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Technology Support for Small Industries in Developing Countries: From 'Supply-Push' to 'Eightfold-C'

Henny Romijn *

The paper is a review of approaches towards technology support for small-scale manufacturing enterprises in developing countries since the 1970s. Early programmes tended to suffer from a number of weaknesses, emanating from inadequate conceptualisation of small firm' competitiveness and the role of the small-scale sector in industrial development, as well as from lack of practical experience with project implementation. However, in recent years important advancements have been made on all these fronts. The paper discusses eight characteristics of recent technology assistance programmes that have tended to be associated with project success. Broadly, successful projects are those that embrace the notion that durable competitiveness of small producers in a competitive economic environment requires that they develop internal capabilities to effectively asssimilate, use, and adapt product and process technologies on an ongoing basis.

Key words: technology support, small-scale enterprises, technological capability, competitiveness, assistance projects, industrialisation.

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* Queen Elizabeth House, University of Oxford

1. INTRODUCTION

Small enterprises (SEs) typically make a much larger contribution to manufacturing employment in poor countries than in economically advanced ones. An estimated 63 percent of manufacturing employment is generated by *registered* firms with fewer than 100 employees in countries with an average income per capita between US$ 500 and 1000. The percentage is close to 40 percent in countries with average incomes between US$ 1000 and 2000 (Gillis *et al.* 1996, p. 496). These figures still grossly underestimate the true state of affairs, since very large numbers of small firms are not part of the formal economy.

However, the developmental contribution of the great majority of these manufacturing SEs is limited to generating subsistence employment 'of last resort'. Hence, in the face of fast labour force growth and limited employment absorption in the modern large-scale sector, developing country governments have been under acute pressure to mount efforts to improve productivity and earnings in these enterprises. Since the early 1970s, this has spawned a plethora of policies and programmes, and an almost boundless literature documenting these.

In this write-up we review one subset of this literature, namely studies that shed light on policy measures aimed at strengthening *competitiveness* through improved *technological performance* in SEs involved in manufacturing activities. Technology is considered to be an important determinant of small manufacturers' ability to compete in the context of economic liberalisation and increasing global integration of developing countries. This is because many of their markets, even traditional ones, are undergoing fast change. In this situation, lack of capability to adapt and upgrade spells defeat, while firms that are capable of keeping up with, or even initiate improvements will have an edge over competitors. SE competitiveness is of course affected by a large number of other important factors, such as the exchange rate or government subsidies. However, these remain outside the purview of this paper.

The main objective of this paper is not to *describe* the content of different assistance programmes that have been implemented in various countries. Such a task would be endless. Moreover, one cannot learn much from an enumeration of mere facts. The purpose here is, therefore, to look behind the facts – to the extent that the available evidence permits – and to identify which approaches have worked and not worked, and why.

The review has some limitations in terms of its coverage. Its main focus is on programmes and projects with a *direct* technological content, such as development and commercialisation of appropriate technologies, provision of technical extension services and

technical training. It does not deal with financial support schemes, even though these are very common in developing countries. However, SE financing can be given for a number of purposes, among which technological performance improvement is only one – and often not the most important one. There is one notable exception, namely venture capital for high-tech SEs, but this aspect is not covered in depth. Such schemes have begun only recently, are still experimental in nature and generally modest in scale, and exist only in a limited number of developing countries. They assume importance in advanced NICs such as South Korea and Taiwan, but less so in lower-income developing countries.[1]

2. IMPORTANT CHARACTERISTICS OF SMALL ENTERPRISES

Before embarking on a policy discussion, it is necessary to highlight some salient characteristics of SEs in developing countries that are important in the context of this review. Some degree of generalisation is inevitable here. In developing countries the SE sector predominantly consists of poor and primitive firms that are constrained in their day-to-day functioning by the lack of all sorts of inputs and facilities. The sector is typically dominated by large numbers of self-employed workers and very small family-run 'micro-enterprises', many of which operate in the informal sector. In African countries, the bulk of the SE sector consists of these types of 'firms'. However, these activities will *not* be the main focus of this review, because the support programmes mounted for them have tended to be much more focused on poverty alleviation than on business growth.[2] Support aimed at technological development has not been a very prominent form of assistance for this group.

The most important group of SEs for the purpose of this paper is constituted by the substantial numbers of formal small-scale firms employing, say, between five and 50 people, including some hired labour. These types of firms are very common throughout the developing world, especially in Asia and Latin America. But even such small-scale companies operating in the formal sector are best typified as 'small workshops', whose managerial practices and technological characteristics are worlds removed from those of modern large companies. They tend to be engaged in well-established or even traditional activities. Except in some of the Asian NICs, few SEs are in the forefront in new high-tech sectors, and only a small minority engages to some extent in formal R&D. This contrasts with the situation in developed economies where many small companies make significant contributions to the generation of innovations (e.g., Cosh, Hughes and Wood, 1996; Rothwell and Zegveld, 1985), and where

small firms staffed by educated professionals are well represented in new, knowledge-based industries such as information technology and biotechnology.

Researchers have often commented on the underdeveloped state of a dynamic modern small and medium-sized industrial segment in developing countries, especially in Africa. Here, the dualistic industrial structure is so obvious that the term 'missing middle' has been coined to capture it. There is a large degree of internal heterogeneity among SEs, but on the whole the SE sector in developing countries is economically and technologically backward and disadvantaged relative to firms in the large-scale modern sector, and it is usually quite obvious in which side of the spectrum a firm belongs. The cut-off point for the SE sector is usually somewhere in the range of 50 employees, or 100 at the most.

3. EARLY PROGRAMMES

The SE sector was firmly put on the mental map of LDC policy makers in the 1970s, as part of a general disenchantment with industrialisation strategies favouring top-down modernisation through concentration of investment and expansion of the modern large-scale sector that had been pursued in the 1950s and 60s. As the benefits of 'trickle-down' were apparently limited, income-creation approaches based on direct targeting of poorer sections of the population gained widespread favour. The International Labour Organisation took the lead in documenting the precarious position of those working in small (including informal) enterprises, and the serious constraints faced by them (e.g., Sethuraman, 1981).

