



Towards an understanding of the economy of Johannesburg

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1. Introduction

The City has appointed the Centre for Competition, Regulation and Economic Development (CCRED) to conduct research to provide a deeper understanding of the economy of Johannesburg and the ways in which the City can best use the tools at its disposal to ensure a more inclusive, job-intensive, resilient and competitive city economy. This report provides an overview of the work undertaken in the second half of 2014 related to overall trends, understanding industrial nodes and assessing ICT development, and summarises the proposals for next steps.

In order to design evidence-based and effective policies to drive economic development in Johannesburg, the City requires a detailed understanding of the patterns of industrial activity. It needs to understand what economic activity is taking place, how firms are performing, what challenges firms are facing and what opportunities exist for firms to grow and capture new markets. Armed with this information, the City can then target interventions for maximum impact and coordinate its activities with other key branches of government. The purpose of this research is therefore to fill this knowledge gap and to provide the City with the information it needs for effective policy-making.

The research proceeds from the starting point that the purpose of local economic development is to build up the economic capacity of an area. This is a process by which public, private sector and not for profit organisations work collectively to create better conditions for economic growth and employment generation. Cluster development is one of the channels that local economic development initiatives can use to encourage and support inter-firm collaboration, institutional development and provide support in targeted industrial sectors. Johannesburg already has a number of industrial nodes that offer economic development potential, however, there is much to be understood about what is required to improve economic development activity in these areas. A better understanding of these areas will allow the City to have a targeted approach to interventions and leverage resources in the direction of greatest potential return.

The ultimate aim of any intervention by the City should be to encourage the formation and sustainability of vibrant, successful, growing industrial nodes and sector-based clusters around Johannesburg. There are a number of agglomeration economies which can be important at the node level, such as getting public transport right, and getting firms and the local authority to work together to solve infrastructure challenges, reduce crime and coordinate basic training activities. However, there are also substantial benefits to be gained from considering interventions at a sector-based cluster level. These relate to issues such as research and development, product testing, incentives and other government assistance and export promotion; all of which can be more efficiently provided in a coordinated fashion than if each firm makes individual efforts to solve the same problems. At both node and sector levels, there is an important coordination and catalysing role which can be played by the City to ensure that agglomeration economies are achieved. For example, the 'learning' of companies in developing production capabilities and research and development activities is an area in which collective action by government and companies has an important role to play.

In this context, there were three key components of the research with the aim of helping the City to move towards playing such a coordinating role effectively in Johannesburg.

First, a review of major trends affecting the Johannesburg economy was undertaken in order to assess the key opportunities which are available to firms in Johannesburg in terms of growth and expansion. This is intended to assist in the prioritisation of sectors and areas for

further analysis. Second, two industrial nodes were studied in detail in order to assess the factors impacting on firm performance and to understand the agglomeration economies in relation to location and to generate recommendations for the City in terms of how to best support and grow industrial activity in these nodes. Third, one sector, Information and Communication Technology (ICT), was researched in order to generate learnings on the importance of agglomeration economies from the sector-based cluster perspective. Together, these three areas of work suggest strong recommendations for the City in terms of how to move forward with this process and work towards supporting vibrant and successful industrial nodes and clusters.

This report presents a short summary and synthesis of the key learnings from each component of the research. The in-depth standalone reports on the industrial nodes and on ICT sector accompany this report and should be consulted for full details of the methodology and results in these areas. This report should therefore only be considered a high level summary of the findings and conclusions from each component.

This report is structured as follows. Section 2 briefly presents the approach and methodology for each component of the study. Section 3 highlights main trends by sector and considers the impact of the growth of countries in southern Africa on goods and services exports, illustrated by developments in capital equipment exports. Section 4 reviews the key findings from the industrial nodes study and section 5 summarises the ICT sector findings. Finally, section 6 presents over-arching conclusions and suggested ways forward for the City.

2. Approach and methodology

In order to understand the opportunities for firms in Johannesburg, the first research component focussed on understanding the key trends in economic activity in the City. The research was carried out using desktop analysis of key economic trends in Johannesburg, particularly relating to sectoral contributions to Gross Value Added (GVA) and to employment in the City, an assessment of South Africa's exports to the Southern African Development Community (SADC) and a focus on Johannesburg as a regional hub, particularly as it relates to the exports of capital equipment to the SADC region. It also looked at key changes in relative prices, especially of telecommunications and energy, which fed into other components.

The second component of the research is the industrial nodes research. The aim of this area of work is to collect and analyse primary data on patterns of economic development and performance at the firm level, in order to understand constraints to entry, growth, and employment creation. The research was intended as a pilot study to investigate the potential insights which can be gained from such research and to give the City direction in terms of where it can best focus its attention in the near future. It focuses on two industrial nodes (Aeroton and Industria West) and attempts to map out for each the key activities taking place, the recent performance of firms, the challenges they face and critical areas where intervention by the City could make a difference in terms of stimulating economic activity. The two areas were chosen due to their proximity to the City's "corridors of freedom" which are key areas of interest for the City, being long established and having diversified industrial businesses which are relatively labour-absorbing.

The study involved three means of gathering data on economic activity in the two nodes. First a scoping exercise was conducted where fieldworkers were sent to the two areas to gather street-by-street information on the firms located in the two areas, the nature of their business and their contact details. Following this, a census of firms in the two areas was

conducted via an electronic survey. 47 out of the 89 firms contacted responded to the survey, a response rate of 53%. The survey generated data on firm performance and competitiveness, challenges faced, the advantages and disadvantages of the area from a business perspective, and areas where intervention by the City would be most fruitful. Finally, in order to gather more detailed information on firm experiences and to probe into some of the responses given to the survey in more depth, 10 firm interviews were conducted in each area. In addition, 5 interviews were conducted in Wynberg in order to test whether this would be an interesting area for future research. The insights from this data-gathering process are summarised in Section 3.4.

The third component of the research involved an in-depth study of the agglomeration economies in the ICT sector. This comprised a review of available literature on ICT sector cluster development as well as interviews with 25 firms in the ICT sector in order to understand what, if anything, is hindering their growth and how the City could support their growth. Interviews were conducted with ICT sector start-ups and established ICT firms in Johannesburg in order to assess the extent to which policy interventions applied in other cities are applicable in Johannesburg. The interviews were conducted with software developers at Tshimologong (Johannesburg Centre for Software Engineering, Wits University) and at Jozihub. Broadcast media firms in the Auckland Park and Sandton areas were also interviewed.

A significant literature has developed around clustering in many other countries, both developed and developing. Some examples of cluster development are considered, such as: 'Tech City' in London, UK; Nollywood in Lagos, Nigeria; 'Silicon Savannah' in Nairobi, Kenya; Bangalore, India; and a number of cities in the EU. An important contributing factor to ICT cluster development is infrastructure, and broadband infrastructure in particular. The research therefore briefly assesses experiences with broadband rollouts, including that of Google Fiber in the USA and optical fibre rollouts in Kenya. The report provides some analysis of how and where broadband is rolled out and how the City could play a role in broadband development.

3. Selected economic trends for Johannesburg

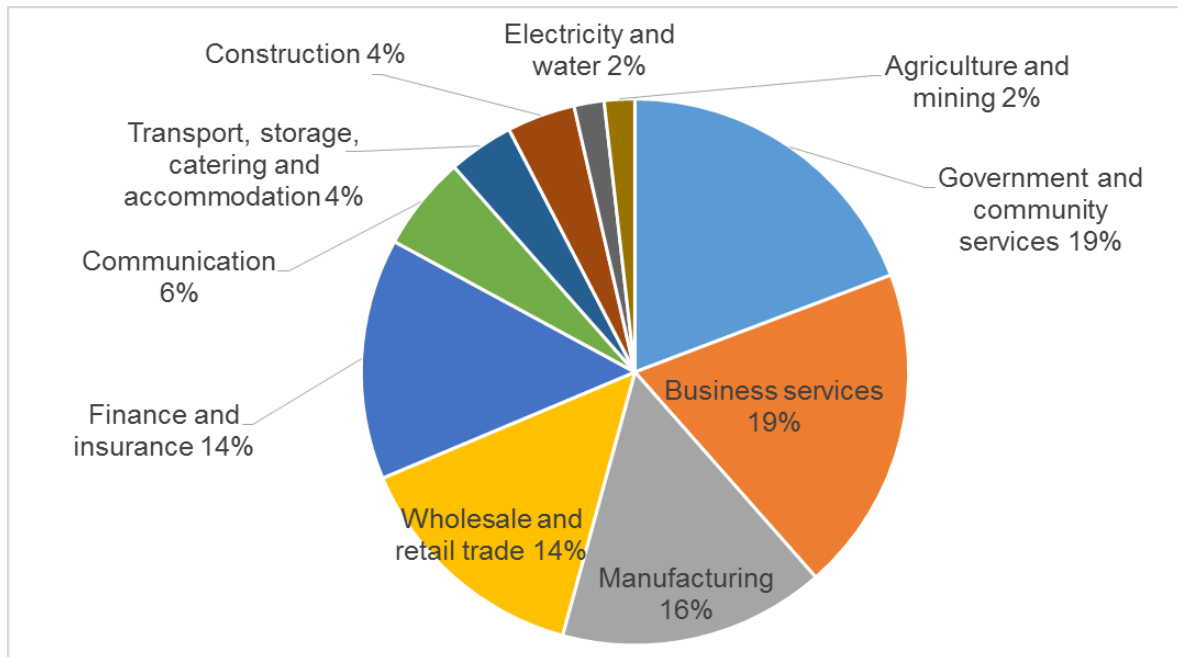
Major trends were analysed to understand the potential opportunities and constraints for Johannesburg emanating from them. These trends include sectoral contributions to GVA and employment in Johannesburg and Johannesburg as a regional hub in SADC, taking the exports of capital equipment to SADC as an important example.

An assessment of sectoral contributions to GVA shows that aside from government and community services, economic activity in Johannesburg is largely in four broad sectors, namely, business services, manufacturing, wholesale and retail trade, and finance and insurance (Figure 1). Business services has also been one of the fastest growing over the past decade and more (Figure 3 and 4). It is a diverse set of activities ranging from security guards and cleaning services to design and engineering activities, legal services and architects. The sector also accounts for a large number of employees, with a 23% share of total employment (Figure 2). Some of the changes in this sector are a result of outsourcing and not actual growth. For example, a factory's cleaning and security workers would have been included under manufacturing when employed by the firm, while when outsourced they would show up as growth in employment in business services.

