



The KENYA INSTITUTE for PUBLIC
POLICY RESEARCH and ANALYSIS

Policy Brief

No. 10/2007

improving public policy making for economic growth and poverty reduction

Improving the Technology Competitiveness of Small Enterprises in Kenya

The *Sessional Paper No. 2 of 2005 on Development of Micro and Small Enterprises (MSEs) for Wealth and Employment Creation for Poverty Reduction* singles out restricted levels of technology as one of the major constraints to the growth of MSEs in Kenya. The *Sessional Paper* further states that most MSEs face limitations associated with use of inappropriate technology, lack of information on existing technologies, and inadequate institutional capacity to support adaptation and absorption of modern technological skills. There is also a wide gap between the suppliers of technology and the end users of technology products. In Kenya, effective transfer of technology is limited because decisions relating to most aspects rest with large local firms and multinational corporations, even though these firms have weak linkages with MSEs. Without access to technology, MSEs lack the capability to produce efficiently, meet deadlines, upgrade product quality and evolve new product designs.

Much of the existing technology available to MSEs is not sufficient to produce goods of a quality or type that enables them to break into new, expanding or more demanding markets. This is because choosing a technology requires specific skills and knowledge that MSEs do not have. Making the right technology choice requires capacity to continuously adapt technology to particular needs and continuously improve technology use through innovation. Thus, MSEs need to upgrade their own internal technology effort, which requires innovation. However, innovation cannot be cultivated in isolation but needs a wealth of supporting services, infrastructure, institutions and enabling conditions. Kenya's national innovation systems are weak; science and technology policy does not command as much attention as it should, and institutions of technology are not only under-funded, but are also ill-equipped. MSEs, therefore, operate at lower levels of productivity, competitiveness, profitability and value addition.

This brief discusses issues related to industrial technology, and does not address biotechnology, medical technology, agricultural technology, ICTs and so on. Broadly defined, technology is the science and art of getting things done through the application of skills and knowledge. It is a body of knowledge of techniques, methods, processes and designs. This ranges from the way a product is made and designed, the way raw materials are sourced and used, and how the production line and workshop is designed and structured, how products are distributed and stocked. It also includes how the MSE (micro and small enterprise) is managed and how the various phases of production or departments are interlinked both within and outside the MSE. It should be noted that a new Science and

This policy brief is based on a study on "Towards Technology Models for MSEs in Kenya: Common Principles and Best Practices", KIPPRA Discussion Paper No. 51 (2005) by Eliud Moyi and Peter Njiraini.

Technology Policy is being prepared, though not yet finalized.

Evolution of Industrial Technology Policy on MSEs

There are three episodes that characterize the evolution of MSE industrial technology policy in Kenya: industrial research and appropriate technology (in the early 1980s), market-based incentives (in the late 1980s), and technological capability (1990s onwards).

In the early 1980s, the focus was on strengthening industrial research within the MSE sector. Financial incentives and legislation were applied to forestall the problem of weak industrial research. Thus, institutions such as Kenya Industrial Research Institute (KIRDI), Kenya Industrial Estates (KIE) and Kenya Medical Research Institute (KEMRI) were established to enhance technology development and transfer, standardization, and innovations in industry.

Although the appropriate technology (AT) approach to technology development achieved some success, it has been criticized for having minimal impact on the technological capacity of MSEs in Kenya. It focused on MSEs but failed to narrow the gap between MSEs and larger enterprises. Critics have argued that the AT approach is responsible for the failure of Kenya to develop a technology vision since it was understood not in terms of the capacity to produce market or demand-led products but in terms of older generation or manual technologies. The approach focused on increase of technological development of the country; technological development of MSEs should also have been part and parcel of the overall national technology development plan.

