	6 (75%)	35 (74.4%)	30 (85.7%)
Advisory services	65	72.2	4 (50%)	37 (78.7%)	24 (68.6%)
Business and technology information	58	64.4	2 (25%)	32 (68%)	24 (68.6%)
Management training	40	44.4	1 (12.5%)	20 (42.5%)	19 (54.3%)
Lands and buildings/premises	35	38.9	5 (62.5%)	17 (36.2%)	13 (37.1%)

Its was also found that the firms in the age groups 3-10 years (growth firms) and over 20 years (declining/renewing) are more likely to access external technology support compared to young/start-up and mature firms (Table 5.21).

Table 5.21: Access and use of business and technology support by respondent firms by age group						
Type of business support	**Number of enterprises and %**					
	Total		**Less than 3 yrs**	**3-10 yrs**	**11-20 yrs**	**Over 20 yrs**
	n=90		n=10	n=30	n=26	n=24
Technology support						
Technical training and skills	43	47.8%	3 (30%)	18 (60%)	9 (34.6%)	13 (54.1%)
R&D	43	47.8%	5 (50%)	17 (56.6%)	8 (30.7%)	13 (54.1%)
Quality improvements	37	41.1%	4 (40%)	14 (46.6%)	7 (23.3%)	12 (50%)
Environmental management	28	31.1%	4 (40%)	8 (26.6%)	5 (19.2%)	11 (45.8%)
Technology transfer	25	27.8%	1 (10%)	9 (30%)	6 (23.1%)	9 (37.5%)
Energy management	20	22.2%	1 (10%)	5 (16.6%)	4 (15.4%)	10 (41.6%)
Intellectual property (IPR)	8	8.9%	1 (10%)	4 (13.3%)	1 (3.8%)	2 (8.3%)

The important element of this investigation is to establish whether there is a positive relationship between respondent firms' technological and innovation performance and their use of external support. This analysis is constructed by comparing means of Technology capacity index (TECHCAP) and Innovation outcome **(INNOUT)** as *Dependent variables,* and 5 types of technology supports and 2 types of general support as *Independent variables* (Table 5.22).

Table 5.22: Access and use of business and technology support and technology and innovation performance of respondent firms (Mean comparison)			
Type of business support	**Received or not**	**Technology capacity (TECHCAP)**	**Innovation outcome (INNOOUT)**
		Mean	**Mean**
Technical training and skills	Yes	3.5	4.1
	No	2.9	4.3
Research and development/ product and process development	Yes	3.6	4.4
	No	2.8	4.0
Quality improvements	Yes	3.5	4.3
	No	3.0	4.1
Technology transfer	Yes	3.8	4.1
	No	3.0	4.2
Intellectual property	Yes	3.6	5.2
	No	3.1	4.1
Advisory services	Yes	3.4	4.3
	No	2.6	3.8
Financial assistance	Yes	4.1	3.3
	No	4.5	2.6
Business/technology information	Yes	4.1	3.3
	No	4.5	2.6
Technology capacity index *5 = Higher Technology capacity* *1 = Low technology capacity*	*Innovation outcome index* *6 = Highly Innovative* *1 = Low-Innovative*		

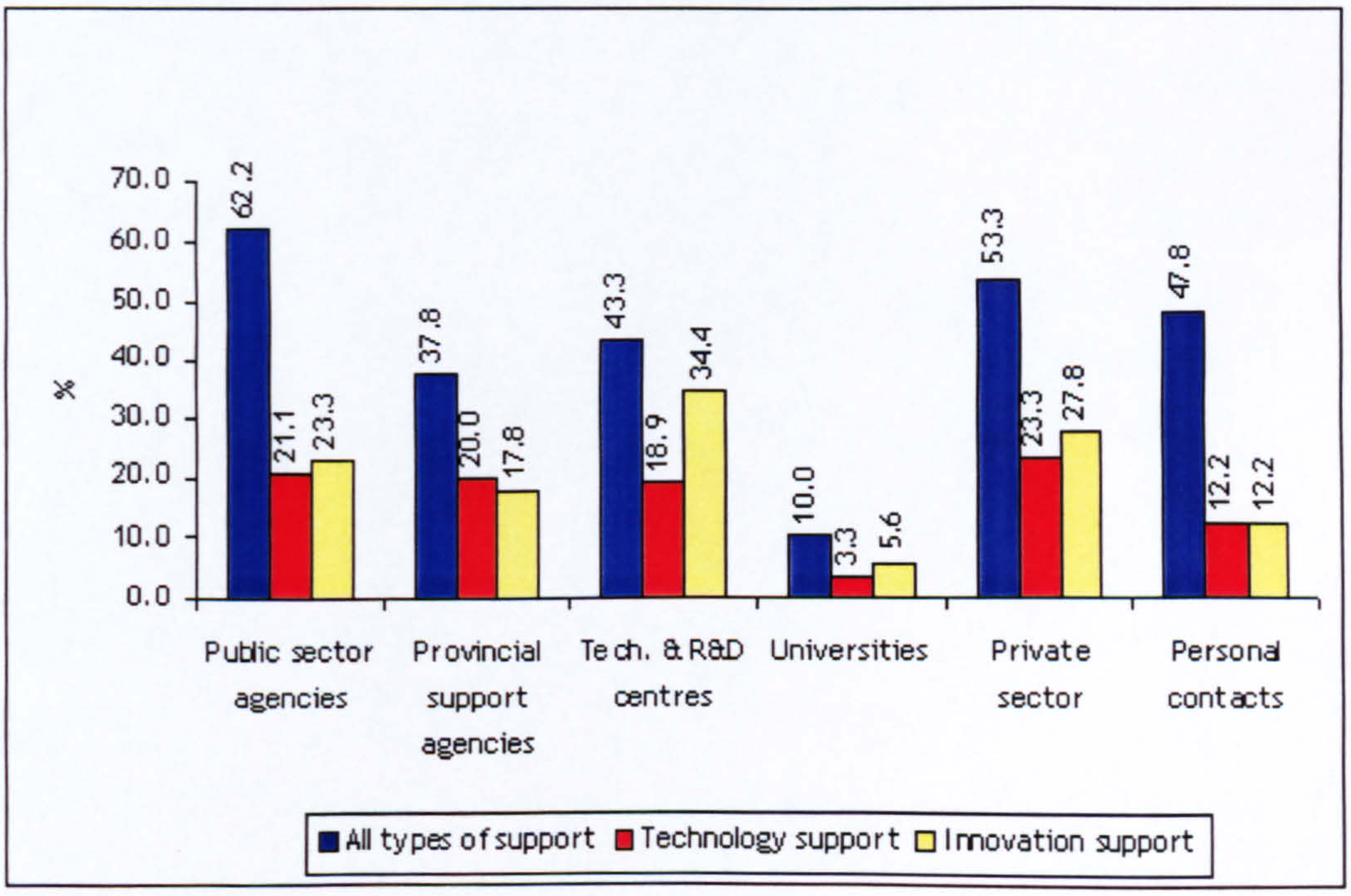
As is evident from the analysis, there seems to be a clear distinction in the level of technology capacity and innovativeness of users and non-users of external business support. The technology capacity, for example, Mean differences of users and non-users vary greatly demonstrating that performance of users was significantly higher than non-users. This is more evident with regard to firms used or accessed specialised external support have shown higher technology performance (Mean indices of research & development/product and process of users - 3.6, non-users - 2.8; Mean indices of technology transfer of users - 3.8, non-users - 3.0 and Mean indices of technical training and skills of users 3.5, non-users - 2.9). The respondent firms that have used advisory services have also shown relatively higher technology capabilities (Mean indices of users - 3.4 and of non-users - 2.6) although use of financial assistance and information services seems to be less significant on technology performance.

In the literature review, the importance of research and development and Intellectual property initiatives on firms' innovation activities has been discussed. This analysis has endeavoured to find out if this proposition is borne out amongst respondent firms. As the data illustrates, the analysis of the relationship between external support and innovation outcomes demonstrates an entirely different view which suggests that such initiatives have played only a relatively modest role in the development of a firms' technology capacity. The firms that sought external support for Intellectual property related activities have shown relatively higher innovation outcomes (Mean index 5.2) while the Mean index of firms that did not seek support was 4.1. The innovation outcome of the firms accessed research and development support have also performed better than non-users. In addition, the firms that have accessed business advisory, financial assistance and information services have also shown somewhat better performance than non-users. These outcomes reflect that technology and innovation support needs firms' vary significantly depending on the size, sector and location. Interestingly, this analysis could not find any positive relationship between firms' innovativeness and transfer of technology and technical skills development.

5.4.3.2 Institutional factors of business and technology support

For analytical purposes, 26 main providers of business support were identified and these were again divided into nine sub-groups, i.e. public sector business support agencies/departments, provincial business support agencies, technology and R&D agencies, universities, banks, private sector agencies, and personal contacts. In the survey, the respondents were asked to specify the agencies and types services they have accessed and used and the results are presented in Figure 5.3.

Figure 5.3: Access to service providers by respondent firms (%)



The analysis presented above suggests that about 62 percent of respondents have cited public sector support agencies as the main providers of business support, of 40 percent of which have cited Industrial Development Board as the main service provider. However, in addition to the public sector agencies, private sector providers also have played a significant role where about 53 percent of respondent firms have used Chambers of Commerce and private consultants for various business support needs. Commenting on this aspect, a respondent stated:

"I am not really aware of any support agency approaching and asking what services I need. Not so far. What I think is service providers do not really understand industrialists' needs. Because I can afford, I hire private consultants for advice, but just imagine those who cannot afford it?"

-Managing Director of a Board of Investment approved camping accessories manufacturing enterprise at Dankotuwa, North Western province (Medium-sized enterprise, Male, Age 28 years)

A majority of respondents interviewed stated that they preferred private consultants to public sector business and technology support and though private consultants are able to provide specialist support customised to individual needs. Small-sized firms are more likely to use private sector service providers (67 percent) than micro and medium-sized firms (42 percent). The survey results suggest that the private sector services and personal contacts have also played a main role. About 53 percent are said to have used private sector providers while 47.8 percent have used personal contacts. An important observation is the role of family and friends in business support where about 40 percent of the total sample have sought support from family and friends for their businesses mainly in the form of advice, finance, premises to a greater extent and technology and innovation to a lesser extent. Family businesses are more likely to seek support within the family network and this is more apparent in places where support services are rudimentary. Highlighting the fact that why family and friends are important in running business, an owner of a family-based engineering firm stated:

"Ours is a well-known engineering firm for machinery and equipment for tea and food processing industry. It is a family business started by my father many years ago and now it branched out to three businesses run by my other family members and we have diversified into a number of areas. We have developed a number of innovative engineering products for food industry and now we have started new product lines, herbal products, fruit, and vegetable dehydration. With regard to public support, I have to tell you that we (small businesses) are really fed up with government promises. What we have decided was to not to wait for the government but to share support among ourselves. I haven't had any support from any organisation so far and I am not too bothered about it."

-Managing Director of an Engineering firm, Kandy, Central province (Small-sized enterprise, Male, Age 40 years)

Among the provincial support agencies, Industrial Services Bureau in the North Western Province has provided both technology and general business support to a one third of the sample firms and about 70 percent of these firms were located in the same province.

The dynamics and determinants of the use of different service providers for enhancing firm's technology and innovation capacity were also deemed to merit investigation. To do this, the firms were asked to indicate which of the service providers they accessed for expert support, especially for technology (technology transfer and technology skills) and innovation (R&D, quality improvements and IPR) related services. The results of the analysis are presented in Figure 5.3. A higher proportion of firms have sought more support for innovation related activities compared to technology related services. It is evident from the data that that firms preferred private sector and public sector general business support providers compared to technology and R&D centres. This might be attributed to two reasons. First, all industrial technology and R&D centres are located in the capital Colombo and this is one of the main concerns among firms located outside Colombo and only 15 firms located outside Colombo have sought services from these institutions. Second, technology support requirements are often generic, and can therefore be easily obtained from the mainstream non-specialist services providers. In terms of innovation support, 19 of the 31 firms have received specialist support for quality improvements and 12 of these firms have accessed Sri Lanka standards, the only recognised service provider in this area. 43 firms have cited personal contacts (family and friends and suppliers and buyers) as being one of the main sources of business support services and of which 11 have received technology and innovation related support. The analysis also reveals that the use of technology & R&D institutions has been very low, only 22 percent of medium-sized and 17 percent of small-sized firms have accessed these institutions. Based on these analyses, it can be concluded that support derived from technology and innovation support from technology and R&D centres is relatively modest and that services are not distributed equally among enterprises in different sizes, sectors and locations. The analysis also found that exporting firms are more likely to receive services from the Export Development Board, the main service provider specialising export and trade in Sri Lanka.

Table 5.23 presents an analysis based on the access to service providers for technology and innovation support by firm size and growth stage. On average, Growth and Declining firms are more likely to seek external technology support compared to Young and Mature firms. It appears that firms in the 'Growth stage' tend to be more active in technology and innovation, especially as regards the transfer of new technology, quality and standards and R&D. In terms of technology support, they are more likely to receive adequate support from both public sector agencies and private sources but very little interaction with 'expert agencies' such as technology and R&D centres and Universities. However, with regard to innovation support, Declining/Renewal firms and Growth firms have used Technology and R&D centres more frequently.

Table 5.23: Access to support service providers for technology support by firms (by size class) (%)

Type and Number of firms (n)		Technology support						Innovation support					
		Public sector agencies	Provincial support agencies	Tech. & R&D centres	Universities	Private sector	Personal contacts	Public sector agencies	Provincial support agencies	Tech. & R&D centres	Universities	Private sector	Personal contacts
Micro	8	12.5	0.0	12.5	0.0	12.5	0.0	12.5	0.0	25.0	0.0	12.5	0.0
Small	47	23.4	14.9	17.0	4.3	29.8	8.5	23.4	17.0	34.0	2.1	38.3	12.8
Medium	35	20.0	31.4	22.9	2.9	17.1	20.0	25.7	22.9	37.1	11.4	17.1	14.3
Young/Start up	10	20.0	0.0	10.0	0.0	20.0	0.0	30.0	0.0	20.0	0.0	40.0	0.0
Growth	30	30.0	16.7	20.0	0.0	33.3	10.0	23.3	16.7	36.7	0.0	23.3	16.7
Mature	26	11.5	19.2	19.2	3.8	11.5	15.4	11.5	19.2	26.9	3.8	23.1	11.5
Decline/Renewal	23	21.7	30.4	21.7	8.7	26.1	17.4	34.8	21.7	43.5	8.7	34.8	8.7

One of the main objectives of this study is to establish whether external interventions have contributed to firms' technology and innovation performance. In order to investigate this, the Mean comparison technique was performed using three variables, Innovation outcome (INNOUT), Technology capacity (TECHCAP) and access and/or use of support providers and the analysis is presented in Table 5.24. It can be seen from the data that the Mean of Technology capacity index of external support users stood at 3.5 compared to non- users (2.8) which suggests a strong link between firms' technology performance and use of support services.

Table 5.24: Technology and innovation performance and access/use of external support providers

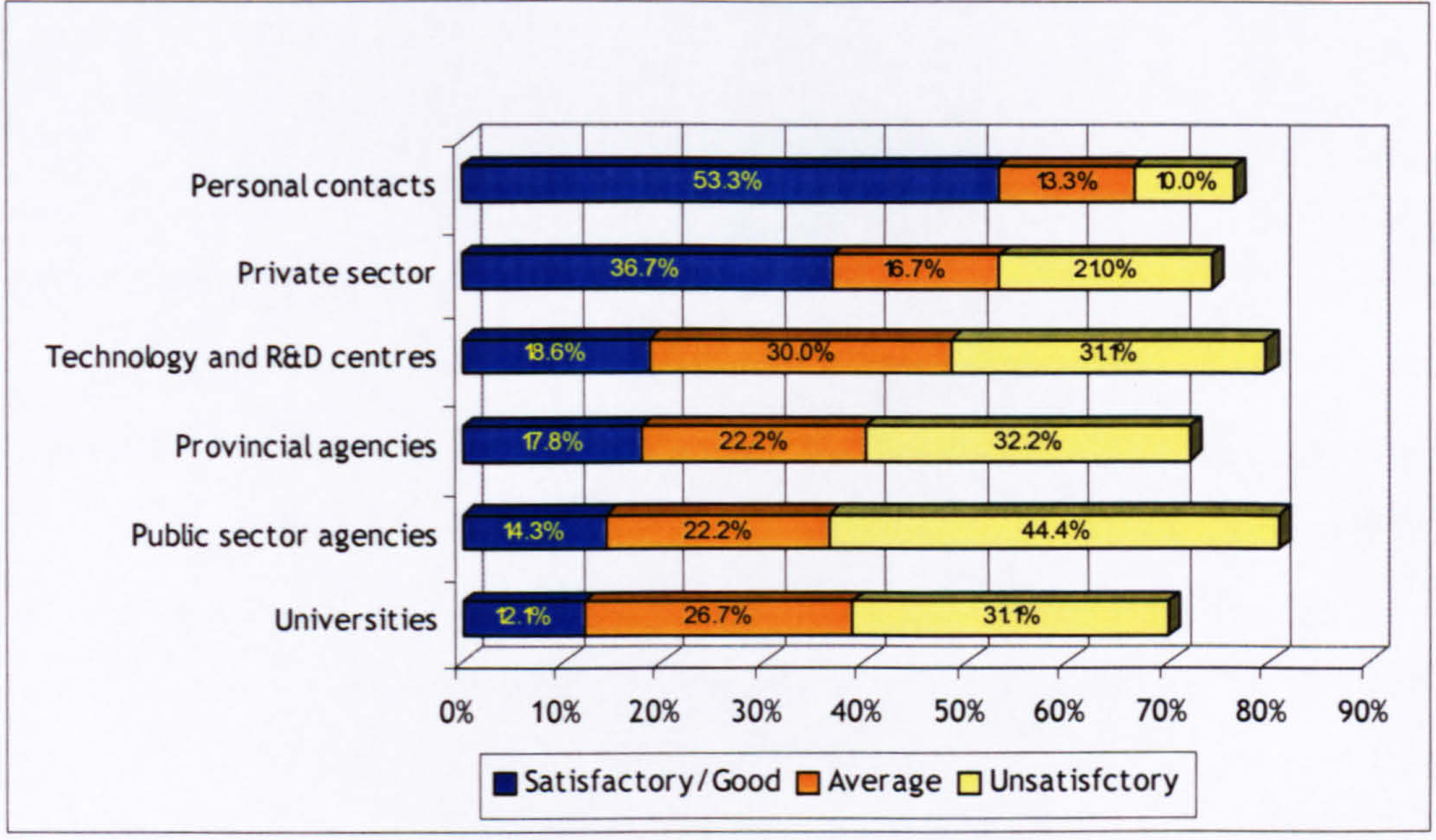
	All services		Public sector agencies		Provincial agencies		Tech. and R&D centres		Universi-ties		Private sector		Personal contacts	
	No. of firms (%)	Mean	No. of firms (%)	Mean	No. of firms (%)	Mean	No. of firms (%)	Mean	No. of firms (%)	Mean	No. of firms (%)	Mean	No. of firms (%)	Mean
Technology capacity index														
Firms used / accessed external support	50.0	3.5	21.9	3.9	20.0	3.7	18.9	3.6	3.3	4.6	23.3	3.6	12.2	3.8
Firms not used / accessed external support	50.0	2.8	78.9	3.0	7 2	3.0	81.1	3.1	96.7	3.1	76.4	3.1	87.8	3.1
Innovation outcome index														
Firms used / accessed external support	61.1	4.4	23.3	4.6	17.8	4.4	34.4	4.1	5.5	4.6	27.8	4.8	12.2	5.0
Firms not used / accessed external support	38.9	3.8	76.4	4.1	82.2	4.1	65.6	4.2	94.5	4.2	72.2	4.0	87.8	4.1

Although not significant, there seems some differences of average Technology capacity index between users and non-users particularly those firms that have sought technology support from public sector, private sector and non-formal (personal contacts) providers where users of such services have performed relatively better than non-users. The data also illustrates a low Mean index of Technology capacity index for firms that received services from technology and R&D agencies and universities. However, the three firms that obtained technology support from universities have shown relatively higher technology performance with a Mean technology index of 4.6 compared to 3.1 for non-users.

In terms of Innovation performance, a general observation derived from this analysis is that both users and non-users faired equally. However, over 61 percent of firms have used external services, with Innovation index averaging 4.4 for users compared to 3.8 for non-users. Considering the effectiveness of interventions, interestingly, the difference between Mean Innovation indices of users and non-users does not vary greatly compared to Technology capacity index. However, in terms of the level of innovation the users and non-users of private sector support services and informal providers, there are some differences (4.8 against 4.0 and 5.0 against 4.1 respectively)

The above analysis provides a fascinating perspective about the external interventions and firms' technology and innovation performance. Overall, no strong association between support interventions and firms' performance could be established. It should also be noted that technology and innovation performance of sample firms is not apparently significant. The main reason being the type of activities these firms engaged in cannot be considered as 'technologically intensive' and 'innovative' judging by international standards. Based on the technology and innovation performance indices computed for this analysis it can be concluded that the firms in the sample have demonstrated little evidence to identify these firms as 'high-performing'. On the other hand, it might also be said that the firms in the sample have not used the external support services very effectively and that is why these firms' technological performance has been not particularly impressive.

Figure 5.4: Opinions of respondent firms on technology and innovation support



In the survey, the owner/managers were asked to express their opinion *vis-à-vis* the effectiveness of the technology and innovation support system in the country. The results reflect an outcome corresponding to the access and use of external support. Slightly over half (53.3 percent) of the owner/managers have rated personal contacts (or informal sources) and private sector service providers (36.7) as 'satisfactory or good'. When asked why informal sources and private sector providers are rated as 'good', the response was quite fascinating. The owner/managers felt that informal and private sources are more reliable and easily accessible when support is needed. With regard to the public sector providers, nearly a fifth of the respondent felt technology and R&D centres provide satisfactory service while only a small proportion of the sample (17.8 percent and 14.3 percent respectively) rated provincial and public sector agencies as 'satisfactory'. Commenting on the existing services, two owner/managers interviewed stated:

> *"There are myriad of support agencies in the country but none of them have done any good to us (coconut fibre industry). This industry is entirely dependent on traditional technology passed on to me by my father and I am running this business with 29 years of knowledge and experience. I can foresee a bleak future and this industry will die in the near future "*

- Owner of a small-sized coconut fibre mill at Kuliyapitiya, North Western Province (Male)

"I personally think in general support services are really helpful for businesses. The government agencies as well as Chambers of Commerce which I have been involved with over the past several years, seem to have done very little to support businesses. I don't want to blame them for their inefficiency but the government should be blamed for not monitoring and supporting them. I am sure the service providers can do a better if they get support from the government."

- Managing Director of a small-sized ceramic products manufacturing company, Kurunegala, North Western province (Male, Age 56 years)

According to the data analysis, only 12.1 percent of respondents felt that universities are a good source of support while another group indicated that universities are too academic and did not believe that they have a good understanding of business needs. When asked owner/managers' opinion about current technology and innovation support, the majority (74 percent) have indicated that there are difficulties in accessing these services as they are only available in the major cities, for example mostly in Colombo. The owner/managers interviewed indicated that regional biases in the deployment of support services are deep rooted and this has alienated entrepreneurs in rural and regional locations. An entrepreneur stated that:

"There is a wide regional gap within the support framework. Support services are biased to 'urban' and larger enterprises. The policy makers treat all SMEs as a homogenous group and policies and made without considering regional factors and business problems. In addition, support services do not understand how enterprises operate in different environments."

-Wood products manufacturer at Kandy, Central province (Small-sized enterprise, Male, Age 33 years)

The analysis also suggests that service providers are specialised only certain fields or sectors for example, food and beverages, light engineering and Coconut and coconut fibre based products sectors, about 65 percent of respondents agreed with this proposition. Some 82 percent of respondents highlighted large gaps in service provisions where in most cases services are limited to new 'technology intensive' product sectors. About 74 percent were not very impressed by the quality of business support services and indicated that this is the very reason why most enterprises approach private sector consultants, buyers or suppliers and friends in similar businesses when support is needed. The bureaucracy of government support agencies is one of the major concerns raised by 70 percent of respondents while nearly 75 percent of firms felt that existing service provisions or government policies do not address the problems and constraints businesses are currently facing. 46 percent of respondents believed that service providers have very little knowledge about the way Sri Lankan businesses are operating and that they lack awareness of businesses needs.

The above analyses provides an insight into the relationship between existing support infrastructure and performance of SMEs and based on these facts and considering the level and quality of available support I argue that, these firms have demonstrated an ability to operate in any given situation, provided the necessary support is made available to them at the right time. Considering their problems, constraints and support there appears to be a significant mismatch between the existing support services and needs of SMEs and this will be basis for the next section.

5.4.4 Barriers to technology and innovation and external support needs of respondent SMEs

It was argued in Chapter 2 that barriers and constraints to technology and innovation are major issues for SMEs regardless of a firms' age, size, sector, and organisational characteristics. These problems and constraints impact considerably on the technology capability and technological behaviour of firms. This section highlights two important sides to this issue that provide a rationale for specific SME interventions that can stimulate technology and innovation capabilities of SMEs. A myriad of barriers and constraints encountered by SMEs have been identified in literature discussed in Chapter 2 and based on this, 14 closely linked barriers are constraints have been identified for this study and are divided in to three categories: technology related, innovation related and generic problems.

As seen in Table 5.25, 54.4 percent of respondents have indicated that their competitiveness is seriously hampered by a shallow technology base and low technology content. This issue has been reflected in other firm-level constraints such as 'Limited production capacity' (43.3 percent) and 'Very old equipment' (20.0 percent). The latter is quite common among manufacturing enterprises, Coconut and coconut fibre sector and Food and beverages sector in particular. These barriers in effect, have significantly affected firms' innovation activities where about 60 percent of respondents said to be constraints by 'Limited product range'. This is considerably apparent among enterprises in Sri Lanka where limited domestic market and lack of export opportunities are major hurdles for enterprises. In the past 25 years, the domestic market has constantly been flooded with cheap imported goods, therefore the local producers are finding enormous problems in competing with imported goods. When interviewed, an owner of a firm raised concerns over cheap imports and stated:

> *"I am running my textile weaving business with greatest difficulty because recently I have lost the export order to Japan for Silk Kimonas and since then I have been unable to find another importer. Domestic market is very limited and competitive due to cheap imports of similar products. There is no proper system of support for business like mine."*
>
> - Silk textile manufacturer at Kandy, Central province (Small-sized enterprise, Male, Age 52 years)

Table 5.25: Barriers and constraints to technology and innovation				
	Total firms (%) N=90	Number of firms		
		Micro N=8	Small N=47	Medium N=35
Technology related				
▪ Firms technology being used is very shallow	54.4	5	29	15
▪ Limited production capacity	43.3	5	20	14
▪ Lack of technically skilled workers	41.1	3	21	13
▪ Lack of technology know-how	23.3	2	13	6
▪ Not aware of new technology	21.1	3	13	3
▪ Very old machinery and equipment	20.0	2	10	6
Innovation related				
▪ Limited product range	60.0	4	30	19
▪ Too many rejects and waste	6.7	-	3	3
▪ Poor quality products	5.6	-	5	-
Generic problems				
▪ High cost associated with technology development and innovation activities	65.6	5	32	22
▪ Financial constraints	60.0	6	30	18
▪ Lack of market information	52.2	3	29	15
▪ Lack of customer response on products and services	41.1	3	25	9

Almost all owner/managers interviewed have indicated that the real level of capital expenditure on machinery and equipment is exceptionally high due to various market and regulatory impediments. Acknowledging the fact that firms are lacking expertise to assess technical feasibility of investment, owner/managers have indicated that certain external irregularities, for example, the absence of reliable information sources regarding machinery and equipment or technology solutions such as prices, sources, local agents, after sales services seriously affect firms' technology acquisition. Other aspects associated with this issue is include the 'Lack of market information' (52.2 percent) and 'Poor customer response for products and services' (41.1 percent) which respondent firms perceive as hindering factors for innovation.

The mismatch of skills and knowledge has also emerged as potential constraints to firms' ability to become technologically progressive. Some 41.1 percent of respondent firms are said to be constrained by 'Lack of skilled workers' and another 23.3 percent with 'Lack of technical know-how'. This is where specific interventions are necessary to promote technical education and education-industry linkages. As Autio and Garnsey (1997) suggested, new technology-based firms are likely to evolve and grow in an innovation network or within a production chain. An interesting finding in this analysis is that only a small number of firms (less than 6 percent) have considered 'product quality' and 'rejects and wastes' as constraints. This may be attributed to the island-wide quality assurance programmes implemented by the Sri Lanka Standards and other business support agencies that have effectively contributed to this programme. The 'Quality and Productivity Decade', 'Quality Awards' and 'Productivity Awards' programmes implemented by the government have been widely acclaimed by not only SMEs but also larger firms and the corporate sector as effective interventions to raise awareness about the quality issues among enterprises. However, there are some shortcomings on the part of agencies charged with implementation. A respondent has indicated that:

> *'..these initiatives are 'short-lived and not sustained thereby discouraging us to seek their assistance'.*

As part of this analysis, technology and innovation support needs of firms were analysed and the findings are presented in Table 5.26. As the data suggests, over 75 per cent of enterprises have emphasised the need for effective external interventions to enhance their technology and innovation capabilities. With regard to technology support, 82.2 percent of the firms have stressed the need for support to improve or make changes to existing production process by bringing in new technology and new methods of production. As indicated previously, finding technically skilled workers is one of the major constraints and this was highlighted again by 81.1 percent of respondent firms who felt that there is a need for technical skills improvement programmes to ensure the supply of skilled workers. ICT support is another service demanded by over 80 percent of respondent firms. It emerged in the survey that firms are increasingly concerned about the energy saving methods and environmentally friendly practices. The respondent firms also indicated that high production costs prompted by rising energy bills is rendering local firms uncompetitive in both domestic and international markets. As mentioned in Chapter 4, energy costs are extremely high in Sri Lanka compared to neighbouring South Asian countries and the country is facing a serious energy crisis due to rising energy demand.