Wholesale and retail trade has also been increasing employment alongside growth in economic activity (Figures 3 and 4). The demand for these services obviously depends on

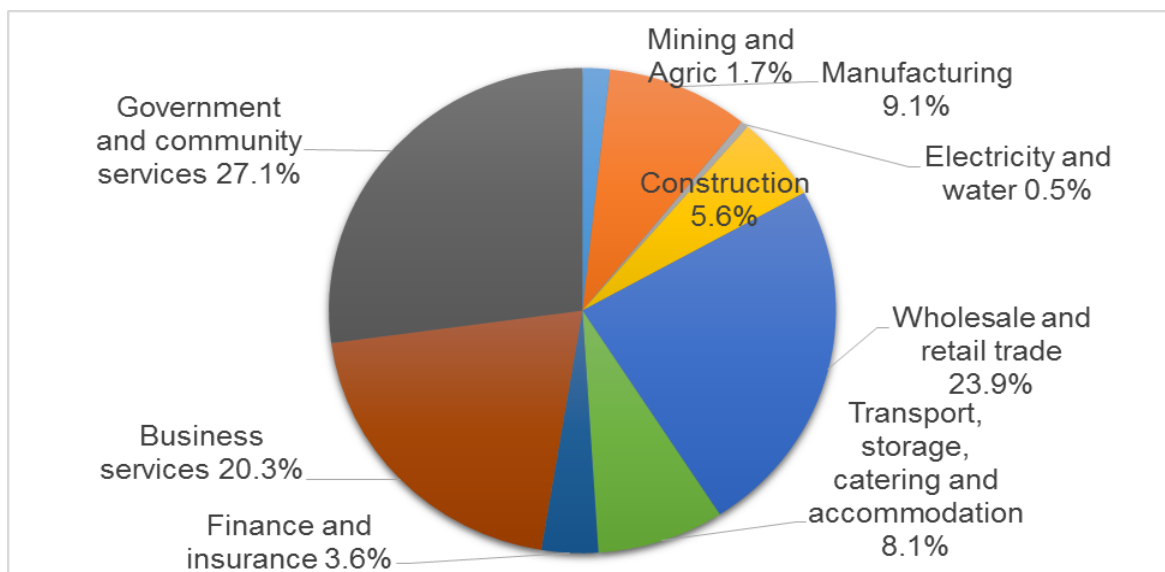
wider growth of incomes and the activities that underpin the sustainability of the economy. By comparison, Finance and insurance, which has also grown rapidly in terms of value added, accounts for a very small share of employment (Figure 2) and has not been creating jobs (with employment levels even contracting somewhat over the period, Figure 4). While finance is a critical enabler of economic activity, the main job impact is in the growth of goods and services activity which is enabled rather than in finance itself.

