

Chapter One

Introduction

The Study

Kenya's development plans for the 1989 - 1993, 1994 - 1996 and 1997 - 2001 periods put special emphasis on the contribution of micro, small and medium size enterprises in the creation of employment in the country (Republic of Kenya, 1989; 1994; 1997). The focus on these enterprises as loci for employment generation reinforced the themes of Sessional Paper No.1 of 1986 on Economic Management for Renewed Growth (Republic of Kenya, 1986), and Sessional Paper No.2 of 1992 on Small Enterprise and Jua Kali Development in Kenya (Republic of Kenya, 1992). Data from various studies confirm the basis of the thrust of those development plans and Sessional Papers. The results of the 1993 National Baseline Survey of the Micro and Small Enterprises in Kenya (GEMINI PROJECT) estimated that there were 910,455 micro and small size enterprises in Kenya offering employment to 2,050,855 people (Parker and Torres, 1994). Six years later, another survey, the National Micro and Small Enterprise Baseline Survey of 1999 found that there were 1,289,012 micro and small enterprises in the country, employing 2,381,250 people in 1999 in Kenya.

A paper by the International Development Research Centre (IDRC) on small enterprise development pointed out that small and medium size enterprises (SMEs), in addition to having high employment creation capacity, possess three other critical attributes which warrant the attention of development specialists and policy makers in developing nations. First, an economy with a large number of these firms will have a fairer income distribution than that which is dominated by a small number of large-scale enterprises (LEs) as more people will own businesses. Second, development of small and medium size manufacturing firms entails accumulation of technological capability among a large number of people and firms. The consequence is that the extent of technological accumulation in economies with a large number of small and medium size industrial firms will be widespread. Third, because developing nations, like Kenya, have limited capital, it is more prudent to spread the available resources by promoting the development of efficient and dynamic small and medium size enterprises in these nations (IDRC, 1993).

The challenges thrown to small and medium size enterprises by the development plans with regard to employment generation, enhancing fair income distribution and deepening technological accumulation makes it necessary that appropriate policy interventions be put in place to enable the enterprises to realise their potential. For the manufacturing small and medium size enterprises, which are the focus of this study, specialists identify the critical interventions as:

- Investments in infrastructure, especially electricity, water, telecommunications, roads and railways.
- Promotion of research and development (R and D) through public and private bodies, and university systems. Many nations are using tax credits and subsidies to promote investments in research and development by the private sector.
- Investments in education of technicians and technologists; development of human resource capacity in management of technology (MOT); and promotion of entrepreneurship education.
- Development of a supportive financial market.
- Development and maintenance of a rational market system which reflects factor prices. In addition, literature gives support to inter - firm co-operation in marketing.
- Putting in place stable and rational company registration laws, tax regimes, import and export laws, environmental regulations and product quality standards.
- Deployment of industrial technology extension services.

The focus of this study was on industrial technology extension, and to a small extent technical training. Boone (1989), Millard (1990) and Tiffin (1994) argue that deployment of an effective industrial extension system greatly enhances the accumulation of technological capacity at the firm level.

The study documented and examined those activities in which industrial technology extension should engage. Specifically, the study first examined the extension needs of small-scale and medium-scale manufacturing firms in Nairobi. Second, the research determined and documented the government and voluntary organisations which provide industrial extension technology in Kenya. Third, the study collected information with regard to the nature of industrial technology extension provided to small and medium size manufacturing firms in Nairobi, Kenya. Finally, the study examined the industrial technology extension offerings of other nations with the aim of drawing lessons for policy with respect to Kenya.

The classification of the enterprises for this study is based on the Government of Kenya's Sessional Paper No.1 of 1986 and the 1989-1993 Development Plan. According to the documents, firms are classified by the number of full-time employees which they engage. Firms which employ less than five full-time workers are referred to as micro-enterprises. Those which employ between five and 49 full-time workers are called small-scale enterprises (SEs) and those with 50 to 99 full-time employees are classified as medium-scale enterprises (MEs). Those firms with 100 and above full-time workers are large enterprises (LEs). (Government of Kenya, 1986; 1989).

Statement of the Problem

Studies indicate that agricultural and industrial technology have many dimensions (David, 1993; Bell and Pavitt, 1993). This view is supported by Tiffin (1994) who delineates five dimensions of technology as hardware, software, liveware, systemware and innovationware. These dimensions complicate the gathering and utilisation of technological information, particularly for small-scale and medium-scale enterprises which usually possess limited resources.

The complexity in the acquisition and effective use of technological information makes a case for institutional services which are staffed by qualified personnel and provided with sufficient resources, not only to address the various dimensions of technology, but to also provide linkages between firms and what Desai (1993) calls the "repositories of tacit knowledge" (the universities, laboratories and research institutes) and to engage in the promotion of efficient and effective use of technology (Ayika, 1990). Beyond the documented questions of the complexity of technology and linkage between firms and R and D bodies are the broader questions of the technology needs of small-size and medium-size enterprises and institutional frameworks for providing desired industrial technology extension services. Specifically, the key questions which need to be addressed by bodies which deploy technology extension services to small and medium size manufacturing firms are:

- Which organisations are currently engaged in the provision of technology extension services to small-scale and medium-scale enterprises in Nairobi, Kenya?
- Should technology extension be deployed by a public body, voluntary agencies or trade associations?
- Have the personnel engaged in the provision of technology extension been adequately prepared for their tasks, and if not, what kinds of pre-service and in-service training programmes would be needed to enhance their performance?
- What are the actual industrial technology extension needs of SMEs?
- What support systems should universities, national polytechnics, institutes of technology and technical training institutes provide to SMEs?
- Is gender of the proprietor or manager of an enterprise a factor in accessibility to advisory services?

Unfortunately very few, if any, empirical studies relating to these question have been conducted in Kenya. Without the knowledge base such studies would provide, it will continue to be very difficult to formulate appropriate policies with regard to the management of technology (MOT) and institutional frameworks for providing effective industrial technology extension services to small and medium size firms. It is these questions which this study attempted to address.

Purpose and Objectives of the Study

An attempt was made to document the current state of technology extension to small-scale and medium-scale enterprises in Kenya, the technology needs of small and medium size firms, and to examine the institutional arrangements which could best meet the needs of the small and medium size enterprises in Nairobi, Kenya.

The specific objectives of the study were:

- To determine the type of industrial enterprises in which small and medium size enterprise proprietors engage.
- To examine the industrial technology extensions needs of small and medium size firms in Nairobi, Kenya.

- To document the government and voluntary bodies which provide industrial technology extension services to small and medium size enterprises in Nairobi, Kenya.
- To document and examine the nature of industrial technology extension services provided to small and medium size enterprises in Nairobi, Kenya.
- To identify and analyse strategies used in gathering, interpretation and dissemination of industrial technology to small and medium size enterprises in Nairobi, Kenya.
- To determine the adequacy of the technology extension services offered to small and medium size enterprises in Kenya.
- To determine and analyse the approaches used by other nations to deploy industrial technology extension to small and medium size enterprises.
- To draw lessons for policy in Kenya with regard to technology extension services to small and medium size manufacturing firms.

Significance of the Study

This study attempts to provide a valid body of knowledge on the following areas:

- The institutions which currently offer industrial technology extension programmes to small and medium size enterprises in Kenya and the nature of programmes provided.
- The kinds of linkages that have been and should be established between the SMEs and R and D agencies.
- The support systems which universities, polytechnics, institutes of technology and technical training institutes can and should provide to SMEs.
- The technological needs of small and medium size enterprises in Nairobi, Kenya.

The findings of the study will be made available to the Government of Kenya, voluntary agencies, educational institutions and research bodies through seminars and reports. First, it is expected that the Government of Kenya, which is beginning to put due emphasis on the development of small and medium size enterprises, and voluntary agencies might benefit from the findings when formulating policies towards the development of small and medium size firms. Second, the ideas emerging from the study could be used by educational and training institutions as bases for planning new programmes and courses, and evolving appropriate support systems to small and medium size firms. Finally, it is expected that the research will generate an interest in the field of industrial technology extension in Kenya and Africa as a whole, and that research bodies will find it prudent to support or even commission other studies in the area.

Chapter Two

Research Methodology

Introduction

Agencies which offer technology extension services to small and medium size industrial firms should, ideally, establish viable frameworks for the systematic gathering, interpreting, processing, storage and dissemination of information needed by the firms. They achieve this broad mission by engaging in the following activities:

- regular determination of technology needs of the small and medium size industrial firms
- promoting technology as a tool for improving production efficiency and product quality
- assisting in the establishment of beneficial linkages among firms
- promoting linkages between firms and R and D organisations
- setting up institutional arrangements for co-ordinating consultancy services for firms
- providing needs-based skills training programmes for managers, supervisors and workers of the firms
- establishing centres from which firms may source technological information

The selected research methods and procedures were meant to facilitate the efforts of the agencies which undertake some or all of these extension activities in Nairobi, Kenya. The findings, coupled with the information on the industrial technology extension needs of small and medium size manufacturing enterprises in Nairobi and experiences of other nations which provide support to SMEs, were to form the foundations for recommending potential institutional arrangements. These would give the basis for deploying effective extension services for manufacturing SMEs in Kenya.

Conceptual Framework for Identifying Industrial Technology Extension Providers and Activities for the Small and Medium Size Manufacturing Enterprises

Literature on the theories and practices of industrial extension provides a basis for viewing industrial technology information management as a system consisting of three primary subsystems of R and D subsystem, technology extension subsystem and technology user subsystem (Boone, 1989; Bwisa, 1991; Röling, 1988; Tiffin, 1994; Van den Ban and Hawkins, 1996). Van den Ban and Hawkins (1996) and Röling (1988) stress that ideally, the subsystems should engage in the generation, encoding, sending, receiving and decoding of knowledge and information during the communication process. The specialists emphasise the need for effective interaction among the subsystems.

Literature on the management of technology (MOT) for SMEs document efforts by East Asian governments to create systems which simulate this theoretical framework. Though the interventions used by individual countries vary, the critical elements of interacting R and D, extension services and user subsystems permeate all the systems reviewed (Meyanathan, 1994). The theoretical model and the cases from East Asia provided the foundation by identifying the sources of technology, nature of technology, extension providers and activities, and the SME characteristics for this study. The resultant model is presented in Figure 1.

The model indicates the relationship among the three subsystems. First is the R and D subsystem which comprises public and private research bodies, universities and polytechnics, and manufacturing firms. Manufacturing firms appear in this subsystem because many private firms undertake their own research and development activities. The technologies, which result from R and D activities, have five dimensions of hardware, software, liveware, systemware and innovationware as the model shows.

The second subsystem shown in the model is the industrial technology extension subsystem. A number of public and private bodies provide the extension services as indicated in the model. The primary mandate of these bodies is to facilitate the effective use of the technologies generated by the R and D subsystem. The bodies, therefore, undertake a number of activities to promote the uses of technologies by the various members of the user subsystem. In the model the users of technologies are the small and medium size manufacturing firms.

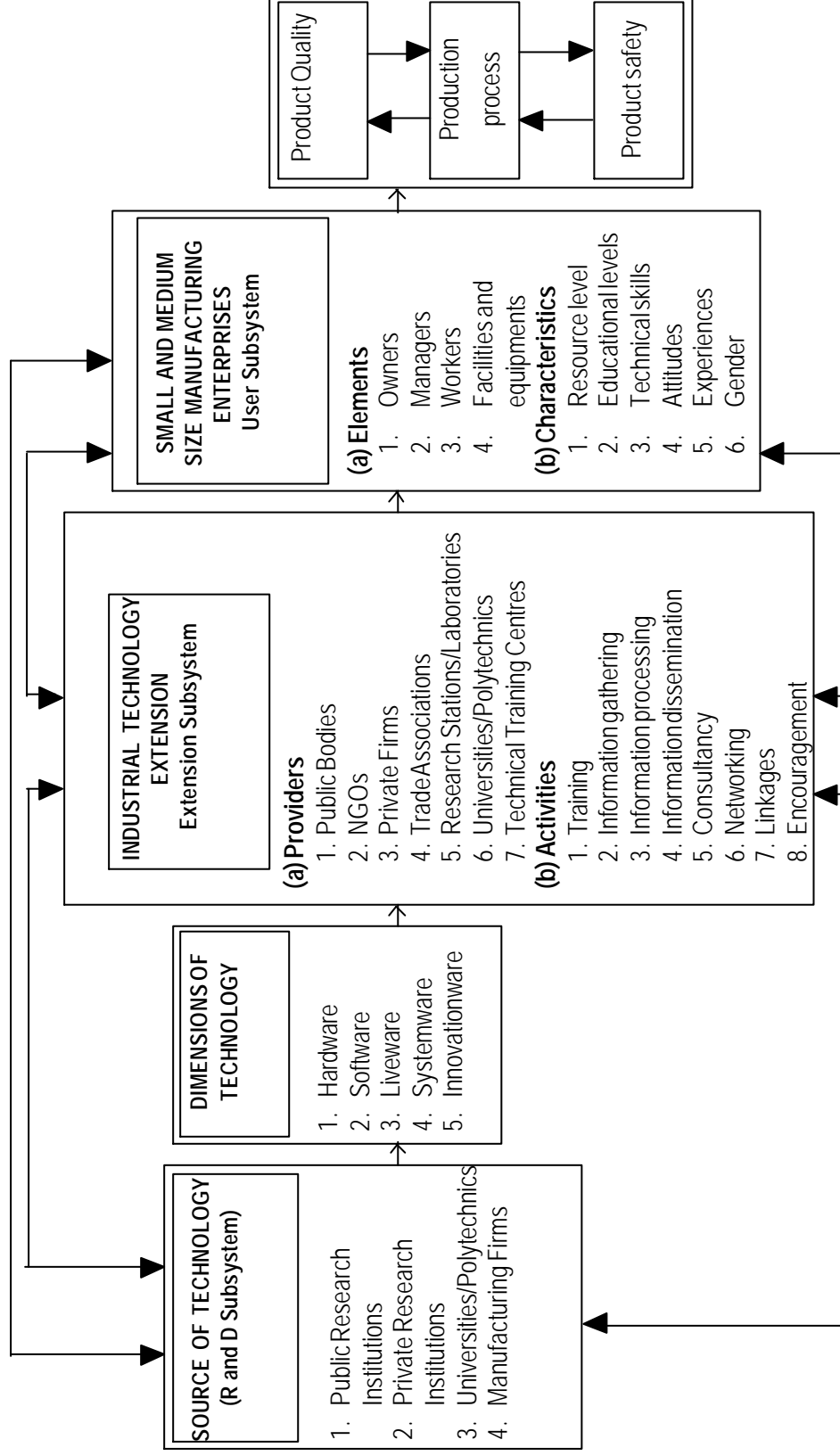
The third subsystem is the user subsystem. It consists of individual enterprise owners, managers and workers who use the technologies generated by the R and D subsystem to produce goods and services. Their capacity for adopting technologies is greatly influenced by their levels of education, experiences, technical skills and attitudes.