From the late 1980s, the policy focus shifted towards market-based interventions within the MSE sector. In line with market-based structural adjustment reforms, the government's

role became more facilitative. It created infrastructure facilities and an economic environment for business. Policy thrust targeted new innovative production techniques that would

Although the appropriate technology (AT) approach to technology development achieved some success, it has been criticized for having minimal impact on the technological capacity of MSEs in Kenya. It focused on MSEs but failed to narrow the gap between MSEs and larger enterprises. Critics have argued that the AT approach is responsible for the failure of Kenya to develop a technology vision since it was understood not in terms of the capacity to produce market or demand-led products but in terms of older generation or manual technologies. The approach focused on increase of technological development of the country; technological development of MSEs should also have been part and parcel of the overall national technology development plan.

replace imported manufactures, disseminate new technologies, use tender procedures to give preference to MSE bids, and use new building and architectural codes that favour use of MSEs products.

In the 1990s, policies aimed at enhancing technology capability within MSEs were not strikingly different from those of the 1980s. The government encouraged research and development, linkages between small and large enterprises (through sub-contracting), and strong support institutions involved in technology development and diffusion. Another important policy effort was to improve the product and quality of MSEs and exporters through information exchange, jua kali technology support and identification of technological and workforce requirements.

Currently, there are minimal “innovations” in the policy framework, as most of the elements of policy remained generic. Focus remains on enhancement of linkages between small and large enterprises through measures such as business incubation. The new MSE policy has proposed interventions focusing on enhancing the ability of MSEs to adapt and adopt new technology, enhancing the capacity of institutions that support technology development, improving access to information on available technology, and enhancing provision of technological skills. It is important to note that issues such as commercialization of technology, programmes for “technopreneurs”, and technology benchmarking were downplayed in the Sessional Paper No. 2 of 2005.

Industrial Technology Support Institutions

The MSE technology policy should be implemented within an institutional structure. There are many institutions ranging from those providing technology extension, quality and standards, protection of industrial property, innovation and technology development to those involved in policy formulation and planning. Other institutions originate technology policy and play an oversight role, whereas others develop general policies on MSEs. These institutions range from government and quasi-government to voluntary bodies.

Government involvement in technology services for MSEs is usually justified on the basis of the perceived market failure in technology markets. In Kenya, the Department of Micro and Small Enterprises offers technology support services related to capacity building and facilitates linkages between MSEs and technology institutions.

The National Council for Science and Technology (NCST) is the apex body dealing with all technology development issues in Kenya. Among

its key roles include: determining priorities for scientific and technological activities; advising the government on a national science policy, including general planning and the assessment of the requisite financial resources, and ensuring co-operation and co-ordination between the various agencies involved in making the national science policy. However, the Council has poor linkage with industry as very little marketing or commercialization of the research output is done, yet small enterprises have limited access to information on the research carried out. Other important technology institutions include:

- *Kenya Industrial Research Development Institute (KIRDI)*, which offers technology-related extension services to small and medium manufacturing firms in terms of industrial training, consultancy services, product testing, information gathering, processing, dissemination and advisory services. The Institute suffers from lack of market-oriented research, low funding and weak linkages with other research institutions.
- *Kenya Bureau of Standards (KEBS)* is a regulatory body responsible for promotion and enforcement of adoption of standards in industry and commerce to ensure quality improvement, and industrial efficiency and productivity. KEBS has supported MSEs through free quality assurance services, laboratory services, training and advisory services.
- *Kenya Industrial Property Institute (KIPI)*, whose role includes: processing patents, trademarks, service marks, industrial designs and utility models; disseminating patent information; and instituting infringement proceedings in relation to industrial property.
- *NGOs and international organizations*, which promote use of appropriate technology through research, training, advocacy, and dissemination.

- MSE associations also channel technology services to MSEs. They disseminate and enforce a stock of common quality, standards, rules and norms; disseminate technical knowledge; provide a forum for technological learning; and, function as channels through which local producers acquire crucial tacit knowledge for local adaptation, either directly or indirectly. Evidence shows that only about 22 per cent of MSE associations provide technology services. This is because most associations are formed for social welfare rather than advancing business interests of MSEs.

Technology Acquisition and Use Among MSEs

Three factors underline technology capability among enterprises: creation and use of technology; technology infrastructure; and development of human skills. One of the main areas in which MSEs are seriously constrained is in technology use and creation. About 93 per cent of MSEs in Kenya have never received advice on technology from any source. This shows that both public and private outreach activities in the technology area remain fairly shallow.