Figure 1: Sector shares in value-added, Johannesburg, 2013



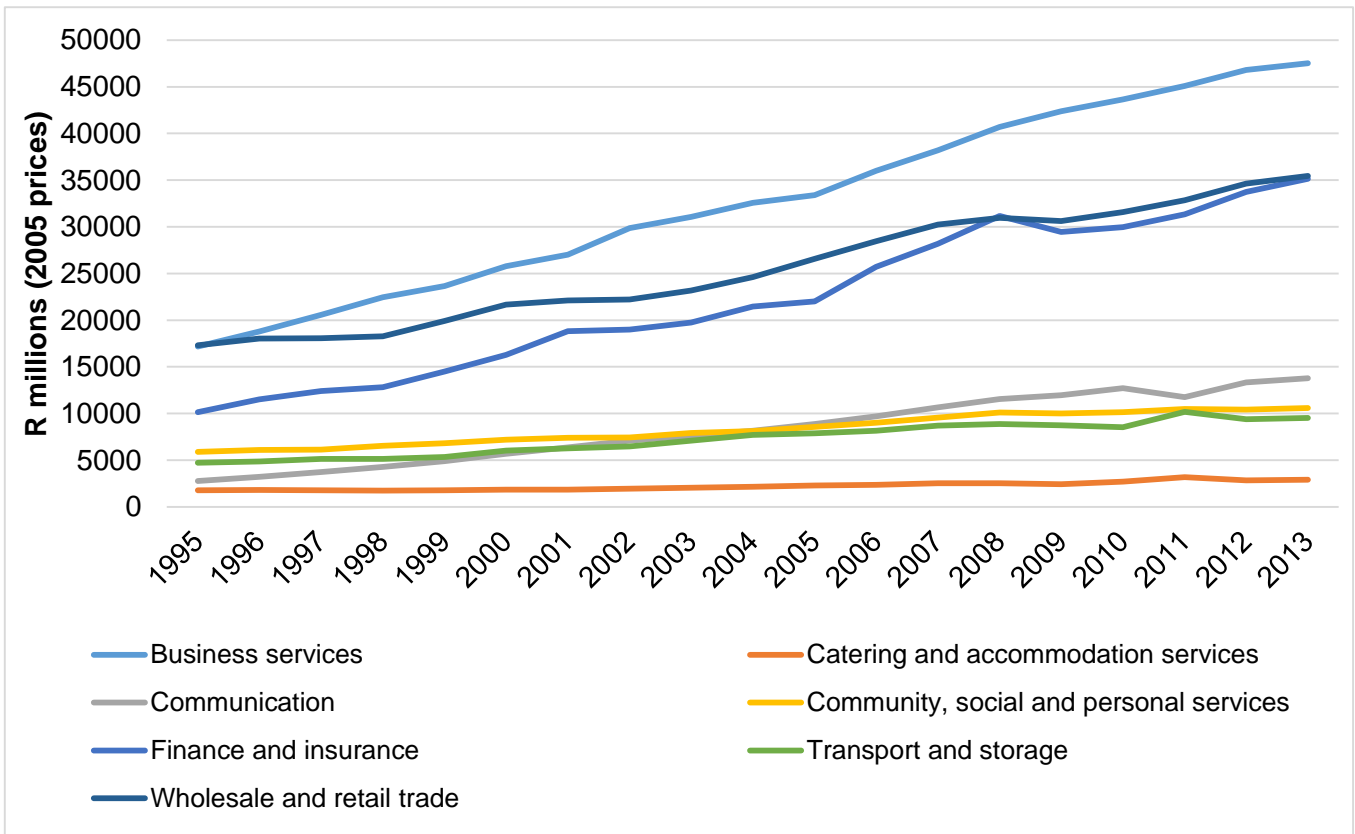
Source: Quantec

Figure 2: Sector shares in employment, Johannesburg, 2013,



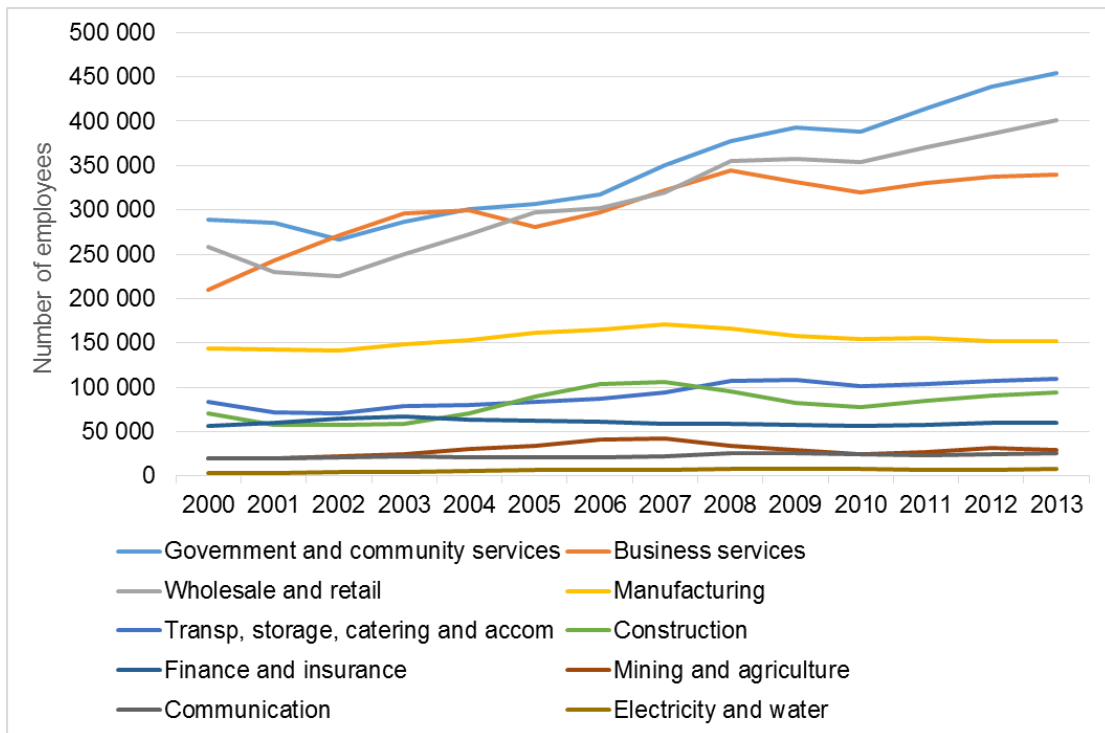
Source: Quantec

Figure 3: Services, real GVA



Source: Quantec

Figure 4: Formal and informal employment in Johannesburg



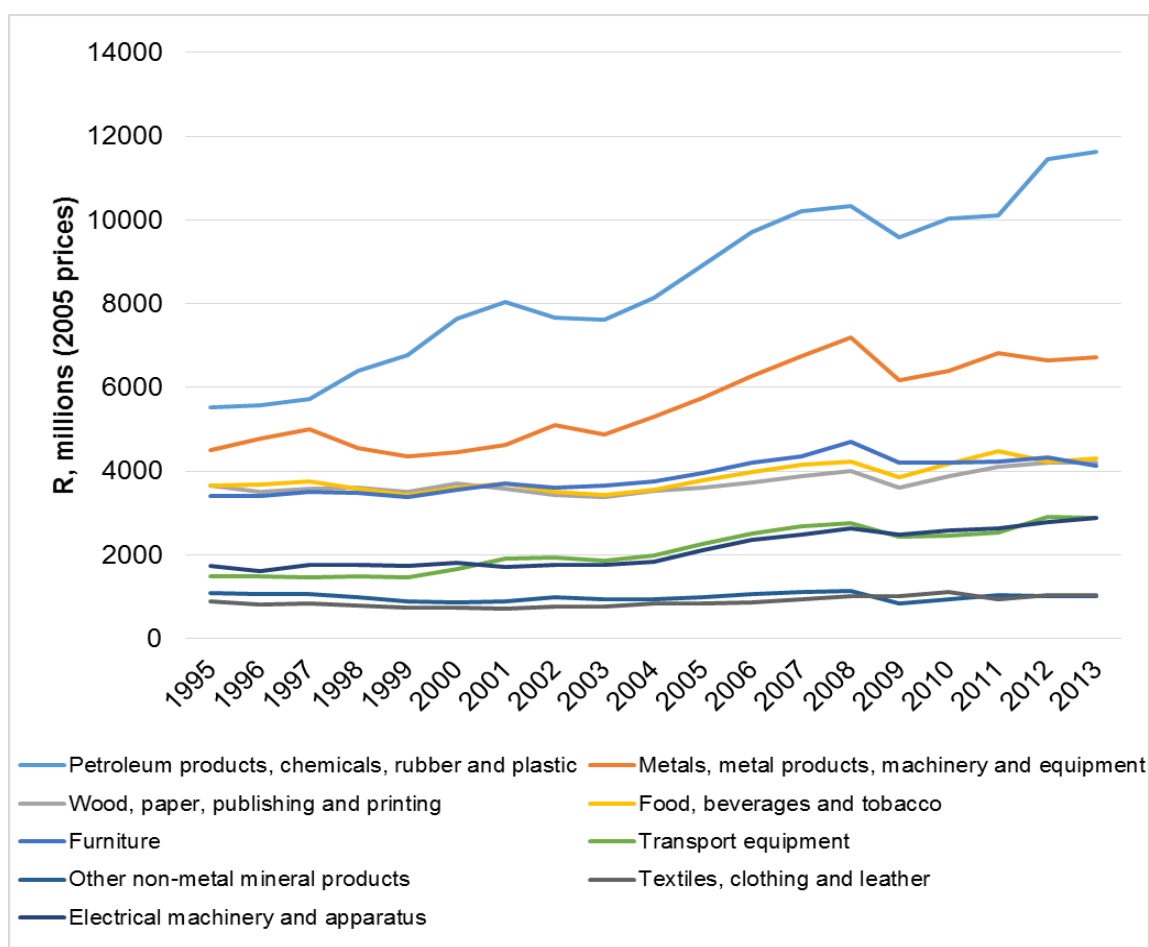
Source: Quantec

Manufacturing is one of the largest sectors in terms of value added but much smaller in terms of employment. However, this understates its impact on employment overall as a strong manufacturing base means substantial jobs in related services, such as those that have been outsourced as well as the transport, logistics and finance which is required for producing and supplying goods. While manufacturing employment is higher than in the mid-1990s, it has not recovered to the levels just before the 2008 financial crisis.

In terms of subsectors of manufacturing, the largest two broad sectors, with strong growth in each year over the period until 2008 are petroleum products, chemicals, rubber and plastic products, and metal products, machinery and equipment (Figure 5). In this regard, it should be noted that Johannesburg has neither oil refineries nor large steel mills or metal smelters. The growth in these activities is of downstream processing of the basic materials (made elsewhere) into higher value added products.

In third place are three sub-sectors very close together and having recorded only very low growth (Figure 5). These are furniture, food, beverages and tobacco, and wood, paper, publishing and printing. As we describe below, metal products, machinery, and food products have all grown on the back of increased exports to SADC countries.

Figure 5: Manufacturing value-added, Johannesburg

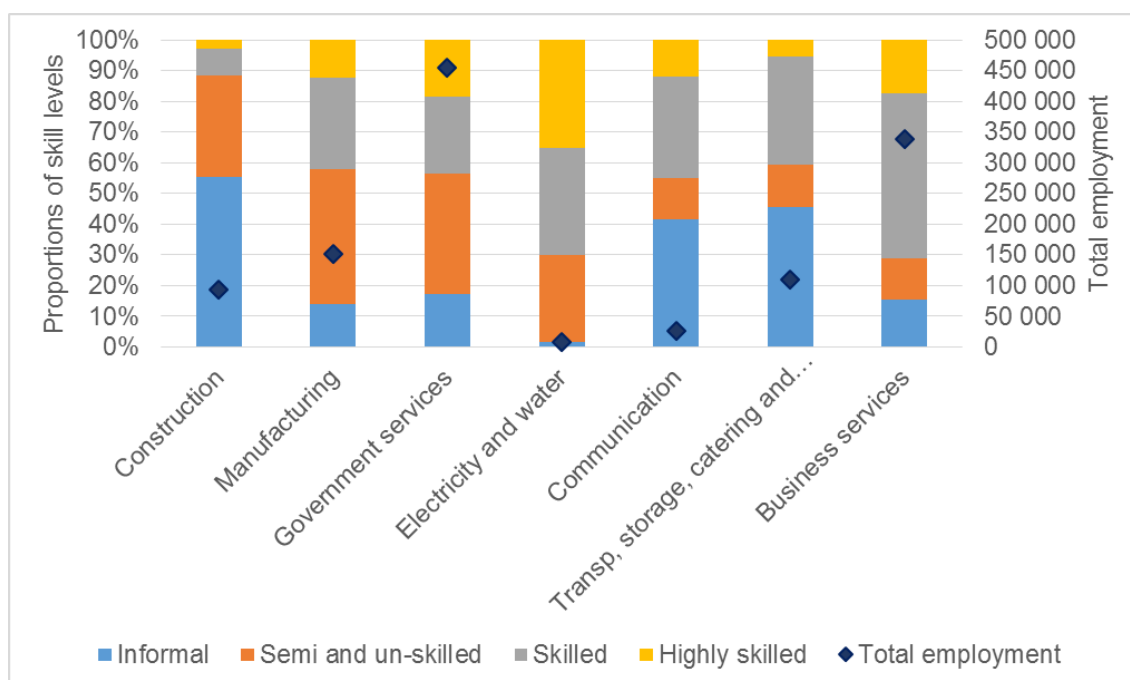


Source: Quantec

Manufacturing also has a relatively high share of semi- and unskilled employees (Figure 6), which is where job creation is most urgently needed. The sector with the highest proportion of informal and semi/unskilled labour is construction, however, the overall amount of employment in construction overall is much less than in manufacturing.

After government services, the highest total employment is in Business Services, which is also the sector with by far the highest proportion of skilled employees. As discussed above, this is a very diverse and heterogeneous sector running from security guards to engineering and legal services. The overall importance of skilled employees in this sector in Johannesburg, however, suggests the critical skills challenges that need to be addressed if Johannesburg is to continue to grow employment as it has done, linked to the city as the major hub for professional services in the region.

Figure 4: Skills breakdown of employment, by sector, 2013



Source: Quantec

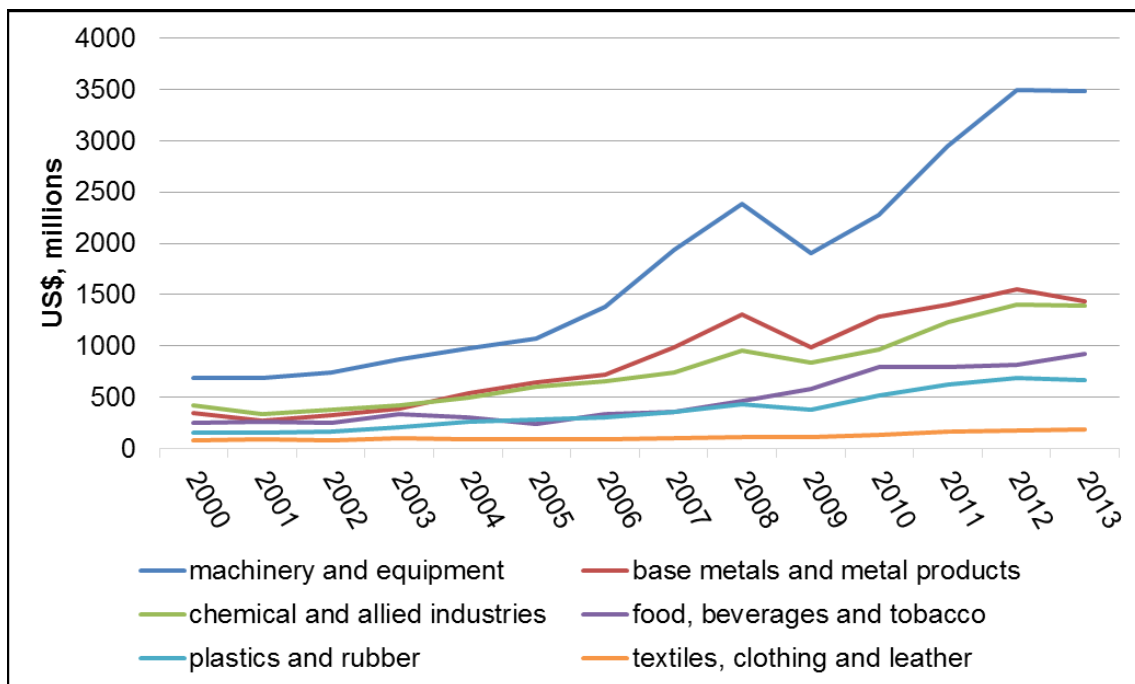
Johannesburg as a regional hub

Johannesburg is not only important for the South African economy but also for the SADC region as a whole. This is particularly important as overall SADC growth rates have been high over the past decade (with some exceptions). For example, growth rates over the past decade in Mozambique and Zambia have averaged around 8% per annum (World Bank Development Indicators). This is important for both South Africa and for Johannesburg for a number of reasons. First, a great deal of the imports into these countries originates from South Africa. Imports from South Africa are between 60-70% of total imports for Namibia and Botswana while Mozambique's imports from South Africa were on average roughly 35% of total imports (UN Comtrade data, 2014). Any growth from these countries would mean a growth in exports for South Africa. Second, Johannesburg benefits from these trends as a lot

of commodities which are exported to the region pass through Johannesburg from the seaport in Durban. Finally, there are important linkages between the drivers of growth in these countries and demand for products manufactured in Johannesburg and the greater Gauteng area, as well as demand for related services. The two key drivers of regional growth are mining and agriculture. This links to demand for light industry manufactures and capital equipment, while the related growing urbanisation fuels demand for processed food products.

The largest single grouping of South African exports to SADC countries is machinery and equipment (Figure 7). This has also grown very strongly over the past decade. As we show below, this growth has mainly been due to mining equipment to meet the demand from countries such as Zambia, Mozambique and the DRC. Following this are base metals and metal products (which includes both basic steel and aluminium made elsewhere in South Africa, as well as products made from these metals), and chemicals and allied industries. The fourth largest sector, food, beverages and tobacco has also recorded very strong growth since 2007. Beverages (such as fruit juices) are mainly produced elsewhere, but there is an important concentration of processed foods companies in Johannesburg.