The subsystems should interact on a continuous basis. This model provided the foundations for the research methods and procedures of the study which focused on the industrial extension subsystem. Specifically, the study documented and analysed:

- the level of development of the industrial technology extension subsystem in Kenya
- the current technology extension services provided by the industrial technology extension subsystem to small and medium size manufacturing firms in Nairobi, Kenya
- the technology extension services needed by small and medium size manufacturing firms in Nairobi, Kenya

Research Design

Survey methods and a non-participant case study were used in the study. The two survey methods, interviews and questionnaires were used because the respondents had varied educational backgrounds. Interviews were used to collect information from the owners or managers of manufacturing SMEs, directors of government agencies, non-governmental organisations which provide support to SMEs and international bodies. Questionnaires were used to collect information from foreign-based



Source: Researchers, 2000

Figure 1: Conceptual Framework indicating the relationship between sources of technology, technology extension services and users of technology

organisations which provide assistance to SMEs. Both interviews and questionnaires were used to gather information from the vice-chancellors of the universities and the principals of national polytechnics, technical training institutes and institutes of technology.

Research Population and Sample

The population of the study consisted of:

1. Proprietors and managers of small and medium sized manufacturing firms in Nairobi, Kenya. To qualify as a manufacturing firm for the study, a firm had to fall into one of the following industrial categories:
 - agro-based manufacturing
 - pulp and paper production
 - wood and wood products processing
 - textile and clothing manufacturing
 - fish processing
 - chemical processing
 - capital goods and spare parts production
 - ceramics and glass processing
 - iron and steel processing
 - electrical and electronic products manufacturing
 - mechanical products manufacturing
 - construction equipment production
2. Vice-chancellors of the public universities, principals of the national polytechnics, technical training institutes and institutes of technology.
3. Directors of government agencies engaged in the development of small and medium size manufacturing firms.
4. Directors of non-governmental organisations (NGOs) which provide assistance to SMEs in Nairobi.
5. Local directors/representatives of the International Labour Organisation (ILO), the United Nations Industrial Development Organisation (UNIDO) and the United Nations Development Programme (UNDP).
6. Directors of foreign-based organisations which provide extension services to SMEs.

The population for SMEs was generated from information provided by the Kenya Management Assistance Programme (KMAP), the Kenya Industrial Estates (KIE) Limited and "Jua Kali" associations. A total of 1051 enterprises qualified for inclusion in the study. Because there was no authoritative information regarding which of the firms were small-scale enterprises (SEs) and which ones were medium-scale enterprises (MEs), only one sampling frame was compiled for the 1051 enterprises. The enterprises in the frame were organised in alphabetical order. A table of random numbers was used to select 210 (20 percent) enterprises which formed the sample for the study. Another 12 enterprises were selected for use during the pre-testing of the instrument.

The population sizes for the vice-chancellors of the public universities, principals of the national polytechnics, principals of the technical training institutes and principals of institutes of technology were derived from the Kenya Education Directory (Year 2000 Edition) and Ngware (2000). There are currently five public universities, four national polytechnics, 20 technical training institutes and 17 institutes of technology in Kenya (Kenya Education Directory, 2000; Ngware, 2000). The population sizes for educational institutions consisted of the vice-chancellors of the five public universities, the principals of the four national polytechnics, the principals of the 20 technical training institutes and the principals of the 17 institutes of technology. The sample sizes for the vice-chancellors of public universities and the principals of national polytechnics, technical training institutes and institutes of technology were the same as the population sizes. The directors of government agencies included in the study were those of the KIE Limited and the Kenya Industrial Research and Development Institute (KIRDI). The head of the Department of Micro and Small Enterprise Development (MSED) in the Ministry of Labour and Human Resource Development was also selected for the study. The sample size was therefore three.

Seven NGOs were selected for inclusion in the study. Their directors thus formed both the population and sample. The local directors of ILO, UNIDO and UNDP comprised both the population and sample.

Finally, the foreign-based organisations included in the study were identified by the embassies and high commissions in Kenya. Countries selected were: Japan, the United States of America, United Kingdom, the Republic of Germany, Netherlands, Canada, India, South Korea, South Africa, Egypt and Mexico. Embassies and high commissions of five countries responded to the request for names of bodies which provide assistance to small and medium size manufacturing firms in their nations. They provided the names of eight organisations. The directors of the eight organisations formed both the population and sample sizes.

Data Collection Instruments

Interview protocols (schedules), questionnaires and observation record forms were used to collect information during the study. Interview protocols were used to collect information from owners and managers of SMEs, the directors of government agencies, directors of NGOs and local directors of international agencies.

Questionnaires and interview protocols were used to collect information from the vice-chancellors and principals of educational institutions. Questionnaires were used to collect information from the directors of foreign-based organisations.

Interview Protocol for SME Owners and Managers

The instrument consisted of five parts. The first and third parts elicited information on enterprise profiles. In parts two and four, the owners and managers were asked to provide information about the professional characteristics of the owners, managers and workers of the SMEs. In the last part, the owners and managers were asked to indicate on a seven-point scale the degree to which specified services provided

by industrial technology extension organisations are needed by their enterprises. The rating scale ranged from 1 for "Least Important Extension Service" to 7 for "Most Important Extension Service." The seven-point scale was selected because of the need for precision. The owners or managers were to individually rate the extension services needed. The interviewers, however, assisted where necessary. The instrument was first pre-tested by being administered to owners and managers of 12 SMEs. The comments and responses of the owners and managers were incorporated when producing the final protocol.

Questionnaires for Vice-Chancellors and Principals

The questionnaires had six parts. Parts one, two and three asked for information on institutional profiles, academic programmes, industrial development units, research and extension activities, and linkage arrangements. Part four dealt specifically with assistance provided to small and medium size manufacturing firms. The last part of the instrument solicited recommendations for setting up and providing technology extension services to SMEs. In part five, the vice-chancellors and principals were requested to use a seven-point scale to rate approaches to providing industrial technology extension services to SMEs. The scale ranged from 1 for "Least Effective Approach" to 7 for "Most Effective Approach." The seven-point scale was selected because of need for precision. The rating was undertaken by the vice-chancellors and principals.

Interview Protocol for Directors of Government Agencies

The protocol had five parts. Parts one and two elicited information about the profile and mission of each agency. Part three sought information on assistance provided to SMEs by each agency. In part four, the directors were requested to provide information on linkages between their agencies and local and international educational and research institutions. Finally, the directors were asked to recommend the technology extension activities and institutional frameworks for upgrading the production processes and products of SMEs.

Interview Protocol for Directors of NGOs

This protocol had six parts. Parts one and two sought information on the profiles and missions of the NGOs. Part four sought information on linkage arrangement between the NGOs and government, research and educational institutions. Part three elicited information on the support provided to SMEs by NGOs. Part five asked the directors to state their needs and constraints in providing support to SMEs. The final part of the protocol addressed the recommendations for upgrading industrial technology extension services to SMEs.

Interview Protocol for Directors of International Agencies

The protocol had six parts. Parts one and two sought information about the profiles, missions and the range of clients of the agencies. Parts three and four requested the directors to state the nature of

support programmes which the agencies provide to SMEs. The fifth part sought information on the linkage arrangements which the agencies had with local educational, research, government, and voluntary agencies. The final part of the interview focussed on the recommendations for deploying extension services to SMEs.

Questionnaires for Directors of Foreign Agencies Providing Assistance to SMEs

The questionnaires primarily sought information on the nature of assistance which the agencies provide to SMEs in their countries of constitution.

Data Collection

Data collection was implemented in three phases. During the first phase, which lasted from October 1999 to January 2000, owners and managers of the selected small and medium size manufacturing firms were interviewed. In the second phase, information was collected from the vice-chancellors and principals of educational institutions, directors of government and voluntary agencies, and local representatives of international bodies. This phase lasted from April to July 2000. The last phase, which started in May and ended in November 2000, involved collection of information from the directors of foreign-based bodies which provide support to SMEs in their countries of constitution.

Collection of data from the proprietors of manufacturing SMEs was preceded by the pre-testing of the interview protocol and training of research assistants (RAs). The pre-testing was conducted using 12 proprietors of SMEs. Their inputs were incorporated during the review of the protocol. After the production of the refined instrument, training was held for five research assistants. During the training session the basic principles and practices of interviewing were addressed and the trainee RAs were then guided through the interview protocol item-by-item. Four of the five trained RAs collected information during the first phase of data collection. To simplify data collection from the proprietors of the SMEs, the study area, Nairobi, was divided into the following research zones:

- Industrial area and the surroundings
- Landhies/Kamukunji areas
- Kariobangi/Kahawa areas
- Kibera/Dagoretti/Satellite areas
- City margins

Each of the first four zones was covered by a research assistant. The last zone was left for the researchers. During the study, 103 SME proprietors were located and interviewed.

The second phase of data collection lasted three months, during which three directors of government agencies, eight directors of NGOs, three local directors of international bodies and a consultant to a training programme for micro and small enterprise proprietors and workers were interviewed. In addition, questionnaires were forwarded to the vice-chancellors of the public universities and the principals of the national polytechnics, technical training institutes and institutes of technology. Selected vice-

chancellors and principals were also interviewed. The last phase of data collection involved dispatching questionnaires to foreign-based bodies using postal, e-mail and fax services. Two RAs were also attached to four SEs and one ME to record information on the SMEs with regard to product designs and production processes.

Data Analysis

The data were analysed using qualitative and quantitative methods. Summaries of the records of each interview were generated. The summaries were then analysed for trends. Information from foreign-based organisations was also primarily qualitative, and, thus, summaries of contents of each questionnaire returned were produced. Summaries were made from the central ideas in the summaries. Quantitative analyses were mostly descriptive. Percentages were used to describe the type of ownership of SMEs, the registration status of SMEs and the type of manufacturing in which the SMEs are engaged. Percentages were also deployed to show the small and medium size differentiation of the enterprises, and to document the educational levels of SME owners and workers. Means and standard deviations were generated from the ratings of technology extension needs of SMEs and approaches for deploying those services.

Chapter Three

Review of Literature

Introduction

A 1972 report by the International Labour Organisation (ILO), on the unemployment problem in Kenya and the need to focus on the emerging informal sector as a partial solution to the problem started the crystallization of attention of policy makers on the small size enterprises in the country (Billetoft, 1996; ILO, 1972). The Government of Kenya has since prepared a number of sessional papers and development plans which focus on the development of micro, small and medium size enterprises in Kenya (Republic of Kenya, 1986; Republic of Kenya, 1989; Republic of Kenya, 1992; Republic of Kenya, 1994; Republic of Kenya, 1996; Republic of Kenya, 1997).

The enterprises themselves have also increased in number to a level where in 1999 it was estimated that there were about 1.3 million micro and small size enterprises in Kenya offering employment to 2.36 million people (Central Bureau of Statistics, 1999). This quantitative growth of the sector has engendered sustained research, resulting in a wealth of literature, particularly with regard to size, employment generation capacity, financial support and business regulations. Key areas of the sector, however, have not been studied as much. This study focuses on technology extension services provided to micro, small and medium size manufacturing firms, which is one of the areas that has received scant attention. Literature on the theories and practices of extension services provided to these enterprises, thus, continues to be insufficient both in scope and scale.

Due to the mixed state of research in the sector, the literature cited in this review is a combination of data and ideas from local research, government reports and external work. The first section of the review addresses the concepts in small enterprise development. The key terms of informal, cottage, *jua kali*, micro, small and medium enterprises are examined with regard to their meaning locally and internationally. The second section focuses on micro, small and medium enterprise sector in Kenya, both in its broadest sense and with special emphasis on manufacturing enterprises in Kenya, which is the study area. In the third and fourth sections, the concepts of technology and technology extension are examined with respect to technology diffusion and adoption. Literature on technology extension practices in various countries is reviewed in section five. Finally, a summary of the review was presented to stress the technology extension approaches used in specified nations.

Concepts in Small and Medium Size Enterprise Development

The terms informal, micro, cottage, small, and medium enterprises are commonly used in small and medium enterprise literature internationally. In Kenya, another term Jua Kali has been added to the repertoire. Informal enterprises have been defined by Gichira (1991) as those enterprises whose owners do not usually conform with the regulations governing normal business activities like business registration, tax payment, observance of wage regulations and contribution to workers' social security funds. Billetoft (1996) and a report prepared by the International Development Research Centre (IDRC) in 1993, however, caution against the use of informal or formal nature of an enterprise to classify it. The concern here is that countries vary with regard to laws governing businesses. Instead, they have opted for classification which employs the number of workers which a firm engages on a full-time basis as the primary criterion for grouping enterprises. The IDRC (1993) groups firms with 1 - 4 workers as household enterprises (HH). Those with 5 - 99 workers are classified as small and medium enterprises (SMEs) and those which employ 100 and more workers are designated as large enterprises (LEs). With regard to specific nations, the classifications tend to be congruent. In Indonesia, the Central Bureau of Statistics (PBS), according to Wie (1993), classifies firms as follows:

- cottage Enterprises (CEs) are firms employing 1-4 workers
- small-scale Enterprises (SEs) are firms employing 5-19 workers
- medium-scale Enterprises (MEs) are firms employing 20-99 workers
- large -Scale Entreprises (LEs) are firms employing over 100 workers

Other bodies like the Central Bank of Indonesia (Bank Indonesia), the Indonesian Ministry of Industry and the Capital Investment Co-ordinating Board (BKPM) use the value of assets of a firm to classify it. Under this classification, a firm with assets valued at less than US\$300,000 is referred to as a small-scale enterprise (Wie, 1993). The classification of enterprises in The Republic of Korea, though based on the number of workers employed by enterprises, is quite different from that used by IDRC (1993) and Indonesia (Wie, 1993). Kim and Nugent (1994) grouped the firms in Korea as small, medium and large enterprises as follows. Small enterprises are those which employ 5 - 19 workers, medium enterprises employ 20 -199, and large enterprises are those which have 200 or more employees. In Japan, Small and Medium Enterprises (SME) are firms with less than 300 workers.

