

# Counteracting innovative constraints: Insights from four case studies of African knowledge intensive metalworking & automotive clusters – ‘The *Akimacs*’

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We respond to repeated calls over the years to further develop cluster theory specifically in an African context. Our contribution is to construct a framework which integrates theories focusing on path dependency; transaction cost economics (efficiency and systemic interdependency models); and regional development (lock in models). Our focus is on the innovativeness of African clusters and constraints on such innovation. Thus, drawing on cluster literature on constraints to innovation coupled with insights from current empirical work within African automotive clusters, we examine the challenges of counteracting the multilevel constraints which hinder innovation in African clusters. We develop a model for counteracting cluster constraints focusing on the impact of variations in innovative frequency, diffusion of innovations, innovative speed, and protection of innovation. The model emphasises the opportunities that arise when new entrant and incumbent firms interact to neutralise constraints at transactional, social & ecological, and knowledge levels.

**Key words:** African clusters; multilevel constraints; innovative frequency; innovative diffusion; innovative speed; innovative protection

## 1. Introduction

Scholars in Africa often argue that factors such as poor physical infrastructure, corruption, political instability and a poorly developed entrepreneurial class stifle innovation and progress (Adeboye, 1997; Fick, 2002; Robson et al., 2009). However, despite the peculiarities and uniqueness of such African business systems, little attention has been paid to the specific challenges of innovating within African contexts (McCormick and Maalu, 2011). Where attempts have been made to identify the challenges / constraints on innovation in African business settings (Adeboye, 1997; Fick, 2002; Robson et al., 2009), there is little guidance on how such challenges could be counteracted. A specific focus of attention in the economic development literature is itself underdeveloped in the African context, industrial clusters; so there have been repeated calls over the years to further develop cluster theory specific to the African context (Naudé and Havenga, 2004, 2007; Bergman, 2008).

Our aim, therefore, is to contribute to the theory and practice of managing and counteracting innovative constraints in an under-researched but important field, taking as our reference point where required some selected knowledge intensive automotive African SME clusters. Drawing on this current empirical work, but mainly on an integration of theoretical work from unconnected fields, we identify several features of an African cluster which, despite them operating in a hostile business setting, could counteract innovative constraints, and the conditions under which this might be possible. These are expressed as four Propositions which we hope may be of interest and value beyond the specific clusters which have contributed to their development. Here, our approach mirrors that of Fayolle et al. (2010) in this journal in setting out a research agenda for linking levels of culture and entrepreneurial intention.

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In order to support the basis of our four propositions with references and data, we opted for a qualitative approach as suggested by Eisenhardt (1989), who argued for shaping hypotheses and theories using rich empirical material derived from case studies. In so doing, we collected evidence from selected detailed case studies of African clusters conducted by a variety of scholars whose work was likely to highlight constraints to innovation and growth in African clusters, whether or not this was a stated aim.

The rich empirical material used in our '*corpus*' is the basis for shaping our propositions; these we intend as a theoretical contribution in the reportedly under-theorised field of African clusters (Naudé and Havenga, 2004, 2007). Included are rich case study findings from studies of four 'African knowledge intensive metalworking & automotive clusters', hereafter referred to as *Akimacs*. These comprise: Suame magazine automotive parts and metalworking cluster *Ghana*, Nnewi automotive parts cluster *Nigeria*, Durban Auto cluster *South Africa*, and Kariobangi metalworking cluster *Nairobi Kenya*. A key feature defining most enterprises in these African metalworking and automotive parts clusters is that they are knowledge based. We should make clear from the beginning that our definition of knowledge-based clusters in this context excludes modern sector clusters like Oil or IT. We have identified patterns in the way in which *Akimacs* have counteracted innovative constraints whereas most other clusters in Africa, classified as survival clusters, have failed. We hope our propositions stimulate and guide interest on how to counteract innovative constraints in African cluster settings by highlighting some of the most important questions as yet unanswered and suggesting further research areas open to exploration and analysis.

These Propositions have been generated through combining a careful examination of the extant literature on the interaction effects between new entrants and incumbents in African cluster settings, with some case studies of knowledge intensive African clusters. In particular, we focus attention of the relative innovative potential of incumbent and entrant firms. Empirical studies of African clusters generally conclude that the entry of new firms intensifies competition, lowering the sales revenues and profitability of the incumbent firms within a cluster (Yoshino, 2011). New entrant firms in such settings are characterised by scholars as imitators and copy cats, while the incumbents are viewed as rigid and resistant to change (Hill and Rothaermel, 2003; Asaba and Lieberman, 2008; Yoshino, 2011).

Thus, in African cluster settings interaction means that innovation is suppressed all round: the new entrants fail to radically innovate due to their tendency to imitate the ways and methods of the incumbents, which favor incremental innovation at best (Oyelaran-Oyeyinka et al., 1996; Oluwajoba et al., 2007; Robson et al., 2009). However, while this picture of new entrant's negatively affecting incumbent performance has some justification, the tendency may not be universal.

When confronted by multilevel constraints (environmental, systemic, or cluster related) some new entrant firms will perform better than others will. For example, Sonobe et al., (2011) describe how new entrant firms in a metalworking cluster in Nairobi overcame the congestion effect and declining performance levels over time. They pointed out that artisans' levels of education, size, and number of employees could change over time leading to changes in profitability, marketing, and product quality (Sonobe et al., 2011). This leads directly to the formulation of the central research question as follows: What opportunities could arise when new entrant and incumbent firms within a knowledge intensive African cluster interact to neutralise constraints at transactional, social, ecological and knowledge levels?

In addressing this question, three levels of constraints to innovation commonly hindering African clusters are identified. A model is then developed of counteracting cluster constraints focusing on the impact of variations in: innovative frequency, innovative diffusion, innovative speed, and innovative protection within clusters. The model identifies conditions under which new entrants can counteract cluster innovative constraints within African settings. This gives a deeper understanding of multilevel cluster constraints in an African context and suggests proposals which might promote innovativeness.

## **2. Innovation: Definitional issues**

It is vital to be clear about the definition of innovation in this context. Since this paper is aimed at understanding the constraints of innovation in African cluster settings, then innovation is only defined within the context of African SME clusters and their environments. Thus, we acknowledge the eclectic nature of innovation and its constraints in African business settings, particularly given the historical, social, economic, and institutional factors inherent in regional development challenges of Africa. Thus, while we recognise that innovation can result from the actions of human agency (“entrepreneurs”) to found new ventures, introduce new products or processes, new marketing methods, and new organizational forms (Schumpeter, 1984), we argue that innovativeness and control over its inhibitors or facilitators is usually beyond the sole action of a heroic Schumpeterian entrepreneur. Here we follow Peneder in arguing that:

“Schumpeter’s emphasis on individual characteristics, personified in the heroic function of entrepreneurs is not a fully satisfactory explanation of how novelty enters and variety persists in the system. On the contrary, innovation research regularly demonstrates how firmly embedded innovative activities are in specific social and institutional arrangements” (Peneder, 2001: 24).