Therefore, it is not surprising that the early technology support programmes designed for SEs predominantly adopted a 'supply-push' approach (UNDP *et al.,* 1988). It was thought that the availability of a variety of services would help overcome their resource constraints and thereby help them to strengthen their competitiveness. Many countries set up state-run small and medium enterprise development organisations (SMIDOs) that were charged with the task of providing these services, which covered such aspects as technical and management training, marketing assistance, advice about technology choice, assistance with technology procurement, provision of subsidised finance and so on. The aims of these programmes were generally broader than technological upgrading alone. In addition, there were a number of bodies, both state and NGO, that were focusing more specifically on technology support. There have been some good results from these programmes, but they were also beset with a large number of problems. Here, we only discuss some issues that bear closely on

technological support specifically. Inevitably, we have to employ a very broad brush approach which does not do justice to the specificities associated with particular programmes and variations in conditions across different countries.

(a) Primitive notion of SE competitiveness

To begin with, the conceptual framework underlying these programmes was somewhat primitive. The term 'competitiveness' was based on the standard textbook neo-classical model, in which economic performance of firms is a function of their costs and prices in a static framework in which technology is exogenous. According to this framework, the precarious existence of many SEs was largely due to the fact that larger firms could be expected to be more efficient as a result of economies of scale and the use of more modern and productive technologies. The question whether small enterprises were able to operate efficiently at all was hotly debated. A number of studies were conducted that attempted to find evidence in favour of the SE case, or vice versa, depending on the ideological bent of the researchers (e.g., Little *et al.*, 1987; Goldar, 1988).

On hindsight, one can see that the conventional textbook conceptualisation of the firm was somewhat harmful because it prevented researchers and policy makers to explore approaches that did not match this model. This is noticeable from the fact that these older studies invariably judged SE competitiveness by formally comparing relative costs and prices of *individual* firms of different sizes. In other words, there was no recognition of potential competitive advantages that might accrue through exploitation of cluster or network effects among groups of small firms. Another problem with the early approach was that the preoccupation with the problematic horizontal (competitive) relations of SEs with their larger counterparts to some extent prevented researchers and policy makers to probe for growth possibilities for SEs through development of *complementary* (vertical) relations with these firms, although some notable exceptions did exist.[3]

(b) Technology equates machines

Another limitation of the early programmes was that they conceptualised technology primarily as *machinery and equipment*, in line with the current thinking in the literature about technology and development in the 1970s (e.g., Sethuraman, 1977; Harper, 1984). Thus, the

main aim of the programmes at that time can be seen as bolstering the competitive position of individual small firms relative to larger ones through the adoption of more efficient 'hardware', with which they could lower their cost of production and/or improve the quality of their products. The underlying assumption was that a one-time injection of improved technology would be sufficient for strengthening the competitive position of SEs in the economy. Needless to say, such a one-time injection is useful, but by itself it is inadequate. Competitiveness should derive from SEs' capacity or capability to absorb and improve process and product technology on an *ongoing* basis. Yet, some useful lessons can be drawn from these early programmes, which are discussed below.

(c) 'Appropriate' technologies and their limitations

The question as to how SE technology (as defined above) could be improved in the best way led to a big debate. Some claimed that the lack of competitiveness of SEs was mainly caused by the fact that efficient technologies suited to small-scales of operation did not exist.[4] Others tried to show that such technologies did indeed exist in several industries, but that there were serious disincentives to their adoption (Stewart, 1977; Bhalla, 1985). These emanated from distorted factor prices (especially in the form of heavily distorted allocation of credit in favour of the large-scale sector and overvalued local currencies), and a variety of other unfavourable macro-economic policy variables favouring demand for products made by large modern firms (such as product standards based on developed country conditions, unequal land ownership and so on) (Stewart, 1987; Stewart and Ranis, 1990; Haggblade *et al.*, 1990).

Both arguments carried some weight. The first one led policy makers to promote research in science and technology (S&T) institutes aimed at the development of small-scale efficient technologies. Much was written about the different options that could be used for achieving this, namely downscaling of large-scale modern technologies, upgrading traditional technologies, or blending modern with traditional technologies (see, e.g., Bhalla *et al.*, 1984; James, 1989*)*. Foreign donors were also much involved in these types of projects. This was the golden age of the Appropriate Technology movement.

This approach gained a degree of success, but there have also been many failures. Many so-called 'appropriate' technologies failed at the commercialisation stage. One big lesson had to be that technology development in the public domain and its subsequent diffusion to the private sector in top-down fashion was not an effective model.[5] Many

scientists of the technology institutes were competent engineers, but they knew little about the requirements of poor producers and communities, were usually located far away from them, and had little awareness about the importance of socio-economic variables. Even where that was not the case, significant communication barriers between developers and prospective users tended to preclude effective exchange of information. Incentive structures in these institutes did not favour such unprestigious research activities either (see below).

The success cases (which were mainly situated in East Asian countries such as Japan and China) highlighted that technologies have to be developed in close collaboration with the prospective users through a process in which these users can take significant control over the direction of the project and in effect assume ownership of the technology. Another essential condition for success is that equipment producers (i.e. capital goods makers) have to be involved at an early stage of development, since these actors (rather than the users or the technology institutes) have to take care of repair, maintenance, replication, and modification in the light of practical experience by the users. Technologies are rarely perfect when they come 'off-the-shelf'. Often, several rounds of forward and backward feedback of information between developers and users are needed to improve and adapt them in iterative fashion. For this reason, the best technology development model appears to be one which involves close and ongoing interaction between users, institutes and producers as equal partners with complementary knowledge and skills.[6]

(d) Lack of incentives and competitive pressures for SEs

There were other major design and implementation flaws associated with many of these early programmes, and it has to be noted that some programmes that are currently running are still suffering from these problems. Supplying crucial missing ingredients to SEs is a good thing in underdeveloped economies where well functioning markets for essential services rarely exist, but in practice it has all too often bred complacency among the recipients. There were cases where small entrepreneurs took the assistance for granted simply because they belonged to the underprivileged SE class.

But even in cases where entrepreneurs genuinely appreciated the support they were receiving, results have often been disappointing. This has been especially the case when insufficient attention was paid to *market incentives* that would induce small entrepreneurs to take up the assistance and make good use of it, and when *market pressures* on the firms were

simultaneously removed. Incentives and market pressures are absolutely essential for ensuring success in technology support programmes, not only because they spur people into action but also because they give concrete direction to their efforts and guide them towards identifying what specific support they need. We will come back to these issues in the next section.

(e) Problems with the functioning of institutions

Generally there have also been big problems with the incentive structures in the institutions providing the assistance. Providing support for small enterprises in developing countries is not as rewarding and glamorous as assistance to bigger business. It is less visible, does not bring political influence or important contacts, and much effort has to be put in to achieve good results. Not surprisingly, the most successful technology support projects have involved highly committed individuals who were not primarily driven by high monetary rewards.[7] In addition to lacking incentives, many programmes have lacked sanctions on bad performance. State-run or parastatal organisations were commonly functioning with 'soft budget constraints' and did not have to rely on commercial sources of revenue for their continued existence.