Besides Kenya, Zimbabwe and Nigeria were among the African countries examined. In the Zimbabwean case, classification of enterprises is dependent on the purpose of and the organisation conducting the categorization. Commonly used criteria are the number of employees, value of assets and turnover levels. The Government of Zimbabwe, for example, refers to small enterprises as those firms with 100 or less workers and assets worth Z\$3 million (US\$54,545.5). Small Enterprise Development Corporation (SEDCO) defines small enterprises as firms with 50 or less employees and annual credit needs of less than Z\$100,000 (US\$1818.18). Other bodies, however, have three categories within the small-scale sector. Medium-scale enterprises are those firms which employ 50 - 100 workers, small enterprises are those which engage 5 - 49 workers and micro enterprises are those firms that employ less than 4 workers. Micro and small enterprises are also viewed as informal entities (Kapoor, Mugwara and Chidavaenzi, 1997). Nigeria uses turnover to classify enterprises. The Central Bank of Nigeria categories

firms with turnover of up to 500,000 Naira (US\$454.34) as small-scale enterprises (Ekpenyong and Nyong, 1992).

Classification of enterprises is primarily by the number of employees engaged by firms in Kenya. The Government of Kenya's Sessional Paper No.1 on Economic Management for Renewed Growth (Republic of Kenya, 1986), Sessional Paper No.2 on Small Enterprise and Jua Kali Development in Kenya (Republic of Kenya, 1992), and the 1989 - 1993, 1994 - 1996 and 1997 - 2001 Development Plans (Republic of Kenya, 1989; Republic of Kenya, 1994; Republic of Kenya, 1997) provide the bases for classification of enterprises in the country. Those firms which engage less than five employees are referred to as micro-enterprises. Those which employ 5-49 workers and 50-99 workers are respectively classified as small-scale enterprises and medium-scale enterprises. The firms with 100 or more workers are categorised as large-scale enterprises.

From the literature, it can be observed that there is some similarity with regard to enterprise classification across a number of nations. Firms with less than five workers are variously referred to as cottage, household and micro enterprises. Most of the nations categorise firms with employees in the range of 5 - 49 as small-scale enterprises. The medium-scale enterprises are those which have 50 - 99 workers. Firms with 100 or more workers are grouped as large-scale enterprises. The nations with large economies, like Japan and South Korea, consider firms to be large-scale when their employment capacities are much higher.

Finally, a term which is unique to Kenya is "Jua Kali." "Jua Kali" simply means hot or harsh sun in Kiswahili. "Jua Kali" enterprises thus, refer to businesses which are conducted in open air as the operators lacked resources to set up working facilities. Originally, the term Jua Kali enterprises was preserved for vehicle maintenance and low level manufacturing which were carried out in the open air. These operators were exposed to the direct heat of the sun, hence the term "Jua Kali." Now, however, Jua Kali enterprises refer to informal manufacturing in Kenya (King, 1996).

State of Small and Medium Size Enterprises (SMEs) in Kenya

The Government of Kenya spelt out its policies towards the small and "Jua Kali" enterprises in two sessional papers and three development plans. In these documents, the government stressed the critical role of small enterprises in the national economy and outlined the policy interventions needed to enhance their growth.

The first sessional paper, Sessional Paper No.1 of 1986 on Economic Management for Renewed Growth, singled out the small enterprise sector and rural economy as future generators of employment (Republic of Kenya, 1986). Three years later, in 1989, the Government prepared a paper, "A Strategy for Small Enterprise Development in Kenya: Toward the Year 2000," (Republic of Kenya, 1989) in which it documented the major impediments to small enterprise development and enunciated policies for improving the performance of the sector. Critical barriers identified were:

- difficulty in raising capital

- limited managerial skills
- regulatory constraints
- low marketing skills
- limited extension services
- difficulty in getting access to technology

The last two constraints formed the centrepiece of this study.

The second sessional paper, Sessional Paper No.2 of 1992 on Small Enterprise and "Jua Kali" Development in Kenya was published in 1992 (Republic of Kenya, 1992). In the document, the Government of Kenya outlined the contributions of the small enterprise sector to the national economy, the key ones being the following:

- employment creation
- enhancing the participation of indigenous Kenyans in the economy
- promotion of local savings and investments
- promoting the development of entrepreneurship and managerial skills among local Kenyans
- engendering the acquisition of skills among workers

The document also noted the small number of manufacturing firms with 10 - 50 workers in Kenya, and argued for policies that would lead to the expansion of this range of enterprises, which it termed the "Missing Middle."

Policies for improving the performance of the sector included measures geared towards the promotion of research, inter-firm linkages, technical training and technology extension. The specific measures to be taken were:

- The Kenya Industrial Research and Development Institute (KIRDI), in collaboration with universities, was to conduct research; modify and adapt technology; and disseminate technological information to small size manufacturing firms.
- The provision of incentives to firms to encourage their investments in research and development (R and D).
- The promotion of university-industry linkages.
- The examination of the potential of large firms sub-contracting some components of their production to small size firms.
- The promotion of exports from small enterprises by furnishing them with information on the standards demanded by foreign markets.
- The establishment of business centres in rural areas to provide information to small enterprises.
- The enhancement of the capacity of staff in public and private organisations who work in small enterprise agencies through training.
- The promotion of training of small enterprise owners, managers and workers.
- The provision of extension services to the small enterprise sector.

The sixth (1989 - 1993), seventh (1994 - 1996) and eighth (1997 - 2001) development plans stressed the role of small and medium size enterprises in creating employment, though when it came to details, only the small enterprises were sufficiently discussed (Republic of Kenya, 1989; Republic of Kenya, 1994; Republic of Kenya, 1997).

In the 1989 - 1993 Plan, emphasis was on the small-scale and "Jua Kali" enterprises. These firms were viewed positively in the plan because of their capacity for employment creation, promoting participation of local Kenyans in the economy and enhancing a fairer income distribution in the country (Republic of Kenya, 1989). The plan proposed accessibility to credit; review of regulations which were impediments to small enterprise developments; and development of training, counselling and extension programmes. The seventh and eighth plans also stressed employment creation capacity of the small and medium size firms.

Gichira and Nzomo (2000), in a paper presented during a workshop in Nairobi, Kenya, provided some revealing statistics about the small enterprise sector. The number of firms in the sector stood at 1.3 million in 1999. Of the enterprises, 64.0 percent were in trade, 23.0 percent in services and 13.0 percent in manufacturing. The specialists also put forth a more refined classification of small enterprises. The enterprises employing 0-5 workers were categorised as micro enterprises. Those employing 6-11 workers and 11-49 workers were referred to respectively as small-scale enterprises and small-scale industries. Finally, the state of small enterprise sector is examined with regard to results and policy positions contained in two national baseline surveys and Ministry of Labour and Human Resource Development's Policy Framework for Micro and Small Enterprise Development in Kenya (Draft).

The first survey report, the Micro and Small Enterprise in Kenya: Results of the 1993 National Baseline Survey, provided data with regard to the size of the micro and small enterprise sector by the time of the survey in 1993 (Parker and Torres, 1994). The estimated number of micro and small enterprises was 910,455 providing employment to 2,050,844 people. The distribution of the enterprises by location was as follows:

• Nairobi and Mombasa	70,411
• Other towns	129,535
• Rural areas	710,509

The enterprises fell into broad categories of commerce and trade, manufacturing, and services as indicated below:

• Commerce and trade	551,736	60.6%
• Manufacturing	244,912	26.9%
• Services	113,807	12.5%

An interesting aspect of the survey is that, though it set out to document firms with 1 - 100 workers, the results showed that 98.6 percent of the firms had 1 - 10 workers and the remaining 1.4 percent had 11 - 50 workers and none in the 50 - 100 range. This survey incidentally categorises firms with 1 - 10

workers as microenterprises and those within 11 - 50 range of workers as small enterprises. A purposive survey which included known commercial and industrial areas captured medium scale enterprises, but the number was still small. The microenterprises comprised 89.9 percent, the small enterprises 9.8 percent, and 1.3 percent for medium enterprises.

The survey provided profiles of small and medium enterprises. The small enterprises which employed 11 - 50 workers were mostly in manufacturing and services. With regard to medium-size enterprises, employing 51 - 100 workers, all the firms were in manufacturing or services. The National Micro and Small Enterprise Baseline Survey of 1999 data showed major increases in the number of micro and small enterprises and employees in the sector from those of the 1993 survey. The number of enterprises increased from 910,455 to 1,289,012 and employment in the sector increased from 2,050,844 to 2,361,200 people. Of the enterprises, 172,764 (13.4 percent) were in manufacturing.

The distribution of the enterprises by location is as follows:

- | | |
|-----------------------|---------|
| • Nairobi and Mombasa | 204,280 |
| • Other towns | 238,953 |
| • Rural Areas | 845,879 |

(Central Bureau of Statistics, 1999).

The Policy Framework for Micro and Small Enterprises Development in Kenya (Draft) prepared by the Ministry of Labour and Human Resource Development in 2000 affirmed the Government of Kenya's commitment to the development of the small enterprise sector. Within the Ministry of Labour and Human Resource Development (MLHRD), the Department of Micro and Small Enterprises Development (MSED) has been created. Its mission is to formulate, co-ordinate and monitor policies regarding the development of the small enterprises sector in the country (Ministry of Labour and Human Resources Development, 2000). The department has three divisions, namely: Division for "Jua Kali" Development, Division for Business Development Services, and Division for Policy Development, Implementation, Monitoring and Co-ordination. The department will focus on eight broad areas:

- Information management
- Marketing
- Physical infrastructure
- Legal and regulatory framework
- Business development and entrepreneurship
- Gender and special interest groups
- Micro-finance institutional development
- Technology and skill development.

With regard to access and use of technology, the document identifies the primary constraints as:

- limited capacity among the micro and small enterprises to identify, seek and utilise appropriate technology; and
- weak institutional arrangements for providing access to technology.

The limitations of the micro and small firm owners in sourcing and using technology stem from their low levels of education and limited financial resources. These limitations on the part of the SME owners is supported by research from other nations (IDRC, 1993).

The other constraint, weak mechanisms for generating and processing technological information, centres on the underdevelopment of research and technology disseminating bodies. The document stated that there are weak, if any linkages among research bodies, non-governmental organisations, universities and the enterprises (Ministry of Labour and Human Resource Development, 2000).

The literature indicates a commitment on the part of the Government of Kenya to the development of micro and small enterprises in the country. The medium size enterprises, however, seem to receive only scant attention. This perfunctory treatment may be due to the small number of enterprises in the category. But because the Government of Kenya, in its Sessional Paper No.2 of 1992 on Small Enterprise and "Jua Kali" Development in Kenya, expresses concern at the limited number of enterprises employing 10-50 workers, which it refers to as the "missing middle," policy makers and researchers should also focus on the constraints to the development of enterprises which employ 10-100 workers and suggest appropriate policy interventions. Moreover, a major policy thrust should be to put in place a set of public and private institutions which would engender the graduation of small enterprises into medium size enterprises category, and eventually maturing into large scale firms.

Technology

Assigning a precise definition to technology has proved difficult because early economists tended to view technology primarily as hardware used in production. This understanding of technology is now accepted as an oversimplification. The current view is that technology has a number of dimensions which should be reflected in its definition. Aduda and Kaane (1999) state that technology "is a body of knowledge of techniques, methods, processes and designs" (Aduda and Kaane, 1990, p.130). Tiffin (1994) provides a more expansive meaning to technology by providing both a definition and dimensions of the concept. Technology, according to him is "an organised way of using natural principles to design and construct something" (Tiffin, 1994, p.14). The dimensions are hardware, software, liveware, systemware and innovationware.

Hardware is the physical object, like a machine or equipment used in a factory or by consumers. This is the dimension of technology which is most conspicuous because it is observable. The software and liveware components of technology which David (1993) refers to respectively as codified and tacit knowledge are critical if staff are to make effective use of the hardware. Software is compressed and codified information to enhance its transmission, storage and reproduction. This information can be in the form of programmes for computers or instruction manuals for operating machines. Liveware dimension represents the skills which staff need to effectively interpret and use the software in operating the hardware. Acquisition of liveware occurs through demonstrations, instructions and advisory services by the experts (David, 1993; Tiffin, 1994). The last two dimensions, systemware and innovationware, emphasize the fact that technology can only have optimal impact on production if, first, it is employed in

a functioning system of physical infrastructure, electricity, postal services, telecommunications, railways, roads, water supply and production supplies; and second, firms which use the technology should engage in continuous improvements of the technology through research and innovation (Tiffin, 1994).

A developing nation, like Kenya, needs to put in place institutional arrangements for generating and disseminating technology. Organisations which play a primary role in the technological generation and change are identified by Coombs, Saviotti and Walsh (1987) as:

- Bodies which generate new technology, like universities, public and private research and development laboratories (R and D).
- Organisations which generate and use technology such as large manufacturing firms.
- Organisations which use technology embodied in machines and operating practices.

A report on the Kenyan manufacturing sector prepared by the Department of Economics of the University of Nairobi and University of Gothenburg (1993) stated that, in Kenya, progress in production processes within the industrial firms is dependent on importation of technologies. The technologies are in embodied forms, in which case the technologies are in the form of imported machines, or in disembodied forms where the technologies are acquired in the form of licensing, consultants or management. The findings of the study on which the report was based indicate that most of the equipment used by manufacturing firms is imported and installed in the plants without any modifications.