The innovation process itself, which involves design, development, implementation, and mastery of novel ideas, takes place within an institutional and social context with people engaged in the process bound by repeated transactions over time (Van de Ven, 1986; Parto, 2008). The social arrangements and local institutional settings in clusters influences modes of governance guiding what knowledge to share, which specialised assets to develop, which relationship specific investment are to be made, and what enforcements to deploy (Dyer and Singh, 2004; Bell et al., 2009).

Moreover, social structures such as kinship and friendships can be critical in fostering or inhibiting learning and innovation in African clusters (Mytelka and Tesfachew, 1998; Parto, 2008) where more formal institutions are often weaker than those in contexts where classical innovation studies have been carried out. In fact, there is evidence that most African Small and Medium Sized Enterprise (SME) clusters are dominated by multi-generational family-owned SME’s passing old practices, systems, habits, and cultural values from one generation to another (Brautigam, 1997; Oyelaran-Oyeyinka, 2004; Madichie et al., 2008). Family networks are on one hand a vital source of social capital, resources, and connections for new firms (Staber, 1997; Robson et al., 2009), but on the other may impede innovation, should more senior family members prefer to use older technologies, or to resist the introduction of specific innovations (Staber, 1997; Hausman and Fontenot, 1999; Oyelaran-Oyeyinka, 2004).

In this context, it is necessary to define ‘innovation’ from the perspective of the cluster firms. Here we take innovation as “...the processes by which firms master and implement the design and production of goods and services that are new to them, irrespective of whether or not they are new to their competitors – domestic or foreign” (Ernst et al., 1998, as cited Mytelka and Tesfachew, 1998).

Such a contextual definition is apposite in this study since the main goal is to examine the innovativeness of African clusters and constraints thereon in terms of the local artisan's enactment of social value creation (Korsgaard and Anderson, 2011) and their cultural perception of opportunities (Dana and Anderson, 2007).

### **3. New entrants vs. the incumbents**

A phenomenon which continues to intrigue scholars and policy makers is the relative innovative impact caused by the activities of new entrants and incumbents in either an industry or a cluster of related firms (Staber, 1997; Hill and Rothaermel, 2003). In a cluster of related firms, it is expected that the entry of new competitors would alter or shape that cluster's growth (Staber, 1997; Mytelka, 2000). A cluster is a geographic concentration of related SMEs, often with a defined geographical boundary and known population (Porter, 1990, 1998; Staber, 1997).

Scholars have argued that SME clusters are collectively more efficient (McCormick, 1999; Schimtz and Nadvi, 1999) but also as a group more vulnerable to shocks caused by the entry of new competitors, the adoption of new policies, or the introduction of changes in the rules of competition (Mytelka, 2000; da Rocha, 2009). A persistent theme in literature derived from a study of clusters in the developed world depicts new entrants as radical innovators that exploit new technology and rise to market dominance while incumbents may go in to decline (Staber, 1997; Hill and Rothaermel, 2003). But in an African setting, these new entrants that are supposed be the actors central to the innovation process have apparently failed to transform clusters into dynamic industrial systems (Pedersen, 1997; Mytelka, 2000). So the question arises: why should this be so? This has led to various explanations as to why the interaction of new entrants and incumbents has failed to transform African clusters into dynamic industrial systems.

One credible explanation is that new entrants to African clusters originate mainly from the incumbent firms as spin offs having the same geographical, social and cultural roots as a result of the traditional apprenticeship system (Robson et al., 2009). This has the undesired effect of limiting the diversity of new entrants originating from elsewhere (Staber, 1997; Buenstorf and Geisseler, 2009). As a result, owner-managers of new entrant firms have limited capacities and skills to undertake innovative activities (Robson et al., 2009). This has profound implications since the innovativeness of spin-off firms is recognised as being linked to their owner's technical knowledge-base (Cooper, 1973; Watkins, 1973).

Moreover, as compared to the West, this particular constraint is intensified by the absence of a more general technological ecosystem where applied research is undertaken and new knowledge generated.

### **4. Multilevel constraints to innovation in African cluster systems**

However, the literature suggests that the situation is not this simple and that there are multilevel constraints hindering the ability of African clusters to innovate generally and which make it particularly difficult for the new entrants to introduce discontinuous and / or disruptive innovations. Characterising these cluster systems' constraints in turn involves integrating insights from a variety of diverse fields which have served as lenses to examine industrial clusters, including: transaction cost economics, organizational sociology, population ecology, and the knowledge based view. Some of these explanations overlap due to the difficulty in delimiting cluster boundaries.

#### ***4.1 Transaction level constraints***

There is a tendency for firms within the same cluster to engage in multiple transactions with other specific cluster member firms over time (Bell et al., 2009: 632). The manner in which these repeated transactions are organised and governed has important implications. Clusters are pushed towards improved horizontal specialization, vertical disintegration, and costs reduction (Brautigam, 1997; Oyelaran-Oyeyinka, 2004; Oz, 2004; Scott, 2006).

Repeated dealings over time can lead to increased trust and social bonding (Tidd and Bessant, 2009: 285). Although, this "...repetition of transactions is the basis of efficiency...systemic interdependence creates constraints to change" (Tidd and Bessant, 2009: 286). Systemic interdependence is a major constraint to innovate. Different activities undertaken within a cluster are "...systematically related to each other and through repetition are combined to form transaction chains" (Tidd and Bessant, 2009: 286). Transaction chains, once created, exert an influence on the mechanism for change, such that SMEs engaged in repeated transactions within a cluster often find it difficult to switch trading partners or evolve an already existing governance structure (Bell et al., 2009; Tidd and Bessant, 2009).

Breaking such chains may incur excessive quantifiable costs as well as the risks associated with change or transition. Typically, transition costs are the sum of take down costs incurred in dismantling existing governance structure plus set up costs when building a governance structure to accommodate future transactions (Bell et al., 2009). Thus in a cluster "...if the transition costs are perceived to exceed the benefits of adopting the new governance arrangements, firms will choose to persist with the current structure, even though it might represent suboptimal design at the transaction level" (Bell et al., 2009: 634). African incumbent SMEs often get trapped with a particular suboptimal design dictating governance related path dependencies, influencing also the path of new entrants (Bell et al., 2009).

#### ***4.2 Social and population ecology level constraints:***

Local institutions play a vital role in regulating cooperation and competition of firms in a cluster (Van Dijk and Sverrisson, 2003). In some instances, the thick and dense institutional structure based on commonly held worldviews often found in African clusters leads to regional and cognitive 'lock in' or sclerosis (Martin and Sunley, 2006; Powell and Grodal, 2006). A cluster or region is said to be 'locked in' where previous structures, processes, and configurations built during periods of increasing returns have then become a source of increasing rigidity and inflexibility to change (Martin and Sunley, 2006; Powell and Grodal, 2006; Yoshino, 2011).