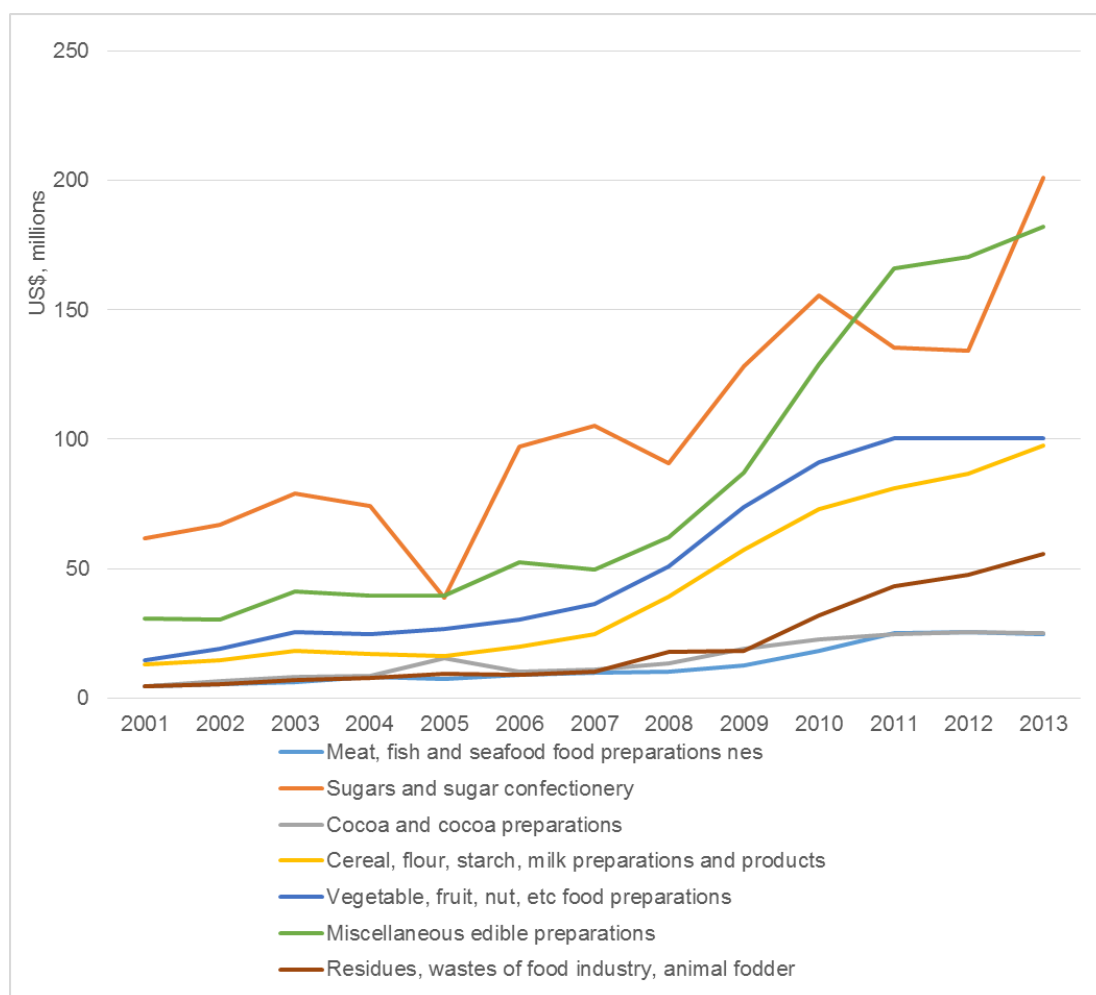
Figure 7: South African Exports to SADC (main non-commodity products)



Source: Quantec

As discussed, an effect of increased growth in SADC countries in recent years has been the increase in incomes and demand for consumer goods. A decomposition of the food exports to SADC shows that the highest exports are sugar confectioneries and the sub-sector “miscellaneous edible products” (Figure 8). The latter is made up of processed foods such as yeast, sauces and condiments, soups and ice-cream. The “miscellaneous edible products” has shown very high growth since 2007, as has vegetable and fruit preparations, and cereals, flours and milk preparations. Other food groups such as animal fodder have also experienced export growth into the SADC region.

Figure 8: South African exports to SADC, food¹

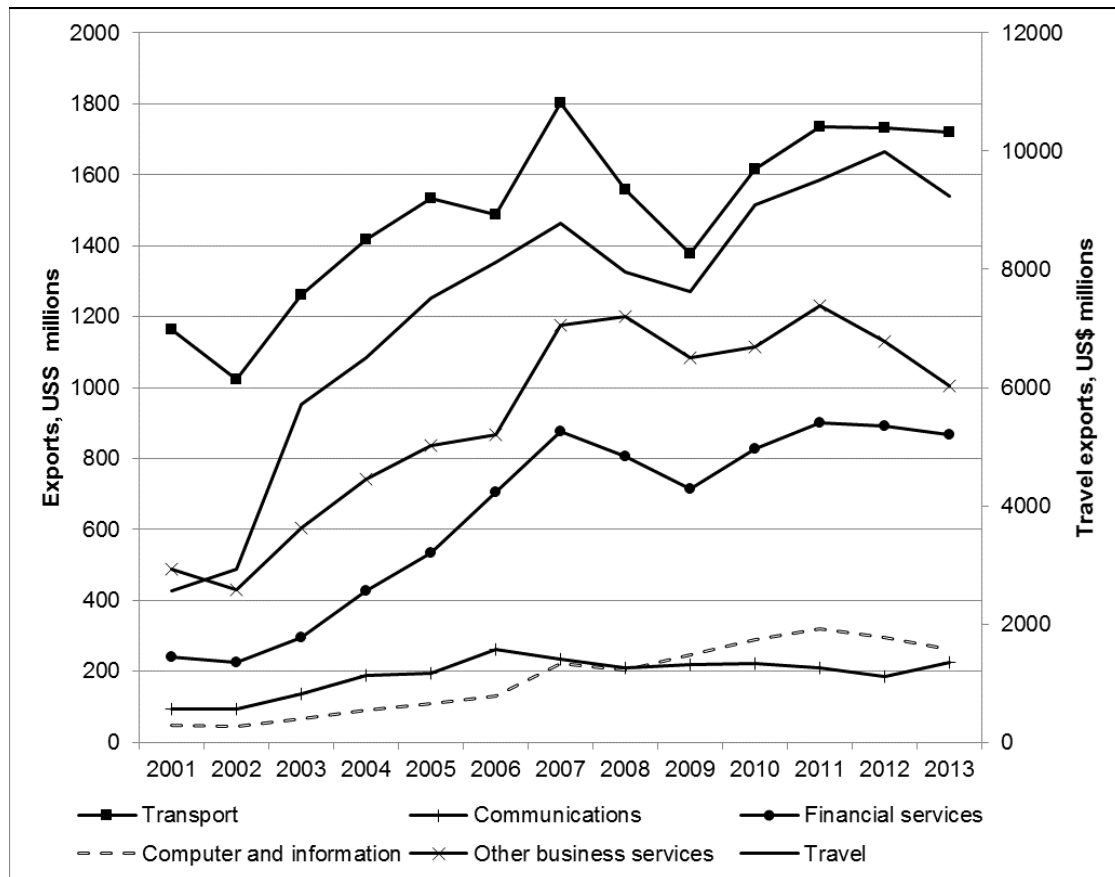


Source: Quantec

South African exports of services have also grown in recent years (Figure 9). It must firstly be noted that travel exports are plotted on the secondary axis on the right as they far outstripped the exports of other service categories. However, the results below show that the highest services exports are transport, financial services and “other business services”. Given that road freight is the primary mode of transporting traded goods, it can be assumed that the transportation trend reflects the increase of exports to SADC countries of products such as machinery and equipment, food and other consumer goods whose exports are reflected to have grown in Figures 7 and 8. “Other business services” includes business, professional and technical services, which is where the services offered by a number of Engineering, Procurement and Construction Management (EPCM) firms which are doing work in the mining sector in the SADC region (and beyond) would be recorded.

¹ Beverages and tobacco have been left out in order to illustrate the trends in the exports of food specifically.

Figure 9: Selected SA services exports to the world



Source: UNCTADStat.

The story above has only presented a one-sided view of South Africa’s trade relations by just showing regional demand for South Africa’s exports. However, the relationships need to be understood in reciprocal terms. While South Africa’s main exports into the SADC region are machinery and equipment which is mostly used in mining and construction, South Africa imports from other African countries are highly concentrated with minerals taking up 81% of South Africa imports from African countries. In contrast, exports are more diversified as the top 5 export products only account for 19% of South Africa’s exports to the rest of Africa.

The trends analysis suggests that Johannesburg is well-placed to benefit from the growth of countries in the region, particularly in the areas of consumer goods such as processed food and inputs into mining. A short case study of the capital equipment sector is presented next in order to illustrate this point.

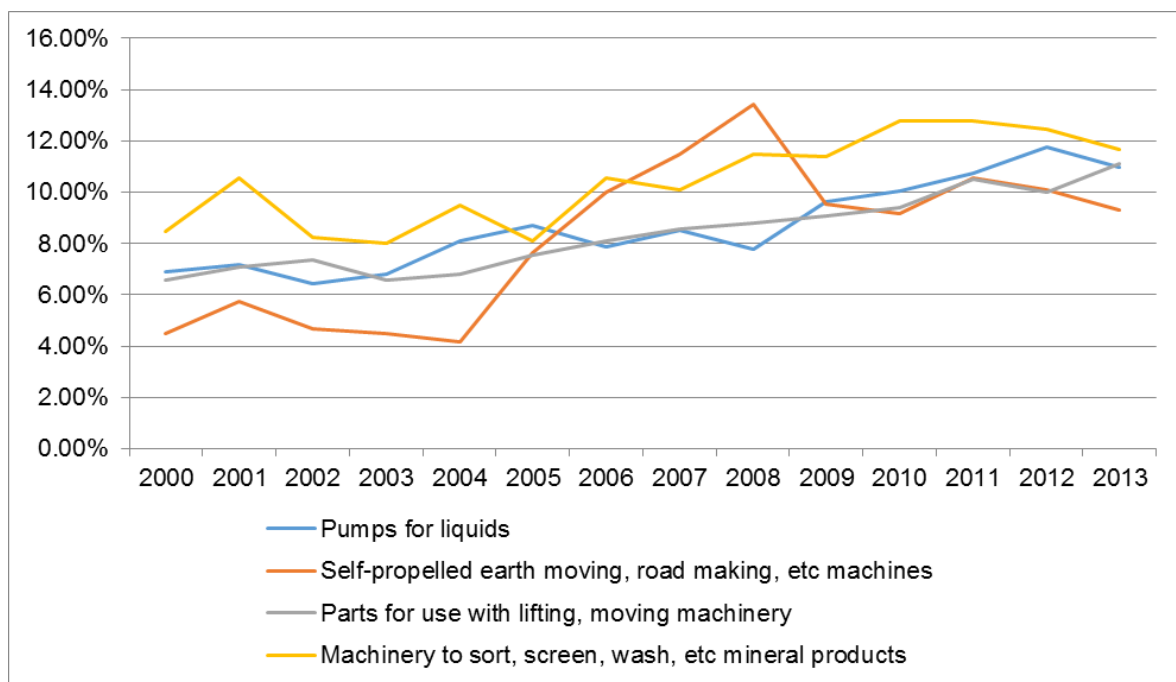
Capital equipment exports to the region

As illustrated above, the top non-commodity exports from South Africa to SADC were found to be machinery and equipment (Figure 7). In this section we discuss these exports by firstly breaking them down into more disaggregated subsectors and secondly by providing insights from a study of the regional value chain of capital equipment into the mining sector.² Disaggregating the exports of machinery and equipment into its subsectors reveals that 44% of the exports comprise of 4 products which are all products which are used in the processing of minerals, as well as to a lesser extent construction (Figure 10). Moreover, the

² This is a study for Trade and Industrial Policy Strategies by CCRED researchers, Judith Fessehaie, Phumzile Ncube and Reena Das Nair, which is currently being finalised.

share of these products have risen in the rapidly growing total capital equipment exports overall, emphasising their dynamism.