Ideas on the management of technology by firms and nations have been suggested by a number of specialists. Tiffin (1994) identified the following three stages: technological transfer, technological innovation and technical entrepreneurship. During the technological transfer stage, hardware, software and liveware are provided to firms which need both the machines and knowledge to produce goods. Governments, on the other hand, should focus on technological diffusion so that the maximum number of firms get access to the technology.

The second stage, technological innovation, occurs when firms start to produce their own technology. Tiffin (1994) states that technological innovation usually requires joint efforts of firms, public (R and D) laboratories and universities. The last stage, technical entrepreneurship, takes place when firms integrate technological innovations with other components of the business to produce the desired goods and services.

Aduda and Kaane (1999) have also suggested similar ideas as Tiffin (1994) with regard to micro and small enterprises in Kenya. Their ideas for managing technology are encapsulated in the following steps:

- promotion of acquisition of appropriate technologies by firms for the production of consumer goods
- systematic reduction of embodied technologies in favour of disembodied technologies
- development of national capacity for tooling, designing and industrial engineering
- development of national capacity for production of software for controlling production processes.

Technology Extension

Various activities are covered by extension, and as such, organizations intending to deploy extension services should determine and emphasize those extension services which adequately further their goals. It is, however, generally agreed by extension specialists that extension is a type of non-formal education (Boone, 1989). Inherent in its non-formality is its voluntary nature. Also, because it is primarily an educational undertaking, promotion of learning should be its major focus. In practice, therefore, extension organizations engage in training, advising, informing and encouraging their clients. Rölting (1988) stressed that in some nations, like the United Kingdom, the emphasis is on advising, thus the use of the term "advisory services" for their extension offerings, while in the United States of America and Canada the thrust is on providing information to extension clients.

Boone (1989) stressed two principles with regard to the educational nature of extension. First, extension should be within the client's context, and second, extension client's should be active participants in extension offerings.

The first principle underlies the necessity for extension providers to determine and analyse the situation of the clients, particularly their problems, resource base, experiences, culture and needs before designing extension programmes. It is only with thorough understanding of the client's situation that the extension organizations will be able to plan and implement programmes that adequately address the needs of their clients.

Active involvement of the clients, which is the other principle, has a number of implications. First, extension providers should engage the clients during extension planning, implementation and evaluation. Extension specialists now recognise the essence of empowerment of extension clients through participation. Second, involvement of clients entails learning by doing, which educational psychologists have determined to be both motivating and results in optimal acquisition of mental and practical skills. Stemming from this idea is the fact that, for an individual to adopt an idea, there is need for trial and evaluation phases which require active learner involvement (Boone, 1989).

The ultimate goal of providing extension services is for clients to adopt a new idea or innovation. Van den Ban and Hawkins (1996) define adoption as the "decision to apply an innovation and to continue to use it" (Van den Ban and Hawkins, 1996, p.275) and an innovation as "ideas, methods or objects that are considered new for the individual" (Van den Ban and Hawkins, 1996, p.279).

Van den Ban and Hawkins (1996) have provided a description and explanation on how users come in contact with and adopt a new technology. They have identified five stages in the adoption process, that is awareness, interest, evaluation, trial and adoption; and five adopter categories - innovators, early adopters, early majority, late majority and laggards.

The theories behind adoption of innovations continue to attract research interest because of the impact of technology on production techniques, production environment, and product quality. Rogers and Beal (1960) originally came up with a process which had the following stages:

- awareness
- information
- application
- trial
- adoption

There is some convergence in this process and the one suggested by Van den Ban and Hawkins (1996). Both processes begin with the user becoming aware of the new technology. The next stage is when the user decides either to ignore the technology or show interest and seek more information about the technology. The third stage is where there is a little divergence. According to Van den Ban and Hawkins (1996), at this stage the user examines the information on the technology before deciding to try it on a limited scale. Beal and Rogers (1960), however, refer to it as the application stage. The client uses information to design a product for production on a small scale. The last two stages, trial and adoption are similar and the user tries the innovation on a limited scale before engaging in large scale production.

Recent research has shown that adoption of an innovation is not as simple as represented by the five stages (Van den Ban and Hawkins, 1996) and also does not always follow the described sequences. First, the technology can be rejected along the sequence depending on the user's situation. Second, after adoption of a technology, users will seek more information, and even seek training or expert advice before they become comfortable with the technology. Agencies which deploy extension services therefore need to pay sufficient attention to post-adoption requirements of their clients. Bell and Pavitt (1993) and Tiffin (1994) emphasize the post-adoption processes in their work.

Beal and Rogers (1960), Van den Ban and Hawkins (1996) have identified five adopter categories. The researchers found that when producers come in contact with a new technology only a small number of them will initially adopt the technology. These people, usually referred to as "innovators," tend to be well educated and well endowed with resources and, thus, can take the risks associated with new technology. Those producers whose educational background may be limited, but have large amounts of resources at their disposal can hire specialists, and thus enhance their capacity for absorbing new technology. After the "innovators" have adopted a new technology, a much larger group of producers will adopt the technology after observing the benefits of the innovation. These are usually producers who are well endowed with resources and well educated but are not willing to take risks as readily as the "innovators." After adoption of the innovation by these producers, who are termed "early adopters" there usually follows a much faster adoption of the innovation by the bulk of producers who form the "early majority" and "late majority." There usually, however, exists a small group of producers who find it difficult to adopt innovations until it dawns on them that they are being left behind by other producers. These producers, referred to as "laggards," are usually poorly educated and have limited resources and normally find it easy to accept ideas from people they know well and trust.

The diffusion theory should be viewed primarily as a tool for guiding extension agencies in choosing appropriate extension methods and techniques to use during the various adoption stages and with particular adopter category (Ascroft, R'ling, Kariuki and Chege, 1973; Van den Ban and Hawkins, 1996). Some findings by Beal and Rogers (1960) provide some details on the influence of various sources of information on adopter categories:

- Informal sources (friends, neighbours and relatives) were the most important sources of information for laggards.
- Impersonal sources (radio, television, magazines, research publications, manuals) were more easily and effectively used by innovators and early adopters.
- Personal sources (extension personnel, friends, relatives, neighbours) were most effective sources of information to the producers who adopt innovations late.

Extension services which serve manufacturing firms aim at enhancing accessibility to technology and accumulation of technological capabilities. Tiffin (1994) viewed the services primarily in terms of linking research and development (R and D) agencies with the firms. This linkage function of extension services has been emphasised by various specialists. Ayika (1990) and Desai (1993) stressed the linkages between firms and what Desai (1993) referred to as "repositories of tacit knowledge – universities, laboratories, research institutes." Kyerematen, (1995) however, cited the case of Empretec, a business agency, which facilitates its extension services through training and consultancy. Another dimension which Kyerematen (1995) added is the need for institutional arrangement, like Empretec in Ghana, to deploy extension services. Röling (1988) took a similar position, arguing that extension services usually need large outlays in terms of qualified personnel, equipment and facilities, and financial resources. Kyerematen (1995) gave cases of institutional arrangements in the Republic of Korea and Japan which have proved quite effective in technological dissemination. For extension services to achieve their desired goals of promoting accessibility to technology, adoption of innovations, and integration of technology, they need to encourage firms to desire, receive and use technology (Tiffin, 1994).

Cases of Industrial Extension Services to Small and Medium Size Manufacturing Firms

Many nations currently deploy various forms of industrial extension services to manufacturing firms. The services are particularly valuable to small and medium size enterprises as most of these firms lack the levels of resources which would enable them to engage in their own research and development (R and D) activities. In this section of the literature review, public and private industrial extension services provided to small and medium size manufacturing firms in a number of countries are documented and analysed. The emphasis of the review is on services offered in eight nations: five in East Asia, two in Africa and one in South America.

Industrial Extension Services to Small and Medium Size Manufacturing Firms in Indonesia

The Government of Indonesia has put in place a number of promotional bodies which target small and medium size manufacturing firms. The most important of these is the Small-Scale Industries Development Programme which falls under the Ministry of Industry (Wie, 1993). Under the Programme, both inputs and technical assistance are provided to clusters of small-scale manufacturing firms. The technical service centres provide extension services to the firms. The extension field officers who provide the services to the enterprises are given special training to prepare them for their tasks.

The Small-Scale Industries Development Programme has also promoted "Foster Father-Business" partnerships and linkages. A "Foster Father" is a large enterprise that has access to various markets and is thus in a position to help small-size firms market their products. The arrangement has the effect of the "Foster Father" promoting the management, access to technology and improved production techniques of the small-scale firms. Another related policy intervention is the "localization" or "deletion" programme in which small and medium-size firms are assisted to manufacture parts and components for the major assembly firms (Meyanathan, 1994).

Industrial Extension Services to Small and Medium Size Manufacturing in the Republic of Korea

The Republic of Korea offers an array of extension services to small and medium size manufacturing firms. The services are usually in the form of technical assistance, information services and training programmes (Kim and Nugent, 1994). The key agencies involved are Industrial Advancement Administration (IAA), the Small and Medium Industry Promotion Corporation (SMIPC), and research institutes.

The major agency which provides extension services to both large, medium and small firms is the Industrial Advancement Administration which is under the Ministry of Trade, Energy and Industry. It was established in 1973 to coordinate the extension services offered to large, medium and small firms in Korea. Under it are the National Industrial Technology Institute (NITI) and 11 regional industrial technology institutes (RITIs) which offer extension services to firms. The institutes follow a basic procedure in their services. First, they receive application for assistance from firms. Second, the institutes assemble experts from universities, public organizations and private institutions. Third, the experts are attached to firms for a period as advisors (Kim and Nugent, 1994).

The Small and Medium Industry Promotion Corporation, unlike the Industrial Advancement Administration, targets only small and medium-size firms. The corporation, which was set up in 1979, offers managerial and technical training, technical information services and financial support. In addition, it assists small and medium firms that wish to have access to foreign expertise. It thus, in addition to having branches in Korea, maintains offices in Europe, Japan, the United States of America and China. The Corporation also has a technical and management training institute (Kim and Nugent, 1994).

A number of research bodies in Korea engage in extension activities. The Korea Institute of Industrial Technology (KAITECH) which was established in 1989, besides engaging in research and development, offers polytechnical education and has six development centres through which it transfers technology to firms. Other research bodies like Korea Institute of Science and Technology (KIST) and Korea Institute of Machinery and Metals (KIMM) also offer extension services.

Other public bodies which offer technical services to small and medium manufacturing firms are the Korea Productivity Centre (KPC), the Korea Institute of Design and Packaging (KIDP) and the Industrial Technology Information Centre (ITIC). KPC provides services related to factory and office automation. The centre provides technical assistance, training and information on automation. KIDP provides services geared towards improvements in industrial and product packaging. The Industrial Technology Information Centre, which was established in 1962, collects, processes and disseminates information to manufacturing firms.

Finally, there are a number of non-profit bodies which offer an assortment of extension services to firms. The Korea Standards Association (KSA), which has eleven regional offices in the country, provides training and information on quality standards to small and medium size firms. Specific industrial associations provide extension services to their members, the key ones being the Electronics Industry Association of Korea (EIAK), the Korea Textile Industry Technology Institute (KOTITI), Korea Automotive Technology Institute (KATECHI) and the Korea Association of Machinery Industry (KOAMI) (Kim and Nugent, 1994).

Industrial Extension Services to Small and Medium Size Manufacturing Firms in Singapore

Singapore started putting in place policies to promote small and medium size firms development in 1986 with the establishment of the Small Enterprise Bureau (SEB) under the Economic Development Board (EDB). The SEB, which was to be supervised by the Committee on Small Enterprise Policy, was to coordinate government policy on small and medium size firms. In 1986, the Bureau established the Local Industries Upgrading Programme (LIUP). The thrust of the programme was the promotion of partnerships between multi-national enterprises (MNEs) and suppliers and subcontractors which were mainly local small and medium size enterprises (SMEs). Under the programme, multi-national enterprises in the country were to be reimbursed up to 90 percent of the cost of training provided to small and medium size firms. The SMEs were to bear the rest of the cost of training. Training was to be in the areas of management, quality control and production processes, and entailed actual training of staff, visits to the factory and consultancy services.

A critical element of the LIUP is the release of experts by multinational firms to the EDB for two to three years. The experts are designated LIUP managers and are to identify the areas of possible assistance to the small and medium size firms. The recommendations of the experts and the support of the EDB are usually positive signals to the managers of various state financial schemes about the viability of the SMEs (Wong, 1992).

The EDB has also entered into arrangements with universities regarding various forms of assistance to small and medium size firms. A number of agencies, besides the EDB, also provide assistance to SMEs. Two of these, the Singapore Institute of Standards and Industrial Research (SISIR) and Skills Development Fund (SDF), primarily focus on the enhancement of product quality and production processes. SISIR, which was set up in 1969, apart from providing testing services, also provides services in the areas of quality control, standardization, new product development, provision of information about quality demands of external markets and improvement in production processes. SDF coordinates various schemes which target the upgrading of SMEs through training, modernization of production processes and consultancies (Wong, 1992).

Finally, in 1988 an SME Master Plan was prepared which aimed at the integration of the programmes of public and private bodies that were providing assistance to small and medium size enterprises. The SME Master Plan, later referred to as Enterprise Development Plan, was a blueprint for development of small enterprises and was to achieve its goals through a network of state and private agencies (Wong, 1992).

Extension Services to Small and Medium Size Manufacturing Firms in Malaysia

Meyanathan and Salleh (1994), in their discussion of the extension and skills training programmes for small and medium size manufacturing firms in Malaysia, identified research and educational bodies as the primary providers of technology extension services. The main research bodies mentioned are the Standards and Industrial Research Institute of Malaysia (SIRIM), the Forest Research Institute (FRI) and the Malaysian Agricultural Research and Development Institute (MARDI).

SIRIM of Malaysia, apart from engaging in research and defining the standards which manufacturing firms need to meet for quality assurance, promotes technology adoption by firms through its industrial extension unit. SIRIM also has a deposit of seven million technical documents containing technology information on research and development (R and D) results, standards specification, patents and technological data which are accessible to large, medium and small manufacturing firms (Meyanathan and Salleh, 1994).

MARDI, through its Food Technology Division (FTD), uses training programmes to promote technological absorption in which selected firms have their staff trained for three years. In addition, FTD assists in upgrading the quality of management, production processes, product quality and packaging (Meyanathan and Salleh, 1994).

