

Networking Technical Change and Industrializa- tion: The Case of Small and Medium Firms in Nigeria

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ATPS SPECIAL PAPER SERIES No. 20

Published by the African Technology Policy Studies Network, P.O. Box 10081, 00100
General Post Office, Nairobi, Kenya.

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PUBLISHED BY ATPS COMMUNICATIONS DEPARTMENT

Printed by Newtec Concepts
P.O. Box 00800, Westlands
14180 Nairobi, Kenya
Tel: 4449849, Fax: 4450399
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ISBN: 9966-916-09-1

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ATPS is supported by a growing number of donors including the International Development Research Centre (IDRC), the Carnegie Corporation of New York, the Rockefeller Foundation, the World Bank, the OPEC Fund, Ford Foundation, Coca-Cola Eastern Africa, the African Development Bank, *InfoDev*, and the Royal Dutch Government.

List of Abbreviations and Acronyms

EPZs	Export Processing Zones
MNC	Multinational Company
SAP	Structural Adjustment Programme
SME	Small and Medium Enterprises

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1. Introduction

The relevance of clustering to the industrialisation process of developing countries has been widely debated in the last decade (Van Dijk et al., 1997) and the role of clustering in attenuating some of the problems faced by small and medium enterprises (SMEs) is now widely documented, (Nadvi, 1996, 1997). The problems of SMEs are well known and relate largely to market failures in input and product markets. At the heart of the issue are information deficiencies as a result of weak institutions and poor finance, and technical and marketing support in developing countries. The difficulties faced by SMEs are accentuated in poor countries with limited capacity for policy design and implementation (Romijn, 2000). This situation has been made more difficult as a result of the rapid pace of liberalisation for which most African countries were ill prepared. "The recent liberalisation and globalisation of financial markets has made it even more common for developing countries with inadequate banking structures, information imperfection and poor institutions and infrastructure, to suffer from vulnerability through external shocks" (Bhalla, 2001; Lall, 2001). Developing countries suffer from more than financial market failures; pervasive labour and technological market failures are also common.

Clustering provides an alternative route for SMEs development, and a potentially less costly avenue for policy support. As Schmitz and Nadvi (1999) suggest, "clustering facilitates the mobilisation of financial and human resources", leading to the gains of *collective efficiency*. Nadvi and Schmitz (1994) provide a number of reasons for this. First, clustering is a significant form of industrial organisation for small-scale manufacturing. Second, clustering promotes different types of inter-firm linkages; third, clustering is identified with diverse forms of social networks, which are associated with personal ties, and the notions of trust and reciprocity in competitive behaviour. Fourth, a cluster is not a planned intervention yet the state has a role in promoting it. While past efforts have concentrated on comparing emergent clusters with advanced clusters, particularly the Italian model, it has become more important to take a more "dynamic approach, which seeks to understand the processes that lead to success or failure" of cluster growth and development (Schmitz and Nadvi, 1999).

This paper pursues this line of inquiry in seeking to analyse the *processes and the dynamics* of cluster growth in Nigeria. Clustering, as Porter (1998) observes are not unique but typical and possess "the enduring competitive advantages in a global economy". He suggests that the strength of clusters can be found "increasingly in local things - knowledge, relationships, motivation - that distant rivals cannot match".

In this study, the author proceeds with the “obvious” proposition that poor production networks have been slow in developing because there are no specialised services and firms to take on manufacturing linkage roles. Manufacturing subcontracting in two clusters with contrasting history, habits, and practices provides evidence for the proposition. The nature and content of production networking is analysed, specifically subcontracting and factors that determine the pattern of subcontracting among SMEs in one rural-based and two metropolitan clusters, Nnewi and Lagos respectively. The influence of social networks on manufacturing that have persisted and deepened because of weak institutions of contract enforcement is also examined.

Section two of the paper reviews the dynamics of inter-firm linkages, clustering and industrialisation, followed by a discussion on the typology of clusters in developing countries. Section three analyses the survey result of two manufacturing SME clusters in Lagos which are compared with the Nnewi cluster in Eastern Nigeria. The comparison is useful, given the contrasting characteristics of the two clusters. The Nnewi cluster is located in South-eastern Nigeria (Oyelaran-Oyeyinka, 1997), where businesses bear strong family and ethnic accents. This unique ethnic character of Nnewi is due as much to geography as it is to historical and cultural forces. Nnewi is an industrial enclave located in a rural setting in the heartland of Igboland, populated by a homogeneous ethnic group with a strong sense of kinship. On the other hand, Lagos is a highly cosmopolitan industrial centre, served by a large port, and has employed a pool of both the employed and unemployed educated manpower; it's a melting point of sorts for all Nigerians. Section four concludes with a summary of the main findings.