Whereas the world is rapidly changing towards knowledge-based technologies, Kenyan enterprises are still straddling between either labour-intensive or capital-intensive technologies. Technology used by Kenya's MSEs is mostly embodied in form of tools, equipment and machinery, with little industrial engineering. The only disembodied technology is in form of licensing, consultancy and management. Most MSEs rely more on human-powered machines compared to animal powered, fuel powered and electric machines. The machines used by MSEs are mostly outdated or belong to what has been referred to as "third and fourth generation technologies". They use recycled and reconditioned tools and equipment. In addition,

the practice of purchasing old machines and adapting them to their production requirements is prevalent within the sector. One of the main methods used for technology choice in MSEs is simple imitation based on observation.

Whereas the world is rapidly changing towards knowledge-based technologies, Kenyan enterprises are still straddling between either labour-intensive or capital-intensive technologies. Technology used by Kenya's MSEs is mostly embodied in form of tools, equipment and machinery, with little industrial engineering. The only disembodied technology is in form of licensing, consultancy and management. Most MSEs rely more on human-powered machines compared to animal powered, fuel powered and electric machines.

Problems Associated with Technological Support for MSEs

Policy framework: Most policy pronouncements by Government regarding technology are not implemented. Therefore, there exists a huge gap between policy formulation and implementation. This makes it difficult for MSEs to take advantage of the competition resulting from liberalization of markets and economies. The country lacks a national, coherent and comprehensive science, technology and innovation policy to guide technology-relevant decision making. The Science and Technology Act is over 20 years old and does not take into account current developments in information technology and biotechnology. Kenya has not designed a vision on technology for MSEs.

Technology support institutions: Although the National Council for Science and Technology

was established to assess and advice on the adequacy of scientific and technological research and development carried out in the country, its links with industry are extremely weak. Very little marketing or commercialization of the research output is done, and small enterprises have limited access to information on the research carried out. The location of the Council in Nairobi limits access to its services.

The activities of the Kenya Industrial Research Institute are limited in a number of ways: lack of market-oriented research and development activities, low funding levels, inability to attract high caliber staff, and weak linkages between Research and Technology Organizations (RTOs) and MSEs, and between the RTOs. Funding for the Kenya Industrial Estates (KIE) is low and can no longer sustain business incubation services. In addition, privatization of the sheds lowered the oversight role of KIE over the individual business persons.

Intellectual Property Rights (IPRs). These aim to foster innovation in the private sector

by allowing inventors to benefit from their inventions. Instruments of IPR, such as patents, copyrights, trademarks and trade secrets enhance competition and the working of technology markets. The role of the Kenya Industrial Property Institute (KIPI) in protecting IPRs is weak. In Kenya, small firms are involved in practices where they copy new innovations without regard to regulations and standards on the IPRs.

Creation and use of technology: The productive and investment capability in the MSE sector is weak due to high costs of importing equipment, shortages of machine components and parts, limited availability of process machinery and low sophistication of production processes as well as other factors related to relatively lower levels of firm level technology absorption. In addition, the capacity for innovation is weak due to low incentives for research and development (R&D), weak university-industry linkages, inadequate supply of technical personnel, and low priority by government on information and communication technology.

Electricity and telephone: Most modern technologies are based on electricity yet half of the MSEs operate on worksites without electricity and only a third of MSEs have access to telephone. Power interruptions serve as a serious constraint to the operations of urban enterprises. About 56 per cent and 36 per cent of urban firms have access to electricity and telephone, respectively. Accessibility of MSEs to government technology extension services is limited by their informality and low educational achievement.