There have also been organisational problems. Assistance to SEs usually has to involve groups of them in order to be worthwhile. Organising and interacting effectively with groups is difficult, especially when institutions are geographically some distance removed from the SEs. Communication and effective interaction with small entrepreneurs is also difficult because of class and education differences between assistance providers and the entrepreneurs. On top of all this, staff of technology institutes has sometimes lacked the required education and experience, and it has been difficult to attract more talented and capable individuals because of the unattractive salaries and career options.

The SMIDO programmes have had even more modest results than the programmes run by specialised technology development institutes and NGOs, and it is not worthwhile to dwell much on their role and functioning. Their activities and performance have been evaluated in many studies, including several studies commissioned by aid donors that were supporting these organisations.[8] They suffered from similar incentive and organisational problems as the technology institutes. However, in addition they lacked effectiveness because of their wide coverage, both in terms of the nature of the business activities they promoted and the types of the services provided. The manpower tended to be more generalist than specialist. The role of these institutes was not to develop appropriate technologies themselves, but rather to provide

assistance with choice, procurement and financing of equipment for new ventures, and sometimes also provide management and technical training and consultancy. More often than not, the technology choices were not guided by sound knowledge of the relevant options and their (lack of) suitability in the local situation, and the new ventures were often run by inexperienced entrepreneurs. The repayment record of the financing schemes, based on soft loans, tended to be quite bad. Training was often modelled on approaches suited to more developed countries, emphasising formal off-the-job education that was insufficiently geared to the specific technical bottlenecks that individual enterprises might be facing.

(f) The lack of a conducive macro-environment

The 'macro-incentives approach' to technology improvement mentioned earlier gained considerable influence in the 1980s, a bit later than the appropriate technology approach. A series of studies was undertaken which linked inappropriate technology choices to biased incentive structures emanating from adverse macro- and 'meso'-level policies that were commonly pursued in developing economies in the 1970s. Its arguments shed much light on why the effectiveness of the early SE programmes remained so limited. It is probably true that the lack of success of these programmes can be traced as much to problems in the general economic and institutional environment in which they had to function as to flaws in conception, design and implementation at the micro-level.

In particular, the problem of lack of market opportunities faced by SEs referred to above, was at least partly caused by the general economic malaise and the lack of growth possibilities for small companies in many economies pursuing import-substitution strategies that favoured modern, large-scale forms of production. Highly overvalued local currencies and cheap credit made it very attractive for large import-substituting companies to establish highly capital-intensive and integrated production facilities. This was so even in industries that are characterised by a very high divisibility of tasks in the production process, such as manufacturing of automobiles, trucks and tractors and electric consumer goods. In an environment where capital goods were so cheap, there was little incentive to establish backward linkages to local companies, even though countries commonly tried to encourage localisation through a variety of tax and financial incentives and local content regulations. The impact of these policies has generally been very modest. Few policy makers understood that the Japanese success in establishing elaborate and dynamic subcontractor networks was first

and foremost driven by an extreme capital scarcity in the economy, which affected even the largest *keiretsu* (Watanabe, 1983).

To the extent that the approach advocated 'to get the prices right', it tied in well with the sort of reforms that countries had to introduce when they embarked on structural adjustment. However, the approach went well beyond pointing towards biased factor prices. It also drew attention to major institutional, legal and structural constraints that prevented the SE sector from flourishing, and that could not be remedied quite so easily.

(g) Lack of integration of SEs in countries' overall industrialisation strategies

The macro-incentives approach was particularly useful because there was but a dim awareness about how the SE sector was linked to, and affected by what was happening in the economy in general. Curiously, the huge numbers of studies about small-scale enterprises and the informal sector that were generated in the 1970s never made any mention of the formal industrial sector, while studies about countries' industrialisation in general in turn tended to disregard the SE sector.

This lack of integration in research had its effect on the policy level. Policy makers generally did not properly integrate the promotion of their SE sector within their broader industrialisation strategies and objectives, almost as if it was existing in a vacuum. Recently, one can see some signs of positive change in this respect in middle and higher income developing countries of Asia and Latin America (see next section), but the problem remains acute in many low-income African countries even in the 1990s. For example, King observes about the Kenyan situation that:

> *…the conceptual separation of Kenya's industrial policy from its micro and small-scale policy development is unfortunate. What is noticeably lacking is a consensus at the highest level in Kenya about an industrialisation policy that moves the country ahead to a next and more competitive stage of manufacturing intermediate goods, but at the same time makes the micro-enterprise world an integral part of that industrial project.* (King, 1996, p.200)

The SE sector received even less attention in countries' science and technology (as distinct from industrial) policies:

> *Governments and aid agencies have historically concentrated their efforts … on building up the science and technology infrastructure in the formal education system and in government R&D institutions…. For many developing country governments and aid agencies, S&T policy had become equated with activities exclusively in the public sector, and is modelled on S&T institutions in industrialised countries that exist in a quite different context. … In consequence there has been a major under-investment over many years in essential parts of the innovative process located in firms and on farms.* (Barnett, 1995, p.20)

This was (and still is) a serious situation because the bulk of science and technology development in less developed countries takes the form of incremental applied and informal adaptations and improvements made 'on the shop floor'. Technology institutes are most useful if they support and enhance that process, rather than conduct prestigious but expensive basic research.

Unfortunately, only a few developing countries have recognised these basic facts and have modelled their S&T policies in full support of their broader industrialisation strategies, notably the fast industrialising countries in East Asia (especially South Korea and Taiwan).[9] In other developing countries, S&T policies and strategies have historically hardly intersected with the socio-economic objectives of industrial strategy, let alone that they would pay any attention to the technological requirements of *SEs* in that process. Many countries still suffer from such legacies, even those that have made a serious effort at reforming their industrial policies to incorporate the SE sector.

Nigeria is a good example of such a case. A number of useful measures were recently introduced in this country as part of its industrialisation strategy to strengthen the technological position of the SE sector, including practical support for capability building through training and technical consulting services, and a programme promoting industrial use of indigenous raw materials. Yet, its S&T policy is still based on its pre-structural adjustment National Development Plan of 1981-85. Its objectives are vague and lack any degree of operationalisation. It aims, among other things, '… to increase public awareness in S&T and their vital role in national development and well-being; to direct S&T efforts along identified national goals; … to create, increase and maintain an indigenous S&T base through research and development, and … to strengthen the technological base of the nation' (Oladeji, 1998, p.129).