2. Inte-Firm Linkages, Cluster Dynamism and Market Demand

In broad terms, there are several forms of inter-firm linkages in both developed and developing countries, among which are: subcontracting, market linkages with customers and suppliers, informal and formal collaboration (joint ventures, franchise), membership of professional and trade associations, and movement of skilled staff from one firm to another. Inter-firm linkages are formed to serve certain production ends. Among these are exchange of technical and market information; and reduction of uncertainties. The kinds of linkages that develop depend as much on firm-level capabilities as on the economic environment. Barr (2000) makes a distinction between networks that reduce uncertainties (common among small firms) and those that are formed to promote productivity growth. According to Mytelka and Tesfachew (2000), firm interactions with external agents "were important sources of technological know-how and technological learning in East and South East Asian economies". These diverse forms of interaction constitute important channels of flows in advanced and developing economies (Pavitt, 1984; Von Hippel, 1988; and OECD, 1999). In the study by Mytelka & Tesfachew (2001), subcontracting, which has yet to be fully institutionalised in African industry was singled out as having been an important source of technology transfer in garment manufacturing and textiles.

Subcontracting thrives where there is vertical disintegration and horizontal specialisation. In the current literature, production activities in firms in Africa are less specialised and more vertically integrated than their developed country counterparts but this should not be taken as parametric since production systems are dynamic. In separate visits to Taiwan, Amsden (1977, 1985) reported dramatic changes in the Taiwanese machine tools industry. Earlier studies revealed high vertical integration and little horizontal specialisation, but this gave way to greater specialisation and significant vertical disintegration within eight years. The restructuring of the Taiwanese machine sector was made possible by a combination of factors. Small producers, producing low quality products for the low-income domestic market had operated side by side with large firms. Then came the opportunity and the incentives for expanding into the export market as a result of the boom in the machine tools market in the 1970s. The small producers had neither the technology nor the financial capability to re-equip in order to compete and as such had two options. They could participate as subcontractors to larger firms or participate in the export market by buying a substantial proportion of their inputs; evidently, subcontracting was an attractive alternative (Amsden, 1977, 1985 and Predergast, 1990).

According to Pack (1981), high levels of vertical integration are a result of low capability of subcontractors in supplying high quality inputs. He suggests that firms systematically underestimate

the cost of internal co-ordination which includes the cost of learning, and as a result do not seriously consider the subcontracting option. Secondly, larger firms in Africa lack the experience to organise subcontracting networks. This might well be a consequence rather than a cause, and it is doubtful if it explains the whole story. On the contrary, large firms in some African countries tend to develop historically more intense trade and production networks with parent companies and therefore have little use for local SMEs (Oyelaran-Oyeyinka et al., 1996). Personal and social networks historically determine the outward direction of production networks. As Brautigam (2001) observed, garment production in Kenya is 100% Asian owned while the low-value tailoring activity is 95% African. Asian businessmen have preferential access to local and foreign technical assistance and supplier credit. Networks defined by education and ethnicity do condition in some measure, the intensity of production networks.

Predergast (1990), advanced another explanation which has both engineering and market dimensions. According to him, firms have the tendency to capitalise on under-utilised capacity by expanding their product range, and in so doing, take advantage of economies of scope. Under-capacity results from insufficient demand for any single product to allow full capacity utilisation of facilities. Low market demand therefore induces an engineering response but in the process of product diversification, firms spread learning efforts in order to master a diverse market and in so doing, become less specialised.

In the Taiwanese experience, export market opportunities as expected created greater output demand and subsequently, product specialisation and lower levels of vertical integration. The state in Taiwan as with other East Asian countries such as Korea was quick in providing technical, financial and marketing support that facilitated the exploitation of export markets (Levy et al., 1993). According to Stigler (1951), firms in early stages of industrialisation internalise every possible phase of production because there is a lack of reliable raw materials, machinery and component sources. This is not the case for mature industries, and by extension advanced economies, where large markets make possible the externalisation of upstream production. For this reason, specialised suppliers enjoy scale economies induced by market size for final products.