Organization theorists have referred to the processes leading to homogenization of particular structures due to mimicry as 'institutional isomorphism' (Asaba and Lieberman, 2008). Here, cultural coherence and social structures facilitating trust building and learning during early development of a district could later become a force to deepen old habits (Staber, 1997; Bell and Albu, 1999; Powell and Grodal, 2006; Asaba and Lieberman, 2008). Cluster social structures are relationally embedded. This means that actors within a cluster population do not only have relations with each other, but also with third parties and are expected to influence and be influenced by each other's behavior (Jones et al., 1997). As has already been noted, an example of this is the dominance of multigenerational family-owned SMEs passing on old practices, systems and habits. This has been argued to have impeded innovation in instances where family elders may prefer to use an older technology or resist the introduction of particular innovations (Staber, 1997; Hausman and Fontenot, 1999; Oyelaran-Oyeyinka, 2004).

Furthermore, what is true for intra-firm behavior is also likely to hold at the inter-firm level, with population ecology scholars arguing that, where firms face the same harsh environmental conditions and resource constraints as do African SMEs, there is a tendency for firms to increasingly resemble one another and converge towards a common worldview (Asaba and Lieberman, 2008). Such shared perceptions are likely to have stifled the innovativeness of African clusters.

#### **4.3 Knowledge systems level constraints:**

The conceptualization of a cluster as a knowledge system where knowledge is created, accumulated, and exchanged is gaining traction among scholars (Bell and Albu, 1999; Arikian, 2009). These scholars assert that a cluster is more than a mere mechanical system of production (Bell and Albu, 1999). There are both local and cosmopolitan aspects to the knowledge exchange system. On one hand, it is argued that a cluster's innovativeness is associated with its capacity to collectively create and exchange knowledge within clusters (Arikian, 2009). Whilst on the other, access to knowledge located outside clusters is vital for longer-term dynamism and radical forms of innovation (Bell and Albu, 1999; Oyelaran-Oyeyinka, 2003; Powell and Grodal, 2006). Thus, a cluster characterised by both intensive knowledge exchanges locally - a 'local buzz' - and with an extensive external network - 'global pipelines' - would enjoy a sustainable competitive advantage (Mitra, 2000; Mytelka, 2000; Bathelt et al., 2004).

Empirical evidence suggests that linkages between African enterprises, even if located in a cluster, to knowledge repositories (such as universities, science parks and R&D centers), is weak (McCormick and Maalu, 2011; Taura, 2012). Consequently, lack of knowledge inflow from outside sources has led to the formation of clusters in Africa whose only sources of knowledge originate locally (Bell and Albu, 1999; Guiliani, 2005). Replication and exchange of the same local knowledge has become a major constraint to innovativeness in African clusters.

### **5. Counteracting innovative constraints in African automotive clusters**

The constraints identified above are all faced by incumbent SMEs in African clusters. New entrant firms are confronted with these levels of inbuilt multilevel constraints but do not seem to have the special advantages enjoyed by more aggressive new entrants in more advanced countries (Hill and Rothaermel, 2003). Robson et al. (2009) found that the superior resources of larger firms outweigh the commonly argued SME advantage of flexibility as far as innovative activity in Africa is concerned.<sup>2</sup> How, then, can African new entrant firms counteract these established multilevel constraints?

Previous models assume that such rigid incumbency cannot be counteracted. It has been argued that new entrants only intensify competition, lower sales revenue, and suppress profitability in congested geographical settings (Yoshino, 2011), with this negative impact being due to the inability of new entrants to radically innovate.

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<sup>2</sup> There are echoes here of Miles and Snow's popular strategic management framework. Incumbents are clearly 'defenders' in their terms, but new entrants seem to lack the capacity to become 'prospectors', delivering the general benefits to the cluster that might otherwise accrue. (Miles and Snow, 1978; Gimenez, 1999; Gimenez, Pelisson et al., 2000).

African SMEs are generally characterised as incremental innovators (Oyelaran-Oyeyinka et al., 1996; Oluwajoba et al., 2007; Robson et al., 2009). The notion that African SMEs are imitative or incremental innovators is acceptable (Oyelaran-Oyeyinka, 2003), but there is considerable variation in innovative frequency, innovative diffusion, innovative speed, and innovative protection within and among clusters. Since the pattern of these innovative dimensions varies from one cluster to another, the nature of the emergent patterns could be the basis for constructing a framework for counteracting constraints to innovation.

Thus, our theory building in this paper begins by explicating the patterns of innovative dimensions as a basis for characterising variations in cluster innovativeness in Africa (Bacharach, 1989; Eisenhardt, 1989, 2007; Corley and Gioia, 2011). In so doing, emphasis is focused on examples from ideal features enabling African knowledge intensive automotive clusters to counteract some constraints. The model is introduced in Figure 1, where we connect the levels of constraints – in the Transaction Chains, Social and Ecological System, and Knowledge System – to the potential effectiveness of *Akimacs* via a series of baseline propositions. The derivation of these Propositions is set out in Section 7, emerging from our explications of respective innovative dimensions characterising knowledge intensive innovative clusters in Africa. But first it is necessary to set out the characteristics of the Akimac case studies so as to ground that discussion empirically.

**Insert Figure 1 about here**

## **6. Case Studies**

In this paper we opted for a qualitative approach as suggested by Eisenhardt (1989), who argued for shaping hypotheses and theories using rich empirical material derived from case studies. In so doing, we collected rich empirical material from four African knowledge intensive ‘metalworking & automotive’ clusters namely Suame magazine automotive parts and metalworking cluster *Ghana*, Nnewi automotive parts cluster *Nigeria*, Durban Auto cluster *South Africa*, and Metalworking cluster Nairobi *Kenya*. A key feature defining most enterprises in African metalworking and automotive parts clusters is that they are knowledge intensive. We refer to these African knowledge intensive and metalworking automotive clusters as *Akimacs*.

A distinct advantage of the approach we have adopted in this study is that it enables us to draw from a fertile pool of managerially relevant contributions of numerous independent case studies of African clusters (Larsson, 1993). In so doing, we have complemented and enhanced the individual, limited, scientific contributions made by independent authors through pooling relevant case studies to overcome the drawbacks of a single case study or questionnaire surveys (Larsson, 1993). This approach of systematically pooling together relevant case studies from across African knowledge intensive metalworking and automotive clusters is crucially important, as it has provided a basis for identifying managerial best practices to overcoming innovative constraints in other African cluster settings. Bell and Albu (1999) adopted the same synthesising qualitative approach in drawing insights from a pool of six rich doctoral case studies conducted in Pakistan, India, Indonesia, Mexico, and Peru to develop a framework for understanding the dynamic role of knowledge systems *vis-a-vis* technological systems in developing countries’ cluster settings.