4. TOWARDS A DYNAMIC CONCEPT OF SE COMPETITIVENESS

Practices and policies for technological upgrading of SEs have moved forward in recent years, especially in the 1990s. We start by examining the changing notion of SE competitiveness. In the next section we look at the effects of this, and of the lessons learnt from failure at the project level during the previous period (already described above), on the design and implementation of recent technology support programmes in different developing countries.

One can clearly discern an influence of the major changes in the economic policy climate that have occurred since, roughly, the early 1980s. In particular, we should mention the ascent of neo-liberal thinking which de-emphasised state involvement in the economy, spelled the demise of inward-looking approaches to industrialisation, and advocated increased openness to trade and foreign investment. The effects of these policies on local industrialisation have been varied. Some of the relatively advanced developing countries in East and Southeast Asia and Latin America are increasingly being integrated in large regional and/or global trade and production networks that are steadily growing in importance. In contrast, in many of the truly low-income economies, where the adoption of outward-oriented policies took place in the context of heavy structural adjustment programmes, industrial development has suffered. Sub-Sahara Africa's share in global manufacturing, already very low with 0.4 percent in 1985, declined to 0.3 percent ten years later (UNIDO, 1996, p.22). Some writers claim that substantial de-industrialisation occurred in the region, although the evidence on this is not entirely conclusive.[10]

In either case, however, the old static notion of SE competitiveness proved increasingly inadequate in the context of the big shift in countries' macro-economic climate and the forces of global integration and marginalisation. One can notice important common elements of change in the literature about small enterprise development across major regions. In particular, the old view that SEs could improve their competitiveness by adopting technical improvements made by other actors is slowly beginning to be replaced by the notion that enduring competitiveness has to depend much more on their own internal capacity to make an independent and unique contribution to local technical progress. This is happening in Asia, Latin America and Africa alike, although there are major inter-regional differences as well.

(a) The East Asian NICs: Systemic competitiveness based on technological capability

The shift is most drastic in the most advanced and fast-industrialising developing economies of Asia and Latin America (especially the East Asian NICs) where one can see a growing realisation that the role of SEs has to go well beyond employment creation for the poor. Rather, they have an essential role to play in the context of their export-oriented industrialisation drive and their increasing participation in international trading and production networks. In the dynamic industrial environment of these countries (until 1997 at least), one notices that *SE competitiveness begins to be perceived as an integral part of industrial competitiveness as a whole*. This is mainly because of the perceived *complementarity* of the activities that large and small firms undertake. The emphasis is on the need for local specialist suppliers that can supply products and services to customers downstream in the 'value chain', react quickly and flexibly to their changing requirements, and begin to play a role in the design and implementation of technological improvements. Thus, SE competitiveness is increasingly being perceived in terms of their *internal capabilities to choose, use, adapt and develop technology*. Such capabilities are a must in order to become, and retain competitiveness in a fast-evolving environment which continuously places new demands upon large and small firms alike (see, e.g., the studies in Meyanathan, 1994; and UNIDO, 1996, pp. 53-6)

By moving in this direction, the SE literature about this region is beginning to link up with the large body of literature about technological learning, industrialisation and development that began to emerge since the late 1970s. This literature largely replaced the old static technology-choice framework discussed in the previous section. The basic point of departure in the 'capability literature' is that the existence of adequate local skills and knowledge for incorporating more advanced technologies in developing countries cannot be taken for granted. Whereas technological hardware (machines and equipment) can be transferred, the capability to make use of that hardware cannot be transmitted so easily. It has to be developed through a gradual learning process, resulting from purposive efforts to assimilate, adapt and modify technology. Many of these efforts take the form of small improvements 'on the shop floor', rather than formal R&D. With the advent of the capability literature, the study about technology and development changed significantly in terms of focus. In contrast to the earlier technology choice literature, it views technology primarily in terms of *human knowledge and skills* rather than *machines,* and it views technology as an *endogenous factor* within firms and developing countries more broadly.[11]

The trends towards a more dynamic interpretation of SE competitiveness in line with this body of literature are evident even in countries like South Korea and Singapore, whose earlier policies were heavily biased towards the promotion of large-scale firms. There was a remarkable shift in their policy-stance after they began to experience the difficulties associated with advancing into higher-technology-based manufacturing without an extensive local subcontractor network of SEs (see Wong, 1994; Lee, 1992; Lee, 1991; Leipziger and Petri (1993); Chon, 1996; Baek, 1992; Cho, 1995; and Chung and Park, 1998). Korea in particular was (and still is) highly dependent on Japan for imports of a variety of crucial parts and components in the electronics industry. Not only has this led to a large trade imbalance between the two countries, but it also does not meet the Korean companies' increasingly specialised design requirements. The Japanese are also increasingly unwilling to supply Korean firms on good terms and according to their needs, as they are increasingly perceived as competitors in the race for a good slice of the electronic components market. An even more serious problem is that in these high-tech industries, most of the advanced capabilities are actually built up in the small supplier companies. Only about 15 per cent of the product value is added in the assembly stage. Backward and inefficient parts suppliers thus leads to high costs of production for the assemblers downstream, and (even more crucial) it also holds up the design-improvement process (Chon, 1996).

(b) Middle-income Asia and Latin-America: Dynamism in SE clusters

A growing concern with the *internal economic dynamism* of the SE sector is also noticeable in recent literature about middle-income developing countries in Asia and Latin America, such as Pakistan, India, Indonesia, Brazil, and Mexico and Peru. However, rather than emphasising the integral, systemic nature of SE competitiveness as in the East Asian cases, most of this literature has been primarily focused on the question under which conditions SEs could display independent economic dynamism. This difference in perspective is likely to be a reflection of the fact that there is still much more dualism and lack of integration between large and small forms of production in these economies compared with NICs such as South Korea, Singapore and Hong Kong. Complementarity in relations is obviously important in some industries, but there are also vast areas in which SEs function independently or where they exist as an alternative mode of production to large-scale manufacturing. In contrast to 1970s literature, however, the central focus of these recent

studies has been on *groups* of SE, especially on how inter-firm interactions in networks and clusters might contribute to their collective competitiveness (e.g., Humphrey and Schmitz, 1996; Schmitz, 1995; Nadvi, 1996; Tewari, 1996; Rabelotti, 1995; Cawthorne, 1993; Sandee, 1995; Pedersen, *et al.*, 1994; Knorringa, 1995).