The Forest Research Institute (FRI) has a small scale industry section which provides extension services to small and medium size wood-based manufacturing firms.

A number of institutions provide training to manufacturing firms. Prominent among them are the Penang Skills Development Centre (PSDC), the Centre for Instructor and Advanced Skills Training (CIAST), industrial training institutes, vocational institutes, skill training institutes and youth training centres.

PSDC is also engaged in the promotion of linkages between translation corporations and small and medium size manufacturing firms.

The PSDC, which was established in 1989, was a product of discussion between Penang State Government in Malaysia and the American Business Council. The centre is a joint project of the private sector, Penang State Government, SIRIM and state-run Universiti Sains Malaysia. The centre offers training in manufacturing processes, management and technical skills. The training could be in-house or at the centre's facilities. Meyanathan and Salleh (1994) underscore the biennial training needs survey which the centre conducts, to determine the skills which firms feel their personnel describe as "must have," is "good to have" and is "nice to have" and then develop relevant courses. From the survey, the centre designs appropriate training programmes which are thus demand-driven.

PSDC is mentioned by the United Nations Conference on Trade and Development (2000) as one of the most innovative initiatives in upgrading SMEs.

Extension Services to Small and Medium Size Manufacturing Firms in Japan

Itoh and Urata (1994) state that, in Japan, firms which engage less than 300 employees are classified as SMEs. Policies for the promotion of small and medium size firms are formulated at the Ministry of International Trade and Industry (MITI) and its SME wing, the Small and Medium Enterprise Agency. The central body which formulates policies for small and medium size firms is the SME Policy Council and has representatives from the private sector, professional groups, trade unions, academic institutions, government and consumer organisations (Itoh and Urata, 1994).

Japan, according to Itoh and Urata (1994), relies mainly on inter-firm linkages, subsidy and tax measures, and training to enhance production techniques and product quality. There are, however, programmes which integrate individualized advisory services. The major form of inter-firm linkage through which firms upgrade their technology is subcontracting. The parent firms which are usually large enterprises (LEs) are usually at the top of a pyramidal or multi-tier structure. Below the LEs are a number of subcontractors or suppliers, which are mostly small and medium size enterprises (SMEs). Parent firms normally train the workers of the subcontractors and upgrade their machines so that they can be sure the supplies or parts produced by SMEs meet the required standards.

Subsidies to small and medium size firms and their industry associations are meant to encourage them to undertake research and development. In addition, SMEs are allowed to deduct their expenditure on R and D from their taxable income (Itoh and Urata, 1994).

Training programmes to small and medium size firms are provided by the national and local governments. Japan Small Business Corporation, a national SME promotional organisation, and local governments regularly organise seminars on technologies for SMEs to encourage the upgrading of production techniques and quality of products within the small and medium size manufacturing enterprises.

Local governments provide other services to SMEs. First, they have technical centres which send advisors to firms and offer testing services. The centres also engage in R and D and exchange of technical information with firms and universities. Second, local governments have programmes under which technical experts from the private sector, universities and research bodies are released to visit and provide technical assistance to SMEs. Finally, local governments have research laboratories which offer testing services to firms, including small and medium size firms (Itoh and Urata, 1994).

Extension Services to Small and Medium Size Manufacturing Firms in Zimbabwe

Industrial extension services in Zimbabwe are at the formative stages. One NGO, ENDA, has established workshops close to clusters of small and medium size firms with the aim of improving their production techniques. The entrepreneurs and their workers are trained at these workshops, following which the owners of the SMEs can hire or buy the machines from the NGO. A public organisation, the Small Enterprise Development Corporation (SEDCO) is also creating an infrastructure for providing similar services to small and medium size firms (Kapoor, Mugwara and Chidavaenzi, 1997).

Extension Services to Small and Medium Size Manufacturing Firms in Ghana: The Case of Empretec, Ghana

Empretec is an international body operating in 10 African and Latin American nations. It was started in 1988 with the primary mission of developing entrepreneurship through training and advisory services (Gibson, 1999).

Empretec programme in Ghana began in 1990 under the sponsorship of the United Nations Development Programme (UNDP), the Overseas Development Administration (ODA) of the United Kingdom, the United Nations Centre on Transitional Corporation, Barclays Bank of Ghana Limited and the National Board for Small-Scale Industries. According to Kyerematen (1995) the main aim of Empretec in Ghana is to act as a catalyst for private sector development by providing a comprehensive range of support services to SMEs, including assisting SMEs in getting access to new technology. Kyerematen (1995) stresses that, before Empretec introduces a new technology to an enterprise, the body prepares the entrepreneur, management and workers to absorb and make effective use of the new technology.

Empretec also promotes upgrading of production techniques and product quality of SMEs through the encouragement of networking among SMEs, linkages between SMEs and large-scale enterprises (LEs), and development of joint ventures between SMEs and foreign firms. Through these linkages, especially subcontracting, the large firms provide training and advisory services to SMEs to ensure that the products supplied to LEs are of the highest standards. Finally, Empretec assists SMEs upgrade their production techniques by matching them with advisors who are usually attached to the firms for a period of time. Gibson (1999) indicated that most of the advisors are retired British business executives.

Promotion of Adoption of Technology by SMEs in Chile

Two bodies, La Corporación de Fomento de la Producción (CORFO) and La Corporación de Investigaciones Tecnológicas (INTEC), are currently engaged in assisting small and medium size enterprises in Chile acquire technology. Both are public bodies with CORFO being primarily a funding agency while INTEC is a technology institute which stresses technology transfer. The two bodies are jointly exploring the possibility of establishing a technology extension service in Chile (Mullin, Adam, Halliwell and Milligan, 2000).

Summary of Technology Extension Services

Industrial extension programmes in eight nations were covered in the review. In the five East Asian countries examined, governments used research bodies, training programmes, linkages and networking, subsidies and preferential tax treatment to upgrade production techniques and product quality. On the other hand, the extension services offered in the two African nations and one Latin American nation covered in the review were in their formative stages.

Each East Asian nation has an agency to coordinate and promote the development of small and medium size enterprises. In Indonesia, the government has established the Small-Scale Industries Development Programme. In the Republic of Korea, there is the Small and Medium Industry Promotion Corporation (SMIPC). The Singapore government provides its support through the Economic Development Board (EDB), and Malaysia has the Small-Scale Enterprise Division (SSED). The Japanese Government has the Small and Medium Enterprise Agency.

The Government of Indonesia's industrial extension has employed two primary tools, the creation of clusters of small enterprises and development of linkages. Extension services are provided to the SMEs from the technical service centres which have field extension offices. The linkage programme, referred to as "Foster Father-Business Partner Linkage," promotes upgrading of the production processes of small and medium size manufacturing firms by linking them with large manufacturing firms.

The EDB in Singapore uses subsidy, tax incentives, training programmes and linkages to promote the upgrading of production techniques of SMEs. EDB uses the LIUP to effect backward linkages between multinational enterprises (MNEs) and local firms which are mainly SMEs.

The Republic of Korea's Small and Medium Industry Promotion Corporation (SMIPC) provides a variety of extension services to SMEs. Research bodies also provide extension services through specialised units which have been established to offer the services. Another body, the Industrial Technology Information Centre, assists SMEs by collecting, processing and disseminating technological information. Both Malaysia and Japan have relied mostly on research institutions to provide extension services to SMEs. The two promote linkages between universities and SMEs. A unique SME promotion initiative in Malaysia is the Penang Skills Development Centre (PSDC). It is a human resource development centre for SMEs which brings together the State Government of Penang, private sector and academia.

Japan has additional institutional arrangements for upgrading technology of SMEs. The government provides subsidies to SMEs and SME associations to promote their R and D activities. Public technical centres and local governments provide technical assistance and information.

The two African countries whose industrial extension programmes were reviewed were Zimbabwe and Ghana. In both countries, the major providers of industrial extension services are private organisations. Empretec, the body which offers the services in Ghana, provides technology information to SMEs, promotes linkages between LEs and SMEs, encourages networking among SMEs and matches SMEs with experts. In Zimbabwe, ENDA, an NGO, provides extension services to clusters of SMEs. ENDA has set up workshops where SME owners, managers and workers are trained. A public body, the Small Enterprise Development Corporation (SEDCO) is creating a framework for providing similar services. Chile, the only Latin American nation whose industrial extension services were reviewed, is in the process of setting a national industrial extension system. Currently, it has a public technology institute, INTEC, which promotes technology transfer to SMEs

Chapter Four

Research Findings and Discussion

Introduction

The findings presented here encapsulate quantitative and qualitative information collected from six groups of respondents:

- Owners of small and medium manufacturing enterprises (SMEs) in Nairobi, Kenya.
- Directors of governmental agencies which provide support to SMEs.
- Directors of non-governmental organisation (NGOs) which provide support to SMEs.
- Vice-chancellors and principals of public universities, national polytechnics, technical training institutes and institutes of technology.
- Local directors/representatives of international organisations which provide support to SMEs.
- Directors of foreign-based organisations which extend support to SMEs.
- The findings are discussed with regard to trends and the available literature.

Small and Medium Size Manufacturing Enterprises in Nairobi, Kenya

Ownership of Small and Medium Size Manufacturing Enterprises

The proprietors or managers of SMEs were asked to respond to questions relating to the ownership of their firms. Table 1 shows that the majority of the firms (52.0 percent) are owned by individuals. The four medium size firms in the sample were either under family ownership (three) or limited company status (one).

Table 1: Ownership of manufacturing SMEs

Ownership	% of 103
Individual	52.0
Family	18.0
Partnership	15.0
Private Limited	15.0

Source: Researchers' Fieldwork, 2000

Close examination of the reasons for preference for individual ownership revealed that the owners have three primary arguments. First, the owners of SMEs felt that the other forms of business ownership usually require more financial outlays and better business training than they had. The second reason was the fear of being encumbered with complex legal and administrative procedures. Finally, the owners of the firms were of the view that, even in manufacturing, all aspects of the business can be managed effectively by an individual. Indeed it emerged that most business owners do not seek or receive advice from governmental and non-governmental agencies.

Classification of Small and Medium Size Manufacturing Enterprises by the Number of Employees

A major objective of the study was to determine if there were differences in the extension requirements between small size and medium size manufacturing firms. There was, thus, a need to classify the firms by the number of employees they engaged on a full-time basis. Table 2 indicates this categorisation by grouping the firms into small-scale (1-49 employees) and medium-scale (50-100 employees) classes. Table 3 provides a much finer grouping by generating narrower classes.

Table 2: Classification of SMEs into small and medium size categories

Categories	% of 103
Small-scale	96.10
Medium-scale	3.90

Source: Researchers' Fieldwork, 2000

Table 3: Classification of SMEs by employees

Classes by number of employees	% of 103
0 - 4	44.70
5 - 9	31.10
10 - 19	11.60
20 - 39	5.80
30 - 39	1.90
40 - 49	1.00
50 - 100	3.90

Source: Researchers' Fieldwork, 2000

According to table 2, only a small number (3.90 percent) of the firms sampled were medium scale. Most of the enterprises (96.10 percent) were small-scale.

Table 3 shows that 75.80 percent of the firms have less than 10 employees. The data confirm the Kenya Government's concerns over the "missing middle" of the limited number of firms with 10-50 employees.

Registration of Small and Medium Size Manufacturing Enterprise

Tables 2 and 3 indicate the state of registration of SMEs and MEs (Medium Size Enterprises) with the Office of the Registrar of Companies and membership of trade associations.

Table 4: Registration of SMEs

Organisation	% of 103
Office of the Registrar of Companies	37.0
National Chamber of Commerce and Industry	19.0
Kenya Association of Manufacturers	20.0
Kenya Federation of Employers	10.0
Kenya Management Assistance Programme	13.0

Source: *Researchers' Fieldwork, 2000*

Table 5: Registration of MEs

Organisation	% of 4
Office of Registrar of Companies	100.0
National Chamber of Commerce and Industry (NCCI)	100.0
Kenya Association of Manufacturers (KAM)	75.0
Federation of Kenya Employers (FKE)	75.0
Kenya Management Assistance Programme (KMAP)	0.0

Source: *Researchers' Fieldwork, 2000*

Analysis of tables 4 and 5 show that when small and medium size industrial firms are pooled only 37.0 percent are registered with the office of the Registrar of Companies. On the other hand, all medium size manufacturing firms are registered. Registration of a firm provides an indication of its formality and reflects on its readiness to benefit from government services. The medium size manufacturing firms, therefore, are more likely to seek government services. This has a major bearing on the accessibility of these firms to industrial technology extension services deployed by governmental agencies. Lack of registration by the small size enterprises, on the other hand, limits their potential for benefiting from the same services.

Membership of trade associations is also high for medium size firms as table 4 indicates. Only a limited number of SMEs belong to trade associations. Membership of trade association provides opportunities for networking and developing business linkages.

None of the medium size manufacturing firms is registered with Kenya Management Assistance Programme (KMAP). Some small size firms (13.0 percent) are registered with KMAP. Low registration

levels by small and medium size manufacturing firms is based on a combination of factors. The smaller firms indicated that KMAP fees were too high. KMAP charges fees of Kshs.10,000.00 for start-up business and Kshs.35,000.00 for existing business. The medium size firms were of the view that KMAP puts high premium on management training, while their needs were mostly on plant designs, product upgrading, production processes and marketing.

Education of Owners of Small and Medium Size Manufacturing Enterprises

Table 6 presents the highest levels of education attained by owners of SMEs. Table 7, on the other hand, provides the educational levels achieved by chairmen/owners of medium size manufacturing firms.

Table 6: Educational levels of owners of SMEs

Highest level of education	% of 103
Primary	13.5
Secondary	42.7
Diploma	11.2
University	22.5
Other qualifications	10.1

Source: Researchers' Fieldwork, 2000

Table 7: Educational levels of owners/chairmen of MEs

Highest level of education	% of 4
Primary	0.0
Secondary	0.0
Diploma	0.0
University	100.0
Other qualifications	0.0

Source: Researchers' Fieldwork, 2000

The level of education achieved by most of the SME owners is secondary school. As table 4 shows, they comprise 42.7 percent of the owners. A unique aspect of the medium size manufacturing firms is that all of them have boards of directors, chairmen and managing directors. As table 7 indicates, all the chairmen have university degrees. In addition, all the managing directors of MEs had university degrees. Educational background of proprietors, managers and workers of businesses is of significance to the agencies which deploy extension services. According to extension literature, better educated individuals tend to adopt innovations much faster. It can, therefore, be stated that extension services targeted at medium size manufacturing firms are likely to have faster impact on the firms' practices and products.