**Insert Table 1 about here**

The selected cases are summarised in Table 1. Two cases are from West Africa (Suame magazine and Nnewi automotive clusters in Ghana and Nigeria respectively), one is from South Africa (Durban Auto cluster), and one is from East Africa (Kariobangi metalwork Kenya). They range in age from more than 80 years to around a dozen, and in size from about 40 firms to several thousand. We chose these clusters for consideration after previous extensive field studies and desk research. We have identified and cross-checked relevant information for all the selected clusters from dozens of online and academic sources. We opted for the above four cluster cases because they met our selection criteria: (1) they are knowledge based; (2) they vary in the proportion of new entrant firms versus the incumbent firms; (3) they vary in the composition of the four drivers to innovation proposed in this study; (4) they offer sufficient insights into critical practices leading to counteracting innovative constraints in the hostile business climate of Africa.

Field work in some of the *Akimacs* reveals that they innovate across a range of automotive parts such as: car drive-shafts, bodies and roofs, trailer shafts, trailer tail-locks, gears, bumpers, exhaust systems, axles, articulated trailers, U-cramps, wheel bolts and others items; agricultural and other tooling and items such as: milling machines, block machines, containers, etc., as well as many other metal fabrications (Taura, 2012). Many of the innovations are driven by specifically local needs, including the ruggedisation of automotive items originally intended for use within a more developed transport infrastructure.

Nigeria, Ghana, Kenya, and South Africa are among the fastest growing African regions. The clusters in these countries have been reported as significantly contributing to regional development, innovativeness, and employment generation. It is therefore at least arguable that conclusions drawn on the above basis will have wider beneficial application elsewhere in Africa.

## **7. The Dimensions of innovation**

Social and ecological system constraints, transaction chain constraints and knowledge system constraints relate to one another to determine the patterns of innovation in an SME cluster. Firstly, the shared beliefs in African cluster systems influence both how transactions are organised and social capital built on the norms of cooperativeness and trust (Beccatini, 1990; Bell et al., 2009; da Rocha et al., 2009). A collective macro culture allows for the emergence of distinct forms of governance influencing knowledge sharing, development of specialised assets, relation-specific investments, and enforcements (Dyer and Singh, 2004; Bell et al., 2009). Some knowledge intensive clusters, identified below, are setting exemplary paths facilitating frequent innovation, diffusion of innovation, speed of innovation, and protection of innovation in a hostile African business setting. The features of these clusters and the conditions under which these dimensions of innovation can surface and counteract the constraints are identified in the remainder of this section.

**Insert Table 2 about here**

## 7.1 Innovative frequency

Innovative Frequency refers to the number of innovations occurring in a cluster. Not all innovations would succeed in the market place, thus the need for many forms of innovation is vital for cluster innovativeness. Clusters with a 'related knowledge base' are more likely to frequently innovate (Mytelka, 2000; Arikan, 2009).

'Knowledge base' here refers to the variety of knowledge competences that makes up a cluster. To build a related knowledge base, a cluster has to be engaged in more than just internal use of knowledge, replication thereof, and exchange of pre-existing knowledge which doesn't add to the cluster's overall knowledge stock (Bell and Albu, 1999).

The most innovative African clusters are those whose boundaries are more receptive to extra-cluster knowledge. Receptivity here refers to capacity, willingness, and humility to learn (Hamel and Valikangas, 2003). Clusters have to be consciously engaged in activities leading to acquiring, accumulating and processing its new related knowledge-base (Bell and Albu, 1999). Scholars have suggested that it is vital for a cluster aiming to be innovative to continuously undertake a 'mapping of their knowledge base' (Bell and Albu, 1999; Mytelka, 2000).

It is very unlikely that an unrelated knowledge-base would yield a desirable innovative outcome (Giuliani, 2005). Relatedness of the knowledge-base is a prerequisite for innovative frequency (Arikan, 2009). Thus, this paper rejects the contention that proximity is the sole condition for innovativeness, or indeed necessarily leads to innovation in and of itself. It is possible for firms located in a geographical cluster to be spatially proximate but 'distant' in their knowledge bases. An unrelated knowledge-base could impede innovation in clusters.

In African cluster settings, the innovativeness of new entrants when faced with multilevel constraints is affected by the existing related knowledge-base present in that cluster. For example, African automotive clusters are knowledge intensive, and co-locate multiple industry specializations in metalwork and spare parts manufacturing all dependent on a related knowledge base.

Notable among these clusters are Suame Magazine automotive cluster in Ghana; the metalworking cluster in Nairobi, Kenya; Nnewi automotive cluster in Nigeria and Durban auto parts, South Africa. These clusters appear to be more innovative than other 'survival' clusters found in Africa due to their existing related knowledge bases and receptivity to learning. Oyelaran-Oyeyinka and Lal (2006) reported some examples from the *Akimacs* (Suame Magazine Ghana, Kamukunji and Kariobangi Kenya) which show that firms with weak R&D and linkages to scientific institutions have a lower tendency to engage in collective learning, which leads to lower performance (See Table 2). Similarly Zeng (2008), summarising studies of 11 African clusters (comprising the *Akimacs* and some others) in an edited collection, reported that the impact of constraints to growth is felt mainly by enterprises with limited linkages to local technical institutes, polytechnics, and universities.

Therefore, based on the above case study findings, we assume that it is more likely that firms with weak linkages to external knowledge bases will be lower performing than those firms that are well networked to external knowledge bases and are receptive to learn. Firms with a disposition to learn and form linkages in the *Akimacs* are reported to have performed better. For example Sonobe et al (2011), based on a survey of 127 enterprises located in the Kariobangi metalworking cluster in Kenya, found that educated entrepreneurs who scale up their human capital are more likely to report multifaceted innovations (See Table 2).

In addition, Morris, Bessant et al (2006) based on three automotive component and timber production case studies, reported that there is an emerging focus for shared learning between organisations in these clusters and that such shared learning helps them to offset learning barriers leading to improved process innovation. Thus, in view of the above, we suggest:

**PROPOSITION 1** *In a cluster characterised by a related knowledge base, facilitated by receptive boundaries to extra cluster learning, opportunities arise for new entrants to counteract cluster constraints and 'lock in'. Clusters with a related knowledge-base and a positive attitude to knowledge sharing will innovate more frequently relative to those that do not have a related knowledge-base or failed to share knowledge.*

## **7.2 Innovative diffusion**

Innovative diffusion is a process by which innovations spread from a source to one or more adopters in a social system. It is affected by behaviours, beliefs, purposes, and existing structures (Hsieh, 2011). Diffusion is facilitated in a cluster through mobility of employees (job-hopping), repatriation of engineers from abroad, and exchange of staff to undertake certain tasks. Firms in a similar network exhibiting structural equivalence are more likely to adopt each other's innovative practices (Nooteboom, 1993).

In addition, firms facing similar environmental constraints often converge on similar innovative practices (Asaba and Lieberman, 2008). Nonetheless, diffusion of innovation is beyond just mere spread or replacement of a new idea/technology, but also encompasses the intrinsic nature of learning, imitation, and feedback associated with the innovative process (Hall, 2006). Innovative diffusion can therefore lead both to enhancement of the original innovation and to improvements in social and economic welfare (Hall, 2006). Thus it has been argued that innovative diffusion is the most important process for "...entities which are 'catching up', such as developing economies, backward regions, or technologically laggard firms" (Hall, 2006).