Development of human skills: An important prerequisite of technology capability building is a labourforce that can select, install, maintain, assimilate, design, manufacture and even create technology. In Kenya, this professional cadre consists of artisans, craftsmen, technicians, technologists and engineers trained in the

Most policy pronouncements by Government regarding technology are not implemented. Therefore, there exists a huge gap between policy formulation and implementation. This makes it difficult for MSEs to take advantage of the competition resulting from liberalization of markets and economies. The country lacks a national, coherent and comprehensive science, technology and innovation policy to guide technology-relevant decision making. The Science and Technology Act is over 20 years old and does not take into account current developments in information technology and biotechnology. Kenya has not designed a vision on technology for MSEs.

Technical Industrial Vocational Entrepreneurship Training (TIVET) and at universities. First, there is lack of a coherent national strategy and a focused policy framework. There are about 10 different ministries dealing with different aspects of TIVET. This has resulted in poor co-ordination due to overlapping functions.

Second, most of the public training institutions have experienced low enrolment capacity and effectiveness due to under-investment and policy neglect. They have obsolete facilities, equipment, curriculum, instructional capacity and quality. Although many firms have lost confidence in public training institutions, the role of the private sector in providing TIVET has not been adequately tapped.

The links between industry and public training institutions (through support for apprenticeship and attachment training, curriculum development and sponsorship) are very limited. The skill needs of MSEs are not being adequately met by the existing TIVET system. The statutory apprenticeship scheme, which was an important source of skills for the informal sector, is practically not functioning. Similarly, Youth Polytechnics (a major source of skills for school leavers) are under-funded. For instance, by 2003, out of 600 youth polytechnics under the Ministry of Labour and Human Resource Development, around 40 per cent did not receive financial support and were supported either by NGOs, churches or through "harambee".

Technology transfer: Technology transfer in the sector is mainly through purchase of plant, machinery, tools and equipment. Other modes are training, labour turnovers and factory visits. The most documented informal channel of technology transfer is through imitation. There is limited evidence on the role of licensing as a channel of technology transfer among MSEs. Thus, much more work is needed to understand the role of licensing in MSE technological development.

The skill needs of MSEs are not being adequately met by the existing TIVET system. The statutory apprenticeship scheme, which was an important source of skills for the informal sector, is practically not functioning. Similarly, Youth Polytechnics (a major source of skills for school leavers) are under-funded. For instance, by 2003, out of 600 youth polytechnics under the Ministry of Labour and Human Resource Development, around 40 per cent did not receive financial support and were supported either by NGOs, churches or through "harambee".

Conclusions and Recommendations

Technology support to MSEs can be delivered in different forms, ranging from specific and targeted programme support to government policy directions. However, the following policy recommendations can be drawn from the above analysis.

Strengthen the public policy implementation framework: This should take the form of instituting a proper mechanism for co-ordinating technology programmes, and monitor and evaluate technology policy implementation. The oversight role of the National Council for Science and Technology should be upgraded by requiring it to install a co-ordination framework that ensures effective reporting, evaluation and monitoring of technology initiatives in Kenya. Such a framework should be integrated within the broad national M&E framework.

The implementation of public policy can also be enhanced through effective policy advocacy by MSE associations. Associations play the role of organizing MSEs so that they can increase their bargaining power through advocacy and lobbying.

Associations can also act as intermediaries between individual business actions and state actions.

Increase funding to technology institutions: There is need for increased funding to technology institutions to enhance their role in managing public technology extension and programmes. This will enable them to also play an effective role in designing and managing technology incentives programmes.

Improve the productive and investment capability: This could be achieved by lowering the costs of importing equipment, plant, machinery and tools by designing proper technology incentive schemes and programmes. Such programmes could take many forms, including direct subsidies and tax credits (for technology licenses and for firms importing new plant, machinery, tools and equipment), affirmative policy to favour small enterprises in public procurement, R&D support, and innovation grants. Best practices support direct subsidies (as in Singapore), affirmative policy in public procurement (as in Brazil) and financial support to R&D (as in UK). In the US, firms are eligible for tax credits for research and experimentation, and innovation research grants. In Mauritius, the government runs product and process development grants for the development of new products.

Enhance access to electricity: The National MSE Fund should be used to fund electrification and telephone access, especially in areas where there are MSE clusters. Clusters are known to enhance the collective efficiency of enterprises by allowing them to reap scale economies in accessing technology support services.