Those agencies targeting small size manufacturing firms whose owners tend to have lower educational background will normally need to use more extension channels and be more patient.

Educational Background of Employees of Small and Medium Manufacturing Enterprises

Table 8 provides a summary of the highest educational levels achieved by employees of small and medium size manufacturing firms in Nairobi.

Table 8: Levels of education of employees of SMEs

Level of education	% of 804
Non-formal education	3.0
Primary education	24.20
Secondary education	55.40
Certificate	7.10
Diploma	5.50
University degree	4.80

Source: Researchers' Fieldwork, 2000

Most of the employees of the manufacturing SMEs had some form of primary education (24.20 percent) and secondary school education (55.40 percent). These employees and another 3.0 percent of the workers, who have received no formal education, comprise 82.60 percent of the personnel in the SMEs. The other 17.4 percent is made up of individuals having certificates (7.10 percent) diplomas (5.50 percent) and university degrees (4.80 percent).

Classes of Small and Medium Size Manufacturing Firms

The enterprise in which a firm engages determines the nature of its extension requirements. The study collected this information, and the findings are summarised in Table 9. The major categories of manufacturing in which the firms engage are engineering (41.60 percent), textile (20.10 percent), wood and wood products (12.60 percent) and electronics and electricals (11.20 percent).

Table 9: Classes of SME firms

Class of enterprise	% of 103
Agro-based	5.60
Chemical and mineral	7.80
Engineering	41.60
Wood and wood products	12.60
Glass	1.10
Electronics and electrical	11.20
Textile	20.10

Source: Researchers' Fieldwork, 2000

Extension Service Needs of Small and Medium Size Manufacturing Firms

Manufacturing firms, small or large, are set up to produce goods which are desired by consumers. In market economies, quality and price of goods are decisive in capturing markets for a firm's products. Many countries have put in place various private and public interventions that are geared at enhancing the capacity of their firms to be competitive in domestic and foreign markets. In Kenya, it is only now that it is dawning on public policy makers that an array of policy instruments is needed to foster growth of manufacturing firms. One of the objectives of this study was to determine the technology extension needs of small and medium size manufacturing firms. From the responses of the owners of these enterprises, and ideas from literature and experiences of other nations, possible policy instruments were to be suggested.

To determine the degree to which specific extension services are needed by the manufacturing SMEs, their owners in Nairobi, Kenya were asked to respond to 20 variables by indicating, on a seven-point scale, ranging from 1 (least important) to 7 (most important), the degree to which the services are needed by their firms. Table 10 shows the means of the responses of the SME owners. Table 11 indicates the means of the responses of the owners of the medium size manufacturing firms only. Table 12 provides the means of the responses of the women owners of small and medium size manufacturing firms.

Table 10 displays the means and standard deviation of the extension services needed by SME owners. All the services are rated above 4.00 out of a possible maximum rating of 7.00. Thirteen services were rated above the mean of 5.00. Examination of the table shows that two services, providing information

on market outlets ($\bar{X} = 6.41$) and advising on marketing of the firms products ($\bar{X} = 6.36$), were rated above 6.00.

The data in table 11 show the means of extension services needed by owners of medium size manufacturing firms. Eleven of the services are rated above the mean of 4.00. The services rated 6.00

and above are: Providing linkages to research and development (R and D) bodies (\bar{X} = 6.75), providing linkages to universities (\bar{X} = 6.75), providing linkages to national polytechnics (\bar{X} = 6.25) and advising on environmental management (\bar{X} = 6.00).

Table 10: SME owners' rating of extension service needs (N = 103)

Services	Mean \bar{X}	Standard Deviation (S.D)
Providing information about sources of tools and equipment	5.43	2.12
Providing information on how to acquire tools and equipment	5.18	2.21
Providing contacts of suppliers of tools and equipment	5.15	2.13
Providing manuals on how to use tools and equipment	4.64	2.34
Interpreting information in manuals on use of tools and equipment	4.39	2.46
Training on proper use of tools and equipment	4.89	2.42
Providing information on sources of raw materials	5.22	2.26
Providing contacts of suppliers of raw materials	5.23	2.30
Training workers on operations of the enterprise	4.98	2.27
Providing linkages to research and development (R & D) bodies	5.18	2.14
Providing linkages to universities	4.35	2.23
Providing linkages to national polytechnics	4.70	2.23
Assisting in establishing linkages with other firms	5.47	1.88
Assisting in testing the standard of products and supplies	5.56	1.97
Advising on location of enterprises	4.56	2.40
Providing information on market outlets	6.41	1.23
Advising on marketing of the firm's products	6.36	1.31
Advising on safety measures	5.33	2.06
Advising on environmental management	5.07	2.27
Advising on maintenance of tools and equipment	5.54	2.08

Source: Researchers' Fieldwork, 2000

Table 11: ME owners' rating of extension service needs (N = 4)

Services	Mean \bar{X}
Providing information about sources of tools and equipment	3.00
Providing information on how to acquire tools and equipment	2.50
Providing contacts of suppliers of tools and equipment	2.75
Providing manuals on how to use tools and equipment	2.25
Interpreting information in manuals on use of tools and equipment	1.25
Training on proper use of tools and equipment	2.75
Providing information on sources of raw materials	1.00
Providing contacts of suppliers of raw materials	1.00
Training workers on operations of the enterprise	4.50
Providing linkages to research and development (R & D) bodies	6.75
Providing linkages to universities	6.25
Providing linkages to national polytechnics	5.75
Assisting in establishing linkages with other firms	5.75
Assisting in testing the standard of products and supplies	4.75
Advising on location of enterprises	5.50
Providing information on market outlets	5.50
Advising on marketing of the firm's products	5.50
Advising on safety measures	3.75
Advising on environmental management	6.00
Advising on maintenance of tools and equipment	4.25

Source: Researchers' Fieldwork, 2000

The means of the responses of the women owners of small and medium size manufacturing enterprises are shown on table 12. Investigation of the tables shows that sixteen services are rated above the mean of 4.00. Four of the services rated 6.00 and above were advising on marketing of firm's products

(\bar{X} = 6.25), advising on maintenance of tools (\bar{X} = 6.10), providing information on marketing outlets (\bar{X} = 6.00) and assisting in establishing linkages with other firms (\bar{X} = 6.00).

Table 12: SME women owners' rating of extension service needs (N = 12)

Services	Mean
Providing information about sources of tools and equipment	4.83
Providing information on how to acquire tools and equipment	4.75
Providing contacts of suppliers of tools and equipment	4.58
Providing manuals on how to use tools and equipment	3.67
Interpreting information in manuals on use of tools and equipment	3.92
Training on proper use of tools and equipment	4.33
Providing information on sources of raw materials	3.75
Providing contacts of suppliers of raw materials	3.75
Training workers on operations of the enterprise	4.83
Providing linkages to research and development (R & D) bodies	4.58
Providing linkages to universities	4.00
Providing linkages to national polytechnics	4.75
Assisting in establishing linkages with other firms	6.00
Assisting in testing the standard of products and supplies	5.17
Advising on location of enterprises	4.00
Providing information on market outlets	6.00
Advising on marketing of the firm's products	6.25
Advising on safety measures	4.73
Advising on environmental management	4.82
Advising on maintenance of tools and equipment	6.10

Source: Researchers' Fieldwork, 2000

Government Agencies Providing Support to Small and Medium Size Manufacturing Firms in Nairobi, Kenya

Extension specialists, like Arnon (1989), Boone (1989) and Röling (1988) put high premium on government involvement on the provision of extension services. Tiffin (1994) argues similarly that, though they may not be the primary providers of the services, governments should create designs and direction for the services.

This study collected information about government and voluntary agencies that currently offer industrial extension services in Nairobi, Kenya. In this section (4.3.0) the government bodies are documented and discussed. In the next section (4.4.0) voluntary organizations which offer extension services to manufacturing SMEs are presented.

The Department for Micro and Small Enterprise Development (MSED)

The Government of Kenya has created a department within the Ministry of Labour and Human Resources Development (MLHRD) which is to assume the responsibility of co-ordination of micro and small enterprise development in Kenya. The Department is currently creating an infrastructure for addressing the core issues relating to micro and small enterprise development. With regard to technology generation and extension, it proposes to undertake the following measures:

- Encouragement of the Kenya Industrial Research and Development Institute to engage in research and development technologies with micro and small enterprise orientation.
- Promotion of training programmes for the micro and small enterprise sector.
- Strengthening linkages among micro and small enterprises, and between them and large enterprises (LEs), research bodies, universities, institutes and voluntary bodies.
- Improving technology transfer through adaptation of imported technology and consultancy services.

Two other bodies from which information was collected were:

- The Kenya Industrial Research and Development Institute
- The Kenya Industrial Estates Limited

The two bodies are discussed in-depth because of their uniqueness in technology generation and transfer.

The Kenya Industrial Research and Development Institute (KIRDI)

The Government of Kenya set up KIRDI in 1979 as the premier industrial research and development body in Kenya. Apart from its Nairobi offices and laboratories, KIRDI has a branch in Kisumu. Government promotion of industrial research in Kenya, however, goes back to 1942 when the British colonial government, which administered Kenya until 1963, established a laboratory at Kabete in Nairobi. Originally the Kenya Industrial Management Board (KIMBO) managed the laboratory.

The laboratory was later taken over by the East African Community, which was providing common services to the three East African nations of Kenya, Uganda and Tanzania. The laboratory became one of the three industrial research centres, the other two being located in Uganda and Tanzania. They were managed by a body named the East African Industrial Research Organisation (EAIRO).

The operations of EAIRO were taken over by a unit in the then Ministry of Commerce and Industry (now the Ministry of Industry, Trade and Tourism) when the East African Community was disbanded in 1977. The unit, the National Industrial Research Complex, was replaced by KIRDI in 1979.

KIRDI achieves its mandate through six research and development divisions and six specialised centres. The specific KIRDI activities which may be classified as extension services are:

- training for industry
- consultancy services
- product testing for quality assurance
- information gathering, processing and dissemination
- advisory services

Kenya Industrial Estates Limited (KIE)

Kenya Industrial Estates Ltd (KIE) was set up in 1967 to extend credit and business advisory services to small-scale enterprises. Originally it was a department of the Industrial and Commercial Development Corporation (ICDC).

After establishment, KIE embarked on the construction of factory buildings in Kenya's major towns. In each building a number of sheds were to be leased to small-scale entrepreneurs. The industrial estates were provided with common facilities workshops (CFWs) where the tenants could have their tools repaired. In addition, these workshops housed expensive and specialised tools for rental. Conceptually, the towns in the country, which were hosting the provincial headquarters, were each to have an industrial estate.

KIE set up similar clusters of sheds, albeit with less facilities, in towns accommodating district headquarters. These industrial facilities were designated rural industrial development centres (RIDCs). KIE intended to facilitate industrial development at the lowest level and thus initiated the establishment of industrial promotion areas (IPAs) at the locational level. The other areas in which KIE was to support small-scale industrial firms were provision of credit, and business and technology advisory services.

Most Africans lacked capital with which they could purchase tools and equipment, and thus KIE initiated a number of lending programmes for them at its inception in 1967. Over the years, it is this lending role which came to pre-occupy KIE.

KIE was also to be an advisory body. It was to engage economists, accountants, engineers and business managers who were to advise the entrepreneurs on business plans, machine selection, plant layout, accounting procedures, product designs, production processes and marketing.

In 1977, KIE was separated from ICDC. It became a semi-government body with the same mandate of providing business premises and extending credit to small-scale industrial enterprises. The sheds provided by KIE were viewed as incubation units from which the tenants would move out after acquiring sufficient business skills.

There was a shift in government policies from the late 1980s with regard to state ownership of production plants and the government embarked on privatisation of its productive assets. KIE was therefore mandated to sell off the sheds to the occupants. Currently, KIE has 18 branches nationally and confines

itself to lending to industrial firms seeking credit of up to five million Kenya shillings and providing extension services.

Indonesia is one of the countries where the government initiated industrial promotional programmes similar to KIE. In Indonesia, as in Kenya, industrial clusters of small-scale establishments have been developed. Technical service centres from which extension services are provided to the small scale industrial firms are adjunct to the industrial clusters (Wie, 1993).

Lessons from KIRDI and KIE Promotional Programmes for Small and Medium Size Manufacturing Firms

Technology used by manufacturing firms has major impact on production processes and product quality. Small and medium size manufacturing enterprises are, however, at a disadvantage as compared to LEs because they normally lack the level of resources and technical personnel needed for R and D. SMEs thus tend to rely on public and voluntary bodies for new technology. In Kenya, the primary bodies which have been providing support services to SMEs are KIRDI and KIE.

Their experiences with regard to technology extension services are documented below.

1. The educational level of owners of small scale manufacturing firms in Kenya is generally low. Consequently, the proprietors of the SMEs do not appreciate the degree to which changes in technology impact on production processes, product quality and market competitiveness. In cases where they develop interest in new technology, their limited education adversely affects their capacity to absorb it.
2. There is limited vertical growth within the SME sector, thus the existence of the "missing middle." The underlying problem is the informal nature of the SMEs. The owners of these enterprises usually avoid engaging professionals, transfer resources among a number of enterprises and attempt to do everything within the firm.
3. Linkages among the small size manufacturing enterprises are weak. Owners of SMEs do not appreciate the benefits of sharing information, pooling resources and creating complementary subcontracting arrangements.
4. Educational institutions have shown little interest in the SME sector. It is now recognised that the growth of industry is hinged on how closely it is linked to universities, laboratories and research institutes which Desai (1993) refers to as "repositories of tacit knowledge." Linkages between educational institutions and research bodies on one hand and with SMEs should, therefore, receive utmost attention.

The interviewees also made specific recommendations for enhancing the quality of extension services provided to small and medium size manufacturing firms.