The vicious circle, whereby firms are unable to specialise in the absence of subcontracting, and subcontracting is not developed due to lack of specialisation has been further elaborated by Rosenberg (1976) in his classic study of the American machine tools industry. Beyond market size as an explanatory variable, he introduces the element of *technological convergence* to explain why and how specialisation and vertical disintegration evolve. Technological convergence connotes the convergence of skills common in the main sector, to the mechanical engineering sector, by which machine processes such as milling, drilling, boring, planing, and polishing are common to a wide range of industries. The machines performing these tasks are subject to a common set of problems. Technological convergence then becomes a common denominator of industries that "...were apparently unrelated from the point of view of the nature and uses of the final product". Product specialisation then results from a combination of technological convergence and vertical disintegration:

“Young industries are often strangers to the established economic system. They require new kinds of qualities of materials and hence make their own; they must overcome technical problems in the use of their products and cannot wait for potential users to overcome them; these young industries must design their specialised equipment and often manufacture them, and they must undertake to recruit skilled labour. When the industry has attained a certain size and prospects, many of these tasks are sufficiently important to be turned over to the specialists”¹ (Stigler, 1951).

Rosenberg’s conclusion is that the extraordinary range of specialisation that characterised the American machine tools industry resulted from technological convergence combining with vertical disintegration. Herein lies the role of technological capability and knowledge acquisition of specific kinds, and learning in networks, in the process of industrialisation. In sum, three elements interact in shaping the extent of vertical disintegration and product specialisation: technological diseconomies, transactional economies, and the extent of market demand (Perry, 1989 and Stigler, 1951).

2.1 Typology of Enterprise Clusters in Developing Countries

An industrial cluster is a dense sectoral and geographical concentration of enterprises comprising manufacturers, suppliers, users and traders. A cluster is not simply a geographic phenomenon; inter-firm interaction and sectoral specialisation are the defining features of a sustainable cluster (Nadvi and Schmitz, 1994). Recently, there have been attempts to provide taxonomy of clusters given the diversity of experiences particularly in developing countries. Pedersen (1997) identified two types that are *diversified industrial clusters* characterised by “vertical specialisation of individual enterprises and vertical diversity of the cluster as a whole”. In this cluster, there is a broad sectoral specialisation but within the sector, individual enterprises and the cluster as a whole are not narrowly and horizontally specialised. Efficiency gains depend on collaboration within and outside the cluster.

The second type is the subcontractor cluster, characterised by a narrow vertical and horizontal specialisation by both individual enterprises and the cluster as a whole. Its collective efficiency derives from reduced transaction costs due to reliance on larger firms as subcontractors. Amin (1994) identifies three generic kinds which are craft-based, artisanal or traditional sector industrial clusters (e.g. footwear, garment making, metalworking, etc.); high-tech clusters (e.g. Silicon Valley); and clusters based on interaction of large and small firms. This is similar to Pedersen’s subcontractor cluster. Mytelka and Farinelli (2000) provide a functional categorisation of clusters that are either “public-induced” or “constructed clusters” such as industrial estates and export processing zones (EPZs) or spontaneous clusters that could be *Informal, Organised, or Innovative*². Low levels of inter-firm linkages characterise informal clusters but organised clusters have advanced somewhat

¹ Quoted from Rosenberg (1976).

² Most clusters in developing countries fall into the informal and organised type categories. Informal clusters generally contain micro and small firms whose technologies are far from the frontier, and have relatively low technological capabilities. Organised clusters have considerable technological competence, engage in training and invest in apprenticeship system. Firms undertake technical upgrading, undertake design adaptations in response to market and can be highly organised and cooperate among themselves.

in this respect. There is relatively greater networking within and outside their national borders as exemplified by the firms in Nnewi, and the surgical instruments cluster in Sialkot, Pakistan.

Recent accounts of the limited studies of clustering in Africa are found in McCormick (1999), Adeboye (1996), Oyelaran-Oyeyinka (1997), Van Dijk (1997) and Brautigam (1997). The clusters vary widely in their levels of development and internal structure and characteristics. In a study of six clusters, McCormick (1999) identified three levels of cluster development. The first one is *groundwork enterprise clusters*, that is, those at the incipient stages whose basic role is to improve producers' access to markets and for joint action. The second category is *industrialising enterprise cluster* which "have much clearer signs of emerging collective efficiency". The third category, *complex industrial clusters* are diversified in size, structure and in inter-firm linkages; they exhibit strong external economies, have reached into wider national and global markets, and demonstrate joint action in institutionalised professional associations, subcontracting and collaborative arrangements.

In terms of internal structural characteristics, the majority of the enterprise clusters, which tend to fall in the first and second categories, operate with low-skilled manpower. They exhibit weak inter-firm interactions and lack institutionalised systems of self-help. With the notable exception of the Nnewi cluster in Eastern Nigeria, the Western Cape clothing cluster in South Africa and the Lake Victoria fish cluster, empirical studies of the relatively more advanced clusters in Africa are limited. Nevertheless, evidence from the literature suggests that clustering "can and does promote industrialisation" (McCormick, 1999), through improved market access, pooling of labour skills, opportunities for technological upgrading as proximity promotes exchange of technical information, and promotion of joint action in dealing with external shocks.