Figure 10: SA exports to SADC: Top 4 machinery and equipment subsectors



Source: Quantec

The Original Equipment Manufacturers (OEMs) are concentrated in Gauteng. These manufacturers are linked to other industries in the province such as transport and engineering services. The engineering services are provided by the Engineering, Procurement and Construction Management firms (EPCMs). Interviews with the firms indicated around 35% of goods they manufacture are exported, and SADC countries are a key market. Some minerals processing equipment manufacturers indicated that at least 70% of new capital equipment sales were to other African countries. The shares reflect both the poor performance of the South African mining sector as well as the boom in mining in other African countries.

Similarly, the EPCM firms interviewed generally do most of their business in Sub-Saharan Africa. In general, the SADC region provides at least 60% of their turnover. The South African EPCMs have carried out work in different mining projects across the region including Mozambique, Namibia, Zambia and Zimbabwe. While these results are not exhaustive, they do reflect the importance of the region to the Johannesburg economy and in turn the importance of goods produced in Johannesburg to the region, in this case, capital equipment goods. Johannesburg's role as a regional economic hub clearly extends beyond financial services to other services such as engineering services and as a hub for the manufacture and export of capital equipment to the mining sector in SADC. In the context of flat domestic demand for many products (and inputs into mining in particular) this represents an important opportunity for firms in Johannesburg.

4. Key findings on Industry Nodes

Two nodes were chosen by the City as pilots for in-depth assessment of economic activity and firm performance, namely Aeroton and Industria West. In each a full census was done of what firms were operating and each was surveyed, with follow-up interviews of 10 firms in each node. Interviews were also done with firms in Wynberg as well as a classification of the types of economic activity for comparative purposes.

In Aeroton the biggest area of activity is manufacturing, in which the most common activities are food processing, capital equipment manufacturing and to a lesser extent furniture manufacturing. There are also a significant number of logistics or distribution firms and some wholesale and retail firms.

In Industria West manufacturing is also the main activity, and in particular manufacturing of furniture, chemicals, and capital equipment and metals. In both areas there is a wide range of firm sizes, with some large firms (with more than 700 employees) in Aeroton.

Both the survey and firm interviews suggest that firms in Aeroton and Industria West are facing challenging economic conditions. The main reason for this appears to be the weak domestic economy and low levels of demand from customers in South Africa. Both areas were also affected by the recent metalworkers strike. The firm interviews confirmed the results of the trends analysis, suggesting that demand in the region is growing much more strongly than domestic demand, and hence firms which export into the rest of Africa are more sheltered from the effects of the weak domestic economy. However, for those surveyed, exports make up only 10% of sales on average, which may explain why the performance of firms in the two areas has been generally poor. Only a small number of firms reported strong sales volume growth over the past three years.

The challenging economic environment has affected firms' willingness to invest in their businesses and the data suggests that firms with equipment older than 10 years old are less likely to be growing than firms with newer equipment. Most of the investments which are taking place seem to be in order to upgrade efficiency and lower costs, although a smaller number of firms did report investments in expansion and product development in the past two years.

Unsurprisingly in this environment, only a small number of firms (around a third) reported having a research and development department at the company and still fewer have access to licensed technology or hold a patent. Some firms reported considering applying for government incentives, such as the Department of Trade and Industry's Manufacturing Competitiveness Enhancement Programme (MCEP), in order to assist with the upgrading of equipment or expansion. However, this process appears to be much easier and more likely to be successful if consultants are engaged to assist, leading to a bias against small firms in the process.

The survey and the interviews suggest that firms find it difficult to find employees with the required skills and experience and a number of firms noted that they sometimes opt to leave positions vacant when they struggle to find someone to fill the position. Firms have all individually sought to remedy this in different ways with the most common approach being setting up in-house training facilities mainly to provide basic training such as machine operation. This represents a duplication of efforts by firms at a cost to each firm. Though some firms provide specialised training that would be particular to the firm, there are a few training modules that are applicable to all manufacturing firms for instance such as basic numeracy and literacy, machine operation and health and safety measures among other competencies among the employees.

Offering training diverts resources from spending that may enhance productivity and increase competitiveness, and externalities may mean that firms will under-invest in training. A number of the firms interviewed noted that once they have invested in trained staff, they often lose them to competitors, and in the survey a number of firms indicated that they head hunt employees from competitors. A high level of head hunting from competitors means that the skills pool is not growing overall and it also dis-incentivises firms from investing in training employees if there is a high probability that they will leave. There were limited if any employees that have come from the Further Education Training (FET) colleges. In the interviews, firms indicated that FET graduates often do not have practical experience but will expect more money and what is required by industry is apprenticeship programmes.

Quality of infrastructure was cited as a major disadvantage to locating in both Industria and Aeroton. Particularly, power and public transport are not provided optimally for firms in Aeroton and Industrial West. In Aeroton, manufacturing firms are particularly badly affected by frequent power outages which occur without warning and last several hours. The survey results show that there is no available public transport in Aeroton and while workers in Industria West use the train, the most common mode of transportation in both areas is private mini bus taxis. In both areas, the lack of availability of public transport after hours affects manufacturing firms' ability to optimise shift patterns to run their business efficiently.

Two further linked issues which were highlighted as challenges in both the survey and interviews are crime and the business environment of the area. Safety and security were mentioned as challenges by a number of firms especially in Industria West where it was noted that the area was generally unsafe and the station was a particular hotspot for crime. Firms also complained that the areas are dirty and unattractive with few amenities, and that this is not an ideal environment to bring clients and customers into.

Overall, Aeroton and Industria West suffer from a number of challenges, mainly related to the poor quality of infrastructure and public services. In an already tough economic environment, these problems impose extra costs on firms and impact on their ability to be competitive. However, both Aeroton and Industria West are well located and have some vacant land, which suggests that more labour-intensive manufacturing could be attracted to the node if infrastructure and other challenges were resolved. As seen in the previous section, opportunities exist for firms based in Johannesburg to grow through focussing on supplying growing regional demand.

Aeroton and Industria West have the potential to be attractive industrial districts for firms that wish to benefit from agglomeration. They are well located and there is available space in each, especially in Aeroton. However, the challenges related to basic municipal services that are critical for continuous production processes make both areas less attractive. Addressing these issues will not only improve the efficiencies and consequently competitiveness of existing firms but would also attract more firms. This is discussed in more detail in Section 6.

5. Development of the ICT Sector

The information and communication technologies (ICT) sector has been identified as a key area of focus for the CoJ, which has set out an ambitious programme to roll out broadband in Johannesburg. Growth of the ICT sector is an important catalyst for development, as it contributes directly to output and jobs and it also facilitates the growth of businesses in other sectors, which in turn further supports employment and output growth. ICT impacts positively on health, education, innovation, competitiveness, the use of resources, pollution control, climate change and social inclusion. In addition cities in the early stages of ICT maturity like

the City of Johannesburg should concentrate on adopting technology that can benefit from ICT driven developments and empowering individual citizens with skills that can benefit them from such ICT developments.

An interesting feature of the ICT sector is that competitors in the sector tend to locate their businesses close to one another, in clusters. According to the literature, there are some common features of ICT clusters. ICT clusters tend to be localised groupings of firms that compete vigorously with one another in an environment supportive of continued investment and growth. Local customers that have specific requirements may be present, although clusters of start-ups may serve customers in other regions or countries. Successful clusters are typically supported by firms in related industries and by the availability of resources, including people, materials and infrastructure. Another interesting feature of technology clusters is that there needs to be a sense of community, including the exchange of ideas, money and resources among the firms and stakeholders in the cluster. Clusters go through life-cycles (antecedence, embryonic, developing, mature, decline, transformation), and their needs may vary at different points of their life cycles.

Of critical importance for a successful cluster is that firms have access to a good source of skilled people. This is one of the reasons why clusters are often located near universities. Collaboration is required between investors, entrepreneurs, universities, research organisations and local governments, among other types of entities, in order to make clusters a success. Universities located near clusters are an important source for knowledge transfer and provide formal means of translating research into a business. They also provide national and international linkages that support cluster development. Access to venture capitalists is also an important source of success for clusters. Finally, clusters need good infrastructure to succeed, including transport links, office space and broadband.

Hub organisations, including large enterprises, provide important anchors for clusters. They spin off smaller 'non-core' businesses and buy up successful start-ups. They therefore attract and grow start-ups and support the reputation of a local cluster. Local leadership from the public and private sector is also important: rather than government attempting to develop interventions in isolation it should rather find ways to support the cluster with existing businesses in the area.

There are two main themes that emerge from existing research on the development of clusters. Firstly, ICT clusters largely evolve organically through the development of an ecosystem of entrepreneurs, investors, skilled workers and supporting adjacent industries. Secondly, successful government interventions are confined to a relatively narrow area, and include: skills development (including support for educational institutions); marketing of the cluster (including through events, branding, official visits, etc.); providing sound infrastructure (including in respect of broadband, transport networks and electricity); and providing access to government data.

Johannesburg is a natural location for an ICT cluster: it has good infrastructure, two internationally renowned universities, a large business community, a pool of skilled workers and an ecosystem of existing ICT firms. The City of Joburg (CoJ) already has a number of initiatives in place to support the ICT sector: examples include the CoJ's broadband network connecting the Tshimologong precinct and support from the CoJ for the Fak'ugesi digital festival at Tshimologong.