Table 5.26: Technology and innovation support needs				
	Total firms (%) N=90	Number of firms		
		Micro N=8	Small N=47	Medium N=35
Technology related support requirements				
▪ Improve existing production process	74 (82.2%)	5	43	26
▪ Technical skills development/training	73 (81.1%)	5	41	27
▪ Use of ICT/E-commerce	72 (80.0%)	6	39	27
▪ Introduce energy saving methods	71 (78.9%)	5	38	28
▪ Introduce new production process	69 (76.7%)	5	39	25
▪ Introduce environmentally friendly practices	62 (68.9%	2	36	24
Innovation related support requirements				
▪ Develop existing products	76 (84.4%)	5	42	29
▪ Identify and develop new products	76 (84.4%)	5	43	28
▪ Strengthen research and development capacity	68 (75.6%)	4	38	26
▪ Quality control/quality improvements	64 (71.1%)	4	42	28
Generic support needs				
▪ Market information	82 (91.1%)	7	42	33
▪ Financial assistance (loans, grants and incentives)	79 (87.8%)	7	41	31

According to the data presented in Table 5.26, it appears that majority of respondents (84 percent) have realised that the development of existing products and new products, enhancing research and development capabilities as well as improvements in quality of products are important to their firms' growth and competitiveness. However, firms stressed that product and process innovation is to a greater extent dependent upon market intelligence that would inform firms the trends and patterns in the market and new market opportunities.

The majority of firms in the sample mentioned that they usually seek bank lending for acquisition of new technology and in some cases firms use their personal resources or get help from relatives or friends. The study also found that three respondents (owners) have borrowed money from private lenders at much higher rates of interest than the bank lending rates . About 71 percent of firms felt that financial assistance is necessary to take up technology development and innovative activities. This could be made available to firms by way of concessionary loans, grants and incentives like many other countries are already doing. Commenting on the existing financial support system, an owner/manager of an engineering-based enterprise said:

> *"Our business is engineering-based and we fabricate machinery and equipment needed by micro and small enterprises. In order to be competitive, we need to undertake R&D but we are struggling with shortage of funds. The government should provide grants and financial assistance for R&D because this involves considerable amount of resources but the investment is high and the return is uncertain."*
>
> - Owner of an Engineering-based small-sized enterprise at Kurunegala, North Western province (Male, Age 48 years)

It also emerged in this study that the majority of respondents that have obtained bank loans for technology improvements have done so mainly to purchase new machinery and equipment. They also have expressed their concerns over the banking system that most banks favour large enterprises and the corporate sector. One of the respondents said that he had to virtually close the business due to increasing pressure from one of the banks following a delay in monthly payments but the bank was not keen to offer any concessions to solve his financial problem. He summarised his experience with this bank, as follows:

> *"My business, dehydration of fruit and vegetables is in the verge of collapse. I was doing a very good white edible copra order and took out a bank loan for this. Unfortunately, this supply did not last long as the international coconut prices fell drastically and as a result, I could not continue with the order. I was left with a huge debt. However, being a qualified technical person, I managed to develop new technology for dehydration of fruits and vegetables and secured a long term export order from and European buyer. In the meantime, the bank was preparing to file a lawsuit against me for defaulting the loan. My request for reschedule the loan based on my current export order was turned down. I wrote to the relevant ministries and took my case to the government bureaucracy but nothing happened. Now the bank is going to reprocess my business and my personal assets. How can Sri Lanka prosper if entrepreneurs are treated like this?"*

- Dehydrated fruit and vegetables producer at Gampaha, Western province (Microenterprise, Male, Age 57)

A number of owner/managers expressed the view that government has taken some drastic policy decisions that have had negative effects on domestic producers and that such decisions should not have been contemplated without consulting local enterprise[80]. One such example is allowing duty free imports of certain products that are already being produced locally. Another example cited was the amount of fiscal and financial incentives and infrastructure facilities offered to Board of Investment (BOI) approved firms while only very limited facilities have been offered to domestic enterprises. Commenting on the overall support system, respondents accepted that the support system is gradually improving but are not keeping pace with the rate at which businesses are growing and/or their needs are changing. Two respondents stated that:

> *"Generally, business environment and policies in the country are private sector oriented but not very favourable to small and medium-sized enterprises. For example, compared to India, the progress of the coconut fibre industry sector in Sri Lanka is not very promising. We don't get enough support from the government, especially for technology and innovation for which Indian manufacturers get government financial assistance. Unfortunately, we don't get that kind of support."*
>
> - Owner of a coconut fibre industry, Kurunegala, North Western province (Medium-sized enterprise, Male, Age 48)

> *"Business support in Sri Lanka is far below the international standards. It lacks professionalism and focus and also too bureaucratic. Businesses are struggling to survive without any support or public attention."*
>
> - Managing Director of a Plastic goods manufacturing enterprise (Medium-sized enterprise, Male, 62 years).

Overall, all respondents highlighted that effective external support interventions at the right time will help to ensure technology and innovation remain as the central force in SMEs.

[80] For example, import of cheap handloom textile and food items from India.

5.5 Summary

The aim of the analysis of data collected from the sample firms was to assess the technological and innovation competencies of SMEs in Sri Lanka and to gain a better understanding of the role the external support system plays as a catalyst for enhanced technological performance and innovation. Several factors emerged from this analysis that shed light on the determinants of technology and innovations capabilities of SMEs in Sri Lanka and of the way in which enterprise characteristics and the external support system influences firms' performance.

One of the key observations of this study is the awareness of owner managers of the importance of new technology and technological change and how they affect business performance and, adoption of new technology, product and process innovation as key business strategies. However, the survey findings revealed that various internal and external factors can inhibit firms' technology performance and innovation. The study also found that firms largely dependent upon foreign technology in the form of hard technology (machinery, equipment and tools) believe that this is far superior to domestic technology. Since foreign technology is easily available in the domestic market at very high prices, investing in technology development and innovation is seen to be a risky affair. Lack of skills and expertise has also contributed to this negative attitude. At a national level, Sri Lanka is still in its 'infant' stages of capital goods manufacturing primarily because of the lack of infrastructure, financial resources and skills and know-how.

The majority of owner/managers who responded to this study have acknowledged that acquiring 'hard technology' (e.g. new machinery and equipment) and 'soft technology' (e.g. skills and training) are as important determinants of firms growth as any other inputs. Among the respondents, medium-sized enterprises have highlighted joint technology development with customers/suppliers and R&D and technology support institutions as effective methods to build technology capacity.

The research evidence also confirms the notion that technology development and innovation in firms is more likely to be driven by market factors ('market-pull'). The analysis also reveals a higher level of product and process innovations by the sample firms and the results also illustrate that small firms' growth is, to a greater extent, linked to new production and process development. However, the variation in innovation outcomes is much greater between firms depending on the sector they inhabit and the type of products and services they produce. The nature of the market in which firms operate as a whole strongly influences the 'radicalness' of innovations. Most firms see this function as an important business strategy although innovation efforts are often determined by prevailing economic uncertainties, strengths and weaknesses of firms. Again, an interesting observation emerged from the analysis is the higher level of innovativeness small-sized firms have demonstrated. Further, firms recognise the importance of continual product and processes development to meet the needs of constantly changing market requirements. The study also found a positive trends in Intellectual Property (IPR) related activities where owner managers have realised that IPR is an important component for the competitiveness of firms (this is more apparent in export-oriented firms).

One of the other notable findings of this analysis is the low level of technology adoption and poor innovation performance of firms in economically important sectors such as the Coconut and rubber sectors which are otherwise considered to be main contributors to the country's export growth. The technological innovation in the Apparel and garment sector is also very limited due to heavy dependence on overseas buyers who control the lucrative product design and development and marketing. Despite the fact that enterprises in this sector are constrained by lack of R&D support, high cost of innovation, and more importantly lack of expertise, some respondents in this sector have indicated that they are fully aware that they ought to develop their innovation capacity for long-term survival and existence. More than the technological innovations, the analysis reveals the higher level of management innovations in respondent firms particularly through quality and productivity improvements through acquisition of local and international standards certifications and adoption of Japanese management systems such as '5S' and 'Quality circles'.

Another observation is the link between firms' growth and age of entrepreneurs at start-up. The firms established by young entrepreneurs have shown relatively higher employment and financial performance. However, it appears that start-up training was not a pre-requisite for the majority of business start-ups. Interestingly, the analysis does not endorse any positive relationship between science, engineering and technology education and firms' technology performance and innovativeness which has been the main focus of the literature on technology and innovation. Incidentally, in Sri Lanka people with higher educational qualifications generally prefer paid employment over a career in business and this is very much apparent in science, engineering and technology careers. This is something that policy makers need to give a lot more attention and consider formulating appropriate policies to attract qualified and skilled young people with entrepreneurial abilities.

The analysis also found the underlying backwardness of local technology transfer, lack of home-grown technology and heavy reliance on foreign technology which can be considered as factors affecting technology and innovation performance of SMEs. With respect to external support services, the analysis shows that SMEs have not made use of technology support adequately in comparison with the level of technology and innovation activities firms have undertaken. Fewer firms have utilised external technology support services of which a higher proportion of them were medium-sized enterprises. In terms of general business support, a significant number of firms have received some form of business support at least once in their lifetime with majority favouring private and informal support providers such as family and friends than public sector providers. In terms of technology support, firms in the sample reported very little interaction with 'expert agencies' such as Technology and R&D centres and Universities. The evidence from the analysis suggests a vast gap between the service provisions of existing support system and needs of SMEs.

An important finding of this analysis is that the formal / informal dichotomy does not fit in the policy agenda and therefore is not appropriate as a framework to understand enterprises and the way in which they operate in the Sri Lankan economy. This issue at no stage in this research appeared to be an important variable.

Chapter 6

A Case Study of Technology Support for SMEs in the Coconut Fibre Industry Sector

6.1 Introduction

Whilst envisaging external interventions are crucial for the survival and growth of SMEs, through a case study analysis this chapter examines the way in which business and technology support organisations can foster the development of enterprises in declining industry sectors through a well defined, targeted and coordinated intervention. The case study analysis in this chapter draws on the debates about social capital in chapter two and the deficiencies identified there in modernisation theory and the informal/formal dichotomy.

In Chapter 2 I argued that the growth by size (based on number of employees) of the enterprise is not an important determinant of 'success' or 'development' and in the case of SMEs in Sri Lanka such assumptions are problematic. The literature cited in Chapter 2 suggests that the notion of modernisation is merely technological and that modernisation theory equates technology with 'development' and "the change from simple and traditionalised techniques towards the application of scientific knowledge" (Smelser, 1968 cited in Allen et al, 2000). The modernisation process illustrated in this chapter reflects upon the latter but highlights that any intervention designed to achieve technological change must take into account the traditional knowledge and techniques in a particular industry sector. Chapter 2 also illustrated that social capital impacts on a firms' technology and innovation capabilities and in Sri Lanka technology learning and sharing have been quite significant in both agriculture and industry. I also argued that collective learning and actions within and between groups in 'traditional' and 'non-traditional' industry sectors in Sri Lanka are relatively strong and this case study illustrates the way in which social capital has contributed to the sustainability of the coconut industry sector. Chapter 2 also distinguished the characteristics and role of 'formal' and 'informal' sectors and argued that, this formal distinction has no relevance in the context of the SME sector in Sri Lanka given the dominant role of the 'so-called' informal sector in both urban and rural locations. This case study on the coconut industry confirms this notion as it demonstrates that a healthy 'informal sector' is vital for technology change and development in a traditional but economically important industrial sector in Sri Lanka.

This case study investigates a pioneering enterprise support initiative launched by the Industrial Services Bureau (ISB), the regional business support agency for the North Western province. This initiative aimed to support the modernisation of enterprises in the coconut fibre industry through technology transfer, new product development and efficiency and productivity improvement. This case study provides an insight into the problems and constraints threatening the survival not only the fibre industry but also other associated industries that create thousands of jobs in the region. This support intervention is multifaceted and involves entrepreneurs and workers in the fibre industry, policy makers, technology and R&D institutes, public sector agencies responsible for coconut industries and providers of technology solutions and allied services. The main issues addressed through this intervention include upgrading existing technology through adoption and adaptation of foreign technology, new product development, training and skills, and marketing. This case study also highlights the problems associated with the transfer of foreign technology and why a well-defined adaptation process is necessary to make technologies appropriate for local conditions.

As discussed in Chapter 4, the role of SMEs is becoming increasingly important in the development of regional economies in Sri Lanka. In addition to facilitating the creation of new enterprises, ensuring the survival and growth of enterprises in traditional industry sectors like coconut and rubber primary and secondary processing activities is equally important. As highlighted in Chapters 3 and 4, traditional plantation-based primary and secondary processing enterprises are losing their competitive positions as technologies change and markets liberalise. At this juncture, appropriate interventions by technology support institutions in safeguarding the competitiveness of these sectors will be crucial to the revitalisation of 'failing and ailing' enterprises.

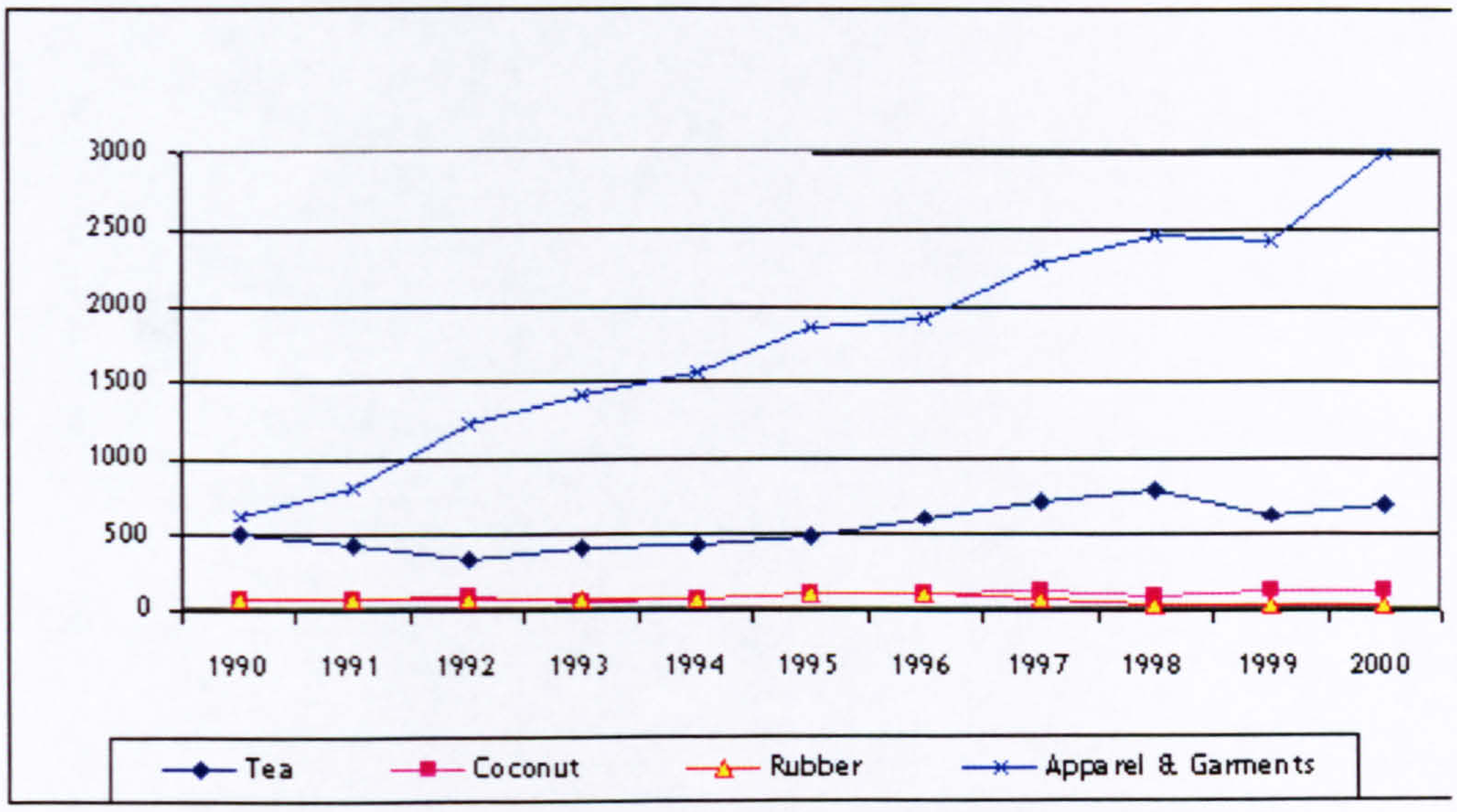


Figure 6.1: Major export sectors and earnings (US$mn)

Source: Central Bank of Sri Lanka (Annual Reports-various years)

Since economic liberalisation policies were introduced in 1977, the economic importance of traditional industry sectors have been overshadowed by emerging industry sectors, particularly the apparel and garments sector which has become the major foreign exchange earner in the country (Figure 6.1). Yet, rubber and coconut remain economically significant as primary sources of raw materials for several industries. The coconut sector is one of the main contributors to GDP and a major source of employment, particularly in rural areas. Among the coconut related industry sub-sectors, the coconut fibre industry remains a major contributor to regional and rural economic development. However, over the past few years, the fibre industry has suffered several setbacks due to stiff competition from artificial fibres in international markets. For example, in the last two decades, the coconut fibre trade has declined from 160,000 to 120,000 metric tonnes. To varying degrees, obstacles and challenges encountered by the coconut fibre industry sector are mostly caused by external economic factors; and firm specific e.g. low productivity, quality inconsistency, limited knowledge and access to potential markets, limited technical knowledge, and lack of R&D facilities and lack of financial support for technology development and innovation (Coir Convention, 2002).

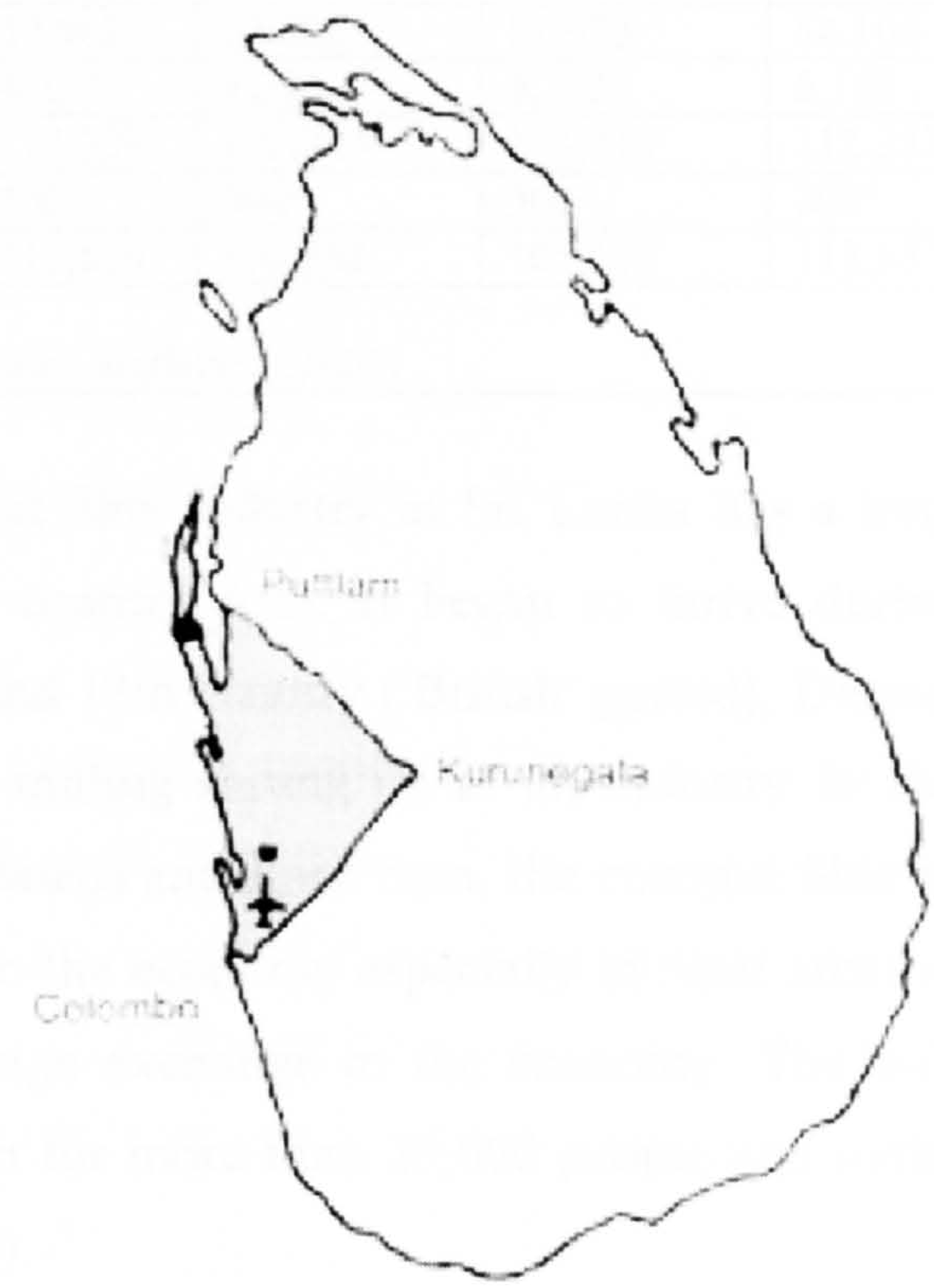
The coconut fibre industry sector is an important contributor to the rural economy [and is well integrated with other economic activities in rural areas through multiplier linkages. The government has repeatedly stressed the need for state intervention for traditional industry sectors through enhanced institutional support. Over the years, a range of financial assistance in the form of grants and subsidised loans has been made available to fibre processing and exporting enterprises. One of the key interventions was the 'Export production villages (EPVs)', an initiative by the Export Development Board launched two decades ago to promote rural exports and to develop export capacity through small-scale rural production networks. An EPV established in the North Western province has successfully supported exporting value added coconut products; linking and creating marketing opportunities for hundreds of micro and small-scale fibre producers. Despite the government's best efforts, the past three decades the fibre industry might be characterised as being afflicted by 'technology poverty' where a considerable number of processing units continue to use old or obsolete technology potentially undermining their competitiveness in both domestic and international markets. Considering the trends and patterns of technology development in major coconut producing countries, the coconut fibre industry in Sri Lanka urgently needs to review its current position in terms of technology development and innovation.

6.2 Coconut and coconut fibre industry in Sri Lanka

Coconuts are grown on about 22 percent of the total arable land in the country and 66 percent of the total coconut acreage on the island is spread, in the main, across four administrative districts, Kurunegala, Puttalama (North Western Province), Gampaha and Colombo (Western Province) which make up the ***"Coconut Triangle"*** (see Figure 6.2). It is the third largest industry in the agricultural sector, after tea and rubber. According to the Coconut Development Authority (CDA), the total area under coconut is 442,400

hectares and the total nuts production is 3,096 million. The total number employed in the coconut industry (plantation and processing industries) is well over 135,000 (CDA, 2000).

Figure 6.2: Coconut triangle



The coconut palm offers numerous opportunities for manufacturing a wide array of products and the coconut-based industries are well established with an adequate growing business base with strong links to domestic and international markets. Coconut kernel is processed into desiccated coconut; coconut milk (cream and powdered) while coconut oil is produced primarily for domestic consumption and a small percentage for the export market. Coconut husk is processed as bristle fibre, mattress fibre and mixed fibre (O'mat), commonly known as brown fibre primarily for the manufacture or processing of finished goods. Coconut shell is processed into activated carbon and charcoal for export (see Annexure 1 - Coconut based products). Sri Lanka is the major coconut fibre exporter among Asian and Pacific coconut producing countries (APCC) (see Table 6.1) and according to the data presented, Sri Lanka's share of the world fibre exports is well over 50 per cent.

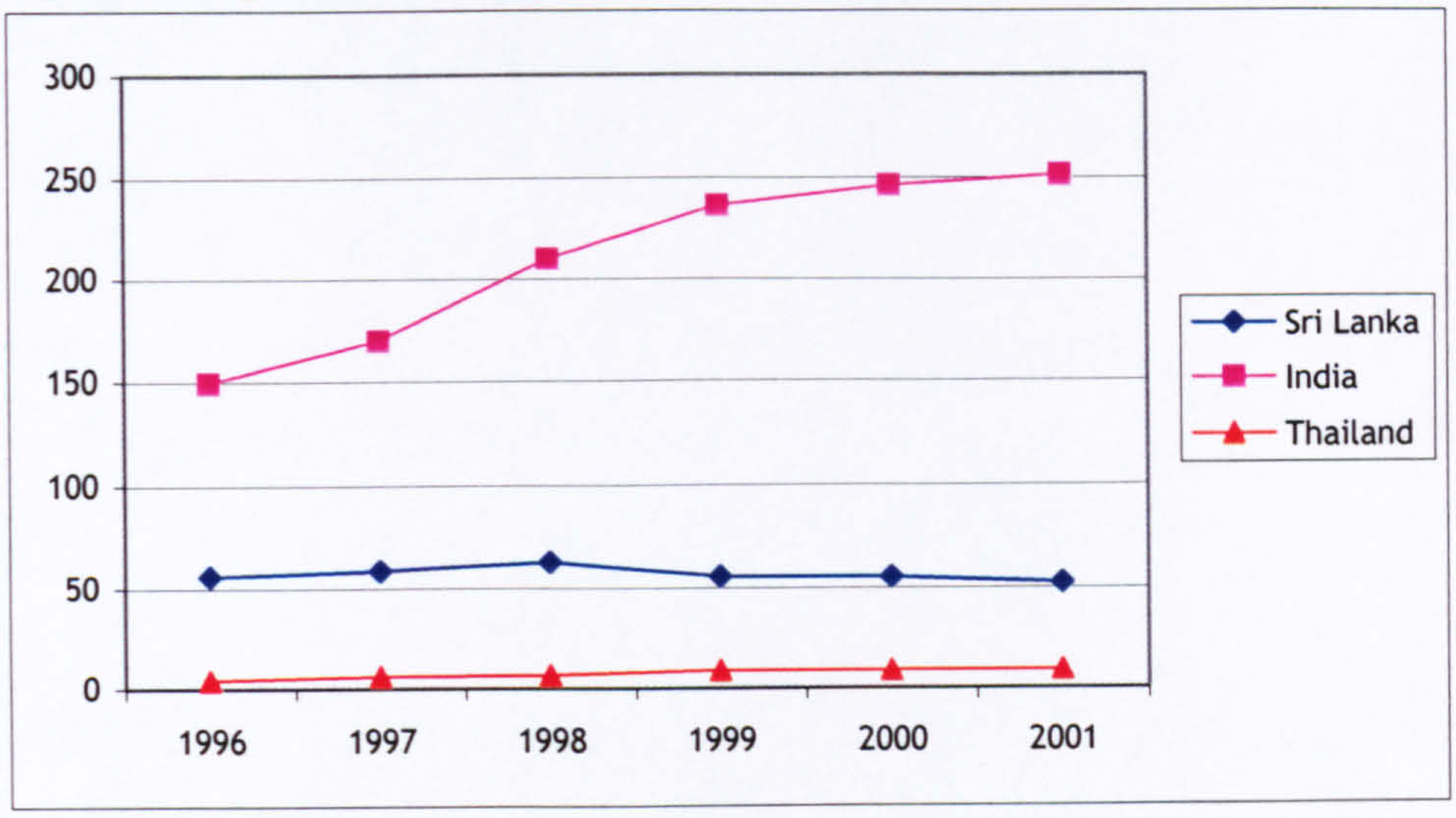
Table 6.1: Exports of coconut fibre and fibre products in the world – 1995-1999 (in MT)					
	Year				
Country	1995	1996	1997	1998	1999
India	48,383	44,660	46,223	51,139	50,697
Indonesia	672	866	595	30	59
Malaysia	138	110	225	139	65
Philippines	917	927	1,001	1,818	1,504
Sri Lanka	57,962	52,402	51,973	54,106	50,787
Thailand	4,257	3,318	4,793	5,105	6,890
APCC Countries	112,329	102,283	104,810	112,337	110,002
Other Countries	300*	300*	300*	300*	300*
World Total	112,629	102,583	105,110	112,637	110,302

*Estimates
Source: Coconut Industry Statistics, (2000)

The coconut fibre industry in Sri Lanka has a long history that dates back to the 13th century A.D. It began to thrive during the 17th century ('Dutch' period) and 18th century ('British' period). During the British period, the coconut fibre milling sprung up as an industry in almost every coconut estate (CDA, Undated) and since then, the coconut fibre industry has been of significant value to the economy especially in rural areas and it has generated much-needed foreign exchange to the economy. The industry has provided direct employment for more than 35,000 people and indirectly for thousands more (CDA, 2000).

Sri Lanka continues to dominate export markets for brown fibre where approximately 80 per cent of the fibre produced in Sri Lanka is exported. Total world coir fibre production is 250,000 tonnes of which Sri Lanka produces 36 per cent. The supply of bristle fibre is dominated by Sri Lanka; the country's unique Ceylon drum production technique is capable of meeting buyers' quality specifications (Rosairo, et.al, 2004). Despite being an economically important sector, the coconut fibre industry has been going through a difficult period since the beginning of 1990s. The graph illustrates that fibre production has been declining over the past few years compared to India and Thailand which have recorded stable growth (see figure 6.3).

Figure 6.3: production of coconut fibre ('000 tonnes)



Source: Fibre Bulletin December 2001, FAO

Sri Lanka produces two main fibre products, namely brown fibre and white fibre. The fibre is extracted from green coconut husk by the natural retting process[81] and white fibre is extracted through mechanical process from dry coconut husks (see Figure 6.4). The types of fibre and fibre products produced in Sri Lanka are given below (Table 6.2).

Figure 6.4: A retting pit on a fibre processing unit

Photo: Courtesy of http://www.fao.org

[81] Retting is a biological process, which softens coconut husks, which made easy extraction of fibres. Retting pits are used by the millers while brackish water sources are used for cottage level manual fibre extraction (mostly in southern coastal area).