The question is where do these clusters go from here? As Mytelka and Farinelli (2000) noted:

"vulnerabilities in the production strategy of the cluster have emerged, especially because firms were not well organised within the cluster to support a continuous process of improvement". According to Nadvi and Schmitz (1994), successful clusters are those that "have an indigenous growth potential, to be resilient in the face of economic crisis and to be conducive to a process of sustained innovation".

This kind of cluster achieves sustained dynamism and competes in the regional or global export market not only on price basis but also by becoming an innovative cluster. It almost certainly is likely to be characterised by substantial inter-firm linkages and networking. Greater subcontracting is one such measure of manufacturing dynamism but of which little is known in African manufacturing. This study is an attempt to contribute to our understanding of network subcontracting in Africa.

3. Characteristics of the Lagos Clusters

The interviews for this study took place in the year 2000 for the Lagos clusters where 50 firms out of a sample of 75 selected were interviewed using various instruments. The firms are based in two locations, Ikeja and Isolo, both containing a large number of firms in a city with close to 60% of all the manufacturing firms in Nigeria. The dominant product groups in the two Lagos clusters are chemicals/pharmaceuticals, domestic and industrial plastics, rubber and rubber products (ISIC 351-356), and fabricated metals (light engineering, ISIC 381). Other product groups in the clusters are paper and paper products (not significant), and food, beverages and tobacco. Except for beverages and tobacco, all the other sub-sectors belong to the chemicals sector and light engineering. Historically, significant inter-firm interactions exist between chemicals and engineering, for instance, among industrial plastics and rubber product manufacturers and machinery makers. The 50 firms analysed comprised 21 small and 29 medium enterprises. Sixty four percent are in the Ikeja industrial cluster, and 36% are from the Isolo cluster. Overall, 32% are in the chemicals and pharmaceuticals sector, 12% in domestic and industrial plastics and rubber, 34% in fabricated metals and 12% in food, beverages and tobacco sectors (table 1). Small firms have a labour force of 1-49 and medium firms employ 50-99 persons; 42% of the firms are small while 58% are medium sized. The firms are established, registered business entities with affiliations to local and foreign Chambers of Commerce.

Table 1: Major Products of the SMEs within the Two Cluster Locations

Clusters	Product Group
Lagos	Chemicals and Pharmaceuticals Fabricated Metals (34%); Chemicals and pharmaceuticals (32%); Domestic and Industrial Plastic and Rubber (12%)
Nnewi	Automotive Parts and Components (85%); Fabricated metals

Source: Survey (2000)

About 70% of the firms were established in the last 20 years, the period of economic structural adjustment. The higher concentration of firms established in the 1990s in Ikeja is due to several reasons. Ikeja is an older, more "desirable" location due to superior infrastructure (although all urban

areas suffer from epileptic power and water supplies). It is a "denser" cluster and therefore better able to offer *collective efficiency* advantage conferred by geographic proximity to other firms, small and large.

All firms are private and Nigerian owned; 61% have sole proprietorship, while private investors jointly own 38%. This ownership structure of SMEs contrasts with what obtains in East Africa where substantial ownership is in the hands of Asians and Europeans (World Bank, 1995).

Similarly, close to 80% of the firms at Nnewi are 10 - 20 years old meaning that despite Nigeria's economic difficulties, a reasonable level of investment was made by Nnewi businessmen during the Structural Adjustment Programme (SAP) years. Due to lack of public utilities, a strong feature of the cluster is the widespread provision of private facilities such as water boreholes, electricity generating plants and communication.

A total of 97.8% maintain standby generating sets while only 2.2% do not. Small firms in particular, tend to spend disproportionately large amounts on utilities.

3.1 The Nnewi Cluster

The study focused on automotive spare parts manufacturing, an area in which Nnewi firms have developed considerable skills. Products manufactured include motorcycle parts and components, cables and hoses, motorcycle engines and roller chains, automotive filters and exhaust systems. Eighty per cent are SMEs and all are fully Nigerian-owned. The rate of capacity utilisation, a measure of performance, was 20% above the 1996 national average of 32%. Local resource-based manufacturers such as rubber products firms averaged in some instances over 70% in the 1990-1995 period.