In the diffusion process within a cluster the role played by 'flagship firms' is a crucial one. 'Flagship firms' are firms that are strategically positioned within a cluster and are capable of reaching out to global networks to absorb, accumulate, and integrate innovations into a cluster (da Rocha et al., 2009). Since flagship firms are the primary agents that initiate local buzz through global pipelines, to use the colourful but evocative language of Bathelt et al. (2004), cooperation between the flagship firms and new entrant firms is desirable in counteracting cluster constraints. Flagship firms may adopt different cooperative postures depending on their chosen strategy (Arikan, 2009). They may choose to cooperate with older incumbents due to loyalty or cooperate with new entrants in anticipation of enhanced innovative prospects. In so doing, one crucial deciding factor has been the level of trust between the potentially cooperating firms. A study of manufacturers in Tanzania reports that, although different forms of social strategies affect innovation differently, trust is one key determinant enhancing the quality of information flow and is also the basis for intra and inter community relations (Murphy, 2002: 2003).

Older incumbents would often copy and imitate the innovative practices transmitted by the flagship firms and pass it on to other close accomplices with no feedback. This diffusion mode can be referred to as 'close ended'. In a close-ended diffusion mode older incumbents are not willing to experiment thus decreasing chances of successful innovation. On the other hand, new entrant firms would imitate, learn, and generate feedback to the flagship firms as they seek legitimacy within the cluster.

For reasons of convenience this diffusion mode can be described as the ‘feedback loop’. In a feedback loop mode of diffusion, the opportunities for enhancing learning and improving the original innovation greatly enhanced. Thus, the degree of cooperative learning between flagship firms and new entrants would partly explain the observed underlying variations in local cluster learning and innovativeness that has been the subject of much debate (Maskell, 2001; DeMartino et al., 2006). This also adds some additional theoretical underpinning to the importance of selectivity and localism in the role of policy in promoting enterprise learning during early industrialization in Africa (Mytelka and Tesfachew, 1998). On the one hand, there seems to be a growing interest in cluster mechanisms which can deliver learning; but on the other, there is lack of clear, detailed understanding of how such configurations could be established (, et al, 2006). Despite a lack of detailed understanding on how to configure such relationships, some clear unequivocal examples emerged in the *Akimacs* to show that ‘flagship firms / key player dominant lead firms’ play a pivotal role towards innovative diffusion and learning. First, Morris, Bessant et al (2006) cite an example of Toyota as a major auto assembler in the KwaZulu-Natal region and the instrumental role Toyota plays in legitimisation of initiatives in the Durban auto parts cluster (See Table 2). They concluded that:

“The presence of key player firms in providing governance, or coordinating role is important in creating and sustaining cooperation. These firms may not play the leading change agent role, but without their sanction, legitimisation, and cooperation it is very difficult to sustain vertical cooperation” (Morris, Bessant et al, 2006: 549).

A second classic example of the critical role flagship firms are playing in *Akimacs* was cited in a study of 11 African clusters by Zeng (2008). This documented how Taiwanese partners and the Nigerian Industrial Development Bank collaborated with some leading firms such as Isaiah Nwafor (a major trusted player on spare parts importation) based at Nnewi automotive cluster Nigeria to accomplish technology transfer – through apprenticeships, in-plant factory training, and learning by doing (Abiola, 2008: See Table 2). Thus, in view of the above, we suggest:

*PROPOSITION 2: In a cluster characterised by the presence of flagship firms, the higher the flagship firms’ cooperation with new entrant firms, the stronger the trust building and legitimization, with opportunities to diffuse innovation in a learning feedback loop. Clusters with such cooperative postures will grow as better learning regions relative to those that do not have such cooperative posture.*

### **7.3 Innovative speed**

Innovative speed is “...the time elapsed between an initial discovery and its commercialization” (Knockaert et al., 2009). It is a measure of how quickly innovations are appropriated into the market place. The speedier innovation within a cluster is, the more likely that systemic interdependency would be weak. This arises because transactions are less likely to be repeated among cluster firms where that cluster is characterised by speedy innovations.

Speedy innovations are motivated first by a high level demand; and secondly, by the sophistication of that demand. Porter (1990, 1998) argued that customer demand and its sophistication is one of the key determinants leading to cluster competitiveness. The demand for automotive parts in Africa is high due to the popularity and growing dominance of cars as a mode of transportation.

Thus, users of cars and related transportation modes in Africa often turn to their local clusters for manufacturing and repair of spare parts. The demand for spare parts and related products is relatively sophisticated in Africa.

The level and sophistication of demand in these clusters forces them to speedily innovate. In so doing, they have had to develop suitable governance frameworks. Hierarchical governance favouring explicit patterns of authority and standard operating procedures is recognised as the main framework guiding speedy innovations (Bell et al., 2009). Examples from the *Akimacs* show that firms could improve their speed even where there are pervasive state, market, and institutional failures to reach distant markets (Brautigam, 1999). Nnewi automotive cluster firms from East Nigerian township have overcome growth constraints despite market, state, and institutional failures (See Table 2). In addition to the above, a detailed case study of six selected African clusters including three *Akimacs* (Suame Magazine automotive Ghana, Kamukunji metalworking Kenya, and Ziwani vehicle repair Kenya (McCormick, 1999)), concluded that collective efficiency alone could not easily explain the phenomenon of cluster improvement or upgrading, thus suggesting that the internal workings of a cluster, available technology, and – particularly – the demand for higher quality products are the key ingredients that shape how a cluster may transition into a full blown industrial district (See Table 2).

Furthermore, higher demand and availability of market access attracts an inflow of new entrants in to a cluster. Based on studies from five African countries – namely Cameroon, Ghana, Kenya, Mauritius, and Rwanda – which include some *Akimacs*, Yoshino (2011) found that the inflow of new entrants leads to downward pressure on profitability of average incumbent firms due to the congestion effect.

Furthermore, this study also suggested that African clusters seeking to improve innovatively must provide opportunities for high performing firms to relocate to alternative locations if required if negative congestion effects were not to be generated (See Table 2). Thus, we suggest:

*PROPOSITION 3: In a cluster characterised by high level and relatively sophisticated demand, opportunities for speedy innovations arise for new entrants to invest on product differentiation and the incumbents to invest on quality improvements. Clusters with a highly sophisticated demand and an opportunity for high performing firms to relocate and avoid negative congestion effect are bound to be more speedily innovative than those that limit firm choice of location constraining them of their mobility.*

#### ***7.4 Innovative protection***

Innovative protection is essential for both new entrants and for incumbent firms. This is particularly so in the case of the protection of new entrants whose survival is dependent on novel innovations. These novel innovations, if well protected, tend to counteract cluster path dependencies. Therefore, clusters as a whole are more vulnerable if innovations within them are not protected. The market for patents is underdeveloped in Africa due to the perceived (and actual) high costs (Nooteboom, 1994; Robson et al., 2009). It is also difficult for many of these African firms to protect themselves using technological complexity due to a general lack of capability to do so (Becheikh et al., 2006).