Table 6.2: Types of Fibre and fibre products		
Product type	**Process**	**End product/s**
White fibre	Extracted from green husks retted in brackish water for 6-9 months.	Raw fibre, carpets, rugs, handicrafts
Brown fibre	Extracted from mature husks of coconut, after retting for a period up to 6 weeks. The fibre is extracted using traditional technology (Sri Lankan Spiked Drum)	Bristle fibre and short/softer fibre
Mattress fibre	Short and softer fibre is separated from brown fibre following extraction.	Rubberised mattresses, pads, upholstery, insulating material, packing material etc.
Bristle fibre	Long and stiff strands of brown fibre following extraction	Bristle fibre, twine, brushes and brooms
Twisted or curled fibre	Manually or mechanically twisted	Rubberised mattresses, upholstery, insulation or drainage pipes, filtering etc.
Coir twine	Manually or mechanically spun using bristle fibre	Mainly used in the Hop-industry
Coir yarn	Manually or mechanically spun using bristle or white fibre	Mats, carpets, rubberised mats, matting, netting, geo-textile etc.
Processed coir fibre products	Finished fibre products	Brushes – thawashi, banister, brooms, brushes Rubberised coir Mats, matting, netting
Fibre pith	Residue from the fibre extraction process	Moisture retainer or to improve soil- in briquette form or loose form
Coconut husk chips	Husk chopped in to pieces	Used for horticultural purposes
Source: Coconut Development Authority (1995)		

From time to time, over 900 fibre mills have registered with the Coconut Development Authority (CDA), mostly spread out in the coconut triangle and along the southern coast. Recent statistics published by CDA show that approximately 508 small and medium-sized enterprises are involved in the coconut fibre industry. At the time of writing, there are 39 exporting companies, 307 fibre mills and 162 coir fibre processing firms registered with the CDA (CDA, 1995). However, the actual number of fibre mills in operation at any given time is likely to be between 400 and 500. The fibre mills can be classified into three types: small, medium and large, depending on the number of defibering machines (drums) used. The small fibre mills usually have 1-3 pairs of defibering drums. The medium mills consist of 4 pairs of drums while large mills are those with five or more pairs of drums. Over 50 per cent of the mills in Sri Lanka fall into medium-size where the number of pairs of drums in use exceeds 2300 (CDA, Undated).

Sri Lanka has a well established institutional framework for the coconut sector. The Coconut Processing Board and Coconut Marketing Board functioned as the regulatory authority for coconut products and marketing respectively until 1980 when Coconut Development Authority was established merging the former. Among the responsibilities of CDA, the modernisation of fibre mills has been a policy priority for several years. As a consequence, fibre mills have received financial assistance to support their modernisation, specifically through the acquisition of new technology, quality and productivity improvement. As reported by CDA, of the 75 mills who receive financial assistance, only 20 have actually invested public money to acquire new technology whereas others have invested in electrification of mills e.g. replace diesel-powered motors.

6.3 Present status of the coconut fibre industry in Sri Lanka

The data presented in the earlier section suggests that over the past 10-15 years, the fibre industry in Sri Lanka has been going through a difficult period with numerous problems and constraints. Many of the problems are multifaceted and are a product of internal and external factors. There is a general decline in the coconut fibre market; moreover, there is a belief among millers that synthetic fibres will increasingly erode the natural fibre market (see for example FAO, 2003). It could well be, but the current declining trend is not necessarily an impact of artificial fibres but may also be due, in large part, to internal factors that are associated with the technology and marketing.

6.3.1 Technological constraints

The fibre industry is constrained by a number of external and internal factors including: the use of old machinery and equipment, unsafe machinery and equipment, low output and productivity, poor quality control, limited resources and a lack of knowledge for the development of new products and value addition. In order to gain a better understanding of these problems, it is worth knowing the operational aspects of a fibre mill. The most important operation in a fibre mill is the fibre extraction process.

The fibre processing technology being used in Sri Lanka is quite unique, highly labour intensive and probably more than 75 years old. The traditional production of fibres from the husks is time-consuming, highly polluting of surface waters, resulting the accumulation of large dumps of pith (FAO, 2002). Defibering machines, the main equipment in a fibre mill and known as the spiked 'Ceylon drum' (or *petti kuttama* in Singhalese) are generally crude, made locally and require special skills to operate. Operation is extremely complicated and can be very unsafe even when operated by skilled persons. Accidents are very common when husks are fed to the machine by hand (see Figure 6.5). However, the advantage of this system is the ability to separate out fibre into long and short varieties. Fibre extracted through this process, known as *Bristle fibre*, is of very high quality (ISB, 1995) and that is why the demand for coconut fibre produced in Sri Lanka is high. Despite these advantages, compared to leading coconut fibre producing countries such as India, Thailand and Malaysia, fibre processing technology in Sri Lanka looks increasingly less able to compete effectively.

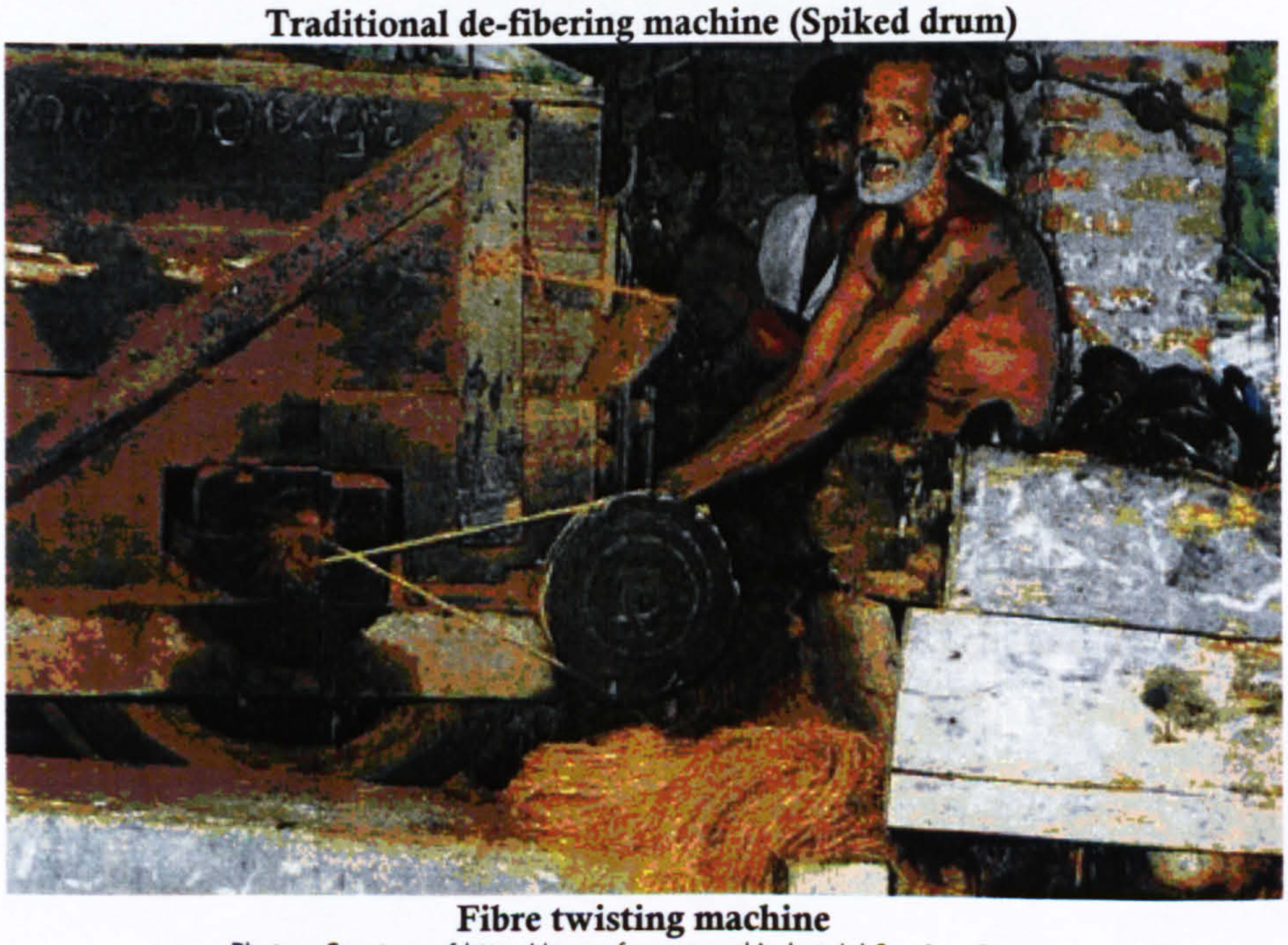
According to the Sri Lanka Coir Council International[82], a key obstacle facing Sri Lanka's coconut fibre industry is the absence of an effective quality control system, particularly between fibre mills and buyers. As millers continue to use old and labour intensive fibre extraction technologies and cleaning methods, this contributes to the production of poor quality fibres characterised by high dust content, short fibres, husk residues, and moisture in

[82] Coir Council International, an apex body represents companies in the fibre and allied industry. It is established to promote growth and development of the Sri Lanka coir industry aims to improve supply chain efficiencies, productivity, product quality and consistency for coir products. It includes a supply chain study to quantify the opportunity cost of current supply chain practices and government policies, which will provide the industry with better information for joint decision-making. The scope of this initiative also includes a demonstration mill to develop, test, demonstrate and, if found suitable, implement the advancements in the primary production of coir. Source: http://www.competitiveness.lk/coir.htm

the fibre. Variability in husk quality, working conditions, poor plant layout, as well as weather exacerbates the problem of assuring quality. Moreover, millers have little or no financial incentive to improve equipment and plant layout, or improve operations to achieve consistent quality (Coir Council International, Undated).

Figure 6.5: Traditional coconut fibre processing machines

Traditional de-fibering machine (Spiked drum)



Fibre twisting machine

Photos: Courtesy of http://www.fao.org and Industrial Services Bureau

Rising production costs are another cause for concern. Labour costs, especially for skilled machine operators, are rising continuously while other direct and indirect costs such as energy, transportation, and maintenance have increased financial pressure. The efficiency and output of old machines is poor (relative to modern machines) and breakdowns are very common resulting in regular interruptions. Moreover, the fibre industry's historical reliance upon a large work force also accounts for the high cost of production. The slow rate of mechanisation in the industry is a major contributory factor. India, by contrast has been able to lower the production costs by mechanising fibre extraction and processing using semi-automated defibering machines, and other machines and equipment to handle cumbersome manual operations (e.g. husk crushing, twisting, spinning, curling, hackling and baling). One of the obstacles facing mechanisation in Sri Lanka is the attitude of the village people who think that mechanisation will take their jobs away (Rosairo et al., 2004).

Generally, technology development and innovation in terms of product development and diversification, and process development are taking place in the fibre industry at a very slow pace for the simple reason that most millers are happy with the existing marketing system based on mutual trust between buyer and seller which gives milers a guaranteed price. This system is found to be very common among fibre millers in rural locations. Those who have direct contacts with the market would have some flexibility to manoeuvre in the market through offering a wide range of products. Innovations in non-traditional products such as coir fibre pith (waste from fibre extraction), coconut husk chips, geo-textiles, used in the horticulture sector, have been progressing over the past few years, mostly by new entrants into the fibre industry.

Coconut fibre is a natural product, primarily a raw material used to produce high-value added products for domestic and industrial use. Although there is a range of industrial and commercial applications of coconut fibre products, the R&D base in coconut fibre sector is relatively weak in Sri Lanka compared to India, Thailand or Malaysia. In Sri Lanka, the absence of a separate agency to undertake or support coir fibre related R&D activities leaves a large vacuum in terms of technology development, product and process innovation. The Coconut Research Institute carries out R&D on coconut cultivation but very little on coconut based products. A handful of larger exporting companies do carry out R&D on their own or with the assistance of foreign buyers or their parent company but this rarely filters down to producer level. The reluctance of SMEs to invest in R&D and technology development has seriously inhibited the evolution of the industry. SMEs argue that investing in R&D is too risky as returns are not guaranteed. Not only is Sri Lanka lagging behind in terms of technological innovations, it is excessively dependent upon other countries such as India for external technical expertise. One good example is the popularity of Indian machinery in coir manufacturing (Rosairo et al., 2004). The need of a dedicated technology support and R&D institution for coconut fibre sector is clearly being felt.

6.3.2 Marketing constraints

The fibre market in Sri Lanka is largely dominated by a handful of large companies who have been in the trade for a long period i.e. they can trace their history as far back as 1900 and have established strong ties with European and Asian importers in particular. Approximately 65 per cent of the market is controlled by 4 large-scale exporters/shippers. Although demand for coconut fibre products has increased, market prices have not improved much in the past 10 years (see for example FAO statistics on fibre export prices). Small and medium-sized fibre producers have been constantly constrained by poor market prices. Irrespective of the fact that demand for coconut fibre and fibre products is generally improving; strict quality controls, price consciousness, and stiff competition in the markets have become extremely difficult for fibre millers (ISB, 1995). Another contributing factor is the absence of a floor price for coconut fibre which often leads to price undercutting by both fibre millers and buyers/exporters (Rosairo et al., 2004).

6.3.3 Labour constraints

The working conditions in most fibre mills are very poor, unsafe and unhealthy. The nature of the fibre industry is such that the style of management closely resembles the feudalistic system that existed in the 19th century characterised by family traditions and a 'master and servant' relationship. Therefore, those who work in the fibre mills are often considered to be of low social status, and in most cases, families are dependent upon mill owners for economic security, particularly in rural areas. Although these types of management practices are gradually disappearing from the industry, they are still prevalent in rural areas. Poverty is still a major problem for the majority of unskilled workers in the industry.

The working environment is generally poor in fibre mills where workers are frequently exposed to many industrial hazards and it is well known that workers suffer from chronic illnesses and can suffer partial or permanent disabilities and poor health. Coir fibre dust causes many health problems, while workers who handle soaked husks are often exposed to skin diseases (CDA, Undated). Therefore, attracting new workers has become an extremely difficult task for most mill owners. One of the major problems fibre millers face is finding skilled workers to operate traditional fibre extraction machines and other associated equipment. This machinery, equipment and working environment is not very attractive to a new generation. On the other hand, the social status attached to certain jobs may also explain a lack of interest in the younger generation.

6.3.4 Inadequate government support

Although the government is actively involved in coconut industry development, its focus is largely limited to coconut cultivation. A subsidy scheme by the government through the Coconut Development Authority has been made available to support fibre mill modernisation and under this programme coconut fibre processors could apply for a financial package up to Rs.475,000 to acquire new machinery and equipment e.g. a defibering machine and husk crushing machine and Rs. 300,000 towards electrification. However, government support for technology transfer and research & development has been very limited. The government has, however, recognised the need for further support in the industry and has made financial provisions to support the fibre industry to modernise, diversify its product base and expand its export markets.

6.4. Technology support for the coconut fibre industry in the North Western province of Sri Lanka by the Industrial Services Bureau

The Industrial Services Bureau (ISB) was set up in the early 1990s by the Provincial Administration of North Western province whose primary task is to support enterprises in the province. The ISB aim to support the creation of an environment conducive to private sector initiatives; better utilisation of region's resources, and better co-ordination of industrial development and investment promotion activities (ISB, 1995). Among the activities of ISB[83], technology promotion has been given the highest priority. Creating and sustaining industry climate in the region are the primary objectives of ISB. Over the past 14 years, it has built its own capacity to intervene in policy and technical issues. It has designed, built and commissioned environmentally friendly and legally accepted technologies to overcome the environmental related problems of SMEs (ISB, 2002).

6.4.1 The coconut fibre industry revitalisation programme

Over the past 20 years, the industrial base of the North Western province has developed rapidly, creating new employment opportunities for a young and skilled labour force and has become the leading industrial centre in the country. However, this new industrial boom has threatened the survival of enterprises in traditionally dominant sectors (e.g. coconut industry, textile and handloom, agriculture and fisheries and traditional arts and crafts) in the province. Coconut is the most economically important agricultural crop in the North Western Province. About 48 per cent of the island's total coconut acreage is in the North Western province (200,890 hectares). There are over 500 enterprises engaged in coconut and coconut fibre processing industries i.e.

[83] The main activities of ISB are: investment promotion; management development and training; technology promotion (technology transfer, facilitating company R&D activities and quality improvement); technical service (energy management, environmental management and productivity improvement); and business advisory services.

coconut fibre, copra, oil, desiccated coconut, and the employment opportunities provided exceeds 10,000 (North Western Provincial Council, 1995). About 70 per cent of the coconut fibre mills are established in the North Western province (CDA, 1995).

The revitalisation programme was first conceived as a result of a preliminary appraisal of the coconut fibre industry in the province conducted by ISB and based on the information gathered from individual enterprises. Following a detailed SWOT analysis (strengths, weaknesses, opportunities and threats), three main reasons were identified by ISB regarding why the coconut fibre sector need support. They are:

- Its impact on the Sri Lankan economy in general and to that of North Western Province in particular ,
- The importance of revitalising a dying industry through technology transfer,
- The importance of preparing the industry to meet the growing demand for natural fibre and fibre products in the global market (ISB, 1995).

In early 1995, ISB held a major seminar together with the Fibre Millers Association, the Coconut Development Authority and other key stakeholders. This seminar gave an ideal opportunity to have an open dialogue and to seek the endorsement and commitment for all stakeholders required for the effective implementation of a programme of action.

A key objective of this seminar was to support the identification and selection of foreign technology solutions most suited to the local fibre industry. Following a series of consultations with stakeholders, the project team identified India as the technology leader in the fibre industry where the coconut fibre industry is well developed and technology and innovation is far superior to other coconut fibre producing countries. During a technology feasibility tour in the Southern Indian State of Tamilnadu, the ISB team managed to establish contacts with leading R&D centres and technology providers as technology partners for this project. Following this visit, two technical staff members (engineers) of ISB were sent to India to be trained in installation, commissioning, operation and maintenance of machinery, and this was arranged by two leading Indian machinery manufacturers.

The seminar and the study tour were the turning point of this programme which gave all stakeholders an opportunity to obtain an in-depth view of the current industry status and future direction of the programme. Following this, the ISB in consultation with main partner organisations prepared a plan of action titled 'Coconut Fibre Revitalisation project" which sets-out specific objectives and targets as given below:

- Enhance the output and productivity of the industry,
- Mechanisation of the existing process as a solution to the acute labour shortage,
- Introduction of modern and appropriate technology,
- Improve general working environment in fibre mills,
- Introduce safety measures to vulnerable pieces of equipment,
- Seek market opportunities for value added products,
- Develop new products and introduce value added products in order to enhance the profitability of the industry.

This programme was a two-tier intervention, first, modernisation through transfer of new technology in order to minimise the dependency on skilled labour and increase the production, and second, to assist enterprises to embark on innovation activities such as the identification of ways to add value to existing products, new product development and R&D. ISB services under this initiative included:

- Preparation of a project report for financial assistance (bank and grants from Coconut Development Authority), and fiscal assistance (duty rebates),
- Sourcing of machinery and equipment which includes importing and clearing,
- Installation of machinery and equipment and commissioning,
- Operator training and maintenance.

In addition to the above, a maintenance service package was offered to fibre millers participating in the modernisation scheme.

Another significant step taken by the government was the creation of a special financial package extended by the Coconut Development Authority to enterprises to support mill modernisation. This package included up to Rs. 250,000 per mill for the installation of a defibering machine; up to Rs. 225,000 per mill for the installation of a husk-crushing machine; grants to cover 50 per cent of the cost of obtaining the main supply of electricity (maximum payment is Rs. 250,000); and internal electrification per mill not exceeding Rs. 75,000. The maximum grant under this scheme was Rs. 300,000 per mill for husk crushing machine and electrification. This financial package can be considered to be a major achievement both for the millers and ISB.

The main programme was implemented in two stages and in stage 1, the ISB focussed on consensus building among all stakeholders (Fibre Millers Association, government agencies -in this case Coconut Development Authority, Ministry of Industries and Export Development Board; North Western Provincial Council, and Banks). This was deemed important as this programme required a substantial amount of both financial and non-financial inputs. With the assistance of Indian technology suppliers, two demonstration mills were set up to educate millers so they were able to see on site the way new production process works. Other activities carried out in Stage 1 included preparation of technical guidelines (technical drawings, technical feasibility etc.), awareness building and training of millers. The awareness programme held with the participation of Fibre Millers Association, CDA and Indian machinery manufacturers was considered very helpful to educate fibre millers about the programme and various options available for millers. The ISB's role extended far beyond that of implementer; they also acted as a facilitator, helping millers to import machinery and equipment. In stage 2, the focus was more on market research and innovation facilitation geared to the strategic needs of fibre millers; specifically seeking market opportunities for value added products, development of new products and introduction of value added products, setting up a special training unit , R&D, testing, and laboratory facilities.

6.4.1.1 Modernisation through technology transfer

The modernisation of fibre mills through new technology transfer was the key component of this programme. Four types of technology options were made available for fibre millers to choose from depending on their financial status and the technology status of their mill.

Option 1: An improvement to the traditional system with the addition of two new machines. The investment can be recovered in 26 months. The recovery period will be reduced to 13 months if a grant is received.

Option 2: An improvement to the traditional system with the addition of three new machines. No dependence on skilled labour. Financial gains are limited.

Option 3: An existing mill with entirely new machinery and process. Investment can be recovered in 15 months.

Option 4: A new mill with entirely new machinery and process. Investment can be recovered in 15 months.

According to the records held by ISB, most mill owners had chosen option 1 & 2 as the investment was comparatively lower than options 3 & 4. Interestingly, most millers preferred a combination of traditional and new technology simply because it allowed both processes to run simultaneously (evidently, they were not entirely convinced that the new technology would not adversely affect the quality of their fibre). During the six year period between 1996 and 2001, a considerable number of millers had shown interest in mill modernisation and were willing to invest in product innovation and diversification as a way of increasing the value added component of their sales. The demonstration mill was a real success as it helped convince millers of the advantages of new technology. According to ISB, the majority of millers favoured a smooth and gradual technology transfer that would enable both mill owners as well as workers to adjust to the new working environment.

Table 6.3 provides a snapshot of the performance of the fibre industry revitalisation programme with reference to the five stages of the modernisation process. As the Table shows, ISB has organised 30 programmes to raise awareness about the programme which included: half a day seminars, visits to demonstration mills and 5 study tours in India. Approximately one fifth of enterprises (123) of the 720 enterprises that took part in the initial awareness building sessions and onsite consultations have embarked on modernisation of which about 72 per cent (88 enterprises) imported machinery and equipment through ISB (see Figure 6.6 for an example of a modernised mills). The data also reveals that almost all fibre processing enterprises in Sri Lanka took part in the programme which affirms that enterprises are persuaded of the importance of technology capacity building to their competitiveness. By 2001, 12 enterprises had commenced development of new products (product innovation) and value additions (see Figure 6.7 for examples of innovative coconut fibre products). According to ISB officials, the number of machines imported through other sources is unknown, but they estimated that it could easily be around 30. In this programme, the Coconut Development Authority had provided financial assistance (subsidies and grants) for over 100 mills towards importing and installing machinery and equipment.

Table 6.3: Performance of the fibre industry revitalisation programme (as at 2002)

	Number of Awareness Programmes	Initial Consultation Service (onsite)	Import of Machinery and Equipment	Installation and Commissioning	Assistance for Product innovation / value Addition
		Number of Enterprises			
1996	4	160	40	30	5
1997	5	80	26	20	2
1998	4	60	30	18	-
1999	2	40	12	10	1
2000	8	180	07	06	5
2001	7	100	08	04	3
Total	30	620	123	88	16

Source: Annual Reports of the Industrial Services Bureau (1995-2001).

At the time of writing, 60 per cent of the fibre millers had modernised their mills with new technology (machinery and equipment) and a larger proportion of them had embarked on product innovation and diversification that had enabled them to venture into new markets both locally and abroad. According to ISB officials, interest amongst millers in R&D and product innovation was surprisingly low. There can be several reasons for this. First, the fibre millers did not see this as significant in terms of revenue generation i.e. there is a ready market for coconut fibre. Second, the majority of fibre millers are constrained by financial and human resources that are necessary for R&D and innovation activities. Third, value addition and product innovation is largely dominated by a handful of big exporting companies. Competing with these firms could bring fibre millers – at the bottom of the supply chain - into direct conflict with much larger, dominant businesses, with potentially severe consequences. There was considerable 'hidden' resistance from larger companies towards this programme and, in general, for supporting fibre millers with new product development and direct export. Fourth, although ISB did not have the expertise or resources, ISB wanted to incorporate R&D and product innovation in the programme by obtaining supplementary expertise and assistance from mainstream R&D and technology support agencies. Unfortunately, ISB were largely unable to do so, simply because of the lack of financial resources as well as a dearth of expertise in these institutions.

According to ISB, the 'Coconut fibre industry revitalisation programme' was a successful intervention and it achieved what was intended. As explained earlier, the only shortcoming was the absence of an R&D and product innovation aspect although it was entirely beyond ISB's control. Currently, the programme is operating at a very low scale, with only technical advisory and aftercare technical support (maintenance and supply of spare parts for defibering machines). According to ISB officials, its capacity and resources are limited to providing aftercare technical assistance and they are unable to assist fibre mills and related enterprises outside North Western province. In order to overcome this, the services are now being offered to enterprises outside the province on a fee basis. A positive development in terms of technical assistance is that the Fibre Millers Association has taken over the continuation of this programme and plays a lead role in providing advice and guidance as well as assistance in connection with importing machinery through different technology suppliers, installation, testing, and training. One of the remarkable outcomes of the programme is the knowledge sharing amongst millers for their mutual benefit which was quite significant to the success of this programme.

Figure 6.6: New technology at work. The Indian defibering machine installed in a fibre mill

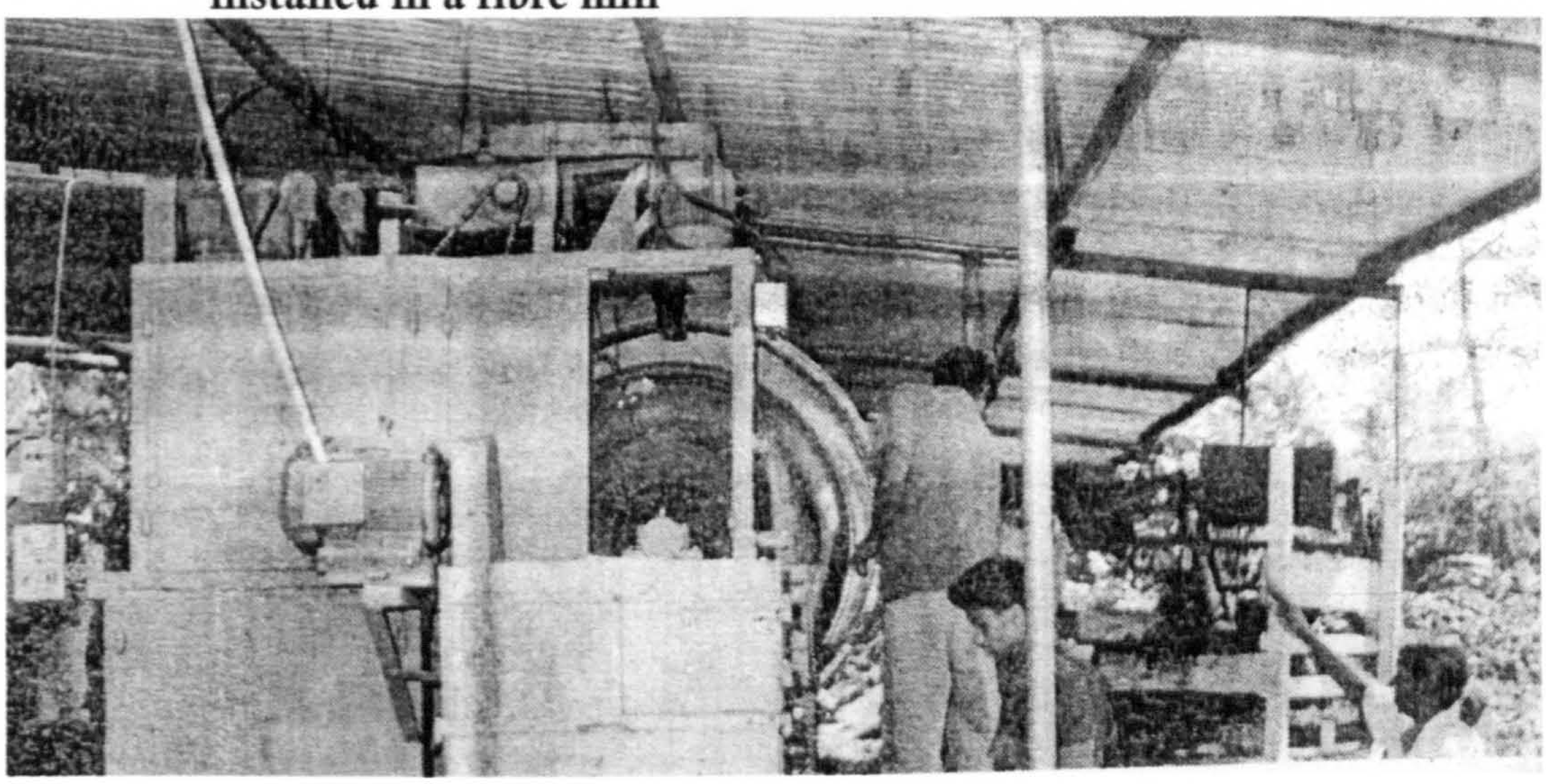
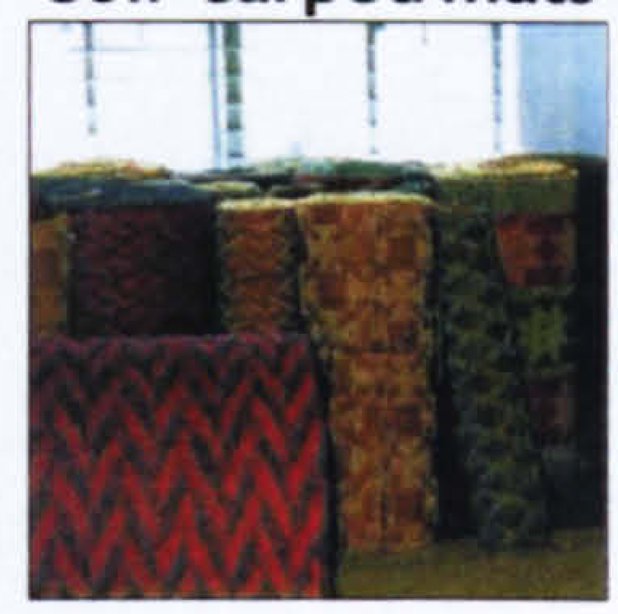


Figure 6.7: Innovative coconut fibre based products (Photos courtesy of Industrial Services Bureau)

Coir twisting

Coir twine

Coir carpet/mats



Products for horticultural purposes made out of coconut fibre, fibre off cut and fibre dust

Coir mats

Rubberised coir pots

Coir hanging baskets

Coco peat

Coco peat discs

6.5 Positive and negative aspects of the programme

The modernisation programme can be considered as an excellent example of a successful public-private initiative. As programme initiators, the ISB has experienced both success and failure throughout the programme and has been confronted by numerous obstacles and constraints. As a new regional business support organisation, with limited resources and experience the programme represented a huge challenge in both technical and organisational terms particularly as ISB is not financially supported by any national or regional authority and that it relies solely upon foreign funds and income generated through various business support services. The scheme owed much of its success to the drive of a young and enthusiastic professional staff and the recognition and support it generated in the business community. The organisation perceived this programme as a good opportunity to broaden its service capacity and coverage while generating much needed revenue for the organisation.