1. Development of a comprehensive national training programme. Critical areas which need to be addressed in the programme with regard to SMEs should be: upgrading the skills of SME owners and workers, funding of skills upgrading for SMEs, certification procedures, training of trainers (TOT) for SMEs, and curricula development for SMEs.

2. Preparation of training programmes for extension staff. The universities and national polytechnics need to be approached to prepare specialized in-service training curricula for extension personnel working with the SME sector.
3. Establishment of supportive linkages between educational institutions and SMEs.
4. Preparation of young Kenyans for business. A major component of this policy thrust should be promotional programmes for encouraging diploma and degree holders to enter the SME sector.
5. Setting up of a technology information network system for the SME sector.
6. Linking SMEs to consultants from the private and public sector.
7. Establishment of a framework for regular determination of real training and extension needs of SMEs.
8. Need to put emphasis on quality assurance.

NGOs Deploying Promotional Programmes for Small and Medium Size Manufacturing Firms

A number of NGOs provide extension services to small and medium size manufacturing firms in Kenya. Six of them agreed to provide information for this study. All of them indicated that they have branches outside Nairobi. One of the organisations, Kenya Management Assistance Programme, is unique in that it was set up by the business community in the country and relies mostly on personnel released by member companies for its training and advisory services. Its background, mission and activities are presented in detail.

KMAP and other NGOs will then be discussed with regard to their experiences and recommendations for the SME sector extension services.

Kenya Management Assistance Programme (KMAP)

KMAP was set up in 1986 by a group of large companies in Kenya with the mandate to facilitate the improvement in the management of small size firms in Kenya. KMAP is thus a voluntary body of the business community in the country. Initially, there were 74 member companies. Today, there are 258 firms that are members of KMAP.

The body, which has a modest staff of 18, depends on the member companies to provide the bulk of the personnel who train, counsel and advise small and medium size business owners. On joining, each KMAP member company undertakes to release its management personnel at the rate of one manager per day per month to KMAP. Each of the companies designates one of its executives as the liaison manager to coordinate the company - KMAP arrangements. Since 1993, KMAP has been inducting professionals from outside the member companies into its pool of experts who are referred to as counsellors. Currently, there are 800 of these counsellors.

Firms wishing to benefit from KMAP services need to register with it and are charged fees at the rate of Kshs.10,000.00 (US\$128.2) for start-up businesses and Kshs.35,000 (US\$448.7) for existing firms. KMAP's clients are served from Nairobi head offices, two branches and a mobile unit. The Nairobi

offices host the secretariat and cater for the clients from Nairobi and surrounding areas. The two branches are in Mombasa, which serves Coast region, and Eldoret, which takes care of clients from Rift Valley Province and Western Kenya. The mobile training unit is used to cover the remaining parts of the country. KMAP currently has 17,000 clients.

The body has also been involved in a training arrangement with Kenya Shell under which university students who are about to graduate are trained in business management skills. The arrangement which is codified "Graduate Self-Employment Programme" has resulted in the training of 639 individuals.

Another venture in which KMAP has been engaged over the last 10 years is a deal with two banks to extend credit to its clients. The first credit arrangement was signed in 1991 with Barclays Bank of Kenya. Under the KMAP - Barclays Bank Credit Scheme, which commenced in 1992, KMAP's clients could, after undergoing KMAP training, acquire credit from the bank on providing collateral worth 50 percent of the loan. A similar agreement was signed with the Co-operative Bank of Kenya in 1998. In both cases, the United States Agency for International Development (USAID) has provided Loan Portfolio Guarantee (LPG).

A number of agencies have supported the work of KMAP. The key ones, apart from USAID, have been the Department for International Development (DFID) of the United Kingdom, the United Nations Development Programme (UNDP) and the Centre for International Private Enterprise (CIPE) which is an affiliate of the American Chamber of Commerce.

Lessons from NGOs' Promotional Programmes for Small and Medium Size Manufacturing Firms

NGOs provided information with regard to their activities, needs and constraints, and recommendations for improving the deployment and provision of technology extension services to small and medium size manufacturing firms. Major activities of the NGOs are:

1. Identification of needs of SMEs. All the NGOs which were interviewed indicated that they conduct regular needs assessment. The NGOs, however, felt that bodies which provide extension services are deficient in needs assessment skills.
2. Conducting training for SMEs. All NGOs train SME owners on business development. Four of the six NGOs that were interviewed, also train owners on tool and equipment use, repairs and maintenance.
3. Provision of tools and equipment. Three of the NGOs interviewed provide tools and equipment to SMEs. Training in the use and maintenance of tools and equipment is a pre-condition for receiving the hardware.
4. Provision of advisory services. All the NGOs provide some form of advisory services. The services include information on technological options, sources of raw materials and marketing outlets for products.

Table 13: Programmes offered by TTIs and IT

Programmes		% of 25
Mechanical Engineering	-	56.30
Electrical Engineering	-	68.80
Computer Engineering	-	50.00
Chemical Engineering	-	31.30
Ceramic Engineering	-	12.50
Textile Technology	-	37.50
Wood Technology	-	62.50
Leather Technology	-	6.30
Food Technology	-	25.00
Business Management/administration	-	81.30
Industrial Education	-	31.30
Management of Technology	-	12.50

Source: Researchers' Fieldwork, 2000

Table 14: Programmes offered by national polytechnics

Programmes		% of 3
Mechanical Engineering	-	100.00
Electrical Engineering	-	100.00
Computer Engineering	-	100.00
Chemical Engineering	-	33.30
Ceramic Engineering	-	0.00
Textile Technology	-	0.00
Wood Technology	-	33.30
Leather Technology	-	0.00
Food Technology	-	66.70
Business management/Administration	-	100.00
Industrial Education	-	33.30
Management of Technology	-	33.30

Source: Researchers' Fieldwork, 2000

Table 15: Linkages of educational institutions to specific agencies

Agencies		% of 31
Ministry of Industry, Trade and Tourism		38.10
Ministry of Labour and Human Resource Development		23.80
Kenya Industrial Research and Development Institute		42.90
Kenya Industrial Estates		19.00
Kenya Association of Manufacturers		28.60
Kenya Management Assistance Programme		28.60

Source: Researchers' Fieldwork, 2000

5. Gathering information. All the NGOs interviewed indicated that they gather information from KIRDI, local universities and foreign educational institutions. Linkages with the Golda Meir Institute in Israel and universities in India and Bangladesh were mentioned.

One NGO, Undugu Society of Kenya, lays emphasis on programmes for youth under stress. It provides training and extension services for the youth who are engaged in small enterprises in Nairobi slums. It also provides start-up tools and equipment.

The NGOs mentioned general and specific constraints in their work. The major ones are outlined below.

1. *Most owners of SMEs are not keen on finance training.* A body like KMAP charges fees for its services, and thus may only reach a small number of the SME proprietors and workers.
2. *Limited local qualified personnel.* SME manufacturing is unique and extension personnel need specialised training to be effective. Local training lacks the required orientation.
3. *Lack of facilities and equipment.* Training in manufacturing usually takes place in workshops, laboratories and factories. These are specialised facilities and thus tend to be expensive for the NGOs.
4. *Financial support is limited.* All the NGOs get financial support from foreign sources. The managers of the NGOs therefore have to spend time soliciting for funds. In the end, they still do not generate enough revenue for their operations.
5. Most owners and workers of small enterprises lack the education background needed to absorb new technology.

The recommendations of NGOs for improving technology extension services to SMEs are documented below.

1. Bodies which deploy extension services for SMEs should put up viable structures for carrying out regular assessment of the needs of SMEs.
2. The government should create institutions for assisting in the gathering, processing and dissemination of technological information.
3. The government needs to set up small business development centres. The centres should serve as information sources, and contract points for consultancy and advisory services.
4. Extension personnel should identify growth-oriented small size firms and package their services to assist them mature to medium size category. Medium size firms should also be identified and supported to grow into large scale enterprises.
5. Universities and polytechnics should develop frameworks for assisting SMEs. The interviewees suggested that areas on linkages should include research, consultancies, training, advisory services and attachment.
6. School, polytechnic and university curricula should be reviewed with the aim of giving emphasis to technological literacy.
7. Universities, polytechnics and institutes should offer courses in small business development.
8. The government should set up industrial extension training centres for in-service and induction training programmes.

Educational Institutions' Promotional Programmes for Small and Medium Size Manufacturing Firms

Educational institutions that were assumed to be likely to offer programmes relevant to industrial development were selected. They included public universities, national polytechnics, technical training institutes and institutes of technology. The heads of the institutions were asked to provide information on:

- institutional profiles
- linkages to government agencies, research organisations and other educational institutions
- special institutional arrangements for assisting SMEs
- rating of approaches for institutional support for SMEs
- resources and institutional structures needed to enhance support for SMEs

Profiles of Educational Institutions

A summary of the qualifications provided by the institutions are:

- All technical training institutes and institutes of technology offer certificate and diploma qualifications.
- All national polytechnics offer training leading to certificate and diploma qualifications.
- The public universities offer programmes which lead to certificate, diploma, bachelors, masters and Ph.D. qualifications.

Table 13 presents the programmes offered by technical training institutes and institutes of technology. The data show that programmes offered by 50.00 percent and above of the institutions are: business management/administration (81.30 percent), electrical engineering (68.80), wood technology (62.50 percent), mechanical engineering (56.30 percent) and computer engineering (50.00 percent).

Table 14 indicates the programmes available at the national polytechnics. There are four national polytechnics, of which three responded. All the three offer programmes in mechanical engineering, electrical engineering, computer engineering and business administration.

Tables 13 and 14 show that business management, electrical engineering, mechanical engineering and computer engineering are given prominence by the national polytechnics, technical training institutes and institutes of technology. These institutions are better placed to provide assistance to SMEs because they are spread around the country. The programmes offered by these institutions, however, seem to be narrow, implying that they may not have the facilities, equipment and experts to assist SMEs engaged in enterprises not available for professional qualifications.

The universities offer a narrower range of programmes. They are limited to mechanical engineering, electrical engineering, business administration and food technology. One of the universities, in addition, has programmes in textile technology and wood technology.

Linkages of Educational Institutions to other Agencies

The study determined the linkages which the public universities, national polytechnics, technical training institutes and institutes of technology have developed with specific agencies.

Table 15 indicates the agencies to which the educational institutions are formally linked. From the data, the agency to which the largest number of educational institutions (42.90) are linked is KIRDI. In follow-up interviews with selected administrators of these institutions, two factors were mentioned as inhibiting formal relationship with governmental and non-governmental agencies. First, governmental agencies were viewed as unstable. They cited examples of the recent changes in government ministerial structures. Second, many of the administrators were not familiar with what most NGOs do.

Approaches to Providing Extension Services to Small and Medium Size Manufacturing Firms

Countries are using a variety of instruments to spur industrial development (Tiffin, 1994). The administrators of universities, polytechnics and institutes were asked to indicate the degree to which 11 specific approaches are appropriate for providing support services. They used a seven-point scale, ranging from 1 (least appropriate) to 7 (most appropriate).

Table 16 displays the means of ratings of the approaches for deploying extension services to SMEs. Ten of the 11 approaches were rated above 4.0 out of a possible 7.0. The highest rated approaches are:

Use of educational institution-based training system for workers of manufacturing firms ($\bar{X} = 5.20$), using NGOs to provide extension services ($\bar{X} = 4.60$), establishment of extension systems at district level ($\bar{X} = 4.60$) and establishment of extension systems at divisional level ($\bar{X} = 4.60$). According to the administrators, the approach that is least appropriate is the use of government extension agency ($\bar{X} = 3.40$).

Table 16: Educational institutions heads' rating of approaches to providing assistance to SMEs (N = 31)

Approaches	Mean
Use of educational institution-based training system for owners of manufacturing firms	4.40
Use of educational institution-based training system for workers of manufacturing firms	5.20
Use of educational institution - based extension system	4.30
Use of government agency extension system	3.40
Using NGOs to provide extension services	4.60
Using research organizations to provide extension services	4.30
Establishment of incubation centres adjacent to universities/polytechnics	4.30
Development of industrial parks	4.20
Establishment of extension systems at provincial level	4.20
Establishment of extension systems at district level	4.60
Establishment of extension systems at divisional level	4.60

Source: Researchers' Fieldwork, 2000

Resources and Structural Arrangements Needed to Improve the Capacity of Educational Institutions to Provide Assistance to SMEs

The administrators of public universities, national polytechnics and institutes were asked to recommend the resources and structures which the institutions would need to enable them provide effective assistance to SMEs.

The key recommendations are summarised below:

1. Training programmes for trainers to provide them with SMEs focus. Another issue with regard to training of trainers (TOT) which was suggested was the need to provide exposure to industry and SME programmes in other nations for trainers.
2. Establishment of SME coordination offices in the institutions to facilitate assistance to small and medium size manufacturing firms.
3. Development of technology demonstration units.
4. Setting up of small business development centres in the institutions.
5. Establishment of autonomous departments to offer programmes on small and medium size manufacturing firms.
6. Creation of frameworks for joint research projects with industry.
7. Entering into arrangements with industry to enable executives to teach some of the courses in the educational institutions.
8. Reorganization of institutional programmes to make it possible for owners and workers of SMEs to take courses on part-time basis.
9. Modification of institutional curricula to incorporate units which are relevant to local industry.

10. Upgrading of workshops, laboratories and equipment.

International Agencies' Promotional Programmes for Small and Medium Size Manufacturing Firms

The study documented the existing projects targeting SMEs in Kenya being undertaken by the international agencies. In addition, information was collected on possible interventions for improving the performance of small and medium manufacturing firms in Kenya.

The major project identified is the Micro and Small Enterprise Training and Technology Project (MSETTP) which is sponsored by the World Bank. The project aims at providing training to 24,000 small and micro size manufacturing firms in the country. The trainees buy training vouchers which entitle them to attend training programmes being conducted by selected training providers spread throughout the country. The project started in 1996 and is expected to end in June 2001.

The International Labour Organization (ILO) and the United Nations Development Programme (UNDP) also have arrangements for assisting SMEs. The two bodies are enjoined to assist SMEs through commitment No. 3 of the Copenhagen Declaration of 1995. Under the declaration, the ILO was to focus on employment creation while UNDP was to put emphasis on poverty reduction. In developing nations like Kenya, the two mandates cannot be effectively achieved without giving due emphasis to SMEs.