This leaves the main options available to these firms as maintaining trade/industrial secrets, and / or maintaining lead-time over competitors (Becheikh et al., 2006). In the absence of third party enforcement mechanisms such as law suits based on patent or other protection, some clusters develop collective sanction mechanisms to enforce action against opportunism and unacceptable behaviour (Jones et al., 1997). This may include, for example, soft sanctions such as exclusion from networks for short periods or indefinitely; or firmer actions such as sabotage of various kinds (Jones et al., 1997).

Some collective sanction mechanisms are clearly more aggressive than others are, and could be employed to protect innovations by cluster firms. However, despite the existence of such strongly bonded collective enforcement and sanction mechanisms in virtually all African clusters, in a previous study we found no significant relationship between firms participating in the collective sanction mechanism and innovative protection from an analysis of 194 firms in Suame Magazine Ghana (Taura, 2012). We did, however, find that firms supported by government through licensing agreements enjoyed better protection of their innovations (Taura, 2012). This finding raises important questions about the extent and purpose to which collective sanction mechanisms are actually being deployed, particularly in the *Akimacs*. Although the relationship we found was not significant enough to warrant drawing firm conclusions, based on the knowledge based nature of the *Akimacs*, we can speculate that such firms might view collective sanctions differently. It seems likely that the *Akimacs* employ their collective sanction mechanisms to protect innovations more actively, given their knowledge intensive nature and the tendency to more readily innovate, than would the other forms of ‘craft based’ survival clusters whose firms might be using collective sanction mechanisms solely to ensure conformity. Thus, we suggest:

**PROPOSITION 4:** *In a knowledge intensive cluster characterised by active collective sanctions to protect innovations, opportunities arise for new entrants to introduce novel innovations and counteract path dependencies. Clusters with active collective sanction mechanisms deployed mainly for protecting innovations will be more innovative than those without such active collective sanction mechanisms.*

## **8. Testing the Propositions: Operationalisation, measurement, and method**

Our aim in this paper has been to open up the research agenda on African clusters by presenting the model above and its related propositions. We give some more general examples of how this might be done in the concluding discussion, but cannot resist setting out one form of quantitative study that could advance the field quite rapidly in the short-term since the methodology is already well developed and has been applied in the chosen context: logistic regression.

Robson et al. (2009; 2012) have applied logistic regression to test the innovativeness of firms in an African setting – Ghana - with illuminating results. We suggest that our four propositions could be tested using an approach similar to the one they adopted to reveal how some of the firms within the *Akimacs* are counteracting innovative constraints. We suggest the logistic regression option given the distinct advantages it has in comparison to other techniques of testing innovativeness of African firms. A key advantage of testing our propositions using logistic regression is that we could test categorical (*dichotomous*) responses of owner-managers in the *Akimacs* to determine the *likelihood* (otherwise called the *odds ratio*) of counteracting innovative constraints. Testing the likelihood ratio of the four propositions might yield insights managers and practitioners involved in managing innovation in African clusters could utilise. Thus, it is possible using logistic regression to determine statistically:

PROPOSITION 1 *How likely would the opportunity arise for new entrant firms to counteract innovative constraints within a cluster characterised by related knowledge base, and receptive boundaries to extra cluster learning?*

PROPOSITION 2 *How likely would the opportunity arise for new entrant firms to cooperate, build trust, and legitimacy with flagship firms to enable them counteract innovative constraints within a cluster characterised by diffusion and feedback loop learning?*

PROPOSITION 3 *How likely would the opportunity arise for new entrant firms to counteract cluster constraints by investing in product differentiation and incumbents on quality improvements within a cluster characterised by relatively sophisticated demand?*

PROPOSITION 4 *How likely would the opportunity arise for new entrant firms to counteract cluster constraints by introducing novel innovations within a cluster characterised by active collective sanction mechanisms?*

In testing our four propositions, the construction of dependent variables would be based on owner-managers' perception of innovative performances of their firms in regards to innovative diffusion (measured by spread of ideas/technology); innovative frequency (measured by number of innovations); innovative speed (measured by commercial exploitation of innovation); and innovative protection (measured by enforcements). The attributes of innovative performance as proposed in this study would represent the dependent/outcome variables. Respondents would be asked, the following questions: "Has your firm undertaken any form of innovation frequently (at regular intervals)?" "Has your firm engaged in the process of diffusing innovations to other firms in the cluster?" "Has your firm been successful at exploiting its own innovations commercially in the market place?" and "Has your firm made efforts to seek enforcements to protect its own innovations?"

On the other hand, the construction of the (explanatory) independent variables (also as perceived by owner-managers) would be based on *knowledge systems, learning atmosphere, governance, and enforcement mechanisms* present in the *Akimacs*. For example, Arikan (2009) suggested a strong correlation between innovativeness of a cluster with its inter-firm knowledge exchange and creation capabilities. Thus, we suggest using investment in knowledge sharing routines, cluster linkages with external knowledge-based sources (universities, science labs, and R&D), and knowledge sharing in a cluster as explanatory variables that underpin the opportunities arising for new entrant firms to counteract constraints through engaging in *frequent innovation*.

Cooperativeness, trust building, and legitimacy could be used as explanatory variables that underpin the opportunities arising for new entrant firms to counteract constraints through engaging in *innovative diffusion*. Governance mechanisms, sophisticated demand and free mobility of firms from congested cluster settings could be used as explanatory variables that underpin the opportunities arising for new entrant firms to invest in product differentiation and for incumbent firms on quality improvement through *speedy innovation*. Collective and third party enforcements could be used as explanatory variables that underpin the opportunities arising for new entrant firms to introduce novel innovations and counteract constraints inhibiting their safety and *protection of innovations*.

## **9. Discussion and contribution**

### ***9.1 A shift in the mind set?***

Previous scholars have generated important insights that improve our understanding of why African clusters lack innovativeness, but less is known about how the constraints to innovation can be counteracted. While the focus of these scholars on lack of innovativeness has served the purpose of identifying some sources of the problem, there seems to have been an unfortunate convergence on the notion that African clusters and the firms located therein are mere survivalists operating in a hostile business setting where it is too difficult to counteract constraints.

This paper has therefore had a clear focus: to develop a model and propositions for counteracting multilevel constraints. It has shown that while multilevel constraints exist in most African clusters, this may be counteracted by new entrant firms, depending on cluster characteristics. Thus, the framework proposed here raises some potentially important questions about characteristics of African industrial clusters and relationships between the multilevel structures within them.

We have shown how systemic interdependencies are formed by transaction chains and counteracted by speedy innovations at transaction level. We also show how cooperative learning between flagship and new entrants firms is likely to be fostered. In addition, we identify the vital issue of identifying and securing a related knowledge base, with receptive boundaries and active collective sanctions. We have tried to show how the aforementioned cluster features can, under certain conditions, lead to different patterns of innovative frequency, innovative speed, innovative diffusion, and innovative protection.