The scheme leveraged a range of political, technical, operational and financial support from stakeholders with the Coconut Development Authority providing financial assistance, the Export Development Board assisting for product innovation and export marketing and the Fibre Millers Association taking charge of raising awareness about the programme among their membership and lobbying where necessary. This coordinated effort shows that there has been a growing recognition amongst stakeholders of the importance of modernisation and diversification in the fibre industry. The response and commitment from the millers was very positive from the beginning as they were rightly convinced that the benefits of this programme far outweighed the risks and that modernisation through new technology transfer is essential for achieving lasting competitiveness.

On the negative side, it is important to note that a small number of millers expressed their concerns over substituting local technology with imported technology while others are entrenched in the belief that that the fibre industry is unique and the quality of fibre can only be maintained by traditional methods. A lack of understanding, resistance or slow response to technological change was also observed which may be attributed to economic reasons, and might be viewed as a 'self-imposed psychological restraint'.

This case study demonstrates that transfers of foreign technology into 'traditional industry sectors' through third party mediation, in this case by a business and technology support agency, are particularly challenging in a regional setting where resources are limited and national government support is lacking. Another factor emerged from this case study is that the traditional industries are embedded deeply into the rural social structure and modernisation through infusing new technology to replace old technology would have significant impacts on the village social structure. In rural areas where the fibre industry is the only economic activity, the livelihood of a whole village is often dependent upon the fibre mill therefore the owner of the mill has an obligatory responsibility to serve the village and safeguard workers interest. This has been happening for at least two- or three generations. Equally, however, the exploitation of labour in such situations is quite common and is perhaps inevitable.

When the idea of this programme was conceived and during the initial period, the opinion of all parties concerning the advantages and disadvantages of both traditional and modern systems had been carefully evaluated, only after that the feasibility of four technology transfer options was conveyed to fibre millers for them to decide which option suited depending on the individual circumstances. Following the successful implementation of this programme, ISB has been invited to contribute to a new national initiative called 'Coir Cluster' by the Ceylon Coir Fibre Exporters Association supported by Sri Lanka-USAID Competitiveness Initiative and Common Fund for Commodities based in the Netherlands. This initiative focuses on opportunities and bottlenecks for technology and market development and stimulates joint research and development involving industry, research institutions, and government support agencies in producing and importing countries.

6.6 Conclusion

The ISB's coconut fibre industry revitalisation project was a major breakthrough in fibre industry development as it helped modernise over 123 fibre mills by introducing new technology and new value added products for export. As in-house research and development capacity is limited, the ISB acted as a facilitator in carrying out joint R&D with national level R&D institutions and private R&D companies, which in turn helped to enhance the enterprises' capacity to undertake R&D on their own. This type of networking and cooperation between institutions and industry is extremely necessary for a country like Sri Lanka where resources are meagre and innovativeness in industry, research and institutions is all too often lacking. What is unique about this technology transfer programme is its bottom up approach and versatility and the reason behind the success of this programme is its uniqueness and determination to adapt foreign technology to suit to local conditions through a well co-ordinated facilitation process. The fibre industry is a social enterprise with a strong social and economic value chain and these types of value chains in traditional settings have a great impact on the regional economy. The transfer of new technology should be a process that will not disturb the existing value chain in a traditional setting therefore, this programme can be viewed as a knowledge transfer process, than technology transfer per se.

This case study evidence shows that government intervention through technology and R&D support providers is crucial in a country where traditional industries are playing a leading role in the economy. It is also essential to recognise the institutional dynamics of technological change and growth in a policy oriented perspective. As Kumar (1977) suggested, technology transfer programmes become more effective only in the presence of responsive local entrepreneurship willing to compliment imported knowledge with extensive in-house technological effort, adaptation, continuous updating and innovation.

Chapter 7

Technology and Innovation Performance of SMEs – Enablers, Barriers and External Support: Case Studies

7.1 Introduction

In the previous chapters, the technology capabilities and performance of sample SMEs (Chapter 5) and the way in which the performance of SME has been influenced by internal and external factors were examined (Chapter 6). The evidence envisaged that although owner / managers are aware that technology development and innovation are vital to be competitive. The Chapter 6 presented a case study evaluation of a good practice business and technology support programme implemented by a regional business support agency (ISB), which discussed issues and challenges, and what works and what doesn't.

Taking a step further, through two case studies this chapter discusses the viewpoints of entrepreneurs on issues and challenges of SMEs especially in embracing technology development and innovation as a means of achieving firms' growth performance and improving competitiveness. These case studies illustrate and provide some evidence on what determines entrepreneurs or firms to innovate and strengthening technology capabilities in an unsound economic environment and, how entrepreneurs perceive external interventions as being appropriate and effective instruments in meeting SME needs.

7.2 Case Study 1: SD TECHNOFAB (Pvt) Ltd, Galle, Sri Lanka

This case study illustrates an innovative and motivated entrepreneur whose drive and determination backed by his academic training contributed to build a successful business. The case study also highlights the technology progress and innovative behaviour of the firm; challenges, issues and barriers firm facing; and the strategies firm adopted to overcome them. This case study also reveals the rationale for firm strategy on technological change and how it has shaped the firms innovative behaviour that further enhances firms' technological capabilities.

The data for the case study analysis derives from the structured questionnaire used for the survey and subsequent face-to-face interviews conducted in June 2002 and telephone interview in April 2006. This case study comprises a brief profile of the engineering sector, owner/manager and the firm; followed by an analysis of firm's technological innovation performance, issues, barriers and challenges.

7.2.1 Profile of the industry sector

The engineering sector in Sri Lanka consists of mainly two sub-sectors; fabrication of machinery and equipment, transport items, industrial and agriculture equipment and light engineering. The former is dominated by few large firms in heavy engineering (e.g. manufacture and repair ship and boats; transport items; and steel fabrication for construction industry) and the latter is represented by a large number of small and medium-sized firms (e.g. industrial and agriculture equipment manufacturers; engineering products for consumer use; foundry work; assembly of motor cycles; and electrical goods). Although Sri Lanka does not have a well-developed engineering sector, economic liberalisation in 1977 has led to the augmentation of new business ventures in engineering and related activities.

Due to the increase in industrial activities in the 80's and early 90's, the demand for industrial machinery and equipment began to rise. However, the relaxation of import tariff on industrial goods as well as duty free concessions offered to export oriented firms seems to have adversely affected the domestic engineering sector. Similar trends could also be observed in certain other sectors, for example, passenger coach and bus building, motorcycles assembly, consumer engineering products and agriculture equipment, where cheap imported goods (both new and used) from places like India, Japan, Taiwan, and Malaysia dominate the local market. The main issue the engineering sector currently facing is cheap imports which is undoubtedly detrimental to the development local engineering sector while certain regulatory barriers too deprive local entrepreneurship and innovation. With the exception of a handful of long established medium and large-sized enterprises, only a little amount of research and development is currently taking place in this sector. Those firms engaged in R&D have been able to capture a substantial share of domestic market with innovative products. Although a considerable number of foreign-collaborated firms are currently dominating the export market, the linkages with local engineering-based (e.g. supply chain arrangements) seem to be very weak.

7.2.2 Profile of the owner/manager

The respondent, ***Sunil Withanachchi***, is the founder of the business and currently the Chairman/Managing Director of the firm. He is 46 years old, academically qualified with two diplomas in automobile engineering and electronics telecommunication from reputed public sector technical training institutes in Sri Lanka. Before starting up this business, *Withanachchi* worked as an Engineer in various capacities for over 14 years of which 7 years in international firms in Saudi Arabia and Maldives. In 1994, after quitting his last job as the Maintenance Engineer at a five star hotel, he wasted no time on starting his business with the help of his family and friends. Since starting his business, *Withanachchi* has progressed rapidly and have been able to establish his name as a successful innovator. He has a patent and a trademark to his credit. He is an active member of various trade bodies and represented Sri

Lanka at international conventions held in China and Thailand. In addition, he has been awarded with prestigious '*Dakshina Abhimani 2005*' award (Southern Excellence) by the Southern Provincial Council for best performance in the field of technological innovations in Southern province.

At the interview, I asked what motivated him to get to get into business rather than pursuing a paid employment, *Withanachchi* responded by saying that running a business was a dream he had from his childhood and always wanted to do something different. He further stated that:

> *"I had a great passion towards technical things, how things work and what I can do to make things work differently. I consider myself as an innovator."*

Answering to the question why he did not want to pursue a paid employment he emphasised that generally the socio-economic environment in the country is not just right for people to innovate and the situation is worst in paid jobs where workers do what they are asked to do and less encouraged to do things using own initiatives. Emphasising on job satisfaction as the key factor *Withanachchi* stated:

> *"..at this moment I have not got a lot of money because I invested all what I have earned, but I enjoy my work; main thing for me is job satisfaction."*

The main driver for starting this business has been his engineering background. The business idea was first conceived during his academic years at the German Technical College, Colombo and after completion of academic training, he joined thousands of other skilled people seeking employment abroad. He has worked for reputed international engineering firms through which he was able to acquire specific skills and experience that were later put in to good use in his business. Being from a rural area, he has seen plenty of business opportunities in the field of engineering, transportation and agriculture, stated:

> *"...my objective is to identify practical solutions through engineering innovations."*

7.2.3 Profile of the firm

Technofab was established in 1994 as a Limited company with an initial investment of Rs. 1 million from personal resources and bank borrowings and five workers. Currently, the business is worth more than Rs. 23 millions (approx. £130,000). The business is located on his own premises where he and his family live. The firm's main line of business is designing and manufacturing transportation and industrial machinery and equipment with improved productivity, efficiency while making them economical. Many of the company's engineering product innovations are based upon the significance of sustainable technologies and solutions for local needs. The products are marketed under the registered trademark **HARDYMEC ®**.

The firm's management style is unique. The owner takes all the decisions unilaterally and his role extends to all areas from managerial functions to technical operations. There seems no delegation of work apart from workshop operation that is handled by 2 supervisors and 13 skilled and semi-skilled workers. Apparently, all workers are trained on the job and no technically qualified persons are employed in the firm. It was mentioned in the interview that there are difficulties in finding technically competent workers who are willing to work in a smaller firm, especially in a remote place, and is struggling survive in the highly competitive market. The general trend is young people prefer 'white collar work' in large companies as against working in smaller firms. He believes that workers can only be developed through on the job training therefore a business like his needs faithful and dedicated workers who would remain in the firm for long periods. He fears that trained workers would leave the company after gaining experience seeking better employment opportunities. Since his company is engaged in R&D, there is a risk of sensitive information leaking to his competitors (most owner/managers termed this as 'hijacking workers').

According to the way the business is functioning, it appears that the production function is entirely dependent on the owner/manager who performs almost every task in the firm from designing, prototyping and production. The only task delegated to workers being the fabrication process that is handled by two supervisory staff assisted by a team of skilled and unskilled workers. This is quite common among majority of SMEs in Sri Lanka where there is no apparent decentralisation of work in the firm.

According to the owner, since the marketing is contracted out to a reputed firm in Colombo, he is able to focus more on production and R&D functions. He believes that a marketing arrangement of that nature is the most suitable way to expand its market share. In addition, working with a well experienced marketing firm would undoubtedly beneficial to the company as the owners of the marketing firm provides him with professional assistance in the form of new ideas for new products and a feedback on customer responses that can be useful in further improvement of existing products etc.

7.2.4 Technological and innovation capabilities and progress of the firm

As engineering based firm, the technological knowledge the firm possesses can be a combination of both explicit and tacit. As is the case with most enterprises, the technology, in this case machinery and equipment, is obtained from the domestic market at a relatively high cost. Therefore, the firm has designed most of its machinery and equipment while there is also a certain amount of foreign technology component in the firm facilitated through a technology partnership with a Chinese company. The manufacturing of two wheel and three wheel tractors is done under a licensing agreement with the Chinese partner.

In terms of technology and innovation activities, over the past 12 years ***Technofab*** has invested substantially on innovative projects. The first project was electro-hydraulic firewood splitter, a simple machine for splitting firewood and this was developed targeting tea factories where firewood is still the preferred energy source. This equipment is now patent protected. ***Technofab's*** major innovation was the transformation of handle controlled two-wheel tractor into steering controlled. Currently this is the main product line of the firm and the two wheel and three wheel tractors are being manufactured in collaboration with a Chinese company. The steering controlled two-wheel tractor has been further developed to suit to land and road use, for example, tiller and trailer for two wheel tractor and agricultural purposes with improved features compared to imported ones; and the tractor-mounted mobile cab-hoist for aerial maintenance work (see Figure 7.1). Other innovative products of the firm include: improved and efficient processing machineries for tea factories and, an incinerator for garbage disposal for local authorities. In addition, ***Technofab*** is currently working on two new projects. First one is design and develop low cost and energy efficient mobile freezer unit for transportation of fish, food product and especially collection of milk while maintaining the quality and the second project is a new vehicle for garbage handling but this project is currently on hold due to financial contraints.

When questioned about the progress of the firm so far, *Withanachchi* stated:

> *"..I can say that I am happy with our progress, especially in an environment which is not particularly encouraging for innovative small enterprises like mine. I can expand my operation but I am scared to do that because our economy is very vulnerable and such an expansion is very risky now. I have come all this way with greatest difficulty and our journey is not a bed of roses. I have to tell you that I was fighting a legal battle for five years with the Commissioner of Motor vehicles who refused my application to register the steering controlled hand tractor which I have developed in 1999. Finally, I have won this case and after this, only I started manufacturing this tractor. This is a landmark case in Sri Lanka and this case has set a precedent followed by several other similar cases of a number of innovators like me."*

Although the owner/manager of the firm is aware of the IPR and its benefits for innovative SMEs, it appears that he has less faith on the IPR system in Sri Lanka and this is not only his personal view but also an enterprise-wide issue. This can be considered as a major barrier for innovation performance of the country. Although one patent has already been registered, the owner/manager seems to have no interest in securing Intellectual Property rights for his future innovations. Emphasising on this matter, *Withanachchi* stated that:

> *"...I don't think I will ever apply for patent. Last time, it took lot of my time for registration process and I had to handle everything on my own. I did not get any legal or external support. The projects I am currently working on is entirely innovative and it is patentable but I can't be bothered about patenting it because I have no trust on people at the patent office. They are corrupt and do illegal activities, for an example, what they do is when an application is made some corrupt people at the patent office sell the design or formulae illegally to local large companies or foreign parties. By the time the application is processed the idea would have already been registered elsewhere. We have no facilities to check this. So what's the point of patenting new ideas?"*

According to *Withanachchi*, *Technofab* is equipped with adequate resources in terms of latest machinery and equipment; the firm has fabricated certain equipment for its use at a very low cost than the market price. Apart from that, the firm has good workshop facilities, plenty of space and storage and IT facilities. Describing the human resource aspect which is the backbone of any small firm, *Withanachchi* stated:

> *"..I have a very good team of workers, all trained by me. When you met me about three or four years ago I had about 30-40 workers and among them were few qualified workers. The problem with the qualified people was, they always compare my business with other companies lager than mine and they don't really understand how I am struggling to come up. Finally, one by one left the company and now I am left with 15-20 workers. However, I am happy about them and they are the backbone of my business. I give training but only what they need to do their job. I have not come across a single company which train people on designing and fabrication. As far as I know no engineering firm in Sri Lanka does it. My business is entirely based on knowledge and intellectual property and in most cases people get training and move to another company taking all my company secrets. This is not an ideal situation."*

7.2.5 Business and technology support and external linkages

One of the main objectives of the case study analysis is to find out firm's innovation and technology cooperation with external actors i.e. suppliers, customers, competitors or other enterprises, consultants/commercial labs/private research and development institutes, universities or higher education institutes, government or public research, technology support institutions. According to the respondent, the firm has been very successful in establishing technology sharing arrangement with a Chinese company based in Shanghai, China who manufactures tractor spares in accordance with ***Technofab's*** own designs. The Chinese company supplies some components required for assembly of tractors. The firm has been working with Chinese partners since 2001 and looking at possibilities of furthering cooperation into other areas too. Apart from that, ***Technofab*** has embarked on an R&D project with the Department of Agriculture Engineering of University of Peradeniya on a project to design a new vehicle for garbage handling. Due to funding cut by the foreign donor agency, the project is currently on hold until the financial matters are sorted out. The owner seemed to be very cynical about the potential benefits of R&D and technology cooperation with other enterprises even supply chain arrangements as his business is unique and has its own style of management practices. Extending his thoughts on this aspect *Withanachchi* seemed to be somewhat pessimistic about the potential advantages of having links between R&D and technology support institutions, stated:

> *"..I have no links with R&D and technical support agencies, universities or business support agencies. The difficulty in working with R&D institutes is their negative approach towards small firms like us and they don't see us as we see ourselves. In most cases they are far behind in terms new knowledge, we entrepreneurs have to tell them what's to be done."*

Although ***Technofab*** does not seem to have much faith on the business and technology support networks, the owner himself has been able to lobby at government level on its own on various matters, as a result, he was granted an interest free loan from the President's Fund for Inventions and Innovations.

Subsequently, these funds have been utilised for further development of multitask two-wheel tractor **(HARDYMEC LOADMASTER)**. Apart from this loan, the firm has not had any form of support towards technology and innovation activities and most funds have come from his family and close friends.

7.2.6 Issues, challenges and barriers for SMEs technology upgrading and innovation

The aim of the case study interview was to identify enablers and barriers for enhancing SMEs technology capabilities and innovativeness. The evidence from this case study reveals certain inherent differences in policy framework and lapses in the current business and technology support system. Expressing his thoughts on business support, *Withanachchi* stated:

> *"In short, my main concern is whether our country has a policy or real desire to promote and safeguard SMEs and particularly innovative ones. I am not quite whether we have a good environment for technological innovations."*

Citing his own experience, the owner of this firm raised concerns over the effectiveness of government policies on safeguarding domestic manufacturers stated that policy makers ignore the contribution of domestic manufacturers like ***Technofab***. The government has allowed duty free import of tractors and this only benefits large trading companies located in Colombo not the manufacturing SMEs. Apparently, ***Technofab*** pays 40 per cent tax on imported tractor spare parts from China whereas the import duty for tractors is much lower. Despite these difficulties, the firm still manage to keep the prices of tractors lower than imported ones. Based on the feedback from customers, quality of tractors manufactured by this firm is much superior to the imported tractors. *Withanachchi* expressed his disappointment over the lapses in the government policy on SME and stated:

> *"..We add value locally and we provide employment and top of that we pay taxes for imported spare parts but I don't think this fair on local manufacturers. Another issue is high interest on bank borrowings. This is hugely unreasonable and discriminatory too especially for local manufacturers."*

Another example of ***Technofab's*** bitter encounters with the government bureaucracy was the five-year legal battle to secure the rights of one of its innovations. When enquired about the existing SME support structure *Withanachchi* stated:

> *"..Our support structure is underdeveloped, especially R&D institutions and universities. We lack educated and committed professionals at these places, brain drain is another big problem for our country it really affects private businesses."*

Currently, the business is running below its capacity due to low demand in the market for two and four wheel tractors. The main buyers for tractors are the public sector agencies and local authorities; but in recent years witnessed the government budgetary allocations on capital investment have been restricted resulted in drop in sales. This shows the vulnerability of small manufacturing enterprises because of too much reliance on concentrated market segments. Answering the question on whether ***Technofab*** has looked at potential markets overseas, *Withanachchi* replied by saying that because of the cumbersome export licensing and certification systems SMEs find it more difficult to get into export business. However, he ascertained that this is possible if a joint venture partnership can be established with a reputed exporter.

The first hand experience of an innovative firm operating in an economy like Sri Lanka where engineering based industry is not well developed reveals that adverse macro-economic policies as well as lack of right interventions put innovative SMEs at a greater disadvantage. Emphasising on this aspect Withanachchi further stated:

> *"We have lobbied to the government on this but nothing has happened yet."*

Figure 7.1: HARDYMEC hoist mounted on a hand tractor developed by *Technofab*

7.3 Case Study 2: Wa-Lu Aqua (Pvt) Limited

This case study illustrates the rise and fall of a business established by a retired public servant-turned-entrepreneur who had the courage to invest in a risky but 'niche' business, and enjoyed both successes and failures during its short business life. The case study also highlights the performance of an aquaculture enterprise which is entirely dependent upon external technological knowledge, market factors, public policy intervention and more importantly natural environmental factors. This case study provides a classic example of a Sri Lankan enterprise struggling to overcome barriers in complex economic and natural environments. This enterprise has been operating in a relatively a novel sector to Sri Lanka characterised by sophisticated technology, limited knowledge transfer, competitive markets, high risk investment as it susceptible to natural hazards, and above all no apparent government intervention in favour of the development of the sector.

The data for the case study analysis derives from the structured questionnaire, and face-to-face interviews in June 2002 and telephone interview in April 2006. The case study comprises brief profiles of industry sector, owner/manager and the enterprise followed by an analysis of firm's technological innovation performance, issues, barriers and challenges.

7.3.1 Profile of the sector

The prawn (shrimp) industry in Sri Lanka started in mid 1980s predominantly in the coastal belt of North West Sri Lanka, in and around Puttalama district. This area provided right conditions for prawn farming with flat lands and the Dutch canal supplied much needed water for the industry. When the industry was first begun it was quite new to many in the aquaculture sector, only a handful of firms had already established prawn farms in the area. At the beginning, Board of Investment offered attractive incentive package for foreign and local joint ventures by way of tax rebates, duty free import of equipment and other inputs and state lands to set up farms. By the early 1990s, the government decision to offer incentives to local investors to set up 'export oriented' enterprises, and relatively high returns of prawn farming has drawn many investors into the prawn industry. Subsequently, the government declared prawn farming as a 'priority industry sector'.

In the early periods, the prawn farming was carried out in a systematic manner, where investors had to go through rigorous setting up process. The prospective entrepreneurs first needed to submit a business proposal together with environmental impact assessment (EIA) for approval by the Ministry of Fisheries and thereafter by the Provincial Ministry of Fisheries. The fact is social and environment impact of the prawn industry was perceived to be relatively high, therefore, the EIA reports became compulsory. These reports were made available for public scrutiny. Often the public resistance for prawn industry was very high in places where there were justifiable negative impact on both livelihoods of people as well as eco-system in terms of potential threat to mangroves, flood plains, and fish breeding in the Dutch canal etc.

In the early days, the technology and know-how for prawn industry were considered as costly and only available through joint venture partnerships. However, there had been a considerable technology transfer through National Aquaculture Research Agency (NARA) and Inland Fisheries Division of the Ministry of Fisheries. An interesting observation was the way in which technology transfer took place at local level. Some technology transfer channels originated from the ex-employees (mostly scientific and technical experts) of first generation of prawn farming enterprises (foreign and local joint ventures) and these technical experts played a leading role in technology transfer through technical consultancy and the knowledge transfer at enterprise level was very much beneficial to new generation of enterprises.

By mid 1990s, the prawn industry was widely spread along the coastal region in the North West province with over 150 enterprises covering a land area of 20,000 acres, 80 hatcheries and 12 processing plants. The export of prawns in 1993 was 808 MT, increased to 5000 MT in 2000 which generated revenue of over 4 Billion Rupees to Sri Lankan economy. According to Edirisinghe, who is also the President of Consortium for the Development of

Aquaculture, the export potential of the prawn industry is estimated to be over 60000MT per annum and worth US$700 millions. The three major markets for prawns exports are the US, European Union and Japan.

Since late 1990s, the pawn industry has been experiencing serious setbacks as a result of over-crowding and unauthorised farming[84], undue political interference, disrespect to industry environmental norms/laws, rising level of pollution in the Dutch canal, spread of diseases like White spot and Yellow head resulting series of crop failures. Currently, the prawn industry is embraced by a numerous problems and a large number of farms have been suspended their businesses resulting job losses, loss of export revenues, and accumulation of large amounts of bank debts by enterprises. According to Edirisinghe, since 2001, the prawn industry as whole is experiencing bad periods, drop in production; drop in sales, undue competition and threats from illegal farmers and more importantly absence of government intervention. Pointing his finger at the government for this situation, he said:

> *"..the Sri Lanka prawn industry is getting to cross roads, spreading viral infection of white spot in 1996 and the dual infection of white spot and the yellow head in 1998 resulting overnight crop failures due to very high pollution of the environment."*

According to the respondent, there are three important areas the government should intervene in order to safeguard and further develop the industry. They are: better implementation of regulations, monitoring and preventing violations of the laws; continuous R&D and diffusion of technical know-how to all prawn farming entrepreneurs; and human resource development in aquaculture and related areas. He suggested that establishment of a dedicated support agency for aquaculture[85] would be able to take up most tasks that required putting industry back into proper shape.

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[84] According to Edirisinghe, the degradation of prawn industry began as a result of the 'gold rush' following the 1994 general election. Soon after the election, the newly elected ruling party politicians in the area allowed their supporters to encroach reservations and buffer zones to set up farms illegally.

[85] National Aquaculture Development Authority (NAQDA) was established in 1999.

7.3.2 Profile of the owner/manager

The owner/manager, ***David Edirisinghe*** is a civil engineer by profession, worked in the public sector for over 30 years in various capacities; retired from the public service at the age of 56 and moved on to run his own business. He is not only academically and professionally qualified in his own field but also in other areas such as business management, marketing, aquaculture, IT, finance and, has also undergone pre-business start-up training. Apart from his business involvements, he is an active lobbyist representing prawn-farming community. Currently he serves as the president of Consortium for the Development of Aquaculture, Secretary of the Association of Prawn Farmers and Exporters. When asked what motivated him to get into business after retiring early from his public sector job, he stated that:

> *".. business was in my blood because I come from a business family and grew up with people in business all around me."*

Following the completion his secondary and higher education, *Edirisinghe* had chosen engineering profession and joined the public service as a Civil Engineer. Responding to the question how this business idea was conceived, he stated that when he realised the retirement is approaching in a few years, he was looking for business opportunities around and was attracted to prawn faming as it was very profitable at the time. He had thought that his civil engineering expertise could be fully utilised at start-up stage especially land clearing, construction of ponds etc. He had also attended a number of businesses and investment promotion seminars held by Export Development Board, Board of Investment, and Industrial Services Bureau through which his business idea was further nourished. Apart from those who were already in, this trade had also encouraged him to start his business.

7.3.3 Profile of the firm

Wa-Lu Aqua Private Limited was established in 1993 as a Board of Investment (BOI) approved limited company with an initial investment of Rs. 30 millions (Approx: £160,000) to produce tiger prawns for export under intensive/semi-intensive aquaculture farming conditions. Being a BOI approved firm, *Wa-Lu Aqua* was entitled to income tax concessions on profits and duty free import facilities for machinery and raw materials. The farm is located in Chilaw on the coastal belt of the North Western province, an area where prawn farming is concentrated. Spread over 30 hectares, the farm consists of over 15 (0.5ha) grow out ponds along with specially constructed reservoirs and canals. The capacity of the farm per cycle (two cycles per year) exceeds over 40 tons of raw tiger prawns, and in addition, culturing Thilapia for local market is also done on the farm.

At the start, there were 50 workers, however at the time of the 1st interview held with the respondent, the number of workers had come down to 16, and currently reduced to 1. The firm has all necessary machinery and equipment including submersible water pumps, paddle wheel aerators, standby generator, laboratory equipment, a small hatchery, cold room and processing and packing facilities etc. The firm had highly trained and experienced technical staff.

The company was started when prawn industry was at its best and during that time the barren land area along the coastal belt and the Dutch canal, and the lagoon between Chilaw and Puttalam towns offered excellent conditions for prawn farming. The firm maintained an eco-friendly sustainable practice throughout, thus enjoyed a number high yielding cycles. At the time of business start up, the prawn farming technology was not easily available. The technology used by *Wa-lu Aqua* for culturing tiger prawn is highly scientific and processing is done in conformity of national and international standards. The two major export markets for processed prawns produced by this firm were European Union and Japan. Initially, the firm sought technical expertise from National Aquatic Resources Agency (NARA) and private consultant. At the time of suspension of the commercial operation of this firm, the firm had employed two technically qualified persons, a graduate aquaculturist and one laboratory technician while the owner/manager himself has been trained in aquaculture and posses adequate technical knowledge.

Until 2003, Wa Lu Aqua had enjoyed good harvests, thereafter began to experience regular crop failures due to spread of white spot disease and marketing problems. The company has tried every possible means to put the business back into operation but has failed as large amount debts being accumulated because of the loss of production resulting loss of revenues. In 2005, production was suspended.

7.3.4 Technological and innovation capabilities and progress of the firm

At the time of business start-up, the firm was adequately resourced with technological know-how, equipment, and other required inputs. As far as technology is concerned three types of technology are being used in aquaculture. First, culturing technology, and the second, back up technology in terms of water purification systems and pollution control methods, and third, processing techniques. The intensive prawn culturing method widely used worldwide was first introduced to Sri Lanka in 1980s by National Aquatic Resource Agency (NARA), and further developed to suit to local conditions. Both NARA and large private companies have taken the lead role in technology adaptation process. Initially, ***Wa-Lu Aqua*** received technology know-how from NARA and subsequently hired an aquaculturist who has been trained abroad to help with technical aspects such as hatching (larvae), stocking, feeding, and disease control etc. Apart from the scientific knowledge that is an essential requirement in prawn farming, the firm also acquired hardware technology from the domestic market. In addition, the firm itself turned out certain machinery and equipment such as aerators to supply oxygen to ponds at a very low cost. The firm had also engaged in limited R&D activities that had helped develop prawn-culturing methods combining traditional methods (indigenous knowledge) and scientific methods. One example is fresh water and wastewater treatment method using fewer amounts of chemicals, feeding and disease control. Although the firm had knowledge and expertise to undertake R&D, it had very modest R&D facilities with basic laboratory to carryout simple tests. Elaborating further on the R&D and innovation activities, *Edirisinghe* stated:

"We can't do much with scientific R&D because we haven't got many facilities here with us. But we do basic onsite laboratory tests, for example, water quality and soil tests. With regard to processing, we have developed our own methods in consultation with our buyers. Generally, there isn't much we can do onsite because we are small timers, large exporters who buy our products do R&D themselves but hardly transferred to small firms. They want to maintain the monopoly on R&D and some R&D institutes too won't allow us to do our own technological innovations, as they fear of losing their jobs."