Drawing on writings about flexible specialisation in dynamic industrial districts in developed countries such as Italy (e.g., Piore and Sabel, 1984; Best, 1990; Pyke and Sengenberger, 1992), these studies have generally suggested that clustering in developing countries can also create effects that help sustain long-term economic competitiveness among the participating firms. Presumably then, the writers presuppose that this form of economic and spatial organisation gives rise to some degree of capability to initiate and diffuse technological and organisational improvements. Unfortunately, this claim has remained largely unsubstantiated. The assumption about technological dynamism remains largely implicit, and the innovation and learning effects have not been investigated systematically. Even though the term 'learning' tends to crop up in some of the studies, it is often not clear what is meant by this, or what the learning entails in practice. The problem is that the studies are not yet well linked to the current literature about technological capability and development (Albu, 1997). Their main sources of inspiration are the economic organisation literature (transaction costs theory) and sociological literature. The writers in this group are generally sensitive to the socio-political and institutional context within which SE clusters function, and these variables have received more attention than 'hard' economic and technological ones.

There are some other studies about SE in middle-income economies that do not belong to the cluster literature, but these have received less attention from practitioners in the small enterprise promotion arena. This is unfortunate because they are explicitly concerned with the nature, determinants and impact of internal technological dynamism of SEs and they are therefore potentially quite relevant for policy and programme design. Firstly, one can learn from them that the technological development potential in the SE sector is heavily concentrated in one specific industry, namely metalworking / light engineering. This is because metal workshops are well equipped to copy, and make appropriate adaptations to, products made by large formal-sector companies or imported from more advanced countries. Appropriate adaptations consist, for example, in design simplifications and substitution of local materials for imported ones. Such adaptations can lead to significant price reductions and bring new products within reach of broad sections of the local population, thereby helping to ensure widespread diffusion of improved technologies. SEs in this industry also tend to be

located close to their markets, which facilitates information exchange between producers and the users of their products and ensures that adaptations fit in with user needs. In countries such as Argentina, Colombia, Brazil, Thailand, Pakistan and Zimbabwe (to mention but a subset of the available evidence), small-scale producers of metal products have built up considerable technological knowledge and skills over time by engaging in copying and adaptation of increasingly complex products.[12] Some started with simple repair of imported farm machinery or simple machine tools such as manual lathes and drilling machines, then moved into actual manufacturing, and gradually evolved into leading medium and large-scale producers of complex engineering products. Over time, the efforts of these firms extended way beyond simple technology assimilation, as they acquired significant internal design capabilities. However, even these studies are not well integrated with the current literature about technological capabilities and development. Only in two studies, an explicit attempt has been made to explicitly use the capability concept and to apply the analytical insights from that literature as a framework for study (Romijn, 1998; Maldonado and Sethuraman, 1992).

(c) Low-income African countries: Technical capability building in individual firms

In the low income-countries, many of which are situated in Africa, the concept of SE competitiveness is also evolving, but more under duress than as a result of emerging opportunities. These countries are increasingly feeling the crunch of international competition from more advanced economies. Their own large-scale industrial sectors have all but collapsed, and they are not being targeted in a big way by foreign investors. Hence, they are beginning to look towards SEs as a potential force for industrial regeneration. Increased attention is being devoted to the question whether, or under what circumstances, SEs can function as an engine of industrial growth and become a source of competitive advantage in their own right. There is also a growing concern that such regeneration cannot and should not be built on low wages, dismal working conditions and paltry profits, at least not beyond the short term. Acquisition of technological capabilities is beginning to be perceived as a major requirement for escaping from the low-wage, low-skills scenario in a sustainable manner. It is also recognised that this will require a supportive policy environment, one in which the SE sector is fully integrated in the design and implementation of industrial support programmes and technology policy (see Wangwe, 1993; Oladeji, 1998; Oyelaran-Oyeyinka, 1997; King, 1996; Massaquoi, 1995; and the articles in *Appropriate Technology*, June 1997).

Thus, one notices that the literature across the different regions is slowly beginning to converge around the theme of technological capability building, even though the context within which this is happening is remarkably different across regions. In the Asian NICs, technological learning in SEs needs to occur not just for their own sake, but also (and especially) because their skills and knowledge has to feed into, and contribute, to the competitiveness of the larger industrial system of which they are an integral part. In contrast, in the poorest African countries, where industrial linkages are still rather underdeveloped, enhanced technological capabilities contribute mainly to increased competitiveness of *firms as individual entities* rather than industrial systems. For the same reason, clustering and networking aspects have not received as much attention in recent African SE studies as in the middle-income economies of Asia and Latin America. Such organisational forms are simply less common in these countries, and to the extent that they do exist, they tend to be organisationally and institutionally less developed than their Asian and Latin American counterparts.

5. INNOVATIVE APPROACHES AT THE PROJECT LEVEL

The new developments at the conceptual level are clearly reflected in the design and implementation of several recent technology assistance programmes and projects. In addition, the modalities of assistance also evolved under the influence of accumulating practical experience with project design and implementation by practitioners. The widespread lack of success of earlier assistance models had led to a great deal of soul searching.

The results of these developments are slowly beginning to emerge in recent projects and programmes. However, even now, most of the documentation about them still does not go much beyond a description of the main features of the content of assistance packages.[13] Such materials are of limited value when one wants to draw lessons about the effectiveness of different approaches. In the absence of abundant analytical materials, the following paragraphs are inevitably rather piecemeal.

(a) Important success factors: from triple-C to eightfold-C

In spite of the scarcity of good analytical studies about effectiveness of technology support projects and programmes for SE, it is possible to identify several broad principles that

have been associated with success in SE technology assistance projects documented in the more insightful studies. Although some of the features are present more strongly in some geographical regions than in others, quite often they do to some extent cut across the regional variations observed above.

We begin with what Humphrey and Schmitz have termed the 'Triple-C approach' to industrial policy (Humphrey and Schmitz, 1996). When comparing assistance schemes across different developing countries, they found the following three factors to be the most critical to good outcomes:

Customer-orientation: The old 'supply-push' method has given way to an approach in which project efforts are much more driven by meeting customer needs and demands. Access to a dynamic market channel that can provide an impetus for, and give concrete and specific direction to firms' improvement efforts, is now considered to be an important necessary condition for successful assistance delivery.

Collectivity: Support is likely to be more effective when it is provided to groups of SEs rather than individual producers. This insight grew mainly out of the clustering literature. Group-based assistance is not only more cost-effective and practical than individual support, but it can also lead to the establishment of linkages between SEs that can lead to higher efficiency and interactive learning.

Cumulativeness: One-off improvements are of limited use. Being competitive is not a state but a process that requires continuous improvements. This in turn requires that firms (or clusters of firms) build up a capacity to continuously upgrade their products, processes and production organisation and become more self-reliant in this respect.