The implication of the theory proposed here is a positive one; that, lack of innovation in African clusters is not universal, since not all clusters in Africa are stagnant survivalists (Knorringa, 2002), or worse, that generally development works except for Africa (Roe, 1995). We therefore, cast light on why some knowledge intensive African clusters faced with multilevel constraints would regress, some would progress, and others would remain stagnant (Staber, 1997; Van Dijk and Sverrisson, 2003). We therefore hope that this research has contributed towards building theories that are more relevant to the African context and the future development of the continent.

### ***9.2 Opening up the research agenda***

We have identified several areas for further research on innovation and constraints of African clusters.

A first area of investigation involves the relationships between multilevel constraints and overall cluster innovativeness. One limitation of the model proposed in this paper is that the relationship between cluster multilevels, although more inclusive than previous attempts, is still an over simplification of a complex phenomenon. The interactions between cluster multilevel (transaction level, social, and knowledge levels) are by no means fully understood.

Previous models have already proposed targeting specific levels as units of analysis. For example, Arikan (2009) proposed a model of inter-firm knowledge exchanges with emphasis on cluster level analysis; Bell et al. (2009) proposed a different model of the organization of regional clusters with emphasis on transaction level analysis; and Bell and Albu (1999) proposed a conceptual framework of knowledge systems with emphasis on knowledge exchanges on cluster boundaries.

Thus, the challenge now is to further develop the multilevel model, and to test statistically or otherwise the interaction effects of these levels and their contribution to overall cluster innovativeness. We detail one approach in Section 8, but others are likely to be appropriate, and qualitative approaches would also be of value, not least in providing cases that might convince managers to behave in somewhat different ways if these were shown to have positive effects. It is to guide such future research that our four falsifiable propositions are presented in the paper (Bacharach, 1989). Such research would also improve our understanding in regards to the stated propositions themselves by seeking to answer questions such as:

First, related to Proposition One, does all the related knowledge-base in a cluster automatically lead to more frequent innovations; and under what conditions would certain clusters utilise their knowledge-base better than others? Secondly, related to Proposition Two, which of the various potential forms of cooperative relationships between flagship firms with new entrant and incumbent firms are likely to be beneficial to those firms, and to the cluster as a whole; and to what extent might the particular and general benefits diverge? This would shed more light on the nature of cooperative learning and add to the growing body of literature on cooperation versus competition in clusters (Newlands, 2003).

There is more generally still wide scope for future researchers to consider making contributions on the determinants of localised variations in learning peculiar to geographical regions (Maskell, 2001; DeMartino et al., 2006).

Once we accept that innovation can and does take place in African clusters, and that this process is open to more active management than previously argued<sup>3</sup>, the future research agenda begins to open up. For example, one can begin to envisage comparative analysis of variations in innovativeness between African clusters, based on cross case synthesis. This research agenda would be more illuminating than the often sterile comparative studies between an under achieving African cluster and an 'ideal' cluster in developed countries (Mkandawire, 2001) and would certainly have more policy relevance to African decision makers.

We can also envisage longitudinal studies of the changes to patterns of innovation in African clusters. This could be implemented using our framework by investigating the nature of changes in frequency, speed, diffusion, and protection of innovations by new entrant or incumbent firms in a study over time, since it would be particularly useful to know at what stage(s) in the life cycle of firms and clusters these factors are most salient and open to policy interventions.

But to integrate our framework with life cycle models of firms and clusters would open up a whole new series of contentious issues which would take us well beyond the intended scope of the current paper. What we have intended is simply to provide through our framework and base line propositions a hopefully fresh, new perspective to theorising African clusters (Eisenhardt, 1989). In this respect, we hope we have responded to the challenge set by Naudé and Havenga (2004, 2007) and Bergman (2008) to further develop cluster theory, especially in Africa.

Our framework contributes by integrating theories from path dependency; transaction cost economics (efficiency and systemic interdependency models); and regional development (lock in models) by showing that these theories are complementary rather than competitive. By integrating these theories with dimensions of innovation it is hoped that we have also made some small contribution to minimising the recognised fragmentation (Martin and Sunley, 2003; Hodgkinson, 2007) of cluster theorising more generally.

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<sup>3</sup> Part of the 'mind shift' we allude to above.

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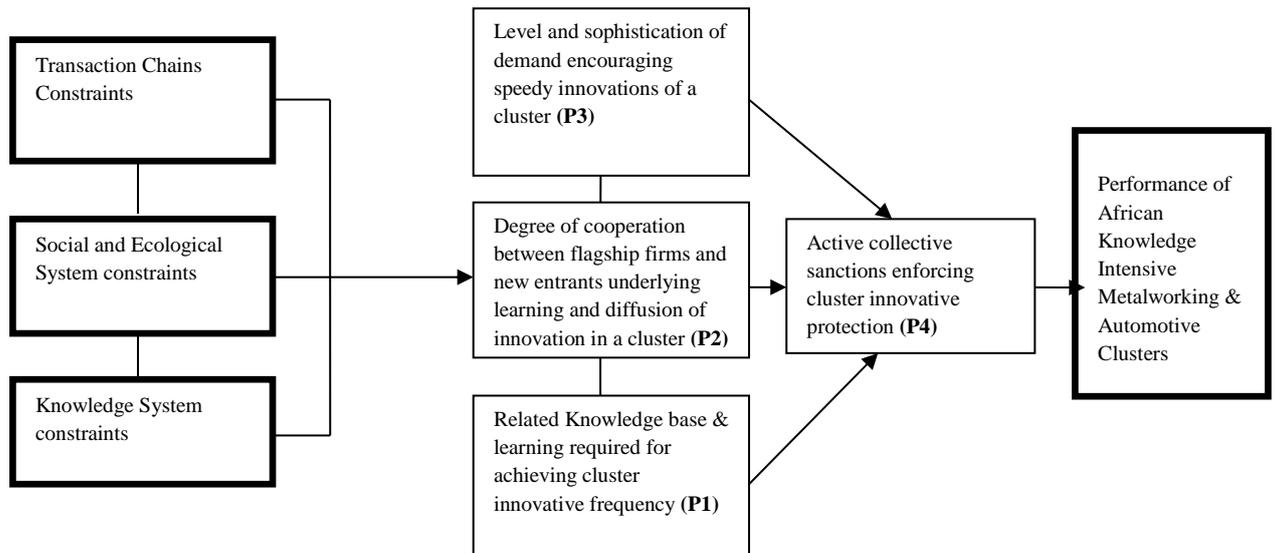
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**Figure 1**