As described by *Edirisinghe*, his firm was very keen in R&D, especially search for low cost and low energy consuming equipment. The prawn industry consumes considerable amount of energy which is very costly in Sri Lanka. As a result, the cost of production is very high compared to the countries in South and South East Asia where aquaculture sector is relatively strong. Referring to one such initiative, he further stated that the firm was very interested in introducing renewable energy and USAID was keen to help, however, for some reason it had not materialised. Admitting the fact that *Wa-Lu Aqua* had experienced both high and lows during its 13 years in business, the owner stated that:

"The firm was successful in certain areas; achieved best results during the times when prawn industry was booming. We were doing very well until the prawn industry was badly hit by white spot disease. Then came marketing problems, high production cost as electricity and fuel costs went up. However, I am not prepared to give up. My aim is to restart my business when the time is right. I want to introduce integrated-prawn/shrimp culture with animal husbandry, fishery and tiger prawns using sustainable methods."

7.3.5 Business and technology support and external linkages

Responding to questions with regard to support services and external linkages, *Edirisinghe* pointed out that compared to other export oriented industries prawn industry received least support and attention from the successive governments. Admitting the fact that fiscal and financial incentives offered to export oriented enterprises had helped to raise the competitive position of aquaculture industry, government inability to recognise the need for coordinated and timely policy intervention was largely felt and perhaps led to the collapse of the entire industry. *Edirisinghe* highlighted the knowledge sharing among enterprises was one of the important aspects of the industry which undoubtedly filled the gap left by the external support services. In addition, business linkages have been formed between prawn farming and other support enterprises such as feed manufacturers/importers, processors, packaging firms, technical support providers, equipment suppliers etc. which provided all prawn farming enterprises the benefit of working together. However, benefits of such networks began to emerge lately when the industry was in the verge of collapse but would be useful in the future efforts.

The respondents believed that one of the positive contributions to ***Wa-Lu Aqua***'s short-term development was the healthy relationship with the NARA who assisted with training, advisory and testing facilities. In addition, the firm had maintained good working relationship with the Provincial Ministry and national Ministry of Fisheries. The firm had established a technical and investment cooperation agreement with a Chinese company based in Shandong province. Commenting further on these networks of support, *Edirisinghe* stated:

> *"Apart from NARA, we haven't had much support from any of the business or technology support agencies. Even at this crisis period, we requested the government to reschedule our loans but no response yet."*

Because of the continuous pressure from the prawn farming community, in early 2000 the government established the National Aquaculture Development Agency (NAQDA) as the main government institution responsible for aquaculture industry.

7.3.6 Issues, challenges and barriers for SMEs technology upgrading and innovation

As described by *Edirisinghe*, managing a prawn faming enterprise itself in highly volatile business environment was a big challenge. At the time *Wa-Lu Aqua* was established in 1993, prawn/shrimp farming was relatively young; not very many farms were operating in this area. Since Sri Lanka was new to shrimp/prawn farming, there were not very many experienced people or adequate expertise in this field. Therefore, *Wa Lu Aqua* had to share its limited resources and learn from each other in the trade. Main problem, according to *Edirisnghe* was the lack of vision for the industry and failure of government bureaucracy to enforce regulations. At farm level, the firms in general did not get enough technical expertise such as advice on technical and management issues and research and development support. As pointed out by many in the trade, Sri Lanka has no system to support R&D by way of grants; therefore firms have to invest large sums of money to develop own R&D capacity which seems to be beyond the scope of most firms. Citing his own experience on this aspect, *Edirisinghe* stated:

> *"Not all the farms had technical and laboratory facilities within own premises. Since there were no laboratory facilities in the area, we had to take water samples to Colombo for testing and that has to be done within few hours. Our farms are located in remote areas about 4-5 hours drive from the main city Colombo. By the time we get to the lab the sample is already spoiled."*

The respondents raised concerns over the way in which the state and private banks financed aquaculture enterprises without giving much attention to the sustainability of the industry. Because of the high rate of return, many entrepreneurs saw this as a good investment but majority entered into this trade without adequate knowledge, but with sheer greed, ignored all sorts of environmental and social norms. This is the main reason why the natural environment deteriorated so much with various diseases spreading across the farming area very fast and now extremely difficult to control.

The application of environmentally sustainable practices is considered the key to successful shrimp/prawn farming business was largely ignored by many owners/managers and one such example is high pollution level in the Dutch canal[86] which caused by discharged of untreated used water in to the Dutch canal. The fact is most farms did not have a proper pollution control and wastewater treatment system that is compulsory by the environmental laws. Most owners ignored this aspect mainly because of various irregularities in enforcement of government regulations particularly environmental protection laws and prevention of unauthorised farming. This was identified as a major contributing factor to the large-scale destruction of the industry. On the outset, the whole industry went out of control simply because of the absence of a proper authority or supporting agency that is vested with adequate powers to regulate, monitor and support enterprises. This is the main reason why the prawn industry has entirely failed in Sri Lanka.

Emphasising on the status of the industry, *Edirisinghe* blamed the authorities for not dealing with these problems at the initial stage when prawn farmers informed the authorities the potential threats to industry. Currently, 90 per cent of the farms are out of business mainly due to the spread of diseases and high pollution level in feeder canals. Explaining the current status of the business, the respondents stated:

> *"It has been almost an year since my business suspended production as my farm was badly hit by White spot and Yellow head diseases. As you know prawn farming requires high initial investment, but the returns can be sometimes, if the conditions are right, exceeds 100 per cent can even go up to 300 percent. At the same time, if a crop fails, firms would lose millions of rupees. This is what happened to us after 2004 and I lost lot of money and that's why I suspended my business."*

As the President of the Consortium for the Development of Aquaculture, *Edirisinghe* assumes that in order to resuscitate the industry, the government intervention is extremely necessary, with adequate and strong

[86] Dutch canal is the main source of water for prawn farms in the North Western coastal belt.

enforcement of regulations, environmental laws while delivering technology and business support needed when and where necessary. He recommends four courses of actions to put the industry back on track. First, to carryout prawn farming under the closed system with a proper on-farm water recycling system enhanced by introducing *Tilapia* and milk fish in the culture system. Second, to promote the modernising programme in controlling pollution with the employment or qualified people e.g. graduates. Third, use energy efficient technologies to reduce the cost of production and increase income through market development, especially overseas markets.

Figure 7.2: Typical prawn farm in Sri Lanka

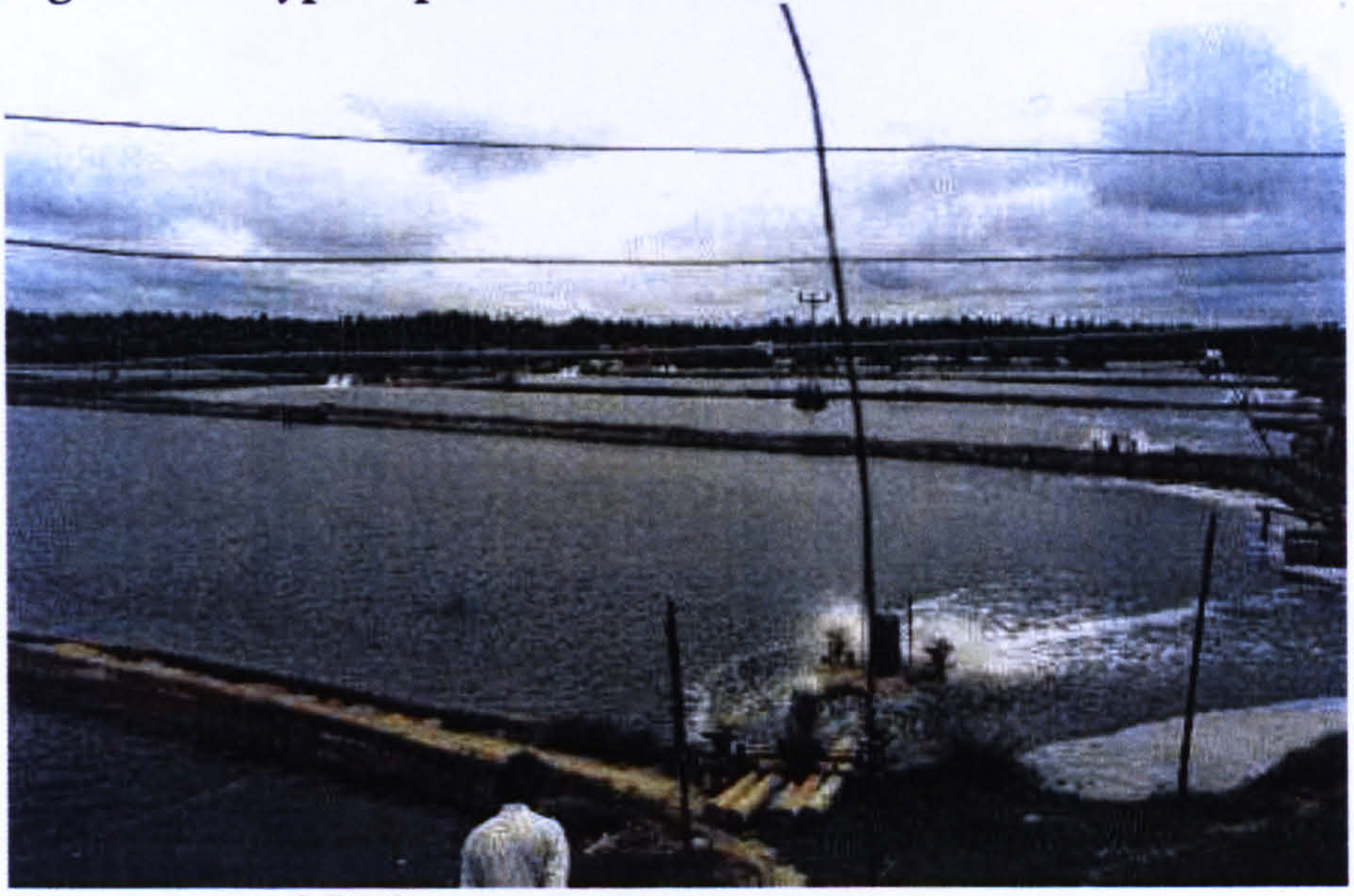
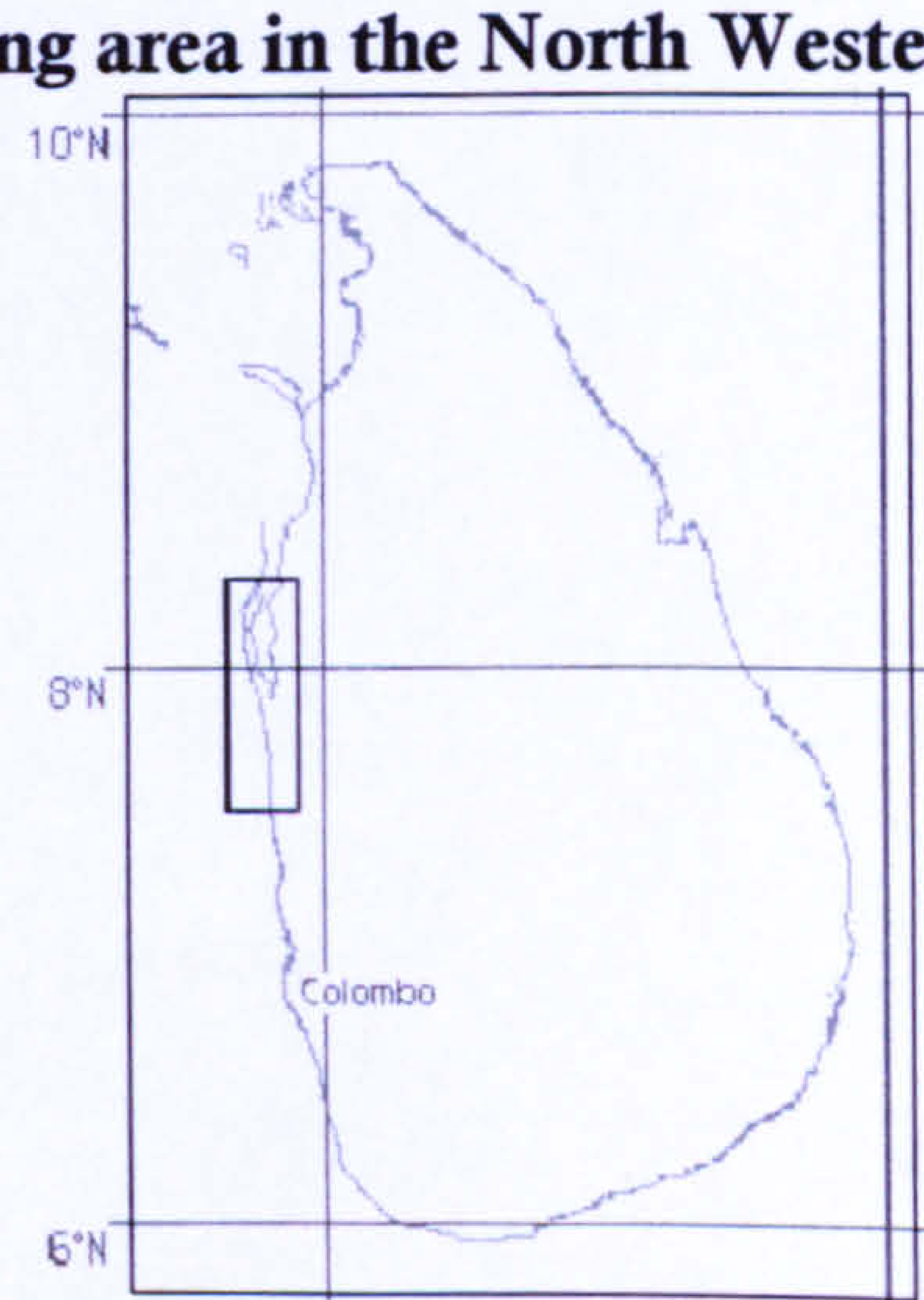


Photo courtesy of FAO

Figure 7.3: Prawn farming area in the North Western province of Sri Lanka



7.4 Conclusion

The above two case studies provide examples of motivational factors of entrepreneurs, character determinants and environmental factors that influence technology and innovation in SMEs. The first case study provide an ideal example of an innovator who managed to bring his own and innovative product ideas to the domestic market and to establish his name as an industry leader. He is very much motivated by his own skills and knowledge but have less faith on the external support system as is the case for most entrepreneurs in Sri Lanka.

The second case study provides similar evidences as the first case study but with an exception of the differences of two entrepreneurs have approached the challenges their businesses were facing. Being matured and now at the retirement age, the owner of *Wa-Lu Aqua (Pvt) Limited* suspended his business as he realised it was too risky to invest any more as the whole industry was in the verge of collapse. Contrastingly, being young the owner of *SD Technofab (Pvt) Limited* seems to be more positive about his business and still wants to continue with his technology development and innovative activities. He is aware that his business is not very risky vulnerable compared to the state of prawn farming industry

These two case studies demonstrate that entrepreneurs have shown a strong desire; aptitude and motivation to progress with technological innovations provided the right economic environment is prevailed and adequate support measures are made available to them. By and large, attitudes of owner/managers seem to be very positive at the start, however, unfavourable economic environment and inadequate external support seem to have caused gradual degradation of firms' technology and innovation drive. This resulted many businesses having a 'laid back attitude' towards technology and innovation and tend to operate with minimum efforts just to survive. A number of business owners I have spoken to envisaged that business climate is not very conducive for innovations or technology development as they assume that the return investment on new technology is significantly low supposedly less susceptible and the risk is very high.

The above case studies illustrate that any enterprise can become technologically progressive provided the new technology is easily accessible and affordable. The underlying factor is, as discussed in chapter 3 & 4, Sri Lanka's technology and innovation capacity is relatively weak and is characterised by underdeveloped technology and business support infrastructure, therefore firms' relative ability to make the full use of their technology investment seems to be limited. A general observation deriving from the above two case studies as well as short interviews with a number of owner/managers is that barriers for technology capacity building is to some extent self-inflicted and internal to firm but could be prevented or addressed properly if a proper policy and support system is in place. Based on the experience of these firms, it appears that some government regulations discourage innovations and there is little incentive for SMEs to innovate. This illustrates the potential scale and complexity of existing policy inconsistencies.

Chapter 8

Conclusion

This chapter draws conclusions, reviews findings and finally discusses future directions.

8.1 Summary

The goal of this thesis was to examine the level of technological progress and innovativeness of SMEs in Sri Lanka and the effectiveness of SME and technology policy support systems in fostering technology and innovation. This research has been shaped by a theoretical rationale that argues that in order to transform technological knowledge into products and services an effective policy and enterprise support system is a pre-requisite. This research is set within a framework that grounded the above rationale in an evidence-based context that drew on relevant policy and research literature and my personal and practical experience of working within the policy and enterprise support environment in Sri Lanka.

My approach to this research blended a combination of desk-based research, a literature review covering theoretical and policy approaches and, quantitative and qualitative analyses of technology and innovation in SMEs. I also examined the rationale for state intervention in supporting enterprises within a broader macro and micro economic policy environment while drawing on good practices from elsewhere and their lessons for Sri Lanka. I considered Sri Lanka's historical evolution, political economy and how they have shaped the development of enterprise, technology and innovation capabilities. This was further examined through an assessment of the effectiveness of SME policies and technology policies and strategies using a conceptual framework that stressed the context-dependent nature of innovation. Moreover, this research is further enriched by empirical work, a blend of quantitative and qualitative analysis which I consider as a worthy outcome of this piece of research. Another important feature of this research is its originality where no previous research of this nature for SMEs in Sri Lanka has been undertaken. This study extends Wignaraja's research on large companies which emphasised that Sri Lanka requires a systematic government support and the creation of new institutions for technological learning; my research demonstrates that effective SME and technology policies and an appropriate institutional framework are major determinants of SMEs' technology and innovation capabilities. These findings are important because SMEs play a vital role in Sri Lanka's economic development.

In this research, I examined various theoretical and policy perspectives relevant to SMEs and technology and innovation in the context of macro economic and firm-level determinants. The design of the methodological and conceptual framework has been greatly influenced by this theoretical and policy perspective as well as my personal experience of working with enterprises, and policy and support institutions. In designing the conceptual framework and research methodology, I considered the economic role of SMEs of all descriptions in Sri Lanka. Despite the fact that SMEs represent a broad base of enterprises operating in the Sri Lankan economy, there is no such definition of an SME, official statistics are not well developed and there are no standard benchmarks such as firm sizes or outputs. The collection of quantitative data pertaining to SMEs is another difficult exercise as most entrepreneurs are reluctant to expose business related information and are often suspicious of researchers. Considering these practical limitations, researching SMEs is extremely difficult in Sri Lanka.

Although the literature review and policy analysis have explored a wide range of issues related to enterprises as a whole, in order to make this research relevant to SMEs, the focus was restricted to enterprises employing below 250 workers as this is the standard definition of SMEs that is internationally accepted. My sample of 600 service and manufacturing SMEs in six provinces in Sri Lanka included single-owned, home-based, factory based and craft. In Sri Lanka the private enterprises account for over 70 per cent of the employment in the private sector. In order to make the quantitative analysis more systematic and comparable, I used the standard numerical definition of SMEs (1-249 employees). One of the important aspects of my sampling is that I make no distinction between 'formal' and 'informal' SMEs, because in practice there is no formal categorisation along these lines in Sri Lanka, either for SME owners or for policy makers. Through my experience and local knowledge as a development practitioner working with SMEs and in the policy and support environment, I found that the informal and formal divide is largely meaningless for policy makers and firms in Sri Lanka. I also found that informal/formal split is a non starter, and motivations of entrepreneurs are diverse. Therefore, the sampling technique I employed was somewhat more ambitious (data sources, number of firms and sectors sampled) and because of this I was able to generate enough data for a comprehensive analysis. With hindsight, some middle ground might have been better or more manageable, with more case study work as I discovered that this approach has yielded very rich knowledge to supplement and enrich the quantitative results. The fact is, quantitative work in developing countries is very difficult and there is no validation procedure that allows me to benchmark how 'valid' this work is. The utility of this framework becomes apparent in the empirical work.

The various analytical tools that were used in this research provided an insight into the technology and innovation performance of SMEs, effectiveness of the external enterprise support system and the influence of firm and owner/manager characteristics on firm's performance. In drawing up the methodology for the analysis of sample firms I considered certain parameters which included: the economic importance of the sector and its level of technological needs, integration with other sectors in the economy and the diversity of products and services. In the selection of sectors, I disregarded the technological sophistication of sectors or branch of sector simply to have a greater diversity of SMEs in the sample to allow me to include SMEs from technologically less sophisticated sectors. As part of this research, case studies were also undertaken to complement the quantitative analysis. Drawing on my access to SMEs and support networks, I chose a specific SME support intervention and two case study firms for further analysis. The case study on support intervention was chosen to justify the need for state intervention in assisting enterprises in the 'economically important sectors' as a means of safeguarding them from economic shocks arising from trade liberalisation and globalisation. The case studies of two entrepreneurs/firms were chosen to demonstrate the entrepreneurs' ability to harness new technology to increase firms' productivity, operating efficiency and profitability. The case studies also demonstrated the extent to which policy and support environments affect firms' performance. Considering the importance of these approaches, this research can be considered as an attempt to provide an insight into the relationship between the technological progression of enterprises and policy and support systems.

8.2 A review of findings

A large body of relevant literature was reviewed and there seems a common proposition that technology, technological and innovation capabilities are considered as important determinants of SMEs' competitiveness. However, such competitiveness can be achieved only through proper utilisation of technology, products/services and technical innovations and better organisational performance supported by appropriate public policy and support interventions (see for example Barber and White, 1987; Malecki, 1997). The literature review also reveals that there is a widely held belief that the technological performance of SMEs can be improved by appropriate and timely state intervention.

I found that with regard to the technology performance of SMEs in Sri Lanka, the industrialisation process (both import substitution and export oriented) has not favoured SMEs compared to newly industrialised countries (East Asian NICs) that followed similar industrialisation strategies; the latter achieved very high growth through continuous upgrading of their technological base. Sri Lanka's industrialisation process is characterised by uneven industrialisation, concentrated sectoral growth and poor vertical and horizontal integration within industrial sectors that has provided limited scope for technological and innovation performance. In this study, several other emerging issues have been discussed that have particularly affected SMEs' technological and economic capacities. One major factor is the social and cultural evolution of Sri Lankan society that reflects certain inherited impediments that are less supportive to risk taking, entrepreneurship, innovation and the adoption of new technologies. As in the case of most developing countries, science and technology in Sri Lanka tend to have a low priority and operate independently with limited links to the rest of the economy. This has been the most notable weakness that reflected on the poor status of science and technology as well as industrial competitiveness. Further, the lack of an 'innovation culture', negative attitudes of customers towards domestic products and a low appreciation of indigenous technological strengths are major barriers that need to be addressed through appropriate policy interventions. In order to do that, policy makers will have to reconsider their policy approaches towards SME development and public support for technology and innovation. In the context of SME performance in Sri Lanka, technology development and innovations have become prohibitively expensive in a highly volatile domestic economic environment; as such, entrepreneurs with innovative ideas are often constrained by lack of facilities, guidance and public support. The fact remains that Sri Lankan SMEs generally operate at very low technology levels and lack the skills, expertise and facilities to develop in-house technological capabilities. While many SMEs are dependent upon foreign technology in the form of machinery and equipment purchased through local suppliers, some entrepreneurs still favour traditional forms of technology, methods and practices. Although little has been written on Sri Lanka's technological performance and capabilities, it emerged from this research that economic development based on free market policies has not adequately been able to stimulate technological growth in the country, especially in SMEs. The analysis of various technology related data provided a good base to suggest how far a country like Sri Lanka will have to move forward to become a technologically progressive country.

One important issue that needs the attention of policy makers in Sri Lanka is over-dependence on global markets that does not help develop domestic technologies, products and process innovations. There is a need for enterprises in Sri Lanka to concentrate on developing in-house capabilities required for technology upgrading and adopting new technology. As discussed in Chapter 2, technological capacity or technological behaviour in SMEs is determined largely by internal and external factors. Internal factors are linked to organisational as well as owner manager characteristics; the experience and training of the owner manager and his or her key assistants and their individual and collective scientific and learning system (Julien, 1994). Considering the various arguments discussed in this thesis, the characteristics of SMEs and owner/managers (entrepreneurs) and their vulnerability to changing macro and micro-economic environments in which they operate suggests that there is a need for effective state intervention to remedy these conditions.

This study attempted to identify the possibilities for Sri Lanka to replicate success stories elsewhere. My results suggest that transferring policies from one setting to another is not as easy one would hope. Such policy transfer processes have to consider the appropriateness and usefulness of policy instruments and involve all actors including beneficiaries in the entire process. As Stone (2000) argued, policy transfer is a process that is often facilitated within networks where networks are vehicles for the spread of ideas and structural locations for social learning. In these multi-organisational contexts, common knowledge and common attitudes to policy change can be fostered. The case study on the coconut fibre industry provided a rich understanding of the knowledge sharing within networks and their role in the technology transfer process.

As emerged from this research an appropriate construction of new strategies, a mix of local knowledge and best practice from elsewhere, would facilitate a new methodological process that can address both 'inherited' technological problems as well as support innovative and new technology-based enterprises. This research identified the underlying backwardness of local technology transfer, the lack of home-grown technology and reliance on foreign technology that affect technology and innovation performance in SMEs. My analysis shows that SMEs make little or no use of existing technology support; there is a vast gap between the existing support services and the needs of SMEs. In addition, constraints encountered by SMEs are to a great extent resulting from their own internal deficiencies as well as macro-economic impediments and general weaknesses in the enterprise support structure. In this research, I argued that what is needed for the existence, survival and growth of enterprises is an effective policy intervention at macro and micro level and a strong business support structure.

With regard to overall SME development in Sri Lanka, the government has recently identified SMEs as a policy priority; however, the problems and constraints of SMEs still remain at large as a result of slow implementation of policies. In this research I argued that there is a need of an effective institutional framework for Sri Lanka similar to that of Small Business Administration (SBA) in the US, and Small Business Service (SBS) in the UK that are capable of taking charge of SME development. This is a major requirement in the case of Sri Lanka. It is now largely recognised that knowledge creation and diffusion is a dynamic process in the 'National Innovation System' that involves many social and economic factors, a wide range of individuals and institutions making a significant contribution for achieving a knowledge-based economy. Therefore, in order to ensure an effective institutional framework, a National System of Innovation seems to be an ideal approach in the context technology and innovation development in Sri Lanka which could form a coordinated and effective support for building the technological and innovative capabilities of SMEs. It is evident that policies that facilitate implementation of new technologies and new products may effectively support SME development while policies simply inducing increased supply could easily fail. This of course needs to be supported by a sound macro economic environment and a stable political regime.

A major part of this research involved an empirical analysis using a sample of SMEs drawn from four provinces in Sri Lanka which aimed to assess the technological competency of SMEs in Sri Lanka and to gain better understanding of the way in which external business and technology support services play a catalytic role in enhancing innovativeness. One of main factors that emerged from this analysis is the high level of awareness of owner managers of the importance of new technology and technological change on business growth and, adoption of new technology, product and process innovation as key business strategies. However, various internal and external factors inhibit firms' ability to achieve higher levels of technology performance. The study also found that the country as a whole is extremely dependent upon foreign technologies in the form of machinery, equipment and tools without much consideration of their appropriateness and suitability to local conditions. The fact is Sri Lanka is still in the 'infant' stages of capital goods manufacturing simply because of the lack of infrastructure, skills and low domestic demand. The owner/managers seem to believe that foreign technologies are superior to domestic technology and they do not seem to understand that adaptation of foreign technology, development of their own technology and innovations can be done at firm level. Since foreign technology is available in the domestic market or imported directly from suppliers, owner/managers perceive that investing in the development of domestic technology and innovation is risky and potentially expensive.

However, certain positive factors can also be seen emerging from this study which could be worth investigating further. One example is that owner/managers seem to believe that acquiring both 'hard technology' and 'soft technology' is a significant growth determinant of SMEs while 'Joint technology development' with customers or suppliers and R&D and technology support institutions can help develop own technology capacity. The evidence from this study also confirms the notion that technology development and innovation in firms are driven by market factors ('market-pull'). The analysis suggests a higher level of product and process innovations and the results also illustrate that small firms' growth is, to a greater extent, linked to new production and process development. However, a large variation of innovative outcome was observed between firms based upon the sector and type of products. The nature of the market in which firms operate as a whole could strongly influence the 'radicalness' of innovations, although such innovation efforts are often constrained by prevailing uncertainties in the market and inadequate facilities and expertise to embark on innovation related activities. Further, firms seem to recognise the importance of continual development of products and processes to meet the needs of the constantly changing market requirements. The study observes a general upward trend in Intellectual Property related activities where owner managers have indicated that they are aware of IPR laws and their relevance to firms' competitiveness, and this is more apparent in export-oriented firms. One of the notable findings of this analysis is the low level of technology adoption and poor innovation performance of firms in sectors which are considered as economically important and main contributors to, the country's export growth (e.g. coconut and coconut fibre and rubber processing). The technological innovation in the apparel and garment sectors also appeared to be very limited due to the dominance of overseas buyers who control the lucrative product design, development and marketing. Interestingly, the analysis does not endorse any significant relationship between education policies and SME performance. The fact is, in Sri Lanka those who achieve higher educational qualifications prefer paid employment rather than self-employment; this is very apparent in science, engineering and technology careers. This area demands the attention of policy makers to consider formulating appropriate policies to attract qualified and skilled young and educated people to start small businesses.

8.3 Future research directions

I must say that this piece of research represents only a tiny fraction of the vast knowledge about SMEs but I consider it as an important contribution in the pursuit of fulfilling the knowledge about SMEs in Sri Lanka, technology and innovation performance in particular. However, as I mentioned earlier (Chapter 2), there has not been much research done on SMEs in Sri Lanka and much more can be discovered especially the way in which macro and micro policies and support interventions and social cultural issues, impact upon entrepreneurship, technology capabilities, innovativeness and overall economic performance. Notwithstanding the fact the this piece of work has focussed mainly on the importance of external support for enhancing technological capabilities and innovations in SMEs, certain areas that need further research have emerged. Although I have explored the political economy of Sri Lanka and its influence on the SME sector, further exploration is needed on how the macro-economic environment shapes the growth and decline of SMEs in different sectors. The social, cultural and religious aspects of entrepreneurship and SME performance also need further investigation.