While the above classification raises highly pertinent issues, the three success factors do not have equal status. The first factor appears to be predominantly concerned with the objectives or focus of the support, whereas the second one is more concerned with the actual modality of assistance delivery. The third one is yet another category because it seems to refer more to the ultimate impact of the support than to an attribute of assistance projects themselves.

In this paper we suggest a more systematic classification of project success factors, by making a broad distinction between (i) project attributes concerned with the objectives / broad focus of assistance projects and (ii) those concerned with the actual mechanisms of assistance delivery. Impact-related factors such as cumulativeness are not included. Instead, we focus on corresponding attributes relating to actual project objectives and implementation that are likely

to promote the relevant outcomes. This leaves us with two out of three attributes listed by Humphrey and Schmitz. In addition, six other factors emerged from the literature review undertaken for this paper. Curiously, each of these six additional factors can also be denominated by a term starting with the letter 'C', so that we can introduce the 'eightfold-C approach' here.

The first three are primarily features relating to the aims or focus of assistance projects, while the remainder relate more to the instruments used to achieve these aims. A summary of all attributes is given in Table 1. In addition to the two features already discussed above, namely *customer focus* and *collectivity*, we have:

Capability focus: Although the non-availability of appropriate 'hardware' (i.e. machinery and equipment) can sometimes be a crucial constraint on the competitiveness of SE, the development of the human factor in the production process is at least as important. In a competitive economic environment, SE need to acquire enhanced knowledge and skills about how to choose, use and improve technology (Romijn, 1998). Only then will they be able to engage in the sort of cumulative adaptation and improvement that Humphrey and Schmitz referred to.

Context: It goes without saying that a supportive economic environment in which growing and technologically dynamic markets constantly provide new potential opportunities for technological upgrading of SE greatly facilitates project success. This also embraces the older notion of a macro-economic policy environment in which technology choices will not be biased against small and labour-intensive forms of production. However, these are not actual project attributes. The emphasis here is more on incentives for endogenous technological development and continuous learning that come from assistance projects aiming to create, what Levy *et al.*(1994) have called 'an information-rich environment' for small firms. Examples include sponsoring courses on selected topics, facilitating the use of specialised consultants, and promoting information sharing among firms.

Complementarity: The concrete content of the assistance has to be tailored to fit in with the general level of economic and technological development of the economy in question. This may appear to be very obvious, but older projects did suffer from such lack of fit. For example, many low-income countries tried to promote subcontracting schemes prematurely. Only now, it is only in the relatively advanced economies of Southeast and East Asia such as South Korea and Malaysia where the lack of a local subcontractor sector has recently emerged as a crucial bottleneck. This is the sort of 'demand-pull' environment where there is a lot of

scope to build technological support programmes for SE around backward linkage development in the economy in general.

Concentration: As we have seen, earlier programmes often lacked effectiveness because the institutions delivering them were 'spreading their efforts too thinly' in terms of the number and variety of economic activities. In such programmes it was very difficult to build up in-depth expertise about the technological and market characteristics of specific industries and the main actors in these industries, how SEs are positioned in these industries and what their main industry-specific problems might be. In response to these problems, the 'sub-sector approach' to SE promotion, launched in the early 1990s, advocates that research and assistance should concentrate on commodity-specific sub-sectors. By giving considerable weight to the study of interactions between firms of different sizes and at different stages in the supply chain, this approach can provide a more thorough insight into the competitive context in which the target enterprises operate (Boomgard *et al.*, 1992). The adoption of the sub-sector approach has also increased the effectiveness of projects by concentrating project assistance efforts. Instead of aiming to target beneficiaries directly, some projects have worked with and through 'nodal actors' in the supply chain, such as traders or material suppliers, who interact with large numbers of small producers (Dawson and Jeans, 1997).

Coordination: Early assistance efforts also suffered from lack of coordination between different service providers and support activities. This is most evident in the East and Southeast Asian countries where governments have tended to establish very elaborate and wide-ranging support structures for SE, encompassing many different financing, training, and consulting projects and programmes. The responsibility for these programmes would be distributed widely over different governmental institutions and departments. Inefficiencies in assistance delivery were common because of duplication of effort. To make matters worse, programmes would frequently be revamped, merged with other initiatives, or replaced with new ones. Such obvious lack of transparency must have been a nightmare for many potential beneficiaries. It must have been a big effort simply to find out how the support structure worked and where to turn for which type of assistance. In recent years, one sees that governments in these countries have begun to improve matters by introducing 'one window' assistance delivery (Meyanathan, 1994).

'*Carrot-and-stick' approach:* We have seen that the flawed incentive structure both for the assistance providers and the beneficiaries was perhaps the singlemost important cause of failure in the early SE technology (and other types of) support projects. In some of the

recent projects, much attention has been devoted to the careful design of a more appropriate set of incentives (see especially Tendler and Amorim, 1996). This appears to entail a combination of 'carrots', i.e. potential rewards that will motivate the participants to take action, and 'sticks', i.e. a set of sanctions that come into operation when they fail to do their best. The carrots are a source of positive pressures on the participants, while the sticks generate negative ones.

The design of a balanced combination of carrots and sticks is an extremely difficult task. It generally requires that one not only pays attention to economic aspects but also to the institutional and socio-political context within which projects are to be implemented. Obviously, it requires an in-depth knowledge of the local situation in all cases.

Table 1: Attributes associated with successful technology support projects for SE

Attributes relating to project objectives / focus	**Attributes relating to mode of implementation**
Customer-focus: Projects designed around client needs rather than driven by supply capacity of assistance institutions	*Collectiveness:* Beneficiaries are clustered groups of SE rather than individual enterprises
Capability-focus: Technological learning rather than one-off improvements in hardware seen to be required for sustaining SE competitiveness	*Concentration:* Focused assistance delivery through more selective targeting of beneficiaries and indirect targeting via 'nodal actors' in the supply chain.
Context: Emphasis on creating an information-rich environment for SE	*Coordination:* Streamlining of assistance delivery by avoiding duplication and striving for complementarity between different projects and programmes
Complementarity: Project aims and focus must fit in with macro-economic structure and level of economic development	*'Carrot-and-stick' approach:* Design of effective incentive structure aimed at project sustainability, making use of, rather than replacing, market forces

An appropriate set of incentives and sanctions that make use of market forces rather than replace the market is crucial for achieving sustainability (or 'cumulativeness') of projects. This applies both to the delivery of the project services and the dissemination of the benefits thereof (Dawson and Jeans, 1997). This aspect is assuming increasing importance in project design. Projects must evolve certain institutional forms of (usually collective) self-help that will, over time, start to function independently from external aid agencies.