Technology clusters are more like a rainforest than a planned farm: they rely on informal interactions, networks of trusted partners and an ecosystem of skilled people, investors, and entrepreneurs. The role for government in the development of clusters is therefore limited.

Nonetheless, there are areas in which city governments can support tech cluster developments. We have developed a set of policy recommendations from interviews with ICT businesses and from the experience of successful ICT clusters in other cities. These are discussed in Section 6.

6. Next steps

The work on key trends in Johannesburg not only showed the continued growth in the services sectors, but also the reciprocal nature of growth in the SADC region. This points to the need for more integrated policies regionally which could facilitate growth, such as the single permit system which is an agreement between South Africa, Zambia and Zimbabwe which was brought about to facilitate trade. It also highlights the opportunities which exist for firms based in Johannesburg to supply growing regional demand. Key sectors in this regard are consumer products such as processed foods and inputs into mining. This is particularly important given the weak growth in the domestic economy and domestic demand.

The industrial nodes component generated a wide range of recommendations for the City in terms of potential interventions to make Aeroton and Industria West more vibrant and attractive to firms and to assist firms to improve competitiveness. The recommendations are discussed in greater detail in the nodes report, but at a high level can be broadly split into two main categories.

First there are a set of area-based recommendations which work towards removing the bottlenecks which are affecting firm competitiveness and setting up the enabling conditions for firms to grow and for the areas to become vibrant, modern, successful industrial nodes. These recommendations are mainly aimed at addressing the infrastructure challenges faced by firms in specific areas and solving existing problems. Key areas for possible intervention based on the research include upgrading and maintaining electricity infrastructure, increasing the availability of public transport, assisting firms to provide useful skills and training, improving safety and security and upgrading the business environment through more regular street cleaning and other initiatives. There is also a very important coordination role for the City with regard to tackling the above-mentioned challenges, where the City can act as a catalyst by engaging with firms to find common solutions to their shared problems. In this way, the City can ensure that economies of agglomeration are realised for each industrial node.

The second set of recommendations build on this to think about how the City can go further in terms of taking a more active role in helping firms to identify and take advantage of new opportunities for growth and expansion. This involves understanding what strengths exist in Johannesburg, patterns of existing industrial activity and where there are opportunities to grow different industries. This set of interventions is more sector-based and forward-looking. We recommend focusing on clusters of firms where champions can be identified for particular initiatives. The most important industrial sectors in Aeroton and Industria West are food products, machinery and equipment, furniture and chemicals. Cluster based interventions in these sectors can make a substantial contribution to improving performance. Key potential interventions include coordinating export promotion for firms into fast-growing regional markets, assisting them in understanding and applying for incentives and assistance offered by government, setting up joint facilities for research and testing and collectively tackling sector-specific skills constraints.

The conclusions of the ICT study also suggest a set of recommendations related to upgrading infrastructure. The research suggests that the City should facilitate the rollout of

broadband by making the CoJ's infrastructure (such as poles, ducts, equipment rooms) available for use by network operators (the Google Fiber model). Public transport is similarly an issue for the ICT cluster and the City could upgrade the transport links to and from technology and media hubs, including improving security for transport routes. The City could assist by providing office / studio space, particularly for media production houses. Finally, as with the findings in Aeroton and Industria West, it is important for the City to upgrade the urban environment (including parking, pavements, roads and street lights).

The second set of recommendations arising from the ICT study relates to stimulating demand for broadband. This could be facilitated by a number of interventions by the City including related to education. A significant proportion of Johannesburg residents do not access the internet at least partly because they don't see the value in it. Education played a key role in the rollout of Google Fiber, for example. Another way in which the City can stimulate demand is through providing broadband vouchers to SMMEs and low income households. Finally, the City can sponsor and organise open data initiatives to support the growth of the developer community.

Way forward

From the above conclusions there is a suggested way forward for the City. We have proposed the key elements that can immediately be incorporated into the City's action plans which should have as its target removing the bottlenecks for firms in Aeroton and Industria West. These bottlenecks include poor power infrastructure and public transport, where the key to solving these problems is ensuring that there is coordination in finding solutions for issues faced by firms. This will establish private and public partnerships to create a conducive environment for firms to operate optimally and, through firm growth, achieve higher levels of employment.

The next step for the City is to design strategies for the identified opportunities for industrial nodes in Johannesburg. The research conducted on the pilot industrial nodes has revealed that there are inaccuracies in the available information on industrial nodes in Johannesburg. The City has industrial node profiles for all 28 nodes which characterise areas in terms of the nature of activity taking place, the status of public infrastructure, strategic opportunities in the area and node land size and land availability. The survey and firm interviews in Aeroton and Industria West have shown that the economic activity characterisation to be incorrect. For example the nodal profile indicates that Aeroton's primary activity is warehousing and distribution whereas we have found that 51% of firms in Aeroton are actually manufacturing, including some very large businesses. The survey results indicate a high contribution of manufacturing to value-added and strong links to related services. This highlights the need to better understand the remaining industrial areas in Johannesburg in order to more precisely characterise the areas to inform interventions by the City to take up identified opportunities.

The second category of recommendations (discussed above) focus on taking advantage of the opportunities that are open to Johannesburg as a city given its locational advantage for servicing the growth in demand in neighbouring countries. If the City is to appropriately identify the sectors where it can encourage clustering and where such clusters should be located it is crucial to have a more complete understanding of the special distribution of firms within the city.

In line with the conclusions and the engagement with the City, we propose that the next phase of research covers:

- A scoping of the remaining 26 industry nodes through a census undertaken by fieldworkers mapping all firms and a short survey of their activities, including size in terms of employees, turnover, and performance. This information will be used to identify patterns of activities across the City to assist with the design of sector clusters.
- In-depth study of a further seven nodes, to be selected by the City based on their significance, potential and to reflect a geographic spread. Together with the Aeroton and Industria West results this will generate a rich data set on firm performance allowing interrogation of the importance of issues such as input costs, skills and government support in firm performance and employment,
- Development of cluster strategies for three clusters. These should be focused on concrete interventions to improve the development of the clusters of firms, including facilitating new entrants. We have found from the survey of Industria West and Aeroton that the more common economic activities are food processing, capital equipment manufacturing and to a lesser extent furniture manufacturing and chemicals. From the existing data on output and employment at the city level it is obvious that these sectors are large (aside perhaps from furniture, although this is more labour-intensive) and the trends analysis indicates that there is significant growth potential if there is improved competitiveness. Further clusters can be added at a later stage.

The scoping for the remaining industrial areas will be based on the Lightstone Business database which has contact information for firms in all the 28 industrial areas. The database will, however, only be used as a starting point as a comparison of the Lightstone Business Database with the survey data showed that there are some firms not accounted for in the database. For example, in Aeroton the Lightstone database does not have information on some of the bigger manufacturing firms such as Polyoak, Sasko and Premier Food (Blue Ribbon). The omission of firms could lead to mischaracterisation of industrial nodes. Two of the firms omitted from the Aeroton database are involved in large scale food processing and all the firms are important for employment as they employ in excess of 500 employees each.

The City could then repeat the firm survey annually in order to track firm performance over time and changes in nodes, and assess the impact of City interventions.

7. Developing the Information and Communication Technology sector in the City of Joburg

7.1. Background

The City of Joburg (CoJ) is assessing ways in which it could support economic growth and has commissioned this paper as part of a programme of work with the Centre for Competition, Regulation and Economic Development (CCRED) at the University of Johannesburg. The information and communication technologies (ICT) sector has been identified as a key area of focus for the CoJ, which has set out an ambitious programme to roll out broadband. Growth of the ICT sector is an important catalyst for development, as it contributes directly to output and jobs and it also facilitates the growth of businesses in other sectors, which in turn further supports employment and output growth.³

This report addresses the question: In what ways could the City of Joburg support the development of the ICT sector?

This question is addressed in two ways: first we review the existing literature on the development of ICT clusters. Second, we explore obstacles to growth for a range of mostly small businesses in the ICT sector through interviews with owners and / or managers of 25 ICT businesses.

In the rest of this section we explain our methodology and provide background to the development of ICT clusters, the ICT sector in SA and the CoJ's broadband plans. In the next section (section 2) we provide a review of the literature on ICT cluster development. This is followed by a summary of the results of our interviews and of the key areas in which the CoJ could intervene to support the ICT sector (section 3). We set out our conclusions in a final section (section 4).

We discuss our research approach next.

7.2. Methodology

We first approach our research question (how could the CoJ support the development of the ICT sector?) by means of a review of available literature on ICT sector cluster development. We then interviewed 25 firms (mostly start-ups) in the ICT sector in order to understand what, if anything, is hindering their growth and how, if at all, the CoJ could support their growth.

A significant literature has developed around clustering in many other countries, both developed and developing. We explore the experiences of clusters in:

- The UK, such as 'Tech City' in London;
- Nollywood in Lagos, Nigeria;
- 'Silicon Savannah' in Nairobi, Kenya;
- Bangalore, India; and
- A number of cities in the EU.

An important contributing factor to ICT cluster development is infrastructure, and broadband infrastructure in particular. We therefore briefly assess experiences with broadband rollouts, including that of Google Fiber in the USA and optical fibre rollouts in Kenya. We provide

³ The broadcast media sector is assessed as a sub-sector within the wider ICT sector, and the latter term encompasses the broadcast media sector.

some analysis of how and where broadband is rolled out and how the CoJ could play a role in broadband development.

We conducted interviews with ICT sector start-ups and established ICT firms in Joburg in order to assess the extent to which policy interventions applied in other cities are applicable in Joburg. The interviews were conducted with software developers at Tshimologong (Johannesburg Centre for Software Engineering, Wits University) and at Jozihub. We also interviewed broadcast media firms in the Auckland Park and Sandton areas. The questionnaire we used is set out in Appendix C.

Next, we provide a brief overview of what clusters are.

7.1.1 What are clusters?

An interesting feature of the ICT sector is that competitors in the sector tend to locate their businesses close to one another, in 'clusters'. Features of clusters include, following Copeland and Scott (2014) and Porter (1990):

1. Localised grouping of firms in a similar sector that compete vigorously with one another in an environment supportive of continued investment and growth;
2. Local customers that have specific requirements may be present, although clusters of start-ups may serve customers in other regions or countries;
3. Successful clusters are supported by firms in related industries;
4. Clusters are supported by availability of resources, including people, materials and infrastructure;
5. For technology clusters, there needs to be a sense of community, including the exchange of ideas, money and resources among the firms and stakeholders in the cluster; and
6. Clusters go through life-cycles (antecedence, embryonic, developing, mature, decline, transformation)⁴, and their needs may vary at different points of their life cycles.