3.1.1 Origin and Investment Strategy of Nnewi Cluster Firms

The firms employ relatively sophisticated technology and manufacture products that require some measure of technical skills. The size of investment is substantial, measured against the typical small firm in Africa, and for this reason, firms need to master significant elements of investment and production capabilities. The capabilities were acquired through long years of trade, networking with local and foreign agents, and visits to factories of suppliers. Investment in these segments of industry requires knowledge of machine tools, product design at the early stages, and process and complex product design at later stages.

In all the cases but one, the road to manufacturing was through trading apprenticeship to importing and finally, manufacturing. Entrepreneurs raised capital from trading, and subsequently entered into manufacturing partnership with technology and machinery suppliers. None of the founders had previous production experience except one entrepreneur who had previous experience with a multinational company (MNC) producing electrical cables. This entrepreneur then went on to establish business along the same line.

Once persuaded, an entrepreneur imports machinery and equipment, and contracts engineers to set up the plant. Procurement of machinery is sometimes done piecemeal as capital becomes available, until a whole plant assembly is ready. The pattern of investment is unbelievably uniform for all the firms.

Firms acquired production capability through technological training of start-up/pioneering staff in Taiwan or on-the-job. In each instance, the foreign technical partner provides training manuals as well as technical assistance in installation and plant commissioning. Most owners are semi-literate, coming from trading backgrounds and without formal engineering schooling. Training is for that reason very important and central to the firms' subsequent technological capability acquisition strategy. On-the-job training during production takes the form of "close marking" of foreign technical partners. Overall, firms succeeded in acquiring investment, production and minor innovation capabilities to a great extent. Major innovations involving advanced design skills and process capabilities are yet to be seen since firms are still basically copying and modifying foreign designs. Table 2 shows that much of the innovation undertaken is minor, yet important improvement to old processes and products. Medium and large firms are more active in carrying out innovations to technological processes, as well as to products.

Table 2: Reasons for Innovation by Firms in Nnewi

Firm size	Old process improvement	Old product improvement	Different variety of existing products	Capacity expansion	Others
Small	52.3	20.4	-	22.5	20.0
Medium	59.0	16.3	16.7	18.17	50.0
Large	50.0	50.0	75.0	-	-

Source: (Oyelaran-Oyeyinka, 1997)

3.2 Comparing Firms and Cluster Characteristics

To understand the content and nature of emerging manufacturing networking, we examine in some detail, the subcontracting activities in the Lagos cluster. Subcontracting refers to user-producer relation, usually a form of non-equity arrangement between firms, in which goods and services are provided according to the specification of the user. This mode of inter-firm linkage often demands communication and consultation, and in most cases leads to obligational relationship (Perry, 1999). How much firms externalise their activities is subject to a number of factors ranging from the level of production know-how outside the firm, through the need for specialised intermediate inputs, to cost-reduction.

The need for secure supply sources, in timeliness and quality, and the decision on the choice of local as opposed to distant suppliers, particularly for low-volume supplies play a part in the firms'

decisions in underdeveloped economies. A good number of the 32.6% firms in these two clusters subcontract some aspects of their productions. However, they are mainly non-core operations such as packaging, labelling, printing, production of bulk materials, and animal feed production, among others. Sixty eight percent of those that subcontract do so because of the greater efficiency of the subcontractors - a recognition of the role of specialists, while 10% do so because of irregular demand (Table 3). Cost savings through lower inventory costs and the lower wages paid to subcontractors (16%) are additional reasons for subcontracting. Thirty nine percent of the subcontractors seek advice from firms on process-related problems while over 80% do so in respect of product improvements.

Table 3: Reasons for Subcontracting

Reasons for subcontracting	Total %
Irregular or low demand	9.7
Savings on inventory	6.5
Greater efficiency of subcontractor	67.9
Lower costs of subcontractors	16.1
Total	100

Source: Survey (2000)

Three sets of reasons were adduced for poor subcontracting of core production. First, firms express fears about the high risks involved in contracting firms with no track records. In particular, firms that manufacture custom made machinery were concerned about financial penalty arising from delays and defects. Second, and related to the first, is scepticism about the ability of potential subcontractors to meet delivery dates since one of the motivations for this activity is to speed up delivery to customers or the retail market. For instance, 45% of the firms "frequently" returned orders, while 29% occasionally did so. Twenty percent had "frequently" changed subcontractors as a result of consistently poor performance, or disagreement on specifications, while 35% did so occasionally. Forty two percent offered personnel to supervise subcontractors "often" to avoid poor quality, while 26% did so occasionally. The third set of reasons is what one may term: *"we can do it, why take it out"*. Due to slack machinery capacity from low market demand, firms tend to underutilize engineering capabilities and machine capacity. For this group of firms, it makes little sense to subcontract, particularly when they have to pay wages even when firms with superior capabilities are available.