The implications of my findings for SME policy and strategy in Sri Lanka are profound. One of the key issues emerging from this research is the necessity of public intervention for technology and innovation capacity building in SMEs. This research also revealed that the relevant theories of enterprise development in the context of Sri Lanka need to be formed in the context of local economic conditions, knowledge, culture and values. The further research on SMEs in terms of technology and innovation performance in specific industry sectors would undoubtedly contribute to the redesign of policy instruments. One of the key objectives of this research was to identify good practice policies elsewhere and their transferability. Apart from the key good practice macro-policy instruments and certain institutional interventions, particularly in the European context, this research found that transferring good practice is somewhat difficult because western literatures make assumptions about the structure of enterprises (for example, formal and informal), and the use of different categories to identify SMEs etc. On the other hand, the lack of benchmarking and standard definitions in Sri Lanka (and in most developing countries) can be problematic for researchers and policy makers. Moreover, quantitative work in developing countries is very difficult and there is no validation procedure that allows me to benchmark how 'valid' this work is. As such, they need clearer definitions to structure future data collection; creating employment is a key rationale for SME support and thus it needs to be measured. I was able to overcome some of these difficulties and do this work because of my experience and connections and access to SME owners.

In terms of the methodological implications of this research, it is worth noting that the research methodology needed to consider the socio-cultural values that are of particular relevance to the understanding the behavioural aspects of enterprises as socio-economic phenomena. Therefore, the adoption of a multi-method approach that combined both quantitative and qualitative methods, that included an holistic case study approach and grounded theory analysis is quite useful to explore peoples' experiences and behaviour. However, the limitation of this approach is that it requires in-depth local knowledge; without this, the only option would be to follow a more restricted methodological approach. My mixed methodology allowed a context sensitive theoretical understanding of the performance of enterprises in Sri Lanka in their broad social and economic context.

The final important aspect with regard to future research is the importance of discovering the innovation potential of SMEs in key industry sectors that have competitive advantages and to explore how best these SMEs can be supported through specific policy interventions.

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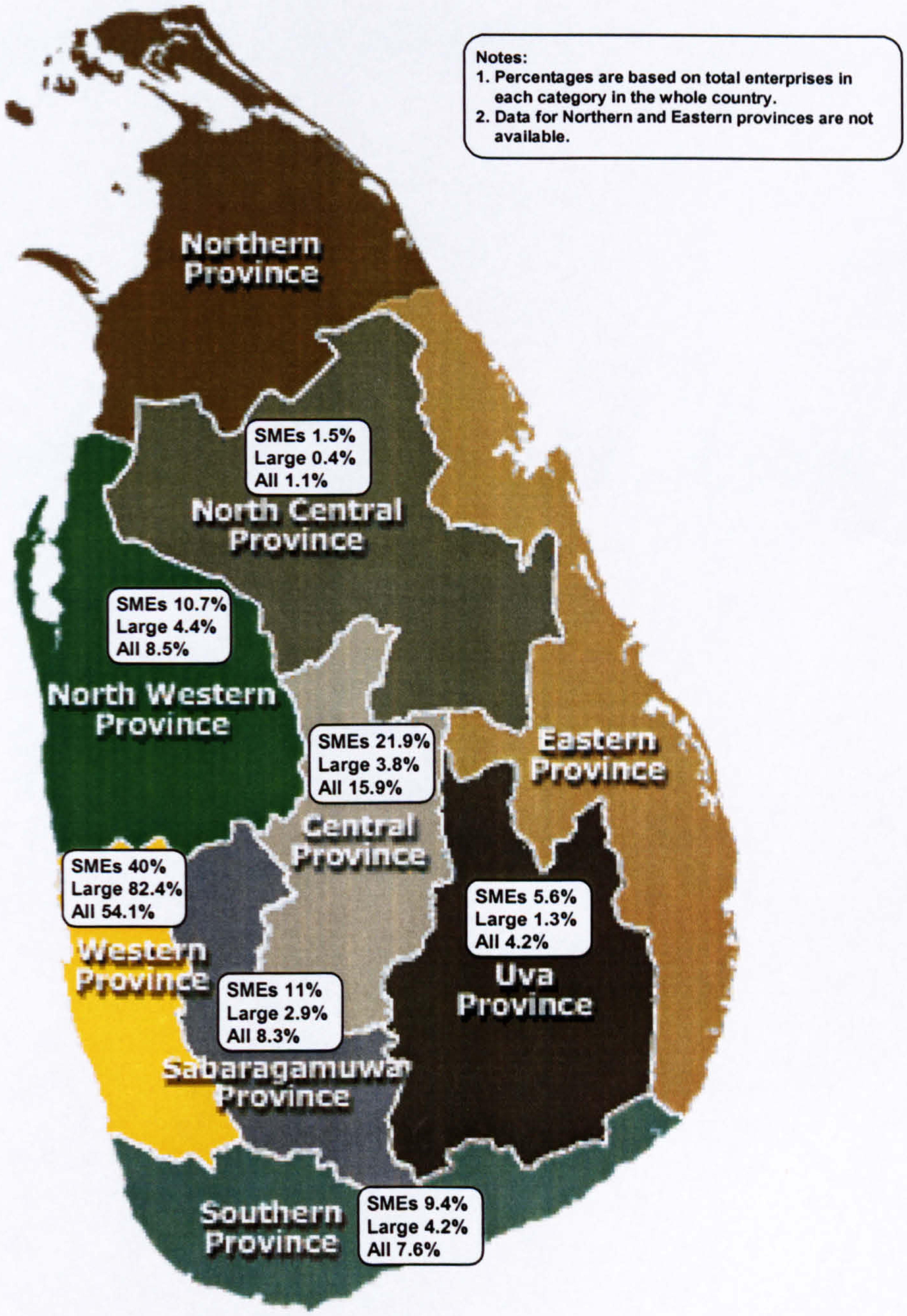
Map 1 - Spatial Distribution of Enterprises



Annex A:

Business support services available for SMEs and support institutions in Sri Lanka

The following chart illustrates the business support framework and it clearly explains the heterogeneity and complexity of the existing structure. Profiles of main business support institutions are below.

Public Sector SMEs Support Institutional Framework

Ministry	Department/Agency	Subject area/Responsibilities
Ministry of Agriculture	•Dept. of Agriculture •Dept. of Animal Production & Health •Dept. of Export Agriculture •Post-Harvest Technology Institute	Agriculture enterprises R&D
Ministry of Commerce	•Registrar of Companies •National Intellectual Property Office •Sri Lanka Inventor's Commission •Standards Institute •Department of Commerce	Company registration IPR issues Support inventors Quality and productivity issues International trading/exports
Ministry of Economic Reforms, Science & Technology	•National Engineering, R&D Centre •Arthur C. Clark Centre for Modern Tech. •Industrial Technology Institute •National Science & Technology Comm. •National Science Foundation	R&D S&T Policy Funding R&D, information
Ministry of Enterprise Development, Industrial Policy & Investment Promotion	•Board of Investment •Industrial Development Board •Export Development Board •Department of Textile Industries •Department of Small Industries •Handicrafts Board •National Crafts Council •National Gem & Jewellery Authority •Textile Training & Services Centre •National Institute of Business Managt •Gem & Jewellery Research & Trng. Cen.	Investment promotion & regulation, grant incentives SMEs support (tech.& advise) Export promotion Support textile industry sector Support rural enterprises Support traditional enterprises Support traditional enterprises Support gem/jewellery sector Training providers
Ministry of Finance	•Bank of Ceylon •Peoples Bank •Regional Development Banks •Other Commercial & Development Banks	Provision of finance/credit
Ministry of Youth Affairs	•National Youth Service Council •Small Enterprises Development Division	Training provider Enterprise development
Provincial Councils (9 provinces) *{Western, Central, North West, Southern, North, East, Uva, Sabaragamuwa, North Central}*	•Agriculture/Livestock Departments •Industrial Services Bureau North Western province •Southern Development Authority •Industrial Development Authority (Western & Central Provinces)	Agriculture enterprises Enterprise development, R&D Regional Development Enterprise development

Entrepreneurship development: pre start-up and start-up support

Entrepreneurship development and business start-up support have particularly become an important strategy in SMEs development. The current changes taking place at the policy level reflect the government realisation that the country needs entrepreneurs with enthusiasm, willingness and a capacity to undertake entrepreneurial activities who can contribute to the country's economic growth. Typically, business start-up processes in Sri Lanka have been spontaneous and those who were reasonably wealthy and influential went into business. The traditional family businesses had great influence on entrepreneurial activities. About two dozens of the larger firms are run by few business families on whose shoulders the future of the economy rests (World Bank, 1995). Generally, the formal entrepreneurship training was not regarded essential for start and run a business. On the other hand, bankers, commercial banks in particular, generally do not consider training on business management as a positive factor in assessing creditworthiness[87]. Many start-up initiatives were not structured and delivered properly. The International Labour Organisation (ILO) first introduced the formal business start-up and entrepreneurship training during late 1970s popularly known as 'Improve Your Business (IYB)'. The IYB programme was based on a model developed by the Swedish Employers' Federation in the early 1970s and implemented in 1977 by the Swedish International Development Authority (SIDA) followed by another programme called 'Start Your Business (SYB)' implemented in 1990 which focussed on business expansion. The new version of this programme 'Start and Improve Your Business (SIYB)' provides training for both business start-ups and existing businesses. The 'How to Begin an Industry', 12 day entrepreneurship training programme commenced in 1987 by the Chamber of Commerce and Industry supported by the Asia Foundation introduced was later modified by the Sri Lanka Business Development Centre (SLBDC) and continued as a fee levying certificate course. In 1985, the Open University of Sri Lanka introduced a one-year certificate course on

[87] The author was in-charge of a branch at a leading state owned development bank and according to my personal experience, the bank did not consider prior training as an essential qualification for financial assistance.

Entrepreneurship and since the focus is more on 'about entrepreneurship' this programme is very much attracted by business support professionals rather than young and aspiring entrepreneurs. The fact is small entrepreneurs do not regard this type of academic programmes neither provide knowledge and experience to start and run a business nor supportive to secure finance from financial institutions.

Increasing international donor involvement in enterprise development in Sri Lanka has helped finance business support agencies otherwise would not have been possible for the government to finance entrepreneurship development and training. International donor activities in entrepreneurship development have intensified over the past 10 years and their policies have significantly changed from so called 'doling out money' concept to a more pragmatic approach towards policy and structural changes which have an effect on facilitating the implementation of policies and programmes that lead to increase in private sector activities. Among the international donors the United States International Development Agency (USAID), German Technical Cooperation (GTZ), Swiss Development Agency (Swisscontact), and Swedish International Development Agency (SIDA) are the main agencies, among the other things, supporting entrepreneurship development and training. These agencies have developed their own training methodologies based on their own country and international experience. The USAID assists the Mahaweli Authority of Sri Lanka to enhance entrepreneurial capabilities among the new settlers under the Mahaweli river settlements in North Central, North Western, Central, Eastern and Sabaragamuwa provinces. Sarvodaya Movement, the leading national non-governmental organisation conducts entrepreneurship training programmes for rural youth and women.

GTZ supported CEFE entrepreneurship training based on action learning methodology developed in Germany during late '80s has been introduced by the Sri Lanka-German CEFE Programme in 1995 under the Sri

Lanka-German development programme[88]. The objective of this programme is to assist enterprise training providers to conduct training for potential entrepreneurs, start-ups and expansion of existing enterprises using improved training and follow-up methods, whereby improve or diversify competitive and sustainable micro, small and medium-sized enterprises while focussing on competency building of potential entrepreneurs particularly in regions.

The Industrial Development Board conducts two week long training programme for new business start-ups and expansions titled "Programme for New Investment Promotion and Industries Creation (PIPIC)" delivered by the Centre for Entrepreneurship Development. PIPIC has four phases, viz. selection and recruitment of trainees, business familiarisation, entrepreneurial competency building, product identification and business plan preparation (Ranasinghe, 1996). At the end of the programme, trainees are expected to present their business plan and those with viable business plans are offered with necessary inputs required to start businesses. In 2002, PIPC was replaced by '*Wasanthaya*' (Prosperity) an initiative primarily aimed at fostering entrepreneurship among low-income groups, particularly in rural areas.

Financial assistance for SMEs

The banking sector plays a vital role by providing much needed capital to enterprises. Sri Lanka's banking sector has expanded both strategically and functionally over the past 20 years. Currently, 25 commercial banks operating in the country and their branch network increased from 1096 in 2000 to 1128 in 2001 (CBSL 2001). There are five types of financial intermediaries, namely:

- State banks (Bank of Ceylon and Peoples Bank)
- Commercial banks (Hatton National Bank, Commercial Bank, Sampath Bank, and Seylan Bank)

[88] The training programme consists of classroom teaching, and business games, case studies, field visits and presentation of business plan. The types of CEFE training programmes on offer are:
14 day New Business Creation programme (NBC),
14 day Small and Medium Business Management and Expansion programme (SMBME),
10-14 days NBC for micro enterprises,
14 days Women Entrepreneurship Development Programme,
8-10 days Agricultural Marketing/ Market Orientation of Agricultural Producers programme.

- Development financial institutions (Development Finance Corporation of Finance Bank and National Development Bank)
- Regional Development Banks and (Regional Development Banks in 8 provinces)
- Non-banking financial institutions (Co-operative societies),
- Venture capital institutions (Vanik Corporation, Mahaweli Venture Capital)

The World Bank intervention in SMEs development in Sri Lanka has been mainly in broader financial market reforms with number of lending programmes specifically to address the financial needs of SMEs. The World Bank provided over $100 million in financing SMEs through four credit schemes called SMI 1 to SMI IV between 1979 and 1995. The funding channelled through the National Development Bank (NDB) while state banks and private banks involved in channelling these loans to SMEs. Over 50 per cent of the loans were utilised to acquire new technology in the form of new machinery and equipment. The SMI credit scheme is, in every aspect, the only successful loan scheme so far. Although this scheme was designed to facilitate both start-ups and existing enterprises, most participating commercial banks were not particularly keen to finance start-ups due to high risk involved.

In 2002, a new loan scheme for SMEs titled 'Sahanaya' funded by the Asian Development Bank was launched with a capital of US$ 60 million disseminated through five participating banks in Western, Southern, North Western, Central and North East provinces.

Sri Lanka's venture capital industry is not as developed as other countries in the region. According to the Central Bank, the total number of venture capital companies remained at seven by the end of 2001. In the same year, their total assets and funds invested declined by 7 per cent and 6 per cent respectively. The entrepreneurs generally wrongly perceive private financial institutions as high risk and do not favour a third party involvement in their businesses.

Provision of business advice

Business advice services are considered as fundamental intermediaries of sustainable support within the overall SME support framework. However, the findings of recent surveys by ADB reveal that lack of professionals with advisory skills is the main barrier for effective delivery of business support services. Support agencies often experience difficulties in recruiting professional staff. The profiles of business support agencies listed in Annex A indicate that there is a problem of delivering professional expertise and only a handful of them have the capacity to reach businesses sectorally and spatially. The only regional business support agency, Industrial Services Bureau of North Western Province has developed its own in-house expertise comprising of fully trained professional staff in both technical and general business advisory. Generally, the professional staffs of public sector business support agencies are recruited from fresh graduates and undergo rigorous training both locally and abroad. From the overall point of view, these cadres are specialised in particular subject areas. For instance, Industrial Extension Officers of Industrial Development Board (IDB) are responsible for enterprise development activities at divisional level (sub-regional level). Their task is to provide business advice, preparation of feasibility studies and coordinate with other government agencies in obtaining approvals etc. In the early days, IDB received assistance from ILO to train its staff. IDB largely contributed to the emergence of enterprise development professionals and practitioners in Sri Lanka and while the two state banks; People's Bank and Bank of Ceylon also have trained 'business advisers' specifically to help businesses with business start up planning and managing finance. Similarly, specialists in craft sector, agriculture, vocational training, textile, and engineering are mostly employed by respective sector-based agencies. The larger organisations such as EDB and BOI have business advisory professionals in areas such as finance, trade & marketing, IT, product specific, and engineering. The state departments, e.g. small industries, textile, agriculture, livestock and crafts council, recruit their executive staff through the Civil Service whose tasks are more or less limited to administrative work rather advising businesses.

According to the ADB survey on SMEs, legal and accountancy services are the most sought business supports by SMEs. These types of services are usually offered by independent legal and accounting professionals and which are not commonly provided by mainstream business support agencies. One of the interesting findings is SMEs willingness to pay for services. Nearly 40 percent of the SMEs surveyed (out of 527 SMEs) are willing to pay for legal, tax and accountancy services while only less than 10 percent indicated their willingness to pay for services such as feasibility studies, research and development, technology know-how and information. However, findings of this survey indicated that SMEs are generally willing to pay for high quality services if such services were readily available.

Business premises and infrastructure support

Since the establishment of first industrial estate in 1960s, 37 industrial estates are now in operation which accommodate over 104 commercially operating enterprises with over 12,000 direct employment and some 97 start-ups. Further eight sites in the North Western, Eastern and Southern provinces have been identified by the Ministry of Enterprise Development to be developed in the future. The employment potential of all estates would be around 150,000. Under the Cleaner Production programme, a dedicated industrial estate for leather the industry is being set up in the Southern Province to relocate the tanneries operating in Colombo and suburbs. The objective of the relocation of tanneries is to ensure the sustainability of leather industry while minimising adverse environmental impact. The industrial estate will have the capacity to accommodate over 14 industrial units and currently 7 are operating on this site. Meanwhile, the government has been actively encouraging private sector and offering incentives and concessions to develop infrastructure facilities for enterprises. LINDEL, a subsidiary company of a leading development bank DFCC located near the capital city Colombo is Sri Lanka's first privately managed industrial estate and accommodates over 50 industrial units with an employment potential of over 3000.

There are no operating incubators in Sri Lanka that match the international standards, but UNIDO is currently providing assistance on the establishment of industrial business incubators. However, the first industrial estate that was established in 1960s held features and characteristics similar to that of a modern incubator. The industrial estates later became mere 'property development sites' without giving much attention to provision of incubator services that are essential to early stages enterprises. Under the UNIDO assisted Business Incubator Programme launched in 2002, several incubators are planned for every province. Two small scale incubators have been established recently of which one caters to IT businesses while the other supports technology-based start-ups. The first incubator called 'Navabima' in collaboration with the University of Moratuwa (engineering university) was set up in June 2003 and the second 'Ruhunu Business Incubator' established in collaboration with the Agriculture Faculty of the Ruhunu University (southern Sri Lanka).

Sub-contracting services

Sub-contracting or supply chain arrangement has not been widely practiced by businesses as a strategy in sourcing inputs. The reason being, Sri Lanka does not have a good primary or secondary industrial raw material base apart from agriculture raw materials such as tea, rubber and coconut. On the other hand, 70 per cent of the industrial inputs are imported and the value addition in terms of local content is very low. Devapriya and Ganesan (2000) suggest that sub-contracting is a good method for a developing country like Sri Lanka for facilitating the transfer of technology from large to small enterprises. However, the low resource of local subcontracting firms in Sri Lanka leads to an inferior position in sub-contracting arrangements thus hinders effective technology transfer.

In order popularise subcontracting between companies the UNIDO has introduced an initiative called Sub-contracting Partnership Exchange (SPX) which aims to facilitate sub-contracting arrangements between SMEs and larger enterprises. It has established an information system which provides information and advice to SMEs on sub-contracting opportunities available in larger enterprises and public sector institutions. The SPX has recently introduced 'Reverse Fair' where larger companies exhibit the items that could be outsourced. Those who have the potential to undertake supply of items would be able to negotiate immediately with the outsourcer. The SPX is of the opinion that through this programme, larger enterprise will be able to realise the importance of subcontracting. Although SMEs seems not getting full benefit of such a programme it would elevate SMEs standards to a level acceptable to world class in quality, competitive pricing and speed of delivery which also shows that this scheme does not benefit. In order to meet such levels acceptable to international standards, SMEs need more technological inputs in terms of advice, R&D support and finance which is not an integral part of this programme.

Special support programmes through international donor intervention

International donor agencies provide funding support by way of subsidising the costs of running programmes and initiatives by business support agencies. The ADB study (2001) found that outreach and participation rates of these programmes were very low and support agencies lacked human and financial resources to carryout the follow-ups. Aid agencies are now moving away from providing funding support to agencies instead focussing on facilitating support agencies to build capacity and ensure sustainability of enterprise support.

Commenced in 1994, Sri Lanka-German Private Sector Project (PSP) provide growth oriented SMEs to enhance performance and competitiveness by providing assistance to SMEs in rubber, coconut fibre (coir), footwear and toys industry sectors by offering technology related advice, export marketing assistance.

Support for SMEs in regions

Until late 1980s when decentralisation was introduced, little or no planning has been carried out at regional level to promote enterprise. The Provincial Councils that came along with the decentralised system has taken considerable measures towards developing enterprises in regions. However, the statistics on SMEs in regions suggest that neither the Central Government nor Provincial Councils had efficient and effective strategies for development of enterprises in regions. This may have been attributed to the fact that Central Government holding planning functions and authority over allocation of funds for development activities while the Provincial Councils have to operate within a budget that would only allow them to spend less than 25 per cent for economic development activities. On the other hand, activities that are directly related to regional economic development, for instance, regional industrial development, poverty alleviation, rural infrastructure development and finance do not come under the purview of Provincial Councils. Furthermore, there has been no coherent regional development plan, therefore, national and provincial administrations constantly clash over development priorities.

Amidst the persistent conflict between the Central Government and Provincial Councils over economic development priorities, the North Western Provincial Council has taken an important step ahead of other councils by declaring its own industrial and enterprise development programme. The North Western Provincial Council established its own business support agency in 1990, the Industrial Services Bureau (ISB) whose task was to coordinate industrial development plan in the province. The Bureau acts as a 'one-stop-service centre' where all necessary services are available for business.

Nurturing human resource for SME development

It has been argued in Chapter 2 that a healthy and well-developed human resource base is an enabler for improving the SME sector. Effective policies, programmes and institutional framework can play an important role on nurturing human resource for SME. The following is an analysis of the availability, supply and development of human resources for building entrepreneurial as well as technological and innovation capabilities of SME sector. Among the developing countries, Sri Lanka is renowned for its exceptional record of human development and educational achievements at primary, secondary and tertiary levels. The high level of investment in education has been greatly contributed to a good foundation for industrial development with a pool of educated and trainable workforce. However, in terms of tertiary enrolment, Sri Lanka lags behind countries like Taiwan, Malaysia, Thailand and even India. This aspect points us to the direction whether the country has achieved a level of skills that need to move into technology intensive activities (Lall et al, 1996).

Supply and availability of educated, skilled and trained manpower

Although Sri Lanka has been able to maintain high levels of literacy compared to other South Asian nations, studies have found that that the workforce lacks skills that are essential for industrial upgrading and diversification. The Central Bank (2002) reports that manufacturers face difficulties relating to skills deficiency the workforce which is considered as a major barrier for their growth. The education and training systems are essentially supply driven and therefore do not match with the needs of private sector. A study by GTZ found that vocational training policies and practices in Sri Lanka have evolved in response to both supply-side considerations and demand-side considerations (GTZ-VTW, 2001). The provision of vocational training and skills development remains a state sector function although private and voluntary sectors also to play an important role as a provider of skills and training. However, the sate sector still remains as the main training provider. The GTZ study also reveals that in 1992, there were well over 1750 state, 1500 private and 250 voluntary sector and training providers in the country. The total student enrolment in all sectors was well over 160,000 per annum. The current estimation could easily exceed the numbers by several thousands. The mismatch between supply and demand of skilled workforce reflects the deficiencies and lack of effectiveness of skills and training policies in Sri Lanka. To address this problem, the government has recently initiated restructuring of vocational training and skills development with the help of

Asian Development Bank and German Technical Cooperation (GTZ). Another project funded by ADB aims to improve the quality and relevance of skills training programs that will build a high quality workforce and address the issues of skills mismatch and unemployment among the rural and urban youth. The Project also plans to restructure and reorient the vocational training system through introduction of competency-based training (CBT) to ensure a closer partnership between vocational training institutions and the private sector.

In 1999 the government has established the Skills Development Fund to supports employers to conduct job entry training, upgrading and re-training employees and to improve enterprise based training. The objective of this initiative is to address the shortage of skilled labour in major industrial sectors. The Fund was subsequently renamed as Human Resources Endowment Fund with a further funding of one billion rupees to provide tertiary education and vocational training to students and youth, and to upgrade technical and IT skills.

Mainstream business support institutions

Sri Lanka Export Development Board (EDB)

Established in 1979, the Sri Lanka Export Development Board commonly known as EDB is the main state institution assigned with promotion and development of exports, more specifically non-traditional exports. The EDB consists of 10 functional divisions namely; Trade Information Service, Policy and Planning Division, Services Division, Product Management Division, Human Resources Development Division, Export Agriculture Division, Finance Division, Marketing Division, and Special Project for Regional SME Development. These Divisions seek to co-ordinate all activities of promotion and development of exports to achieve the following principle objectives.

EDB's special project on SMEs focuses on promotion and development of export oriented SMEs in the provinces. Under this programme, SMEs are assisted to development their supply capabilities to cater to export markets. In addition, quality and productivity improvement and skills development programmes are also conducted for export oriented SMEs. The EDB's regional offices are operating within a coordinated institution network in their respective regions.

EDB implements several initiatives to make exporters and potential exporters to be export-ready. The strategy, known as integrated approach to export promotion under which the export market for a particularly product sector is examined initially. Secondly, exporters are provided with technical assistance to undertake product development, packaging, and quality assurance depending on the end market needs. In the final stage, exporters are assisted to prepare promotional materials and are taken on a mission to the overseas market. The advantage of this approach is the exporters are assisted from the start to the end while involved in the process which assist exporters to get acquainted with different overseas markets at each stage. Exporters are also assisted to participate in international trade exhibitions and fairs and carryout their own promotional activities.

Small Enterprise Development Division of the Ministry of Youth Affairs (SEDD)

The Ministry of Youth Affairs through SEDD conducts enterprise development programmes specifically designed for unemployed youths. The main focus is the development of entrepreneurship abilities; enhance efficiency and productivity of enterprises while providing a maximum contribution to national development through the provision of services relating to the small enterprise development sector.

The main functions of the SEDD are:

- Conduct training courses, relevant to the entrepreneurship development and small enterprise management,
- Undertake studies and research work,

- Promote marketing facilities,
- Provide consultancy services,
- Compilation of magazines and manuals etc. those are vital to small entrepreneurs,
- Maintain business information services,
- Produce audio-visual programmes.

These activities are implemented at District and Divisional level through extension officers whose tasks are to identify potential entrepreneurs among unemployed youth and assist them to start self- employment as an alternative to paid employment. Initially the youths undergo short-term training courses (about 5 days) on entrepreneurship and small enterprise management. After completing the training programme, financing is arranged through its own credit institution, National Youth Cooperative (NYSC) and state banks involved in the programme. Small loans of maximum Rs. 50,000 are made available to cover the start up capital and working capital. The programme supports any type business but most youths are prefer to venture into activities such as engineering workshops, tailoring, yoghurt making, mushroom growing, livestock etc. Although no impact assessment has been carried out to determine the programme's economic viability, general understanding is that these programmes have had some impact on creating entrepreneurial culture in general more importantly among rural youth.

Board of Investment of Sri Lanka (BOI)

BOI is the prime organisation responsible for promotion of inward investment. It also provides fiscal and financial concessions for investments with foreign and local content established under the section 16 and 17 of the BOI Act and Inland Revenue Act. Sri Lanka has been a popular destination among foreign investors for several years. Although BOI's main objective is to attract foreign investment, its attention has now been diverted towards the local SMEs sector. The Table 4.10 gives a detailed breakdown of concessions and incentives offered to SMEs and as Table shows, enterprise undertaking direct and indirect export using advanced technology are offered with tax holidays and rebates up to 15 years and are exempted from import and excise duties on project related goods and raw materials. In 1998, BOI introduced two new schemes namely, Thrust industries and designated areas. In respect of thrust industries four sectors have identified. They are: electronic and software development; ceramic and glassware; light & heavy industry; and cutting and polishing of gems & diamonds and manufacture of jewellery. Enterprises are eligible for up to a 10-year tax holiday and duty free import of machinery and equipment, if the investment is over Rs. 50 millions; exports are over 50% and generating employment of over 50 persons.

The government has identified a number of underdeveloped regions classified as 'difficult' and 'most difficult' depending on the acuteness of underdevelopment. These areas are generally poverty-ridden with high rates of unemployment, low levels of economic activities and poor standards of living. The enterprises located in these areas are also eligible for similar concessions provided they employ over 150 persons. In addition, they are eligible for lands at rates well below the commercial rates. Other than tax concessions, companies are also eligible for reimbursement of costs associated with training, purchase of test and laboratory equipment, calibrating, quality control, and product designs and prototypes. The government believes that the inflow of external private sector capital into backward regions will boost rural economies. Several under-developed regions have benefited from this scheme, not only through direct employment but also stimulating local entrepreneurship through increasing economic activities.

Although several packages have been introduced by BOI to encourage entrepreneurs to set up SMEs under BOI schemes, only a few have actually benefited from them. Since BOI does not maintain an island wide coverage, SMEs in regions find it difficult to access its services. The complex administrative procedures too deter local SMEs taking advantage of such benefits.

Sector based government departments

The Department of Small Industries whose mandate is to oversee the small industry sector provides training, technology and marketing assistance for small entrepreneurs and also various forms of support services for self employed persons in rural areas engaged in craft activities such as making brassware, blacksmiths, pottery, handloom, woodworking, etc. The department maintains a branch network throughout the country.

The primary objective of National Crafts Council (NCC) is to develop the modern handicrafts sector while preserving traditional stature. The NCC provides training, financial assistance, and acts as a mediator between traditional artisans and banks to obtain bank facilities. The NCC also operates "craft villages" which aims at preserving traditional arts and crafts and support artisans in their own traditional environment. One example is the traditional village of brassware and jewellery makers in the Central province. Under this scheme, NCC supports artisans/craftsmen with financial assistance, equipment, supply of raw materials at concessionary rates, buy back arrangements and common facilities centres. Further, recently NCC has introduced a pension and insurance scheme for the benefit of artisans.

The Sri Lanka Handicrafts Board (SLHB) also offers similar assistance to that of NCC by helping handicrafts makers and artisans to market their products. The SLHB manages 17 retails centres across the country and some 200 training cum production centres. Over 3000 handicrafts producers sell their products through these retail centres.

The National Design Centre (NDC) offers technical and design assistance for small entrepreneurs in handicrafts sector.