6. SOME ILLUSTRATIONS FROM SPECIFIC PROJECTS

One or more of the general principles outlined above have been applied in several recent projects in different developing countries. We provide one example from one of the industrially most advanced developing economies in East Asia, one from a middle-income country in Latin America, and one from a low-income country in Africa.

(a) Upgrading of local subcontractors in Singapore[14]

The Singaporean experience with technical assistance to SE is perhaps not an obvious example. The country is better known for its success in attracting high-tech multinationals than boosting local small-scale industries. This image is somewhat misleading. Over the years this country has evolved a remarkably well-organised and elaborate support system for SEs, in which technical upgrading takes up a central place. A local ancillary sector is considered to be crucial for Singapore's continued international competitiveness in high-tech electronics. For example, the presence of large TNCs in the disk drive industry depends on the availability of high quality suppliers in precision engineering.

Many of the 'C' features discussed above are in evidence in the Singapore support system, especially demand-led, private sector-supported approaches to assistance delivery, performance pressures, attention to macro-economic fundamentals, carefully thought-out institutionalisation, tight coordination of the different assistance activities, and the importance of a capability-focused approach.

The country has been providing technological assistance to local SEs ever since 1962, but the programmes acquired real momentum in 1989 when the various measures and initiatives were consolidated under the SME master plan presented by the Economic Development Board (EDB) in 1989. Fabricated metal and machinery industries receive most attention because these form the core group of supplier industries.

The Local Industry Upgrading Programme (LIUP) forms the most significant component of technical assistance. It has been designed to forge close links between TNCs and subcontractors / suppliers. The EDB is essentially playing the role of 'network broker', an idea that has also worked well in a few other countries.[15] The TNCs are asked to take several SEs under their wing, and are expected to provide training in areas such as management, quality control, process engineering and industrial engineering through visits, workshops, consulting activities and so on. The aim is ambitious: technical standards are to be raised to a level where the SEs can be internationally competitive, and form attractive partners to the

TNC community locally. In return, TNCs receive considerable subsidies, up to 90 per cent of the costs involved, which are partly borne by the participating SEs themselves. The TNCs also provide an experienced engineer on secondment to the EDB for two or three years (paid for by the EDB), who then works closely with the SEs and identifies focused areas for TNC assistance. The participating SEs meanwhile also have access to a variety of financial support schemes operated by the same organisation. The EDB is the central coordinator of SE support in the country, and it has established a 'one window' approach to assistance delivery.

An assessment of this scheme noted several significant technological learning mechanisms, namely:

- learning through direct know-how transfers,
- learning through feedback provided by stringent quality / performance control by the TNCs,
- learning through exposure to information resources provided by the TNCs, and
- learning through, and as a result of, investments in capital equipment and other forms of new technology by the SEs that they would not have made in the absence of their relationship with the supporting TNC.

(b) Technical upgrading through public procurement in Brazil

One project that embodies several of the features discussed above is a public procurement scheme for school furniture in the Brazilian State of Ceará.[16] The scheme was organised by the Industry and Commerce Department (SIC) of the state government, together with SEBRAE, the Brazilian SMIDO, after the central government decided to seek out alternative, small-scale suppliers of wood products in regions that had been badly hit by a drought, as a sort of alternative to a public works programme.

Thus, the scheme was first of all demand-driven, in the sense that it started with the creation of a new market opportunity that could be used by SEs to 'pull themselves up technologically'. It was also narrowly focused on one particular economic activity carried out by a small group of SEs in one particular locality. However, that technological upgrading did indeed occur also had a lot to do with the clever way in which the scheme was institutionalised. The main institutional elements contributing to its success appear to have been the following:

- Two important features set up tremendous *pressures* on the assistance deliverers and the beneficiaries to perform: Firstly, while a new potential market opportunity was created, the customer, in this case the Education Department, was not obliged to proceed with the procurement from the SE if the quality of the products remained below that of the regular (large-scale) suppliers. Hence, rather than creating a protected market, the scheme created competition between large and small. Secondly, the scheme received a lot of attention in the media nation-wide. Achievement of success could thus bring potentially high rewards (in political terms) for the agencies involved, whereas failure would entail public loss of face.
- In view of the large orders, which exceeded the production capacity of any one of the individual producers, the SEs were contracted as a group. An association was formed for the purpose, with encouragement from SEBRAE. The association was responsible for quality and honouring product warranties, and had to coordinate the activities of the individual members. The one element of subsidy was advance payment of half the order amount, which provided much needed working capital. In case of default of one of the association members, the association was again responsible for repayment. By making the association the focal point in the transactions, it was in the interest of members to monitor each others' performance (rather like the case of the Grameen Bank in Bangladesh). Meanwhile the existence of the association lowered the transaction costs involved in dealing with SIC and SEBRAE. Moreover, group formation enabled the producers to engage in collective learning because they had to communicate and collaborate.
- The customer / demand-driven approach as a starting point of the project also led to a well focused and efficient form of technical consulting and R&D assistance. Participating SEs would meet to discuss their technical bottlenecks, and only then call on SEBRAE engineers to provide assistance with the specific problems they needed to solve in order to deliver the required quality at the agreed price at the right time.

The success of this project is evident from substantial investments in power tools, and capacity and capability upgrading among the participating enterprises, as a result of which they were able to enter new markets and diversify their customer base considerably. At the time that Tendler and Amorim wrote their assessment, a full 70 per cent of output was already going to the private sector. The association has become an important institution locally, initiating many developmental activities without help from the original assistance agencies.

(c) Technology capability building in small metal workshops in Kenya[17]

The Farm Implements and Tools (FIT) programme implemented in Kenya and Ghana by the ILO and a Dutch NGO called TOOL is an example of a tightly focused, dynamic user-driven approach to group-based technical assistance which is designed to operate under quite hostile economic conditions and in economies at a low stage of economic, technological and infrastructural development. The focus here is on the Kenyan component since this is the best-documented part of the programme. Its aim is to strengthen local capacity to undertake activities that can spark technological upgrading of farm equipment and food processing equipment, which can contribute to higher productivity and incomes in user-enterprises (i.e. farms and home industries). This entails a process of technological learning among the participating SEs.