Subcontracting collaboration is in three main areas. First is joint process and product development work that involves elements of upgrading in size, and changes in engineering materials specifications. This technical engineering change is carried out for cost saving and also in substitution whereby a particular material is unavailable or too costly for the local market. This type is common with the mature firms, particularly in food processing machinery. The second broad area is in product standardisation, an exercise that is becoming increasingly important as firms compete with higher quality imports in all sectors. The third area and related to the first is in reverse engineering. Firms will often subcontract difficult designs and more commonly, electrical/electronic parts and components to specialised firms. Of the

three, 30% collaborate in product quality standardisation, 15% in reverse engineering collaboration and 13% in joint product/process development.

From table 4, there seems to be an average incidence of output rejects (index of 2.18) which is above average, and an equally pragmatic response in which most firms second their own staff and participate actively in "supervising" the work of subcontractors. The incidence of surcharge is equally prevalent confirming the scepticism of firms, but most admit to continual improvement on the part of subcontractors. There is a low to average index of switch of subcontractors but from firm-level interview, this happens largely as a result of disagreement in terms of contractual costs and conditions rather than as a result of performance.

Professional ties, informal social interactions, and proximity tend to be the most important forms of social networking. Less than 9% of the workers employed in firms in the Lagos clusters are related to the owners, whereas at Nnewi, the entire workforce is of Nnewi origin. Most have trading outposts in Lagos that are substantially staffed by families and co-ethnics. In the metropolitan cluster, 32% of firms claim that non-professional ties other than family determine business relations, while spatial proximity and family ties are claimed by 19% and 20% respectively.

Table 4: Response (%) to Subcontracting Outputs by Firms

Response to subcontractors "errors"	High or "Frequently"	Average "Occasionally"	Low or "Never"	Response Index
Reject	45.2	29.0	25.8	2.18
Surcharge	-	48.4	51.6	1.94
Change subcontractor	19.4	35.5	45.2	1.74
Joint exercise	41.9	25.8	32.3	2.1

Source: survey. Note: Index was calculated by weighting averages and normalising scores. 3=High, 2=average, and 1=Low.

In the following section, Nnewi firms' and cluster characteristics are compared with that of the metropolitan clusters and in so doing the following are examined: subcontracting, networking, geographical proximity, co-operation and competition, trust and cultural affinity.

Networking: Three types of networking are dominant in the two clusters: trade, production and social. The social network includes professional and family ties, kinship and ethnic bonds. The most prominent at Nnewi is the trade network and social networking. Trade networking has been the mainstay of Nnewi entrepreneurs for decades and the area has for long controlled a huge portion of trade in transportation and automotive spare parts in Nigeria. For the last 80 years, starting with importation from Europe and later from East Asia, Igbo traders of Nnewi origin had accumulated considerable experience and succeeded in forging linkages with partners in Asia. Family ties had

been an important source of credit, and a novice starts out as an apprentice trader, learns the ropes, and is started out with some capital. Outsiders are kept out completely and the new apprentice is soon exposed to international partners. In the manufacturing stage, there is evidence of shared facilities, and informal provision of capital through family ties continues, but manufacturing subcontracting is yet to emerge. This is not surprising for two reasons adduced by firms. First, independent scientific and technological infrastructure such as foundry, forge shops and testing facilities that promote subcontracting, are largely absent. Second and as a result of the first reason, most factories were established to be self-sufficient in terms of core production, the provision of ancillary facilities, and basic utilities, since investment and plant design assumed "Greenfield"¹ conditions. Greater subcontracting may evolve over time when production processes begin to demand greater specialisation, and as the market demands higher quality products.

Geographical Proximity: Firms are concentrated within the locale of Nnewi although there is considerable trading and other supply relationships with companies outside Nnewi. The most remarkable aspects of the linkage relationship is the firms' source of technology which is Taiwan. To this extent, Nnewi cluster differs significantly from the European and Japanese clusters that have their origin in traditional crafts and a longer history of technical apprenticeship. Nnewi is also unique in the sense that while firms derive strength from each other's presence they have few subcontracting relationships. The cluster has no sea or air port, the roads are not good and in most cases are constructed by the entrepreneurs themselves. However, the resource-based firms such as manufacturers of automotive rubber products have strong links with domestic suppliers. The Lagos clusters have developed relatively more intense relationships but subcontracting is more in non-core activities.