Although there are a number of initiatives are to support handicrafts, the sector is still constrained by lack of finance, raw materials and marketing opportunities, skills shortages etc.

Moving away from the traditional role as agriculture extension services, the departments responsible for Agriculture, Animal Production and Health and Export Agriculture activities have initiated several support services for agriculture enterprises. These included information, training, business planning guidance, technical assistance, credit and grants, and marketing assistance

Established in 1968, the National Institute of Business Management (NIBM) is the first of its kind in Sri Lanka whose objective is to provide advanced management training and education for managerial and supervisory staff of the corporate sector and SMEs. It also offers specialised consultancy services for enterprises of all sizes.

Incentives and concession available for SMEs under BOI Law

Description of Activity		*Qualifying criteria*			Incentives				
		Minimum Investment in Rs. Mn.	Minimum direct/indirect export requirements (% of output)	Minimum new employment required	Full Tax holiday	Concessionary Tax at 15%	Import Duty Exemption		Exemption from Exchange Control
							On Capital Goods	On Raw Materials	
Textile & ancillary industries (existing) including yarn, thread etc	Domestic market oriented	5	49	None	None	On Export	Yes	Yes	No
	Export oriented	5	50% or more within 5 yrs.	None	5	On Export	Yes	Yes	Yes, its 90% is exported.
Software Development	Domestic market oriented	None	0-69%	25 technically qualified persons	5 yrs.	As per IR Law after tax holiday	Yes	n.a.	No
	Export oriented (new & existing companies)	None	More than 70%	-do-	8 years	12 years after tax holiday	Yes	n.a.	Yes
Manufacture are trading of Gems, Diamonds & Jewellery	New manufacturing enterprises	10	70%	None	20 years	As per IR Law after tax holiday	Yes	Yes	Yes
	Existing enterprises	5	70%	20 years	20 Years	-do-	Yes	Yes	Yes
	Trading enterprises	None	90%	None	20 years	-do-	During establishment period (2 yrs.)	Yes	Yes
Agriculture, Dairy & Livestock Development	Small scale new (domestic market) Agriculture, Dairy, Livestock Development & Storage	2.5	None	None	None	5 Years	n.a.	Only during project establishment period	No
	New (export market)	2.5	None	None	50%	5 Years	15 Years	Yes	Yes, for the exported qty only.

Source: Board of Investment, Sri Lanka

Technology support and R&D institutions

Industrial Technology Institute (ITI – formerly CISIR)

Industrial Technology Institute (ITI) established in 1955 (formerly known as Ceylon Institute of Scientific and Industrial Research - CISIR) provides technology support and industrial R&D services mainly to manufacturing enterprises. ITI has a staff of over 300 of whom about 60 scientists and engineers and about 100 technicians. It is organised under five specialist area: Food technology, Process and plant engineering, Chemical and environmental technology, Natural products development, and Information and corporate services. ITI is fully equipped with high standard laboratories and R&D facilities and a technical library and information service. The services for industry include: technical consultancy and advice, product and process development, testing and analysis of products and raw materials, calibration of laboratory equipment, and training. A study by Lall_et. al (1996) found that ITI recorded a growth in the first two decades since inception, however in the 1980s suffered some serious set backs that threatened its survival. Shortage of scientists and technicians (brain drain according to Lall), lack of demand for services, outdated facilities and funding constraints were some of the challenges hard to overcome even to date. Another contributing factor was facilities and services of ITI have not been upgraded to meet the needs of the enterprise sector that was changing rapidly with the liberalisation process. Lall et.al (1996) reported that between 1977 and 1994 ITI (CISIR) were offered fewer patents (13) compared to 29 patents between 1955 and 1976 while commercialisation of ITI technologies have been relatively modest. However, ITI has been very strong in developing commercialising own technologies for food and beverage product sector, particularly those utilising locally produced raw materials (fruits and vegetables) and food products. Since 1990, the ITI has been undergoing a rigorous restructuring to improve performance. The aim is to make the services market-oriented while upgrading its facilities. The World Bank and UNIDO fund this programme. However, as reported by annual performance evaluation of Public Enterprise Department, the revenue in the form of government and international grants have increased, however, the Institute has been continuously operating on deficits and the cost of employment also has been on the increase despite reductions in the numbers employed.

National Engineering Research and Development Centre (NERD Centre)

Established in 1974, NERD Centre specialised in engineering related R&D. NERD Centre as and R&D institution is expected to play an important role in technology transfer. Its research activities have focussed on: renewable energy, cost effective building technology, energy management and environmental engineering, and energy efficient lighting systems to areas not covered by grid electricity. NERD Centre's activities spread across ten departments each specialising specific activity. These include: civil engineering, electrical and electronics, renewable energy, energy management and environmental technology, agricultural and post harvest technology, design fabrication and consultancy to industry, techno marketing, and internal administration.

Achievements of the NERD Centre		
International Awards		
Year	Name of the Awards	Awards Authority
1996	Dry Batch Anaerobic Digester	24th International Exhibition of Invention,
		New Techniques and Product of Geneva
2002	Forced Draft Smokeless Firewood Stove	24th International Exhibition of Invention,
		New Techniques and Product of Geneva
2002	Small Scale Coconut Oil Extractor	24th International Exhibition of Invention,
		New Techniques and Product of Geneva
Presidential Awards		
Year	Name of the Awards	Awards Authority
1996	Dry Batch Anaerobic Digester	Sri Lanka Invention Commission
2002	Forced Draft Smokeless Firewood Stove	Sri Lanka Invention Commission

2002	Small Scale Coconut Oil Extractor	Sri Lanka Invention Commission

Industrial Development Board (IDB)

The Industrial Development Board (IDB) was set-up in 1969 whose task was initially to provide technology extension services and promote small industries but later shift their focus towards SMEs. By 1970, the IDB had established nine regional offices to co-ordinate and deliver business support services, provide infrastructure and stimulate entrepreneurial activities. At present, IDB functions under the Ministry of Enterprise Development, Industrial Policy and Investment Promotion. It provides a range of programmes and projects for SMEs:

- Start-up advice, identification of business opportunities and carrying out feasibility studies,
- Entrepreneurship development,
- Business information,
- Marketing advice & guidance,
- Graphic designing & product development,
- technical assistance and engineering services,
- Workshop and foundry facilities,
- Identification of raw materials,
- Management training and consultancy,
- Management of industrial estates and factory premises.

Being the principal business support service, IDB has a well established country-wide network with 22 district offices and a staff of over 600 of whom 70 are extension workers. The government provides financial assistance to IDB, nearly 80% of its annual budget while many of its services generates little income from services but that also from renting lands and buildings on industrial estates. In the 70s and 80s, IDB played a leading role in supporting enterprises those produced import substitute products.

IDB manages about 11 industrial estates which accommodate over 1000 enterprises employing 15000 and provide lands and buildings and on-site facilities at concessionary rates for both existing and new enterprises. However, IDB has not been able to pay adequate attention to upgrading its facilities and assess the demands of tenants for services and consequently, certain estates are under-utilised (Fernando, 2001). IDB posses substantial technical expertise but it is not effectively utilised (ADB, 2001) Being the main public sector business support agency, IDB is constrained by numerous problems. They are financial difficulties, inadequate resources, lack of government support and diminishing public confidence. Being a public sector organisation, the IDB has constantly been suffered from undue political influence. One example is the usual practice of every newly elected government has been using organisations like IDB to provide jobs to satisfy political supporters which has resulted in excessive amounts of non professional staff. The financial constraints, however, has affected not only IDB but also the public sector as a whole. Severe budgetary constraints imposed by the government due to the ongoing conflict have seriously hampered the business support activities as these services are, according to 'government bureaucracy', considered as 'non-essential' public services. However, institutional deficiencies have also contributed to the declining public confidence. Lack of professionalism and innovativeness, inability to retain and recruit professionals due to low salaries offered, and poor quality services have contributed to the current gloomy status of IDB. The World Bank and ADB have recommended the government to consider restructuring and refocus its activities in order to become an effective service provider.

IDB role as the pioneer business support agency has had positive impact on enterprise development. Between 1998 and 2000, IDB had conducted approximately 670 training programmes and 27, 000 individuals have participated. About 9000 self-employments and new businesses have been supported through which over 21,000 employment opportunities have been generated (IDB, 2001).

Annex B: Survey Questionnaire

University of Newcastle-upon-Tyne

UNIVERSITY OF
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ප්‍රශ්නාවලිය

Research Study on Technological Performance of Small and Medium-sized Enterprises (SMEs) in Sri Lanka

Questionnaire

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C·U·R·D·S
CENTRE FOR URBAN & REGIONAL DEVELOPMENT STUDIES

Small Enterprise Research Unit
SERU
C.U.R.D.S University of Newcastle

ප්‍රශ්ණාවලිය සම්පූර්ණ කිරීමේදී <u>එක් භාෂාවක්</u> පමණක් භාවිතා කරන්න.

Please use only <u>one</u> language, <u>either</u> Sinhala or English in completing the questionnaire.

ප්‍රශ්ණාවලිය

මෙම ප්‍රශ්ණාවලියට අදාලව තවදුරටත් තොරතුරු අවශ්‍ය වුවහොත් ඔබ ආයතනයෙන් විමසිය හැකි මහත්මයකුගේ/මහත්මියකගේ නම සඳහන් කරන්න.

නම ....

තනතුර ....

ලිපිනය ....

....

දුරකථන අංකය ....

ෆැක්ස් අංකය ....

ඊ මේල් ලිපිනය ....

අන්තර්ජාල ලිපිනය (WWW) ....

QUESTIONNAIRE

Please give details of the person we should contact with any question about this questionnaire.

Name:..

Position in the Company: ....

Address: ....

....

Telephone number: ....

Fax No. ....

E-mail address: ....

World-Wide Web address: ....

ව්‍යාපාරය පිළිබඳ තොරතුරු

ඔබ සහ ඔබගේ ව්‍යාපාරය පිළිබඳ සාමාන්‍ය විස්තර පහත අසා ඇත. කරුණාකර අදාල කොටුවේ ☒ ලකුණ යොදන්න.

පුද්ගලික තොරතුරු

1. ඔබගේ තනතුර කුමක් ද? ☐අයිතිකරු/සභාපති ☐හවුල්කරු ☐අධ්‍යක්ෂ/කොටස්කරු ☐ප්‍රධාන විධායක ☐කළමණාකරු ☐වෙනත්

ව්‍යාපාරය ඔබ විසින් ආරම්භ කරන ලද්දේ නම් හෝ ප්‍රධාන ආයෝජකයන්ගෙන් කෙනෙක් නම් පහත කොටුවේ සඳහන් ප්‍රශ්න වලට පිළිතුරු සපයන්න. එසේ නොවන්නේනම් ප්‍රශ්න අංක 5ට යන්න.

මෙම ව්‍යාපාරය ආරම්භ කරන ලද්දේ ඔබ විසින් ද? ☐ඔව් / ☐නැත

ඔබගේ වයස අවුරුදු.............. ස්ත්‍රී/පුරුෂ භාවය ☐ස්ත්‍රී ☐පුරුෂ

ඔබ ප්‍රථමවරට ව්‍යාපාරික කටයුතු ආරම්භ කරන විට ඔබේ වයස කොපමණද? අවුරුදු..............

2. ව්‍යාපාරය ආරම්භකිරීමට පෙර ඔබ ව්‍යාපාරය සම්බන්ධයෙන් පුහුණුවක්/අධ්‍යාපනයක් ලබා තිබේ ද? ☐ඔව් / ☐නැත

එසේ ඔබ පුහුණුවක්/අධ්‍යාපනයක් ලබාඇත්නම් එය/ඒවා පහත කාණ්ඩවලට අයත් වේද?

☐දින 0-3 දක්වා ☐දින 4-7 දක්වා ☐දින 8-14 දක්වා ☐මාසය හෝ ඊට වැඩි

☐ වෙනත් ....

3. ඔබ පහත සඳහන් අධ්‍යාපනික සුදුසුකම් වලින් එකක් හෝ ඊට වැඩිගණනක් ලබා තිබේද?

☐සහතික පත්‍ර ☐ඩිප්ලෝමා ☐උපාධි ☐පශ්චාත් උපාධි ☐වෘත්තීය සුදුසුකම්

☐ වෙනත් ....

4. පාඨමාලාවේ විෂය ක්ෂේත්‍රය කුමක් ද?

☐කළමනාකරණ ☐අලෙවිකරණ ☐ඉන්ජිනේරු/තාක්ෂණ ☐පරිගණක

☐විද්‍යා ☐කෘෂිකර්ම ☐ගිණුම්/වෙළඳ ☐මූල්‍ය

☐ වෙනත් ....

ව්‍යාපාරය පිළිබඳ තොරතුරු

5. ඔබගේ ව්‍යාපාරයේ නීතිමය තත්වය කුමක් ද?

☐ තනි පුද්ගල ☐හවුල් ☐සීමිත සමාගම ☐ආයෝජන මණ්ඩල ☐රාජ්‍ය/සමුපකාර

6. ව්‍යාපාරය ආරම්භ කළ වර්ෂය - ....

7. ඔබගේ ව්‍යාපාරය පහත සඳහන් ඒවායින් එකකට හෝ ඊට වැඩි ගණනකට අයත් වේද?

☐බද්ධ ආයෝජන (දේශීය) ☐බද්ධ ආයෝජන (විදේශීය) ☐උප කොන්ත්‍රාත් ☐අපනයන (සෘජු) ☐නියෝජිත
☐අපනයන (වක්‍ර) ☐අනුසමාගම් ☐වරලත් ☐පවුලේ ව්‍යාපාරයක් (පරම්පරාවෙන්)

8. ඔබගේ ව්‍යාපාරයේ නිෂ්පාදන වල ස්වභාවය? ☐භාණ්ඩ ☐සේවා

9. ඔබගේ ව්‍යාපාරය මගින් නිපදවන භාණ්ඩ හා සේවා මොනවා ද?

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10. ඔබගේ ව්‍යාපාරයේ සේවකයින් පිළිබඳ විස්තර දැනගැනීමට කැමැත්තෙමු. කරුණාකර පහත සඳහන් විස්තර සපයන්න.

- මුළු සේවක සංඛ්‍යාව 1998................. 2000.................
- කළමණාකරුවන්/වැඩ පරීක්ෂකවරුන් සංඛ්‍යාව 1998................. 2000.................
- ඉන්ජිනේරු/තාක්ෂණ සේවක සංඛ්‍යාව 1998................. 2000.................
- කම්කරු ශ්‍රේණියේ සේවක සංඛ්‍යාව 1998................. 2000.................

11. මුළු සේවක සංඛ්‍යාව අධ්‍යාපන සුදුසුකම් අනුව

- උපාධිධාරීන් ගණන 1998................. 2000.................
- සහතික පත්‍ර හෝ ඩිප්ලෝමා ලබාඇති ගණන 1998................. 2000.................
- වෙනත් වෘත්තීය සුදුසුකම් ලබාඇති ගණන 1998................. 2000.................

12. ඔබගේ ව්‍යාපාරයේ මූල්‍ය තත්වයන් පිළිබඳ විස්තර දැනගැනීමට කැමැත්තෙමු. කරුණාකර පහත සඳහන් විස්තර සපයන්න.

- වාර්ෂික මුළු පිරිවැටුම (රු. '000) 1998:...................... 2000......................
- අපනයන ආදායම (රු. '000) 1998:...................... 2000......................
- පර්යේෂණ හා සංවර්ධන කටයුතු වියදම (රු. '000) 1998:...................... 2000......................

13. ඔබ හෝ ඔබගේ සමාගම පහත සඳහන් සංවිධාන වල සාමාජිකත්වය දරන්නේ ද?

☐ වෙළඳ සංගම් (නම් පළදේශයේ) ☐වෙළඳ සංගම් (ජාතික) ☐කර්මාන්ත මණ්ඩල (නම් පළදේශයේ)
☐ කර්මාන්ත මණ්ඩල (ජාතික) ☐ වෘත්තීය සංවිධාන (උදා. CIMA, CIM, SLIM, IESL, IEUK)

නව තාක්ෂණය හා නව නිපැයුම්

මෙම කොටසින් අප බලාපොරොත්තු වන්නේ ඔබ ව්‍යාපාරයේ නව තාක්ෂණය යොදාගන්නා ආකාරය සහ ව්‍යාපාරයේ තරඟකාරීත්ව හැකියාවන් පිළිබඳ තොරතුරුය. පහත සඳහන් ඒවායින් එකක් හෝ ඊට වැඩි ගණනක් ඔබගේ ව්‍යාපාරය තුළ ක්‍රියාත්මක කර ඇතිබව හෝ නැතිබව අදාල 'ඔව්' හෝ 'නැත' යන්න සඳහන් කරන්න (අනවශ්‍ය වචනය කපා දමන්න) ඔබගේ පිළිතුර 'ඔව්' නම් එම ක්‍රියාකාරකම් ඔබ ව්‍යාපාරයට වැදගත් වන ආකාරය සටහන් කිරීම සඳහා තීරුව මත ✓ ලකුණ යොදන්න.

			අතිශයින්ම වැදගත්	අතර වැදගත්	වැදගත්	වැදගත් නොවේ
14.	ඔබ විසින් ඔබගේ ව්‍යාපාරයේ සියළුම කටයුතු ආවරණය වන පරිදි සමාන හෝ වෙනත් ව්‍යාපාර/ව්‍යාපාරයක් සමග සන්සන්දනාත්මක විග්‍රහයක් කර තිබේද (Benchmarking)?	ඔව් / නැත	......	......	......	......
15.	ඔබගේ ව්‍යාපාරය නව තාක්ෂණය උපයෝගී කරගන්නේද?	ඔව් / නැත	......	......	......	......
16.	පූර්ණ තත්ත්ව කළමණාකරණය (TQM)	ඔව් / නැත	......	......	......	......
17.	තත්ත්ව කව (Quality Circles)	ඔව් / නැත	......	......	......	......
18.	'එස් 5 සංකල්පය	ඔව් / නැත	......	......	......	......
19.	පාරිභෝගිකයා නැවීම	ඔව් / නැත	......	......	......	......
20.	තත්ත්ව වර්ධනය	ඔව් / නැත	......	......	......	......
21.	පරිසර දූෂණය අවම කිරීම/ අපද්‍රව්‍ය කළමනාකරණය	ඔව් / නැත	......	......	......	......
22.	උපකරණ/කුලී කරුවන්ගේ/ සැපයුම්කරුවන්ගේ කළමනාකරණ හා තාක්ෂණ හැකියාවන් වර්ධනය	ඔව් / නැත	......	......	......	......
23.	බලශක්ති කළමනාකරණය	ඔව් / නැත	......	......	......	......
24.	පර්යේෂණ සහ සංවර්ධන කටයුතු	ඔව් / නැත	......	......	......	......
25.	තාක්ෂණ පුහුණුව හා දක්ෂතා සංවර්ධනය	ඔව් / නැත	......	......	......	......
26.	වෙනත් ව්‍යාපාර සමග අන්තර් සම්බන්ධතා	ඔව් / නැත	......	......	......	......
27.	ගැනුම්කරුවන්/සැපයුම්කරුවන් සම්බන්ධ කර ගනිමින් නව තාක්ෂණික ව්‍යාපෘති ක්‍රියාත්මක කර තිබේද	ඔව් / නැත	......	......	......	......
28.	පර්යේෂණ ආයතන/විශ්ව විද්‍යාල සංවර්ධන ආයතන හා එකාබද්ධව නව තාක්ෂණික ව්‍යාපෘති ක්‍රියාත්මක කර තිබේද?	ඔව් / නැත	......	......	......	......

පහත දැක්වෙන ආකාරයේ තාක්ෂණික හෝ කළමනාකරණ සංවර්ධන කටයුතු ඔබ ව්‍යාපාරයේ සිදුකර ඇත්දැයිදුවෙමින් පවතීද? කරුණාකර 'ඔව්' හෝ 'නැත' යන්න සඳහන් කරන්න. අනවශ්‍ය වචනය කපා දමන්න.

29.	ප්‍රධානතම නිශ්පාදිත භාණ්ඩ/සේවා වලට අමතරව අළුතින් භාණ්ඩ හෝ සේවා වෙළඳපලට හඳුන්වා දී තිබේද?	ඔව් / නැත
30.	නිශ්පාදනය කරනු ලබන භාණ්ඩ හෝ සේවා ක්‍රමවත්ව වැඩිදියුණු කර ඇත්ද?	ඔව් / නැත
31.	නව නිශ්පාදන ක්‍රියාවලියක් හෝ ක්‍රියාවලින් හඳුන්වා දී තිබේද?	ඔව් / නැත
32.	දැනට පවතින නිශ්පාදන ක්‍රියාවලියට / ක්‍රියාවලීන් ක්‍රමවත්ව වැඩිදියුණු කර ඇත්ද?	ඔව් / නැත
33.	නව කළමනාකරණ සැලැස්මක් ක්‍රියාත්මක කර ඇත්ද?	ඔව් / නැත
34.	දැනට ක්‍රියාත්මක වන කළමනාකරණ සැලැස්මෙහි වෙනස්කම් සිදු කර තිබේද?	ඔව් / නැත
35.	නව අලෙවිකරණ සැලැස්මක් ක්‍රියාත්මක කර තිබේද?	ඔව් / නැත
36.	දැනට පවතින අලෙවිකරණ සැලැස්මෙහි වෙනස්කම් සිදු කර තිබේද?	ඔව් / නැත
37.	පරිසර හිතකාමී නිශ්පාදන / රසායනික ද්‍රව්‍ය භාවිතයෙන් තොර නිශ්පාදන වෙළඳපලට ඉදිරිපත්කර තිබේද?	ඔව් / නැත
38.	බුද්ධිමය දේපළ අයිතීන් (IPR) ලබාගෙන තිබේද? ජේටන්ට් බලපත්‍ර PATENTS	ඔව් / නැත
	වෙළඳ ලකුණු TRDE MARKS	ඔව් / නැත
	ප්‍රකාශණ අයිතීන් COPY RIGHTS	ඔව් / නැත
	නව සැලසුම් DESIGNS	ඔව් / නැත
39.	නිශ්පාදන සඳහා හිමිකම් බලපත්‍ර (license) ලබාගෙන තිබේද?	ඔව් / නැත
40.	වෙනත් දේශය හෝ විදේශය ව්‍යාපාර සමග තාක්ෂණය සහයෝගිතා වැඩසටහන් හෝ හුවමාරු වැඩසටහන් ක්‍රියාත්මක කර තිබේද?	ඔව් / නැත
41.	ව්‍යාපාරික කටයුතු සඳහා පරිගණක තොරතුරු හා සන්නිවේදන තාක්ෂණය සහ අන්තර්ජාලය යොදාගෙන තිබේද?	ඔව් / නැත

ඔබගේ ව්‍යාපාර පහත සඳහන් සහතික හෝ කුසලතා සම්මාන ආදිය සඳහා ඉල්ලුම් කලේද? ඒවා ප්‍රදානය කර තිබේද? කරුණාකර 'ඔව්' හෝ 'නැත' යන්න සඳහන් කරන්න. අනවශ්‍ය වචනය කපා දමන්න. ලැබුණු වර්ෂය සඳහන් කරන්න.

		ඉල්ලුම් කළා	ලැබුණා	ලැබුණු වර්ෂය
42.	ලංකා ප්‍රමිති සහතිකය (SLS)	ඔව් / නැත	ඔව් / නැත	
43.	ISO 9000/ISO14000	ඔව් / නැත	ඔව් / නැත	
44.	තත්ත්ව සම්මානය	ඔව් / නැත	ඔව් / නැත	
45.	කාබනික නිශ්පාදන සහතිකය	ඔව් / නැත	ඔව් / නැත	
46.	පළාත්‍යික සම්මාන	ඔව් / නැත	ඔව් / නැත	
47.	අපනයන සම්මාන	ඔව් / නැත	ඔව් / නැත	
48.	ජනාධිපති සම්මාන	ඔව් / නැත	ඔව් / නැත	
49.	වෙළඳ මණ්ඩල සම්මාන	ඔව් / නැත	ඔව් / නැත	
50.	ජාත්‍යන්තර සම්මාන	ඔව් / නැත	ඔව් / නැත	
51.	ව්‍යවසායකත්ව සම්මාන	ඔව් / නැත	ඔව් / නැත	
52.	රාජ්‍ය සම්මාන	ඔව් / නැත	ඔව් / නැත	

තාක්ෂණය හා සම්බන්ධ ගැටළු හා බාධක

මෙම කොටසින් අප බලාපොරොත්තු වන්නේ ව්‍යාපාරය කරගෙන යාමේදී ඔබ විසින් මුහුණ දෙන තාක්ෂණය හා සම්බන්ධ ගැටළු හා බාධක පිළිබඳ තොරතුරුය. පහත සඳහන් ඒවායින් එකක් හෝ ඊට වැඩි ඔබට අදාලනම් හෝ නැත්නම්, කරුණාකර 'ඔව්' හෝ 'නැත' යන්න සඳහන් කරන්න. අනවශ්‍ය වචනය කපා දමන්න.

53.	සරල තාක්ෂණයක් භාවිතා කරයි.	ඔව් / නැත	62.	යල්පැන ගිය යන්ත්‍රසූත්‍ර හා උපකරණ භාවිතා කරයි.	ඔව්/නැත
54.	නිශ්පාදන හැකියාව සීමිතයි	ඔව් / නැත	63.	තාක්ෂණික දැනුම අල්පය.	ඔව් / නැත
55.	භාණ්ඩ/සේවා වර්ග සීමිතයි	ඔව් / නැත	64.	පුහුණු ශ්‍රමිකයන් හිඟය.	ඔව් / නැත
56.	අවශ්‍ය අමුද්‍රව්‍ය පහසුවෙන් ලබාගත නොහැක.	ඔව් / නැත	65.	මූල්‍ය පහසුකම් ප්‍රමාණවත් නැත.	ඔව් / නැත
57.	ආනයනික අමුද්‍රව්‍ය මත යැපීමට සිදුවේ.	ඔව් / නැත	66.	තාක්ෂණ සංවර්ධනය සඳහා යන වියදම අධිකයි	ඔව් / නැත
58.	තත්ත්වයෙන් බාල අමුද්‍රව්‍ය භාවිතා කරයි	ඔව් / නැත	67.	වෙළඳපළ පිළිබඳව නිසි තොරතුරු හිඟය.	ඔව් / නැත
59.	නිශ්පාදන බාල තත්ත්වයේ පවතියි.	ඔව් / නැත	68.	අළුත් නිෂ්පාදන සඳහා පාරිභෝගිකයන්ගෙන් ලැබෙන ප්‍රතිචාර ප්‍රමාණවත් නැත.	ඔව් / නැත
60.	නව තාක්ෂණය පිළිබඳව දැනුවත් වී නොමැත.	ඔව් / නැත			
61.	අපගේ යාම් හා ප්‍රතික්ෂේප වීම් අධිකයි.	ඔව් / නැත			

පරිගණක, තොරතුරු හා සන්නිවේදන තාක්ෂණය භාවිතය

මෙම කොටසින් අප බලාපොරොත්තු වන්නේ ඔබ ව්‍යාපාරය සතුව ඇති පරිගණක තොරතුරු හා සන්නිවේදන තාක්ෂණය පිළිබඳවත් එය කෙතරම් දුරට ව්‍යාපාරික කටයුතු සඳහා යොදාගෙන ඇත්ද යන්න පිළිබඳව විස්තර ලබාගැනීමයි. ඒ අනුව 1998 සහ 2000 වර්ෂ වල මෙම තාක්ෂණය ඔබ ව්‍යාපාරය සතුව තිබුනේද නැද්ද යන්න 'ඔව්' 'නැත' යන්න සඳහන් කරන්න. (අනවශ්‍ය වචනය කපා දමන්න). තවද, පරිගණක හා තොරතුරු තාක්ෂණය ඔබගේ ව්‍යාපාරයේ කටයුතු සඳහා කෙතරම් වැදගත්ද යන්න තීරුව මත ✓ ලකුණු කරන්න.

		1998	2000	අතිශයින්ම වැදගත්	ඉතා වැදගත්	වැදගත්	වැදගත් නොවේ
69.	පරිගණක Computers	ඔව් / නැත	ඔව් / නැත	......	......	......	......
70.	ඉලෙක්ට්‍රොනික් තැපැල් E-mail	ඔව් / නැත	ඔව් / නැත	......	......	......	......
71.	අන්තර්ජාල සම්බන්ධතාවය Internet Connectivity	ඔව් / නැත	ඔව් / නැත	......	......	......	......
72.	ව්‍යාපාරයට අයත් වෙබ් අඩවිය (ප්‍රචාරක කටයුතු සඳහා) (Information website)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
73.	ව්‍යාපාරයට අයත් වෙබ් අඩවිය (භාණ්ඩ හා සේවා අන්තර්ජාල හරහා අලෙවි කිරීම සඳහා) (On-line Trading Website)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
74.	සංයුක්ත තැටි භාවිත කිරීමේ පහසුකම (CD)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
75.	ගිණුම්කරණය සහ දත්ත සැකසීම සඳහා මෘදුකාංග (Accounting & Data processing software)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
76.	වදන් සැකසීම සහ පරිගණක මුද්‍රණය සඳහා මෘදුකාංග (software for word processsing & DTP)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
77.	පරිගණක ආශ්‍රයෙන් දත්ත හා තොරතුරු හුවමාරුව(EDI)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
78.	පරිගණක ආශ්‍රයෙන් සැලසුම් නිර්මාණය (CAD)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
79.	පරිගණක ආශ්‍රයෙන් සිදුකරන නිශ්පාදන ක්‍රියාවලීන්(CAM)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
80.	ව්‍යාපාරය තුළ සහ වෙනත් ව්‍යාපාර සමග පරිගණක ජාල (Computer Networks)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
81.	බාහිරින් ප්‍රවේශ වීමට හැකි පරිගණකගත දත්ත ගබඩාවන් (Online Databases)	ඔව් / නැත	ඔව් / නැත	......	......	......	......
82.	ෆැක්ස් යන්ත්‍ර Fax machines	ඔව් / නැත	ඔව් / නැත	......	......	......	......