The assistance programme essentially functions as a facilitator to get these activities off the ground and to embed them institutionally in such a way that they become self-sustaining over time. The participating SEs and other private sector participants must show a willingness to pay part or all of the costs right from the beginning. Several services have been developed according to this philosophy, which are beginning to show some success. One such activity is the organisation of group visits by small-scale entrepreneurs to bigger enterprises elsewhere in the country or abroad. Another is the facilitation of direct communication with the users of farm implements (i.e. farmers). 'Brokering workshops', initially designed to evaluate the impact of these two activities, became an independent activity in itself because the informal information exchange that took place in these fora obviously filled a need among the participants. Finally, help to SEs in identifying new markets through teaching them a simple form of market research dubbed 'rapid market appraisal' has also been offered.

The effects of these activities appear to be favourable, as indicated by the results and by the willingness of the participating SEs to continue participating over a period of time, and pay at least part of the cost. As far as the results are concerned, the group visits to other enterprises were an important source of ideas about new and improved farm equipment that the SEs could also try to produce. Many entrepreneurs also benefited from seeing metalworking machinery, tools and measuring instruments in operation, and decided to acquire new tools such as scales, a micrometer and so on. Improved linkages with suppliers of spare parts and raw materials were also reported. Even managerial skills were apparently improved,

especially in the area of customer relations, record keeping and employee relations. The trade fairs were also quite successful as a vehicle for effective user-producer interaction. Thanks to the involvement of the smallholder farmers, who took great interest in this opportunity to express their wishes for improved designs and quality, and who even financed their own travel from far-flung places to be able to come to the meeting point, several SEs started to experiment with products. Some did so after they noticed the results of the technological efforts undertaken by their competitors, afraid that they would lose custom if they did not keep up with the new developments – an example of a 'stick-type' incentive in operation.

The FIT programme is strongly demand-driven. The project organisers understood very well that: 'The demand by SEs for (their) services is ultimately financed by sales to their customers, and it is the demand and perceptions of these customers which are therefore the origin of all sustainable activities with SEs.' For that reason, the activities have to translate into substantial improvements in SE products and services, so that customers will stand to benefit when they decide to use them.

One could argue that such improvements may take some time to materialise and that some degree of market failure is therefore inevitable, justifying a permanent public subsidy. However, in resource-poor countries like Kenya, the likelihood of such activities attracting public money on a sustained basis is quite remote. In such conditions, projects like FIT, which do not expect such subsidies and adhere to stringent financial viability conditions, obviously stand the best chance of success.

7. CONCLUDING REMARKS

From 'supply-push' to 'eightfold-C': the practice of technology support for SEs has evidently come a long way since the early 1970s. Firstly, and most important, the notion of what should constitute 'success' in projects and programmes is evolving in a more realistic direction over time. It is no longer based on the idea that SEs should essentially play the role of passive recipients and beneficiaries of improved technologies that have been developed elsewhere in the economy or brought in from abroad. We are moving towards the understanding that durable competitiveness of SE must entail an internal capability on their part to make improvements in products, processes and organisation on an ongoing basis. Only then can we expect such enterprises to make a contribution to countries' industrialisation which goes beyond mere employment generation of last resort. Truly progressive developing economies

are those where firms of all sizes, including the smallest ones, are actively involved in, and contribute to, the national knowledge accumulation process (Bruton, 1985, p.81).

Secondly, there is a growing understanding among LDC government agencies and donor organisations about the broad features associated with project success so defined. These principles appear to be common to projects and programmes across major geographical regions that are technologically and economically quite diverse. Even policy makers and assistance agencies operating in countries that are at higher stages of economic and technological advancement may draw some inspiration from the list of features outlined in this paper. In particular, we now know that the development of producers' capability will generally entail a process of technological learning on the part of the people involved. The literature reviewed for this paper also suggests that such learning is likely to be most effective when producers have an opportunity to interact with each other and with other actors in the economy, especially their customers.

Effective projects are those that stimulate these processes by establishing or facilitating such interactions, by making sure that there is an appropriate incentive structure that will spur producers' efforts (especially one that makes rewards conditional upon performance), and by providing specific professional assistance where needed. This requires an in-depth knowledge of the macro-economic, institutional and socio-political context and concentration of the assistance effort on one or two specific industries.

Of course, the above does not constitute a ready blueprint for technical assistance. Even if there were many more detailed analytical case studies about successful projects than we can draw upon at present – and we certainly do need more of them –, an ideal model is unlikely ever to emerge. Blind copying (although it unfortunately also starts with the letter 'C') is never a good recipe for good results. The design and implementation of every new project must always entail an act of creativity (yet another 'C'!) to adapt and operationalise general principles in such a way as to fit well within the local context within which it is to be implemented.

ENDNOTES

[1] Levitsky (1994) and Aylward (1998) are reviews of venture capital programmes in different developed and developing countries. Park (1993) has details about the Korean case. The Indian experience is described in Karunakaran (1994).
[2] For an elaboration of the distinction between poverty alleviation and business growth as objectives of small enterprise support projects, see Dawson and Jeans (1997).
[3] See especially Watanabe's insightful studies about subcontracting linkages (e.g., Watanabe, 1983).
[4] This argument is based on the 'rigid factor proportions' problem, first propounded by Eckaus (1955).
[5] See Bongenaar and Szirmai (1998) for a detailed account of the problems associated with the top-down approach in a Tanzanian technology institute.
[6] Good examples are documented in Basant (1990), Ishikawa (1975), and Francks (1979).
[7] See Basant (1990), Smillie (1991) and Powell (1995).
[8] See, e.g., UNDP *et al.* (1988).
[9] See Lall (1996).
[10] See World Bank (1993), pp. 149-152, for a discussion about the de-industrialisation debate.
[11] See Lall (1992) and UNCTAD (1996) for good reviews of the capability literature.
[12] The Argentina case is documented in Cortes (1979), the Colombia case in Cortes *et al.* (1987), the Brazil case in Gupta (1994), the Thai case in Mingsarn (1986), the Pakistan case in Aftab and Rahim (1986 and 1989) and Romijn (1998) and the Zimbabwe case in Watanabe (1987). Several additional cases are reviewed in Romijn (1998).
[13] See, e.g., Levy *et al.* (forthcoming).
[14] The Singapore subsection is based on Wong (1994).
[15] For example, in the case of Malaysia's car manufacturer Proton, SEs gained access to manufacturing know-how about complex car components in a similar way. A useful review of successful and less successful policy experiences with subcontracting promotion in different developing countries is contained in Altenburg (1997).
[16] The case is described in detail by Tendler and Amorim (1996) and summarised in Humphrey and Schmitz (1996). This subsection is based on these two works.
[17] The Kenya subsection is based on Tanburn (1996).

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