ILO, through its Jobs for Africa Programme, is engaged in advocacy networking to put employment creation on the national and community agenda. It is also involved in the screening of projects from community - based organisations which could promote its mandate of employment creation.

UNDP is assisting in the establishment of the Department of Micro and Small Enterprise Development (MSED). The department is expected to coordinate the promotional programmes in the micro and small enterprise (MSE) Sector.

The local representatives of the international agencies were asked to suggest ideas for improving the SME sector in the country. Their key recommendations are enumerated below:

1. There is need to develop a national technical education policy. This would be a master plan which identifies critical skills desired by the country and documents strategies for equipping people with the required skills. It was suggested that the policy should address a number of other issues:
 - Setting up of an industrial training council which will focus on national and regional industrial training needs.
 - Standardization of industrial training certificates.
 - Setting up of technical universities to enable graduates of technical training institutes, institutes of technology and polytechnics to pursue careers in their lines.
 - Creation of institutions for regular review of technical education curricula.
2. There is a case for developing an industrial attachment policy to promote linkages between industrial firms and education institutions. Tax rebates and subsidies from the Industrial Training Fund can

be used to encourage firms to participate in the hosting of students and trainers from the educational institutions.

3. Need for training programmes for start-up companies. This should be accompanied by follow-up consultancies once the firms start operating.
4. Small and medium size firms should be linked in order to promote manufacturing and markets for technology within the SME sector.

Recommendations from External Agencies on Promotional Programmes for SMEs

A major objective of the study was the determination of the promotional programmes for small and medium size enterprises in other nations. It was hoped that from the responses and recommendation from the agencies deploying the programmes, lessons could be drawn for application in Kenya.

The names and addresses of the external agencies were provided by the local embassies and high commissions. Eight of the agencies were contacted.

The responses were, for ease of presentation, divided into three broad sections consisting of profiles, support programmes for SMEs and recommendations for deploying promotional programmes for SMEs.
Profiles of External Agencies

All the agencies whose names were provided by the embassies and high commissions are governmental bodies. They provide a variety of services to firms, the key ones being:

- identification of domestic market niches by products
- technology transfer
- assistance to domestic firms to attend trade fairs
- promotion of joint ventures
- provision of information services
- provision of information on external markets

Support Programmes for Small and Medium Size Enterprises

The agencies were asked first, to provide information on the needs of small and medium size enterprises and second, to state the promotional programmes for SMEs. The main needs of SMEs included:

- financial resources
- knowledge about foreign markets
- improved technology. They need both its knowledge and transfer.
- production skills
- distribution channels for products
- training programmes which are relevant and accessible

Programmes for SMEs which were documented:

- Financial institutions for SMEs.

- Establishment of standards and marketing bodies.
- Courses and seminars organized by educational institutions for SMEs.
- Establishment of information centres for SMEs.
- Setting up of bodies to coordinate SME support programmes at national and regional levels.
- Creation of SME coordination offices in research and educational institutions.
- Subsidy programmes for training and research programmes of benefit to SMEs.
- Setting up of bureau for advisors, trainers and consultants for SMEs.

Recommendations for Deploying Promotional Programmes for Small and Medium Size Manufacturing Firms

The recommendations from foreign agencies are:

- Development of technologies which are appropriate to SMEs with respect to cost, size, complexity and maintenance requirements.
- Setting up advisory centres where SME owners can be assisted in starting and registering a business; starting and operating business; general business counselling, marketing, market research, finance, production, taxes, personnel, equipment sourcing and government regulation; preparing business plans, loan application and loan packaging. There is need to locate these centres as close as possible to the SMEs.
- Institutionalization of regular training for SMEs. Use can be made of universities and polytechnics. Some nations have established specialized centres to offer training to SMEs.
- Establishment of information and referral centres.
- Setting up of incubation centres to spur technological and business developments that are relevant to the local economies. These need to be adjacent to research bodies or universities.
- Establishing industrial parks that are provided with electricity, water and adequate physical infrastructure.

Chapter Five:

Summary, Conclusions and Recommendations

This study focused on the state of industrial technology extension programmes for the small and medium size manufacturing firms in Nairobi, Kenya. The study thus needed to collect information from the firms themselves, governmental agencies, NGOs and tertiary level educational institutions. It was also beneficial to the study to document the promotional programmes for small and medium size firms in other nations. Consequently, there was a case for collecting information from external agencies which deploy extension services for small and medium scale manufacturing firms in other countries.

From this overview of the primary purpose of the study and potential sources of information emerged the specific objectives of the study. To effectively investigate the objectives of the study, a review of the small and medium size enterprise (SME) sector was presented. First the concepts in small and medium size enterprise development and the state of small and medium size enterprise development in Kenya were discussed. These reviews drew heavily from the Government of Kenya development plans and sessional papers. This was followed by discussion of the concepts of technology and technology extension. The review was based on the work of Aduda and Kaane (1999), Röling (1989), Tiffin (1994) and Van den Ban and Hawkins (1996). Finally, selected cases of industrial extension services offered in a number of nations were examined. Data were collected through interviews and questionnaires. Analysis of data was both qualitative and quantitative.

Conclusions

The conclusions which emerged from the findings were:

1. Most of the small and medium size manufacturing firms in Nairobi have not registered with the office of the Registrar of Companies. All medium size manufacturing firms are registered with the Office of the Registrar of companies. The SMEs which are registered with the office of the Registrar of Companies made 37.0 percent of the sample.
2. Most of the small and medium size firms in Nairobi have not registered with trade associations and NGOs. The SMEs are registered with trade associations and NGOs as follows: National Chamber of Commerce and Industry (19.0 percent), Kenya Association of Manufacturers (20.0 percent), Kenya Federation of Employers (10.0 percent) and Kenya Management Assistance Programme (13.0 percent).
3. Most of the owners of small and medium size firms in Nairobi have attained primary and secondary school education. All owners of medium size manufacturing firms have university degrees. Over

- 56.0 percent of SME owners had primary and secondary school education. They have not had any additional training.
4. Most small and medium size manufacturing firms in Nairobi engage in engineering enterprises. SMEs engaging in engineering activities comprised 41.60 percent of the sample. This was followed by textile (20.0 percent) and wood and wood products (12.60 percent).
 5. Most employees in the small and medium size manufacturing firms in Nairobi have attained primary and secondary school education. Approximately 80.0 percent of the employees of SMEs have had primary and secondary education.
 6. Small and medium size manufacturing firms need a range of technology extension services. The study found that there were differences between medium, SME and female owners with regard to the needs of technology extension services. Medium size firm owners put emphasis on linkages to research and development bodies ($\bar{X} = 6.75$), linkages to universities ($\bar{X} = 6.75$), linkages to polytechnics ($\bar{X} = 6.25$) and environmental management ($\bar{X} = 6.00$). When all the owners of SMEs rated the services, the major emphasis was on information on market outlets ($\bar{X} = 6.36$). Female owners of SMEs stressed advice on marketing ($\bar{X} = 6.25$), maintenance of tools and equipment ($\bar{X} = 6.10$), linkages with other firms ($\bar{X} = 6.00$) and information on market outlets ($\bar{X} = 6.00$).
 7. Majority of the small and medium size manufacturing enterprises employ less than 10 workers. Over 70.0 percent of small and medium size manufacturing firms in Nairobi employ less than 10 employees. Only 4.0 percent of the SMEs engage 50-100 employees.
 8. There is a government department which has the mandate of coordinating micro and small enterprise (MSE) programmes in the country. The Department for Micro and Small Enterprise Development (MSED) in the Ministry of Labour and Human Resource Development (MLHRD) has been established to coordinate MSE activities in the nation. Its mandate does not include medium enterprises.
 9. Two government agencies provide technology extension services to small and medium size manufacturing firms. The Kenya Industrial Research and Development Institute (KIRDI) and the Kenya Industrial Estates Ltd (KIE) offer extension services to SMEs. KIRDI is the premier industrial research agency in the country. It offers advisory services to firms which seek them and charges fees for its services. Currently it has offices in Nairobi and Kisumu. KIE provides advisory services to firms which operate from sheds rented from its estates.
 10. A number of NGOs offer technology extension services to SMEs. The major services provided by the NGOs are training and business counselling. Two of the NGOs indicated that they also sell tools and equipment to SMEs.
 11. There is limited collaboration between government agencies and educational institutions on assistance to small and medium size manufacturing firms.
 12. There is limited collaboration between NGOs and educational institutions on provision of assistance to small and medium size manufacturing firms.

13. A number of educational institutions have units for assisting small and medium size firms. One public university, two national polytechnics, two institutes of technology and five technical training institutes indicated that they have special units for assisting SMEs.
14. Training of workers for SMEs, use of NGOs, and provision of extension services at district and divisional levels are preferred approaches to providing technology extension services to SMEs.
15. Resources and organization structures needed to deploy effective technology extension services include: improved workshops, laboratories and equipment; retraining of trainers on entrepreneurship, business planning, business start-up and operations; exposure of trainers and students through attachments; setting up demonstration units; setting up business advisory centres; and development of departments for SMEs.
16. There is a need to review curricula of educational institutions to reflect the needs of industry. Involvement of industry during curricular developments and reviews and in teaching would bring in ideas from the business community and prepare students better for entry into the SME sector. SME owners and workers should also be allowed to undertake programmes for certification.
17. Promotion of linkages between the SME sector and educational institutions through attachments and collaborative research.
18. The nation needs a national technical education policy. The policy should address national and regional skill requirements, certification, training for workers and financing of worker training.
19. Small and medium size manufacturing firms usually need a number of services which need to be addressed simultaneously. SMEs need financial assistance, market outlets, electricity, physical infrastructure and technical skills. Only when these are addressed simultaneously with access to technological information will it be possible to improve the SME sector.
20. Most technology used by SMEs is in embodied form. Kenya imports most tools, equipment and machinery. There is thus little tooling and industrial engineering in the country.
21. SMEs need systematic assistance in managing technology. Small and medium size manufacturing firms need to be assisted in comprehending the dimensions of technology and steps in technology management. The government of Kenya will, like most nations, need to play a major role.

Recommendations

Recommended courses of actions to address the conclusions include:

1. There is need for the development of a database for SMEs in the country. Small and medium size manufacturing firms engage in a variety of enterprises and are at different levels of development. For effective support to be provided to them, agencies deploying technology extension services need easily available information about SMEs.
2. The country should establish small and medium business advisory centres. The advisory centres should focus on: starting and registering businesses; business counselling on marketing, production processes, product quality, equipment sourcing, finance, taxes, business planning and loan application. The centres should also be referral bureaux for consultants and trainers.
3. The public universities, national polytechnics, technical training institutes and institutes of technology should set up SME training units. Public universities and national polytechnics are located in the major urban centres in Kenya. They can thus cater for the training needs of SMEs in major towns.

The technical training institutes and institutes of technology, on the other hand, are widespread and can cater for small towns and rural communities. There is, however, need for staff retraining in business management, technology management and technical skills. There may also be need for upgrading of workshops, laboratories, and tools and equipment in the institutions.

4. Establishment of SME liaison departments in educational institutions and KIRDI. The departments should aim at promoting information flow on SMEs among the institutions, coordinating SME support programmes, coordinating institutional SME activities and linkages to government.
5. The nation needs to institute measures for strengthening public and private industrial research and development. The measures needed to promote research include:
 - subsidy and tax measures to spur private research.
 - budgetary allocation for public industrial research.
 - creation of specialist units within KIRDI to address the various needs of SMEs.
 - strengthening university industrial research.
 - promotion of collaborative research.
 - placement of Kenyan researchers in foreign research institutions.
6. Promotion of linkages among SMEs and between SMEs and large scale enterprises (LEs). Legal and fiscal frameworks governing joint ventures and subcontracting should be created to promote LE support for SMEs.
7. SMEs should be encouraged to form sectoral associations. The associations can address research and development, product quality, environmental management, partnerships, foreign markets, sectorial technological developments, training and skills development, and sectorial technological information infrastructure.
8. Development of a national technical education policy. A unifying system for institutes of technology, technical training institutes, national polytechnics and possibly technical universities is needed. It should also address technical skill requirements by sectors, nation and regions.
9. Development of environmental regulations for small and medium size manufacturing. The proprietors of SMEs, local governments, and the relevant central government ministries and departments should work out minimum acceptable environmental standards for SMEs. Fiscal measures can be used to enhance cleanliness around and in plants and safety of products. Administratively, local governments should address siting of plants, drainage systems and water systems.
10. The Government of Kenya should subsidise NGOs which deploy technology extension services. The need to support NGOs which have promotional programmes for SMEs stems from the instability of their current foreign funding sources. Funding of some pilot projects could be instituted immediately.
11. Establishment of technology extension services at district levels. In urban centres the services should be at divisional levels. Government agencies and NGOs which deploy extension services for SMEs should be as close as possible to the firms. SMEs have limited resources and thus the closer the services are to them, the more they are likely to use them.
12. Universities and polytechnics need to establish incubation centres. The researchers and extension specialists can use these centres to initiate technological change and management changes by

- working with local SMEs in skills development through training, counselling and transfer of technology.
13. Training programmes for technology extension personnel need to be developed. The public universities and polytechnics need to develop programmes aimed at equipping technology extension personnel with the skills of communication, technology management, skills development and business counselling.
 14. Technology information centres need to be set up at district or divisional levels. Centres where technology information can be gathered, processed and disseminated need to be set up as close as possible to SMEs. The centres would also be referral points for consultants, trainers and advisors.
 15. Development of SME master plan to guide the development of small and medium size enterprises in Kenya. There is currently a large number of bodies involved in promotional programmes for SMEs. The SME Master Plan would bring into focus the issues of: short, medium and long-term development of SMEs; the role and developments of governmental agencies, NGOs and trade associations; the technological research and development; training for SMEs; regulations, fiscal policies; urban, regional and district policies on SMEs.
 16. Follow-up studies are needed on:
 - extension services for rural-based SMEs
 - extension services for other urban centres
 - government-NGO trade association interaction with reference to SME development.

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