සුළු සහ මධ්‍යම පරිමාණ ව්‍යාපාර සංවර්ධනය සඳහා පිහිටුවා ඇති ආයතන සහ ඒවායින් සැලසෙන සේවාවන්

මෙම කොටසින් අප බලාපොරොත්තු වන්නේ සුළු සහ මධ්‍යම පරිමාණ ව්‍යාපාර වැඩිදියුණු කිරීම සඳහා පිහිටුවා ඇති ආයතන සහ ඒවායින් සැපයෙන සේවාවන් ඔබගේ ව්‍යාපාරයේ සංවර්ධනය සඳහා ඉවහල් වන ආකාරය පිළිබඳව විමසා බැලීමයි. පහත සඳහන් වන්නේ ලංකාවේ දැනට ක්‍රියාත්මක වන ව්‍යාපාර සඳහා සේවා සපයන ආයතන වලින් කොටසක් ආයතන කිහිපයකි. ඒ සමගම ව්‍යාපාර සඳහා සපයන සේවාවන් වර්ග කිහිපයක් දක්වා ඇත. කරුණාකර මෙම ආයතනවලින් මෙම සේවාවන් ලබා ඇත්නම් හෝ ලබාගන්නේ නම් ඊට අදාළ සිත් ඉරෙහි ✓ ලකුණක් දමන්න.

- ව්‍යාපාර උපදෙස් (කළමනාකරණ, මූල්‍ය, නීතිමය, සමිකරණ, පාලන උපදෙස්, අලෙවිකරණ (දේශීය හා අපනයන), සැපයුම් කළමනාකරණය, පරිගණක තාක්ෂණය, රජයේ නීති රීති හා රෙගුලාසි ආදිය)
- තොරතුරු සේවාවන් (වැ.දි. මුද්‍රිත හා ඉලෙක්ට්‍රොනික මාධ්‍ය මගින් සපයන මූල්‍ය තොරතුරු, අලෙවි තොරතුරු, ව්‍යාපාර සඳහා සපයන සේවාවන් පිළිබඳ තොරතුරු, ව්‍යාපාර සඳහා බලපවත්වන නීති රීති සහ රෙගුලාසි, තාක්ෂණ තොරතුරු ආදිය)
- පර්යේෂණ සහ සංවර්ධන සේවාවන් (නිෂ්පාදන සහ නිෂ්පාදන ක්‍රියාවලීන් වැඩිදියුණු කරලීම, නව නිෂ්පාදන සහ නව නිෂ්පාදන ක්‍රියාවලීන් හඳුන්වාදීම, තාක්ෂණය වැඩිදියුණු කිරීම සහ පර්යේෂණ පවත්වා ආදිය)

83.	ව්‍යාපාර උපදෙස්	මූල්‍යමය ප්‍රතිපාදන	ඉඩම් හා ගොඩනැගිලි	තොරතුරු සේවාවන්	පර්යේෂණ සහ සංවර්ධනය	පරිසරය හා සම්බන්ධ සේවාවන් හා උපදෙස්	කළමනාකරණ පුහුණුව	තාක්ෂණික පුහුණුව	පේටන්ට්/ බලපත්‍ර	නව තාක්ෂණය ආදේශ කිරීම	බලශක්ති කළමනාකරණය	තත්ත්ව විධිනය
• ආයෝජන මණ්ඩලය	......	......	......	......	......	......	......	......	......	......	......	......
• අපනයන සංවර්ධන මණ්ඩලය	......	......	......	......	......	......	......	......	......	......	......	......
• කාර්මික සංවර්ධන මණ්ඩලය	......	......	......	......	......	......	......	......	......	......	......	......
• කර්මාන්ත සංවර්ධන අමාත්‍යාංශය (ප්‍රාදේශීය කාර්යාල ඇතුළුව)	......	......	......	......	......	......	......	......	......	......	......	......
• කර්මාන්ත සේවා කාර්යාංශය වයඹ	......	......	......	......	......	......	......	......	......	......	......	......
• කර්මාන්ත අමාත්‍යාංශය මධ්‍යම පළාත	......	......	......	......	......	......	......	......	......	......	......	......
• කාර්මික තාක්ෂණ ආයතනය (කළින් CISIR)	......	......	......	......	......	......	......	......	......	......	......	......
• ජාතික ඉංජිනේරු සහ සංවර්ධන පර්යේෂණායතනය නර්ඩ්	......	......	......	......	......	......	......	......	......	......	......	......
• ශ්‍රී ලංකා ප්‍රමිති ආයතනය	......	......	......	......	......	......	......	......	......	......	......	......
• ජාතික ඇසුරුම් ආයතනය	......	......	......	......	......	......	......	......	......	......	......	......
• තේ/රබර්/පොල් පර්යේෂණායතන (කරුණාකර ඔබ සේවා ලබන ආයතන යටින් ඉරක් අඳින්න)	......	......	......	......	......	......	......	......	......	......	......	......
• පිගන් සහ මැටිභාණ්ඩ කර්මාන්ත පර්යේෂණ මධ්‍යස්ථානය, පිළියන්දල	......	......	......	......	......	......	......	......	......	......	......	......

	ව්‍යාපාර උපදෙස්	මූල්‍යමය ප්‍රතිපාදන	ඉඩම් හා ගොඩනැගිලි	තොරතුරු සේවාවන්	පර්යේෂණ සහ සංවර්ධනය	පරිසරය හා සම්බන්ධ සේවාවන් හා උපදෙස්	කළමනාකරණ පුහුණුව	තාක්ෂණික පුහුණුව	පේටන්ට්/ බලපත්‍ර	නව තාක්ෂණය ආදේශ කිරීම	බලශක්ති කළමනාකරණය	තත්ත්ව විධිනය
• භාර ආයතනය	......	......	......	......	......	......	......	......	......	......	......	......
• විශ්වවිද්‍යාල	......	......	......	......	......	......	......	......	......	......	......	......
• වෙළඳ හා කර්මාන්ත මණ්ඩල	......	......	......	......	......	......	......	......	......	......	......	......
• පුද්ගලික ව්‍යාපාර උපදේශකවරුන්	......	......	......	......	......	......	......	......	......	......	......	......
• බැංකු	......	......	......	......	......	......	......	......	......	......	......	......
• අතිකුත් උපදේශක ආයතන (SMED/AgENT/SLBDC/NIBM)	......	......	......	......	......	......	......	......	......	......	......	......
• සැපයුම්කරු/යෙදවුම් අලෙවි කරන පුද්ගලයන් හෝ සමාගම් හා ගැණුම්කරුවන්	......	......	......	......	......	......	......	......	......	......	......	......
• රජයේ විශේෂ ව්‍යාපෘති මහනුවර/මාතලේ	......	......	......	......	......	......	......	......	......	......	......	......
• රජයේ දෙපාර්තමේන්තු කෘෂිකර්ම / සත්වපාලන / අපනයන බෝග	......	......	......	......	......	......	......	......	......	......	......	......
• රජයේ දෙපාර්තමේන්තු කුඩා කර්මාන්ත/පේෂකර්ම	......	......	......	......	......	......	......	......	......	......	......	......
• ඇඟළුම්/පේෂකර්ම ආයතනය	......	......	......	......	......	......	......	......	......	......	......	......
• මිතුරන් හා පවුලේ අය	......	......	......	......	......	......	......	......	......	......	......	......

ඉහත සඳහන් වූ ආයතන හා ඒවායින් සැලසෙන සේවාවන් පිළිබඳ ඔබගේ ඇගැයීම කුමක්ද? අදාළ කොටුවේ ☑ සලකුණ යොදන්න.

84. ව්‍යාපාර උපදෙස් / තොරතුරු සේවාවන් / පුහුණු

	විශිෂ්ටයි	හොඳයි	සාමාන්‍යයි	අසතුටුදායකයි
රාජ්‍ය ආයතන	☐	☐	☐	☐
පළාත්බද ආයතන	☐	☐	☐	☐
විශ්වවිද්‍යාල	☐	☐	☐	☐
වෙළඳ හා කර්මාන්ත මණ්ඩල	☐	☐	☐	☐
පුද්ගලික ව්‍යාපාර උපදේශකයින්	☐	☐	☐	☐
පුද්ගලික සම්බන්ධකා	☐	☐	☐	☐

85. තාක්ෂණික සේවාවන්

	විශිෂ්ටයි	හොඳයි	සාමාන්‍යයි	අසතුටුදායකයි
රාජ්‍ය ආයතන	☐	☐	☐	☐
පර්යේෂණ ආයතන	☐	☐	☐	☐
පළාත්බද ආයතන	☐	☐	☐	☐
විශ්වවිද්‍යාල	☐	☐	☐	☐
වෙළඳ හා කර්මාන්ත මණ්ඩල	☐	☐	☐	☐
පුද්ගලික ව්‍යාපාර උපදේශකයින්	☐	☐	☐	☐
පුද්ගලික සම්බන්ධකා	☐	☐	☐	☐

මෙම කොටසින් අප ඔබගෙන් දැනගැනීමට අපේක්ෂා කරන්නේ දැනට ලංකාවේ පවතින රාජ්‍ය හා රාජ්‍ය නොවන ව්‍යාපාර ප්‍රවර්ධන සේවා ආයතන සහ ඒවායේ සේවාවන් සම්බන්ධයෙන් ඔබගේ අදහස් ය. පහත සදහන් වන්නේ එම සේවා සම්බන්ධ ගැටළු සමහරකි. කරුණාකර ඔබ ඒවාට එකගද නැද්ද යන වග සදහන් කරන්න. ඒ සදහා 'ඔව්' 'නැත' කොටුවල ☑ ලකුණ යොදන්න.

86. ආයතන බොහොමයක් පිහිටා ඇත්තේ අගනුවර හා ප්‍රධාන නගරවල පමණක් වීම. ☐ඔව් / ☐නැත

87. සන්නිවේදන ගැටළු (භාෂා ප්‍රශ්ණ, සහ නිලධාරීන්ට ව්‍යාපාරික ප්‍රශ්ණ පිළිබදව ඇති අනවබෝධය) ☐ඔව් / ☐නැත

88. බොහෝ සේවාවන් තෝරාගත් කණ්ඩායමකට හා කර්මාන්ත ක්ෂෙත්‍රයකට පමණක් සීමා වීම ☐ඔව් / ☐නැත

89. ව්‍යාපාරික ගැටළු හා ප්‍රශ්ණවලට විසදුම් පරමාර්ථ කරගත් සහායක සේවාවන් නොමැති වීම. ☐ඔව් / ☐නැත

90. ආයතනවල පවතින නිලධාරිවාදය ☐ඔව් / ☐නැත

91. උපදෙස් හා සේවාවන්ගේ තත්ත්වය පිළිබදව සෑහීමකට පත් විය නොහැකි වීම /විශ්වාසය තැබිය නොහැකි වීම. ☐ඔව් / ☐නැත

92. සේවාවන් ලබාගැනීම සදහා යන අධික වියදම. ☐ඔව් / ☐නැත

93. ව්‍යාපාර සදහා රජයෙන් ලැබෙන අනුග්‍රහය, පිටුවහල හා මූල්‍ය පහසුකම් ප්‍රමාණවත් නොමැති වීම. ☐ඔව් / ☐නැත

ව්‍යාපාරය වැඩි දියුණු කිරීම සදහා අවශ්‍ය සහායක සේවා

ඔබගේ ව්‍යාපාරයේ තාක්ෂණය හා නිර්මාණශීලීත්වය වැඩිදියුණු කිරීමට ඔබ අපේක්ෂා කරන්නේ නම් ඒ සදහා ඔබට අවශ්‍ය වන සහායක සේවාවන් මොනවාද? කරුණාකර 'ඔව්' හෝ 'නැත' යන්න සදහන් කරන්න. අනවශ්‍ය වචනය කපා දමන්න.

94. නිශ්පාදනය කරනු ලබන භාණ්ඩ හෝ සේවා ක්‍රමවත්ව වැඩිදියුණු කිරීම ඔව් / නැත
95. ප්‍රධානතම නිශ්පාදිත භාණ්ඩ/සේවා වලට අමතරව අළුතින් භාණ්ඩ හෝ සේවා වෙළඳපලට හදුන්වා දීම ඔව් / නැත
96. දැනට පවතින නිශ්පාදන ක්‍රියාවලිය / ක්‍රියාවලීන් ක්‍රමවත්ව වැඩිදියුණු කිරීම ඔව් / නැත
97. නව නිශ්පාදන ක්‍රියාවලියක් හෝ ක්‍රියාවලීන් හදුන්වා දීම ඔව් / නැත
98. පැරණි තාක්ෂණය වෙනුවට නව තාක්ෂණය ආදේශ කිරීම ඔව් / නැත
99. අඛණ්ඩව පර්යේෂණ හා සංවර්ධන කටයුතු කරගෙන යාම ඔව් / නැත
100. තත්ත්ව පාලනය ඔව් / නැත
101. නිශ්පාදන සදහා SLS / ISO ප්‍රමිතීන් ලබා ගැනීම ඔව් / නැත
102. පරිසර දූෂණය අවම කිරීම/අපද්‍රව්‍ය කළමනාකරණය ඔව් / නැත
103. බලශක්ති සංරක්ෂණය සදහා තාක්ෂණය ඔව් / නැත
104. තාක්ෂණය හා සම්බන්ධ තොරතුරු ඔව් / නැත
105. වෙළදපල තොරතුරු ඔව් / නැත
106. තාක්ෂණික පුහුණුව ඔව් / නැත
107. පරිගණක තොරතුරු හා සන්නිවේදන තාක්ෂණය සහ අන්තර්ජාලය ව්‍යාපාරික කටයුතු සදහා යොදාගැනීම ඔව් / නැත
108. තාක්ෂණය වැඩිදියුණු කිරීමට මූල්‍ය පහසුකම් ඔව් / නැත

මෙම ප්‍රශ්ණාවලිය සම්පූර්ණ කිරීමෙන් ඔබ දැක්වූ සහයෝගය පිළිබදව අපගේ ස්තුතිය පුදකර සිටිමු. කරුණාකර මේ සමග එවා ඇති මුද්දර ඇලවූ ලිපිකවරයෙහි බහා අප වෙත තැපැල් කරන්න.

මෙම ප්‍රශ්ණාවලියට අදාලව ඔබත් කරුණු ඇත්නම් මෙම පිටුවේ සටහන් කරන්න.

General Information

The first section is general information about you and your company. Please write / tick ☑ boxes where appropriate.

Personal Inormation

1. What is your status in the enterprise?

☐ Owner/Chairman ☐ Partner ☐ Shareholder/Director ☐ Chief Executive ☐ Manager ☐ Other

If you are the founder or one of the key founders, please answer the questions in the box. If not, please go to question no. 5.

Are you the key founder of the business? ☐ Yes ☐ No

Your age: .... Are you ☐ Male or ☐ Female ?

What was your age when you first started a business? .... Years

2. Have you ever had business related training / education before start-up of your business? ☐ Yes/ ☐ No

If yes, is it ... ☐ less than 3 days ☐ 3-7 days ☐ 8-14 days ☐ one month or over

☐ Other *Please specify* ....

3. Have you obtained any of the following formal qualifications?

☐ Certificate ☐ Diploma ☐ Degree ☐ Post Graduate ☐ Professional Qualifications

☐ Other *Please specify* ....

4. What is the field of study?

☐ Management ☐ Marketing ☐ Engineering ☐ Agriculture

☐ Aquaculture ☐ IT ☐ Science ☐ Finance

☐ Other *Please specify* ....

Basic information about the enterprise

5. What is the legal status of your company? *(please tick ✓more than one if applicable)*

☐ Sole Proprietorship ☐ Partnership ☐ Limited Liability ☐ BOI Company ☐ State / Co-operative

6. Year of start of company's business operations: ....

7. Does your company falls under any or more of the following? *(please tick ✓more than one if applicable)*

☐ Joint Venture (with local partner/s) ☐ Joint Venture (with foreign partner/s) ☐ Sub-contractor ☐ Agent

☐ Exporter (Direct) ☐ Exporter (Indirect) ☐ Subsidiary ☐ Franchise ☐ Family Business

8. Is this company *(please tick ✓more than one if applicable)* ☐ Manufacturing ☐ Service

9. Please briefly describe your enterprise's main product/s(goods & services) ?

____

10. We would like to know how many people are in employment under each category *by the end of 1998 and 2000?*

- Total number of employees 1998................ 2000.................
- Managerial / Supervisory Staff 1998................ 2000.................
- Technical Staff 1998................ 2000.................
- Manual workers / labourers 1998................ 2000.................

11. Educational level of employees

- Number of Graduates 1998................ 2000.................
- Diploma/Certificate holders 1998................ 2000.................
- Vocational training qualifications 1998................ 2000.................

12. Please tell us your company's

- Turnover (Rs. '000) 1998:........................ 2000......................
- Exports (Rs. '000) 1998:........................ 2000......................
- Research & Development Expenditure (Rs. '000) 1998:........................ 2000......................

13. Are you a member of *(please tick ✓more than one if applicable)*

☐ Trade Associations (local) ☐ Trade Associations (national) ☐ Chamber of Commerce (national)

☐ Chamber of Commerce (Province/District) ☐ Professional Institute (e.g. CIMA, SLIM, IESL, IEUK)

Technology & Innovation

The next section is about technology and innovation activities in your company. Please answer the following questions. If your answer is "yes" indicate how important they are to your company. Please delete 'Yes' or 'No' and tick ✓on the dotted line.

		Highly Important	Average Important	Important	Not Important
14. Have you ever compared your management and production methods with other company/ies? (Benchmarking)	Yes / No	......	......	......	......
15. Have you acquired new machinery / equipment or external technological knowledge?	Yes / No	......	......	......	......
16. Total Quality Management (TQM)	Yes / No	......	......	......	......
17. Quality Circles	Yes / No	......	......	......	......
18. 5 'S'	Yes / No	......	......	......	......
19. Productivity Improvement	Yes / No	......	......	......	......
20. Quality Improvements	Yes / No	......	......	......	......
21. Pollution control / Waste reduction methods	Yes / No	......	......	......	......
22. Sub-contractors'/ Suppliers' standards improvements	Yes / No	......	......	......	......
23. Energy management	Yes / No	......	......	......	......
24. Research and Development	Yes / No	......	......	......	......
25. Internal and external Training and Skills Development directly related to technology development	Yes / No	......	......	......	......
26. Networking with other companies	Yes / No	......	......	......	......
27. Joint technology development and innovative projects with customers/suppliers	Yes / No	......	......	......	......
28. Joint technology development and innovative projects with external research and development institutions and support organisations	Yes / No	......	......	......	......

We are interested to know technology and innovation activities you have implemented in your company since inception. Please answer 'Yes' or 'No' (delete word not applicable)

29. Introduce product/s new to your company (different from mainstream products)		Yes / No
30. Incremental changes to existing product/s		Yes / No
31. A new production process		Yes / No
32. Incremental changes to existing production process		Yes / No
33. A new management structure		Yes / No
34. Changes to existing management structure		Yes / No
35. A new marketing strategy		Yes / No
36. Changes to existing marketing strategy		Yes / No
37. Environmentally friendly products / Organic products		Yes / No
38. Obtain Intellectual Property Rights (IPR)	Patents	Yes / No
	Trade Marks	Yes / No
	Copyrights	Yes / No
	Designs	Yes / No
39. Licensing company's products		Yes / No
40. Technology sharing with local or foreign company/ies		Yes / No
41. E-commerce (or Information and Communication Technology)		Yes / No

Please tell us whether your company has applied and/or received any of the following certifications / awards in recent years? Please answer 'Yes' or 'No' (delete word not applicable)

	Applied	*Received*	*Year*
42. SLS (Sri Lanka Standards)	Yes / No	Yes / No	....
43. ISO 9000/ISO 14000	Yes / No	Yes / No	....
44. Quality awards	Yes / No	Yes / No	....
45. Organic certification	Yes / No	Yes / No	....
46. Productivity awards	Yes / No	Yes / No	....
47. Export awards	Yes / No	Yes / No	....
48. Presidential awards	Yes / No	Yes / No	....
49. Trade Assn/Chamber Awards	Yes / No	Yes / No	....
50. International awards	Yes / No	Yes / No	....
51. Entrepreneur Awards	Yes / No	Yes / No	....
52. State Awards	Yes / No	Yes / No	....

Technology Related Problems and Constraints

This section is about technology related obstacle (problems) your company experience. If you think that one or more of the following obstacles (problems) do or do not experience, Please answer 'Yes' or 'No' (delete word not applicable)

53. Very shallow technological level	Yes / No	62. Very Old equipment and machinery	Yes / No
54. Limited production capacity	Yes / No	63. Lack of technical know-how	Yes / No
55. Limited product range	Yes / No	64. Lack of qualified personnel	Yes / No
56. Raw materials not readily available	Yes / No	65. Financial constraints	Yes / No
57. Dependent on imports of raw materials	Yes / No	66. Technology development costs too high	Yes / No
58. Poor quality raw materials	Yes / No	67. Lack of information on markets	Yes / No
59. Products of poor quality	Yes / No	68. Lack of customer rsponsiveness to new goods and services	Yes / No
60. Not aware of new technology	Yes / No		
61. Too many rejects and wastes	Yes / No		

Use of Information and Communication Technology (ICT)

Please tell us whether your company posses and/or operates computer-based technologies in 1998 and 2000. If yes, please indicate how important they are to your company. Please delete 'Yes' or 'No' and tick ✓ on the doted line.

	1998	2000	Highly Important	Average Important	Important	Not Important
69. Computers	Yes / No	Yes / No	......	......	......	......
70. E-mail	Yes / No	Yes / No	......	......	......	......
71. Internet connectivity	Yes / No	Yes / No	......	......	......	......
72. Company Website (Information)	Yes / No	Yes / No	......	......	......	......
73. Website for on-line trading	Yes / No	Yes / No	......	......	......	......
74. CD ROM or CD Writers	Yes / No	Yes / No	......	......	......	......
75. Software for accounting & data processing	Yes / No	Yes / No	......	......	......	......
76. Software for Wordprocessing and Desk-top Publishing	Yes / No	Yes / No	......	......	......	......
77. EDI (Electronic Data Interchange	Yes / No	Yes / No	......	......	......	......
78. Computer Aided Design (CAD)	Yes / No	Yes / No	......	......	......	......
79. Computer Aided Manufacturing (CAM)	Yes / No	Yes / No	......	......	......	......
80. Computer Network within company/ with other companies	Yes / No	Yes / No	......	......	......	......
81. On line Databases	Yes / No	Yes / No	......	......	......	......
82. Fax machines	Yes / No	Yes / No	......	......	......	......

Support Services for Small and medium-sized Enterprises

This section is about various business supports you company have the access to and/or receive from Governmental and Non-governmental Agencies. Please tell us whether you have received or currently receiving support services mentioned below. *Please put a tick ✓ on the dotted line . (Tick more than one if applicable.)*

Explanatory notes:

- **General Business Advises and Consultancy** (one-to-one advice) on management, finance, legal, labour issues, marketing (local & export) supply and logistics, ICT & e-commerce, government regulations etc.
- **Information Services** (verbal, print or electronic means) on finances, marketing, external business support, government regulations, government incentives, supply & logistics, technology etc.
- **Research & Development** - Product improvements, new product development, process improvements, new processes development, contract research and in-house research

83.	Business Advise	Financial Assistance	Land/ Buildings	Information Services	Research & Development	Environmental Services	Training (Managerial)	Training (Technical)	Patents/ License	Technology Transfer	Energy Management	Quality Improvement
▪ Board of Investment	......	......	......	......	......	......	......	......	......	......	......	......
▪ Export Development Board	......	......	......	......	......	......	......	......	......	......	......	......
▪ Industrial Development Board	......	......	......	......	......	......	......	......	......	......	......	......
▪ Ministry of Industries *(& Regional Offices)*	......	......	......	......	......	......	......	......	......	......	......	......
▪ Industrial Services Bureau (Wayamba)	......	......	......	......	......	......	......	......	......	......	......	......
▪ Ministry of Industries Central Province	......	......	......	......	......	......	......	......	......	......	......	......
▪ Industrial Technology Institute (CISIR)	......	......	......	......	......	......	......	......	......	......	......	......
▪ NERD Centre (Ekala)	......	......	......	......	......	......	......	......	......	......	......	......
▪ Sri Lanka Standard Institute (SLSI)	......	......	......	......	......	......	......	......	......	......	......	......
▪ Packaging Institute	......	......	......	......	......	......	......	......	......	......	......	......
▪ Research Institutes Tea/Rubber/Coconut *(Please underline the relevant Institutes)*	......	......	......	......	......	......	......	......	......	......	......	......
▪ Ceramic Research Centre Piliyandala	......	......	......	......	......	......	......	......	......	......	......	......

	Business Advise	Financial Assistance	Land/ Buildings	Information Services	Research & Development	Environmental Services	Training (Managerial)	Training (Technical)	Patents/ License	Technology Transfer	Energy Management	Quality Improvement
▪ NARA	......	......	......	......	......	......	......	......	......	......	......	......
▪ Universities	......	......	......	......	......	......	......	......	......	......	......	......
▪ Chambers of Commerce	......	......	......	......	......	......	......	......	......	......	......	......
▪ Private Consultants	......	......	......	......	......	......	......	......	......	......	......	......
▪ Banks	......	......	......	......	......	......	......	......	......	......	......	......
▪ SMED/TIPs/AgENT/ SLBDC/NIBM *(Please underline relevant organisation)*	......	......	......	......	......	......	......	......	......	......	......	......
▪ Suppliers/ Buyers	......	......	......	......	......	......	......	......	......	......	......	......
▪ Government Projects (Matale/Kandy)	......	......	......	......	......	......	......	......	......	......	......	......
▪ Government Departments *Agriculture/Livestock/Export Agriculture*	......	......	......	......	......	......	......	......	......	......	......	......
▪ Government Departments *Small Industries/Textiles*	......	......	......	......	......	......	......	......	......	......	......	......
▪ Apparel/Textile Institute	......	......	......	......	......	......	......	......	......	......	......	......
▪ Friends & Family members	......	......	......	......	......	......	......	......	......	......	......	......

If you were asked your opinion about the existing business support services in Sri Lanka, how would you rate their services? Please tick boxes ☑

84. General Business Advise / Consultancy / Information / Training

	Excellent	Good	Average	Unsatisfactory
Government organisations	☐	☐	☐	☐
Provincial Organisations	☐	☐	☐	☐
Universities	☐	☐	☐	☐
Chambers of Commerce	☐	☐	☐	☐
Private Consultants	☐	☐	☐	☐
Personal Contacts	☐	☐	☐	☐

85. Technology services

	Excellent	Good	Average	Unsatisfactory
Government organisations	☐	☐	☐	☐
Provincial Organisations	☐	☐	☐	☐
Research Institutes/Centres	☐	☐	☐	☐
Universities	☐	☐	☐	☐
Chambers of Commerce	☐	☐	☐	☐
Private Consultants	☐	☐	☐	☐
Personal Contacts	☐	☐	☐	☐

Please indicate the problems (obstacles) you experience with regard to the present system of External Business Support (government or private sector support services for businesses).
Please tick ☑ boxes

86. Available only in the capital and main cities ☐ Yes / ☐ No
87. Communication problems (language barriers, officials not fully aware of problems of enterprises) ☐ Yes / ☐ No
88. Support services are biased to certain sectors and groups ☐ Yes / ☐ No
89. Services do not address problems ☐ Yes / ☐ No
90. Too bureaucratic ☐ Yes / ☐ No
91. Poor quality advice and services and unrealiable ☐ Yes / ☐ No
92. Cost of assistance is too high ☐ Yes / ☐ No
93. Inadequate support services, incentives and grants ☐ Yes / ☐ No

Business Support Requirements

In-order develop technology and innovation capabilities in your company, what type of support required from the Government or Business Support Agencies.Please answer 'Yes' or 'No' (delete word not applicable)

94. Develop existing products Yes / No
95. Identify and develop new products Yes / No
96. Develop existing production process Yes / No
97. Introduce new production process Yes / No
98. New technology to replace old technology Yes / No
99. Continuos Research & Development Yes / No
100. Quality control Yes / No
101. Obtain standards and certifications (SLS and ISO) Yes / No
102. Environmental management and pollution control methods Yes / No
103. Energy saving techniques Yes / No
104. Technology related information Yes / No
105. Market information Yes / No
106. Training and skills development Yes / No
107. Information and communication technology (ICT) and E-commerce Yes / No
108. Financial assistance Yes / No

Thank you for your assistance in completing this questionnaire. Please return in the envelope provided.

Please use this page for additonal information, if you have any.

Annex C: Semi-structured Questionnaire for Case Study interviews

- What motivated you to get into business rather than pursue a paid employment?

- Where and how did you get this business idea?

- Can you explain the origin of the technology being used in your company; is it developed by You/your Company, or transferred from local or international sources?

- Can you explain the technology and innovation activities undertaken by your company (process and product)? What progress you have made so far?

- What type of facilities you have in your company to undertake technology and innovation activities?

- Which types of external cooperation partners/parties did you use and where are they located? E.g. suppliers, customers, competitors or other enterprises within your line of business, consultants/commercial labs/private research and development institutes, universities or higher education institutes, government or public research, technology support institutions (Local, national and international)

- Have you received any form of public (government) or government institutional support for technology and innovation activities?

- Can you explain issues / challenges/barriers for technology and innovation you have experienced (or you are experiencing), if any?

Annex D: The composition of survey sample by sectors

(International Standard Industry Classification)

Industry Classification		Less than 9	10-49	50-249	Total
011	Growing of crops and horticulture	-	1	1	2
050	Aquaculture (shrimp farming)	-	1	-	1
151	Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats	2	-	3	5
152	Manufacture of dairy products	-	-	1	1
153	Manufacture of grain mill products, starch products, and animal feeds	-	3	2	5
154	Manufacture of other food products (bakery & confectionery products)	-	5	5	9
155	Manufacture of beverages	1	4	1	6
171	Preparation of coir (coconut) fibre	-	3	-	3
181	Manufacture of wearing apparel	1	3	6	10
191	Leather & leather products, bags, luggage etc.	1	-	1	2
202	Manufacture of wood products, plywood etc.	-	1	-	1
222	Printing and related activities	1	-	-	1
241	Manufacture of basic chemicals, fertilizers etc.	-	1	-	1
241	Manufacture of organic fertilisers, potting materials, pith etc.	-	2	1	3
242	Manufacture of other chemical products	-	-	2	2
251	Manufacture of rubber products	-	3	2	5
252	Manufacture of plastic products	-	2	3	5
269	Non-metallic mineral products	-	2	-	2
281	Manufacture of structural metal products, tanks, etc.	1	-	1	2
292	Manufacture of machinery & equipment	-	4	2	6
31	Manufacture of electrical machinery & apparatus	-	1	-	1
361	Manufacture of furniture	-	3	1	4
369	Manufacturing n.e.s (jewellery, handicrafts, toys, sports goods etc.)	-	6	3	9
742	Engineering and technical services	1	2	-	3
Total		**8**	**47**	**35**	**90**