An important feature of clusters is the 'brand' that is associated with it, which enables firms to more easily attract talent and investors (Copeland & Scott, 2014). The creation of cluster brands can be supported by local governments, as is the case for 'Tech City' in London.

While clusters appear to provide a useful means of growing output and employment, it is important to understand why we should develop ICT clusters in particular, discussed next.

7.1.2 Why develop the ICT sector?

The Ericsson Networked Society City Index 2013 measures the ICT maturity of 31 major world cities (including Johannesburg) in relation to their urban development, which includes social, economic and environmental dimensions. Infrastructure, affordability and service usage are used to develop the ICT maturity index (see Figure 1 below). ICT impacts positively on health, education, innovation, competitiveness, the use of resources, pollution control, climate change and social inclusion. In addition cities in the early stages of ICT maturity like the City of Johannesburg should concentrate on adopting technology that can benefit from ICT driven developments and empowering individual citizens with skills that can benefit them from such ICT developments.

⁴ Copeland & Scott (2014) cite Ariz and Norhashim for the stages of development hypothesis of clusters.

Figure 1: Ericsson City Index



Ericsson Networked Society City Index 2013, available from:
<http://www.ericsson.com/res/docs/2013/ns-city-index-report-2013.pdf>

To improve ICT maturity and increase business opportunities, improved infrastructure should be developed. High ICT maturity enables cities with growing populations to deal with increasing demands for access and improve service delivery through ICT solutions such as e-government. Democracy and transparency are also improved between the government and citizens through ICT maturity. Policies that promote interaction between cities should be implemented as they create economies of scale through joint application of ICT solutions.⁵

An important infrastructure item required for greater ICT maturity is broadband, discussed next.

7.1.3 Why develop broadband?

The City of Joburg has already identified broadband as a key feature of its plans to develop the city. As discussed above, broadband is an important item of infrastructure required for the development of the ICT sector. The CoJ's identifying broadband as a key constraint for growth is very much in line with the development plans of other cities and indeed countries (see, for example, Box 2 below on the rollout of Google Fiber in Kansas City, Provo and Austin).

Box 1: Google Fiber

Google Fiber is rolling out Gigabit internet access in Provo City, Kansas City and Austin.⁶ The

⁵ Ericsson Networked Society City Index 2013, available from: <http://www.ericsson.com/res/docs/2013/ns-city-index-report-2013.pdf>

⁶ In addition Provo Board of Education members stated that this technology will motivate teachers to change the way they teach. This technology is also good for small business and attracts more business as they rate places on how easy it is to work. Available from: http://www.heraldextra.com/news/local/central/provo/speed-matters-google-fiber-brings-one-gig-internet-to-provo/article_4879a53d-b76f-598c-a130-44b25db1b830.html

introduction of Google fiber to Kansas City resulted in the Kansas City Startup Village.⁷ One of the owners of the houses in the Startup Village is a web designer and the founder of a project called Homes of Hackers which accommodates hackers for free for 3 months while they use the 1Gbps Google fiber service to develop their start-ups. Start-ups such as Handprint, Leap2, Local Ruckus, Form Zapper and Rivet Creative have been developed and accommodated by places such as Homes of Hackers and others in the Kansas City Startup Village. Because of the cheap ultra-high speed broadband, as at June 2013 close to 25 startups were within walking distances from each other in the Kansas City Startup Village. The benefits of high speed broadband include the fact that startups can share large files over the network, upload large amounts of data in seconds, and team up with distant partners via video conference effortlessly.

Having said this, there are some developers that think they would still be able to develop their apps with slower speeds than what Google fiber is offering. They nonetheless admitted that their work is faster and easier now because of the speed of Google fiber. Moreover this community is happy to have attracted a lot of people with the same vision, who can now be close to one another and can easily support each other.⁸ Google Fiber has therefore supported the development of a start-up cluster in Kansas City.

For more details see: <http://googlefiberblog.blogspot.com/>

Initial results from the economic impact of Gigabit broadband access (such as that rolled out by Google Fiber, discussed in Box 1 above) suggest that cities that have rolled this out have higher levels of employment and GDP (see Box 2 below).⁹ As a result of this, countries around the world have set out national broadband plans (See Table 1 below).¹⁰ These range from targeting 50% of the population using services that offer 100Mbps speeds in the EU by 2020 to 100% of the German population using services that provide at least 1Mbps speeds (see Table 1 below).

South Africa too has a national broadband plan, and the City of Joburg's broadband projects fall within the scope of this wider plan (discussed in more detail below).

Table 1: National broadband plans (Katz, 2012)

Country	Coverage target (as % of households)	Speed targets
United States	100% (2012)	4Mbps (100%, 2012) 50Mbps
Germany	100% (2014)	1Mbps (100%, 2014) 50Mbps (75%, 2014)
Singapore	100% (2012)	100Mbps (95%, 2012)
Australia	100% (2012)	12Mbps (100%, 2012)

⁷ See: http://www.heraldextra.com/news/local/central/provo/speed-matters-google-fiber-brings-one-gig-internet-to-provo/article_4879a53d-b76f-598c-a130-44b25db1b830.html

⁸ CNET by Marguerite Reardon. 19 June 2013, See http://news.cnet.com/8301-1023_3-57589981-93/google-fiber-spawns-startup-renaissance-in-kansas-city/

⁹ See: <http://www.scribd.com/doc/240187367/Gigabit-Broadband-FINAL-pdf-Copy>

¹⁰ Katz, R. (2012). 'Impact of Broadband on the Economy'. International Telecommunication Union. Available from: http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf

United Kingdom	100% (2012)	2Mbps (100%, 2012)
Malaysia	75% (2010)	33% (50-100Mbps) 42% (1.5Mbps)
Brazil	50% of urban households 25% of rural households	75% (512Kbps – 784Kbps)
European Union	100% (2013)	30Mbps (100%, 2020) 100Mbps (50%, 2020)

Source: Katz, R. (2012). 'Impact of Broadband on the Economy'. *International Telecommunication Union*. Available from: http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf

Box 2: Preliminary evidence of the impact of Gigabit broadband

Preliminary evidence suggests that the value of rolling out Gigabit broadband internet access has a similar effect on GDP to what the rollout of 'always on' broadband had on GDP when compared with dial-up speeds: Gigabit broadband contributes approximately 1.1% to GDP (Sousa, 2014). This was found for an analysis of 14 communities in 9 states in the USA where more than 50% of households are passed by Gigabit broadband, when compared with a control group of 41 similarly sized communities in the same 9 states. The analysis was carried out for the years 2011 and 2012. Using year and community fixed effects, the study was able to control for unobserved (to the econometrician) time-invariant factors such as industry, geography and resource endowments. The increase in output per capita may result from greater infrastructure investment and expenditure, increased economic activity and improved productivity.

Source: Sousa, D., 2014, 'Early evidence suggests Gigabit broadband drives GDP', available from: <http://www.ftthcouncil.org/p/bl/et/blogid=3&blogaid=305>

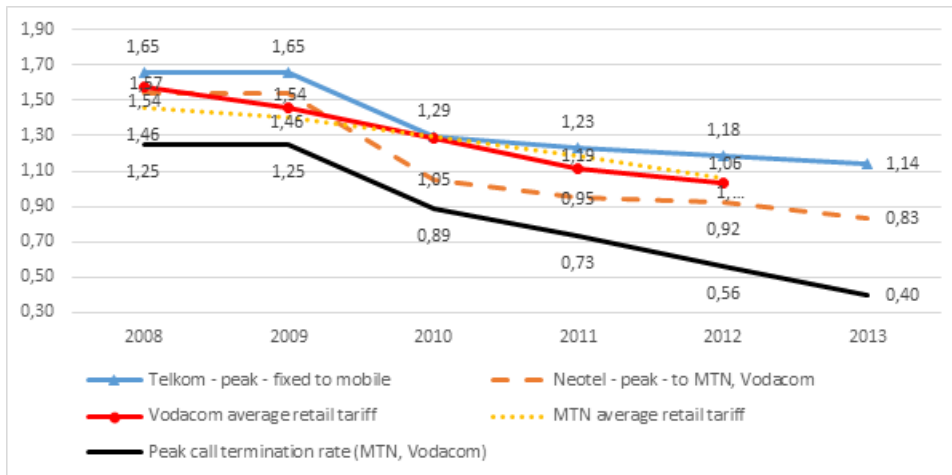
Before proceeding to understanding how the CoJ could develop the ICT sector, we provide a brief description of the status quo of the ICT sector in South Africa.

7.1.4 The ICT sector in South Africa

Retail voice prices for telecommunications services are no longer a significant policy concern, particularly after ICASA's most recent proposed call termination rate reductions.¹¹ Retail voice prices have declined significantly as mobile call termination rates (the wholesale price operators pay one other to terminate calls) declined (see Figure 2 below). Peak mobile call termination rates were reduced by 68% between 2009 and 2013. As a result of this Vodacom's prices, for example, fell by 34% between 2008 and 2012, while Neotel's retail prices fell by 46% between 2008 and 2013.

¹¹ See ICASA, 2014, 'Call termination rate intervention', available from: <http://goo.gl/icXkwd>

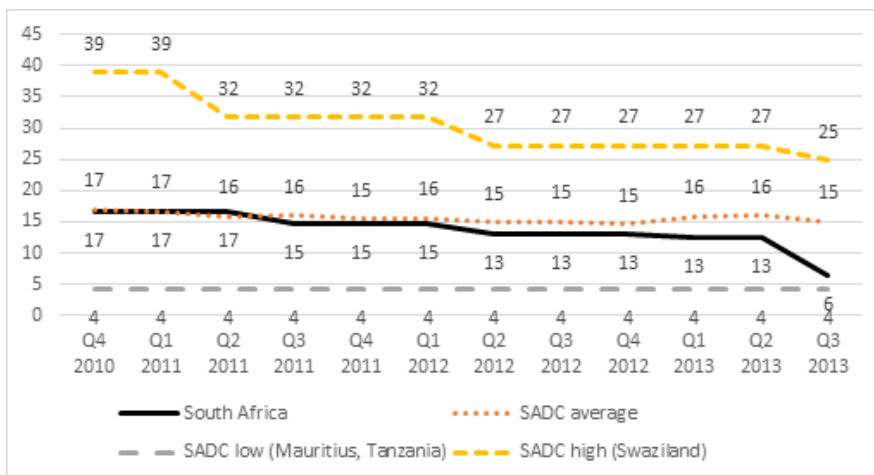
Figure 2: Mobile call termination rates (peak), average mobile retail prices and peak fixed to mobile prices (ZAR / minute)



Source: Hawthorne et al, 2014, 'Review of economic regulation of the telecommunications sector', <http://goo.gl/YeizRT>. Analysis based on data prepared by Research ICT Africa, 2013

This has led to voice prices in South Africa are now among the lowest in the Southern African Development Community (SADC) region (see Figure 3 below). South Africa's lowest prepaid rates are now similar to prices in highly competitive mobile markets, such as Mauritius and Tanzania.