Co-operation and Competition: There is an intense desire by the entrepreneurs for social relevance and high visibility. The subtle competition, which started with trading, seems to manifest in a "manufacturing contest". There was co-operation in trading where a group of traders would entrust huge sums of money to a member for making purchases on behalf of the group. This practice which reduces transactional costs (airfare for instance) is common among family members. This element of co-operation still exists where wealthier kinsmen advance credit to new entrants to start a business; there are shared facilities, equipment and in rare cases, assistance with manpower. Competition and rivalry, however, remain intense and firms protect production "secrets" constantly.

Entrepreneurial Dynamism: A most important source of the relative success of Nnewi is the perceived dynamism of its entrepreneurs. The typical small hi-tech firms in Europe and Japan are run by skilled labour and highly educated manpower. The Japanese entrepreneur is likely to be a product of an apprenticeship system (*deshi*) with its strong emphasis on technical skills, while the Nnewi businessman comes from a trading and apprenticeship background. The majority of Nnewi manufacturers are semi-literates who have learnt to operate relatively modern systems but have low level educational backgrounds, yet evidently good technical factory level skills. The Lagos clusters have a higher level of educated manpower as earlier discussed.

Trust and Cultural Affinity: Nnewi is a culturally homogeneous society and manufacturing, like trading which gave impetus to its growth, tends to be organised along a strong ethnic accent. Family ties are critical while kinship networks formed the basis for informal finance and the apprenticeship system that provided a foundation for Nnewi's success. The way in which the system works needs to be properly understood through systematic research.

In the Lagos clusters, 74% of the owners are from states within the southwestern part of the country while other Nigerians from other parts of the country own 26% of the enterprises. In contrast, all owners of businesses in the Nnewi cluster are natives, not just of South-eastern Nigeria but specifically from Nnewi town (Oyelaran-Oyeyinka, 1997). Most workers are from the town and are related to each other and to owners of firms. The liberal land policy and the relatively more accommodating attitude of Lagosians, contrasts sharply with what obtains in South-eastern Nigeria where a non-native person is most unlikely to have access to land for business. The contrasting pattern of ownership of businesses in the clusters reflects the cosmopolitan nature of Lagos and the different values of the cultures. It is part of what is commonly known as "the son of the soil syndrome" in Nigeria and an important determinant of the nature of ownership and direction of development. Less than 10% of workers in the Lagos clusters are family members of the owners of the SMEs.

3.2.2 Educational Levels of the Entrepreneurs and Workers

All the Lagos firm owners have formal education; the majority have gone beyond high school to have advanced degrees. About 4% have high school certificates while 12.6% have Trade Technical Certificates and/or school certificates (equivalent of high school but with emphasis on technical courses). A total of 63.2% have bachelors degrees, and 20% obtained Higher National Diplomas (a degree course taken in polytechnics, with emphasis on skills rather than theory). The other 8% have postgraduate degrees.

In the skilled workers' category, only 1.3% do not have formal education. Fifteen per cent passed high school, while some 32% have Trade Technical Certificates, and 28% obtained the Higher National Diploma. About 23.7% have bachelors degrees and higher certificates. In the unskilled workers category, 19% have no formal education, while 56% passed high school. About 25% have the Trade Technical Certificate and/or high school certificates (table 5).

Table 5: Educational Levels of Owners

Type of Degree	Lagos Cluster (%)	Nnewi Cluster (%)
University Degree	63.2	5.8
High School or equivalent	36.8	Less than 30

Source: survey

At Nnewi, the path and sequence of transformation from trading to manufacturing is, with few exceptions, extremely similar. Most of the entrepreneurs have only elementary education before

starting an apprenticeship period - usually funded by a relation. There is a strong accent on kinship that defines the structure of trading and subsequently, that of manufacturing. This practice is not uncommon with small and medium entrepreneurs. The strategy is to keep the skills and experiences gained within the family while reducing the risk of losing a valuable worker. Again, consistent with the literature findings on SME clusters, trust between employers and employees is critical for success. Employing relatives into the trading and manufacturing network reduces the risk of sabotage and ensures some measure of loyalty. These distinguishing characteristics of this emergent cluster have dramatically shaped the process of industrialisation in this semi-urban town.

3.2.3 Limiting role of support systems

Common to both clusters is the poor state of science and technology support systems. Response from the Lagos clusters, with relatively better support systems is reflected in table 6. Firms internalize functions that could otherwise be contracted out relatively cheaply, because the specialists are not available outside the firm. In cases where they are available they are within rival firms.