Improve the TIVET system: Although *Sessional Paper No. 1 of 2005 on Policy Framework for Education Training and Research* provides some proposals on how to revitalize the TIVET system, there is need to strengthen its co-ordination by

developing a coherent national strategy. Such a strategy should provide clear directions in terms of redressing low enrolments, under-investment, the role of private sector, relationships between industry and training institutions and so on.

Promote inter-firm technological transfers: Linkages between technologically-superior firms and technology laggards is an effective way of helping resource-constrained MSEs to access foreign technology. Such linkages could be promoted through incentive programmes (for instance through tax rebates) that encourage large firms to sub-contract small enterprises. Transfers could also be strengthened through the public procurement system. This would require that a large firm is awarded a technology contract on the requirement that y per cent of the contract will be sub-contracted to small enterprises. Alternatively, the technology contract could require purchases of x per cent value of the intermediate inputs from MSEs. It is, however, important to guard against stringent requirements being imposed on the sub-contractors by the prime contractors. Where compulsion is not appropriate, the government can use incentives such as "Awards of Distinction or Awards for Excellence" to large enterprises that have established sub-contracting arrangements with small enterprises technology.

Linkages can also be enhanced by promoting the establishment of technology parks and business incubators. These institutions/organizations promote the link between the creators and suppliers of technology (universities and research institutes) with the consumers of such innovations (businesses). Incubators also provide infrastructural support to small enterprises.

Finally, linkages could be strengthened through exchange programmes and factory visits. This is critical in imparting best practices,

capacity building and exposure to marketing and technology enhancement strategies.

Promote research and development: Most of the innovations are a product of research and development. Innovative and competitive firms spend a considerable proportion of their revenues on R&D. Alternatively, firms depend on publicly supplied research and development. Public support towards research and development should be enhanced by initiating programmes that recognize professors (scholars) who develop processes or products for use by MSEs. Firms should be encouraged to invest more resources towards R&D.

Encourage intellectual property protection: Intellectual property rights aim to foster innovation in the private sector by allowing inventors to benefit from their inventions. Instruments of IPR such as patents, copyrights, trademarks and trade secrets enhance competition and the working of technology markets. In Kenya, small firms are involved in practices where they copy new innovations without regard to IPRs regulations and standards. Small firms should be helped to understand the role of IPR and how they can make use of the Kenya Industrial Property Institute to protect their IPRs. In this regard, KIPRA should be supported to extend their outreach activities to MSEs.

Identify technopreneurs through mentoring programmes: Technopreneurs are the people that drive technology markets and come up with new ideas and innovations. Since such people are only a small proportion of the market, targeted programmes should be designed using incubation and mentoring approaches to support the development of technopreneurs. This should be mainstreamed into Kenya's technology vision.

Enhance the role of metrology and standards: In countries such as Mauritius, firms report higher technological development scores mainly due to the pressure to conform to ISO 9000 standards. The Kenya Bureau of Standards should design outreach programmes for small firms to enable them conform to global standards that improve prospects to be competitive.

Deepen market forces: Studies have shown that market-led approaches (through linking MSEs as suppliers and the consumers of their products, and undertaking needs assessments to identify technology gaps) perform better in helping small enterprises to access technology extension services. Policy should encourage the deepening of input, intermediate products and output markets as well as technology markets, for instance, by promoting innovation fairs.

About KIPPRA Policy Briefs

KIPPRA Policy Briefs are aimed at a wide dissemination of the Institute's policy research findings. The findings are expected to stimulate discussion and also build capacity of public policy makers in Kenya. KIPPRA acknowledges support from the Government of Kenya, the European Union (EU), the African Capacity Building Foundation (ACBF), and all other development partners who have supported the Institute's activities.

For More Information Contact:

Kenya Institute for Public Policy Research and Analysis
Bishops Road, Bishops Garden Towers
P.O. Box 56445-00200
Tel: 2719933/4, Cell: 0736712724, 0724256078
Nairobi
Email: admin@kippra.or.ke
Website: <http://www.kippra.org>