### Multilevel Constraints in African Cluster Systems

Levels of Constraints



**Table 1: Case Study Profiles**

<b>Clusters</b>	<b>Suame Magazine metalwork and automotive</b>	<b>Nnewi Automotive parts</b>	<b>Durban Auto Parts (DAC)</b>	<b>Kariobangi Metalworking cluster</b>
<b>Year Founded</b>	Founded in 1930's by some isolated craftsmen in former army depot called 'magazine' during colonial times	Founded 1967-70	DAC established as a public-private initiative in 2002 with about 26 firms initially (Morris & Barnes, 2006)	Founded in the 1980s, by workers from formal-sector factories who lost their jobs as a consequence of the implementation of Structural Adjustment Program (SAP) in garages and workshops along the road
<b>Home Country</b>	<u><i>Ghana</i></u> Located in Ghana and covers an area of about 900,000 square kilometres employing an estimated 100, 000 workers	<u><i>Nigeria</i></u> Located in the South Eastern part of Nigeria in a town called Nnewi. An enclave of about 100,000 inhabitants	<u><i>South Africa</i></u> Located in KwaZulu Natal Region of South Africa	<u><i>Kenya</i></u> Located further away from the capital, Nairobi, than a related but less developed cluster called Kamukunji
<b>No of Firms</b>	8000-10,000 firms including automobile repair, automobile production, retail services, and metalwork. Possibly the largest cluster in Africa	85 firms	Currently 40+ firms	The population is made up of about 300 metalwork related enterprises

**Table 2: Insights from selected case studies of African knowledge intensive metalworking & automotive clusters (*Akimacs*)**

Case Study	Main focus of Inquiry	Empirical sources of data	Insights on how to counteract Innovative constraints
<b><u>Kariobangi Metalworking cluster Nairobi Kenya</u></b>			
Sonobe, T., Akoten, J., & Otsuka, K. (2011). The growth process of informal enterprises in sub-Saharan Africa: a case study of a Metalworking cluster in Nairobi. <i>Small Business Economics</i> 36: 323-335	Relations between New entrants and the Incumbents in shaping growth constraints using entrepreneurs' human capital	Based on a survey of 127 enterprises located in Kariobangi cluster. The enterprises comprise metal fabricators, foundries & lathe turners, and car repairers and panel beaters	<i>"Entrepreneurs become increasingly motivated to make multifaceted innovations that increase profitability, and that more highly educated entrepreneurs are more likely to succeed in achieving such improvements"</i> (Sonobe et al, 2009:333).
McCormick, D. (1999). African Enterprise Clusters and Industrialisation: Theory and Reality. <i>World Development</i> . 27(9): 1531-1551	Constraints to growth and development	Based on six cluster case studies from Africa comprising Kenya East garments, Kamukunji metalwork Kenya, Ziwani vehicle repair Kenya, Lake Victoria fish, Suame magazine Ghana, and South Africa Western Cape	<i>"Collective efficiency alone cannot explain why this should be so. Rather the internal workings of the cluster have to be viewed against the backdrop of markets and available technology. Producers can improve product quality only when there is both a demand for higher quality goods, and the availability of technology to produce such goods"</i> (McCormick, 1999: 1546)
Zeng, D. Z. ed. (2008). Knowledge, Technology, and Cluster Based Growth in Africa. Washington DC: The World Bank	Cluster growth in Africa	Based on 11 cluster case studies : Suame Magazine Ghana, Kamukunji Kenya, The Lake Naivasha Cut Flower Kenya, The Nnewi Automotive Nigeria, The Otigba Computer Village Nigeria, The Mwenge Handicrafts Tanzania, The Keko Furniture Tanzania, The Lake Victoria Fishing Uganda, The Textile and Clothing Mauritius, The Wine Cluster in South Africa, The Western Cape Textile and Clothing South Africa	<i>"Entrepreneurs have limited relationships with local technical institutes, youth polytechnics, national polytechnics, and universities"</i> (Kinyanjui, 2008: 34)

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**Durban Automotive Cluster  
DAC South Africa**

Morris, M. Bessant, J. & Barnes, J. (2006). Using learning networks to enable industrial development: case studies from South Africa. *International Journal of Operations & Production Management*. 26(5): 532-557

The dynamics of learning and innovation using learning networks

Based on three case studies covering groupings of automotive components and timber Products clusters

*“Emerging focus of shared learning between organizations offers a number of potential benefits which may offset some of these ‘learning barriers’” (Morris, Bessant et al, 2006: 533).*

*“The presence of key player firms in providing governance, or coordinating role is important in creating and sustaining cooperation. These firms may not play the leading change agent role, but without their sanction, legitimisation, and cooperation it is very difficult to sustain vertical cooperation” (Morris, Bessant et al, 2006: 549)*

Zeng, D. Z. ed. (2008). Knowledge, Technology, and Cluster Based Growth in Africa. Washington DC: The World Bank

Cluster growth in Africa

Based on 11 cluster case studies as enumerated above

*“Isaiiah Nwafor Group was a major player in the importation of spare parts from Taiwan prior to 1983. The Nigerian Industrial Development Bank assisted the company in acquiring eight grinding machines from its trading partner in Taiwan. The Taiwanese partner trained six Nigerian employees and sent three Taiwanese nationals to transfer the technology. The technology transfer was mainly accomplished through apprenticeship, in-plant factory training, and learning by doing” (Abiola, 2008: 55).*

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**Suame Magazine**  
**Metalworking and Automotive**  
**Cluster Ghana**

Yoshino, Y. (2011). *Industrial clusters and micro and small enterprises in Africa. From survival to growth*. Washington: The World Bank

Downward pressure on profitability for average incumbent firms as a result of the inflow of new entrant firms within the cluster

Based on a set of case studies from five different countries in Africa comprising Cameroon, Ghana, Kenya, Mauritius and Rwanda

*“Data show that good performers in the clusters tend to seek alternative locations. However, the lack of locations available for industrial activities in the same cities generate infrastructure bottleneck (particularly transport and power) and unclear zoning policies and their unpredictable changes limits firms choice of location and constrain their mobility” (Yoshino, 2011: 8).*

Oyelaran-Oyeyinka, B., & Lal, K. (2006). Institutional support for collective learning: Cluster development in Kenya and Ghana. *Africa Development Review*, 18(2): 258-278

Collective learning and enterprise performance

Based on case study of three clusters namely Suame Magazine Ghana, Kamukunji and Kariobangi metalworking clusters in Kenya.

*Unlike in most industrialised economies, private research and development institutions are practically non-existent, and publically funded laboratories are often isolated from productive enterprises” (Oyelaran-Oyeyinka and Lal, 2006: 260)*

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**Nnewi Automotive Cluster**  
**Nigeria**

Brautigam, D. (1997).  
Substituting for the state:  
Institutions and Industrial  
Development in Eastern Nigeria.  
*World Development*, 25(7):  
1063-1080

State, institutional,  
and market failure

Based on a single case study of Nnewi  
township automotive parts cluster in  
Nigeria

*“Institutional linkages have an international dimension  
in Nnewi, particularly the ties established and the  
channels formed through long standing exchange  
relationships between business groups in Asia and in  
West Africa” (Brautigam, 1997: 1063).*

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