Table 6: Ranking of Support Systems by Lagos Firms

	Public	Private
Materials Testing	1	1
Training	2	3
Technical Assistance	1	2
R&D Support	1	1
Industrial Extension	1	1
Electricity	2	4

1 = weak or none 5 = strong

Source: Survey

The similarities and differences are summarized in table 7.

Table 7: Lagos and Nnewi: Comparison of Firm and Cluster Characteristics

Characteristics	Lagos (metropolitan)	Nnewi (rural cluster)
Educational level	Most owners are first degree holders and workers are largely educated	Most owners of businesses are semi-illiterates
Age in production	80% of businesses were established in the last 15-25 years	Similar age structure with Nnewi firms
Ownership	Nigerians own all firms; 61% sole ownership while balance has joint private ownership.	Mostly sole proprietorship <i>by natives of Nnewi</i> .
Relation with support institutions	Average	Very weak
Export orientation	West African markets	Exports to West African countries
Manufacturing origin of entrepreneur	Diverse backgrounds including previous experiences with MNCs	Most come from trading, with close ties to Taiwan and from there, moved into manufacturing of same products
Geography, spatial proximity	Metropolitans cluster with far greater availability of utilities but poorly maintained. Liberal land policies enable a diverse set of business ownership. Factories are located in industrial areas and spatial proximity is a greater determinant of inter-firm co-operation.	A rural enclave with poor roads and power supply. Factories are built on family land. Spatial proximity does not seem to engender horizontal inter-firm co-operation.
Ethnicity, family and kinship ties	Accent on ethnicity is not pronounced; social and professional ties tend to be more a determinant than kinship and family.	This is a strong basis for employment and trust is equally based on filial and family ties. Nnewi cluster originates from "this is our land".
Relation with foreign suppliers of machinery	Diffused and non-uniform. Not as strong and enduring.	Very strong ties with Taiwanese partners.
Relation with local inputs suppliers and subcontractors	Stronger than what obtains at Nnewi. Sources of supply are wider and there is greater scope for co-operation within the metropolis. not subcontracted	Local resource-based activities have strong trading ties with domestic input suppliers. Core activities are not subcontracted

Source: *Linkages in African Manufacturing Cluster: a Nigerian Case Study*

(Footnotes)

1

Greenfield" investment assumes zero-level utilities since plant is on "virgin" land.

4. Conclusions

Table 6 summarises the main characteristics of the clusters in the urban and metropolitan locations. The author discusses how different attributes have shaped the evolution and performance of the clusters. Examining the nature of subcontracting networks in both locations in some detail, the author found that while networks are growing in the metropolitan cluster, they are much fewer in the rural cluster. The availability of specialised agents seems to provide the impetus for firms to engage in subcontracting. Even then, much of the core production activities of firms are still carried out in-house. However, the most striking attribute of the two locations is the differential influence of socio-cultural factors on the evolution of clustering in the two locations.

Economic relations among a group of firms have elements of social embeddedness and can be viewed in three different ways (Granovetter, 1973; McCormick, 1997). The first is the notion that specific and interrelated social and cultural factors give rise to different processes of development. Second is the notion that those socio-cultural identities provide a foundation for trust and reciprocity in firms dealing with one another; and third, that the social milieu exerts strong influence on, and is influenced by, the processes of innovation and technical change. There is evidence from the study that investment decision by firms and the subsequent cluster formation in the rural cluster studied was strongly predicated on ethnic, family and geographic factors. In the metropolitan clusters, family and kinship factors were less influential but social and professional networks were very important.

The role of education of entrepreneurs seems to be neutral in the choice of location for the rural cluster, as other factors tend to be more powerful. We did not investigate the consequences of low educational attainments for firm performance but this will become crucial in an increasingly competitive, skill-based economic milieu. The compelling need for investment security, and the unavailability of land in Eastern Nigeria meant that entrepreneurs locate factories within their own "fathers compound" even in the face of high transaction costs (poor road networks and poor power supply). However, in the metropolitan clusters, social and professional networks are based on educational attainment of owners and for that reason tend to be a strong determinant of business formation and growth.

Spatial proximity plays different roles. Nnewi firms are part of business associations, as are the Lagos firms but the two clusters tend to leverage professional networks in different ways and to different degrees of intensity. The linkage with foreign firms is more crucial to the Nnewi entrepreneur while firms in Lagos have developed greater inter-firm links among themselves.

Whereas in the former, cluster collaboration has grown with input suppliers and traders within and outside the country, the latter engage local firms in maintenance, purchase of spares and in sharing of information on technical and market matters. Newer firms trade and conduct much of their financial transactions in Lagos where they maintain trading outposts.

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