Figure 3: Prepaid voice prices in SADC countries (USD), OECD usage basket (2010 - 2013)

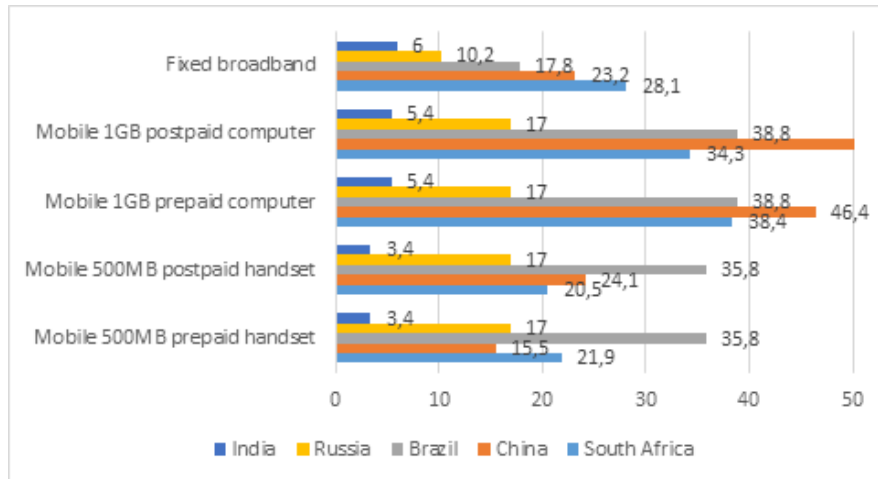


Source: Hawthorne et al, 2014, 'Review of economic regulation of the telecommunications sector', available from: <http://goo.gl/YeizRT>, analysis of MTN (2005-2013) and Vodacom (2005-2013), and Telkom (2005-2013); and Voice price comparisons (2009-2013) used for Neotel

However, the same success is not true in markets for broadband services. Prices for fixed broadband in SA are higher than prices for fixed broadband in all other BRICS countries,

and even mobile broadband prices do not compare particularly well with other BRICS countries (see Figure 4 below).

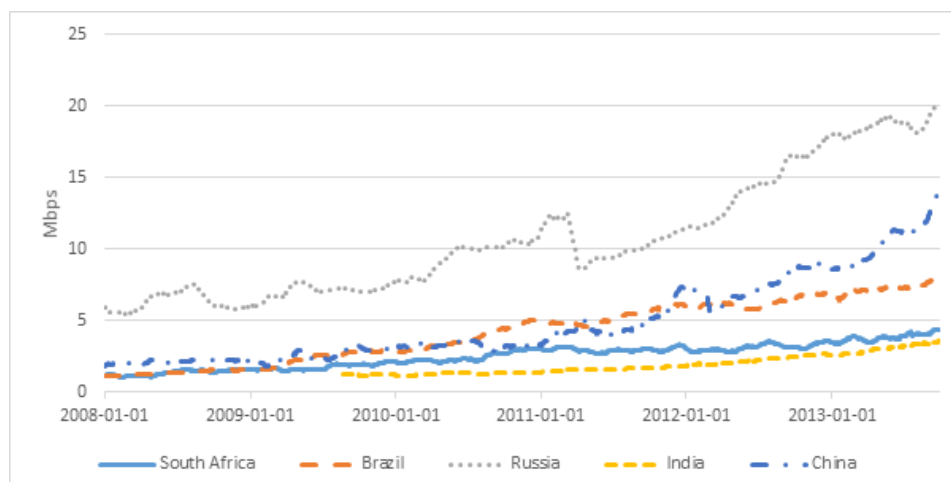
Figure 4: Prices for fixed broadband in SA are significantly higher than in BRIC countries (USD, 2012)



Source: Source: Hawthorne et al, 2014, 'Review of economic regulation of the telecommunications sector', <http://goo.gl/YeizRT>, Analysis of International Telecommunications Union prices, (2009-2013)

While South Africa has among the highest prices for broadband services, it has among the slowest broadband speeds when compared to BRICS countries (see Figure 5). South Africa is also getting left further behind: China and Russia in particular are experiencing rapidly increasing average speeds while South Africa's average speeds are not increasing anywhere nearly as quickly.

Figure 5: Broadband speeds in BRICS countries (Mbps)



Source: Source: Hawthorne et al, 2014, 'Review of economic regulation of the telecommunications sector', <http://goo.gl/YeizRT>, analysis of Ookla Netindex (2013)

This suggests that interventions are indeed required in broadband infrastructure. To this end, the Department of Communications (now the Department of Telecommunications and Postal Services) developed and published a National Broadband Plan, entitled ‘SA Connect’.¹² The targets set in the broadband plan are reproduced in Table 2 below. By 2020, the minimum average speed for 50% of the population is targeted at 100Mbps, and 90% of the population must experience a minimum average speed of 5Mbps.

Table 2: SA Connect (SA’s national broadband plan (minimum average speeds in Mbps))

Target	Penetration measure	Baseline (2013)	By 2016	By 2020	By 2030
Broadband access in Mbps user experience	% of population	33.7% internet access	50% at 5Mbps	90% at 5Mbps and 50% at 100Mbps	100% at 10Mbps and 80% at 100Mbps
Schools	% of schools	25% connected	50% at 10Mbps	100% at 10Mbps 80% at 100Mbps	100% at 1Gbps
Health facilities	% of health facilities	13% connected	50% at 10Mbps	100% at 10Mbps 80% at 100Mbps	100% at 1Gbps
Government facilities	% of government offices		50% at 5Mbps	100% at 10Mbps	100% at 100Mbps

Source: ‘South Africa Connect’, Available from: <http://www.doc.gov.za/documents-publications/broadband.html>

In order to achieve average speeds of 100Mbps, fixed line infrastructure is required. This is because the radio frequency spectrum used by mobile networks is a shared medium: while long term evolution (LTE) Advanced, for example, offers maximum speeds of up to 1Gbps, the average speeds experienced at a particular location will depend on the number of users and the usage profile of those users.¹³ In order to ensure that user experience is reasonable, mobile networks typically charge high prices for each gigabyte of data usage. According to Telkom, for example, mobile networks generally charge 4-5 times what fixed networks charge on a per Mbps basis.¹⁴ Fixed line networks, and optical fibre networks in particular, are not shared in the same way and offer dedicated (or near dedicated) capacity: the 1Gbps speed offered over Google Fiber, for example, is dedicated to each individual household.

The bulk of the costs of broadband networks are in the access network. The access layer costs approximately 60% of a fixed line broadband network’s operating costs and 50% of the capital expenditure (see Figure 6 below).¹⁵ At the services layer (Internet Service Provider

¹² Available from: <http://www.doc.gov.za/documents-publications/broadband.html>

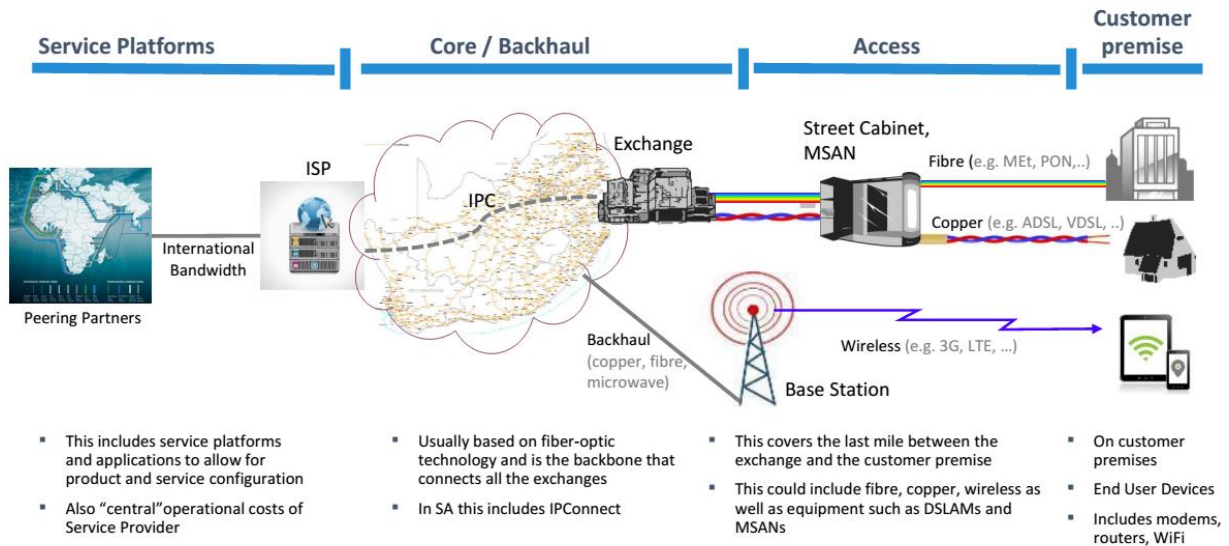
¹³ See Tabbane, S., 2013, ‘Evolution of communication technology from 2G to 4G LTE IMT’, available from: <http://goo.gl/Q6bn3H>

¹⁴ Source: Brian Armstrong, 2013, ‘Broadband in South Africa, the roadmap to growth’, Telkom, available from: <http://goo.gl/tvtFd>

¹⁵ See Armstrong, B., 2013, cited above.

layer), there are several providers and this market is competitive. The Core/backhaul networks are also becoming significantly more competitive, with Telkom and Broadband Infraco now facing competition from MTN, Vodacom, Neotel, FibreCo and Dark Fibre Africa on several main routes.

Figure 6: Broadband network layers and associated costs



Global Experience: Source: McKinsey*

Typical share of Opex

- 15%
- 25%
- 60%
- n/a

Typical share of Capex

- 20%
- 30%
- 50%
- n/a

Source: Brian Armstrong, 2013, 'Broadband in South Africa, the roadmap to growth', Telkom, available from: <http://goo.gl/tvtFd>

The key bottleneck, from an existing infrastructure and competition perspective, is therefore in the access network. The City of Joburg's planned interventions as regards access networks are therefore targeted at the correct network layer.

The CoJ's plans are discussed again in section 4. We discuss the CoJ's planned interventions next.

7.1.5 Summary of CoJ's broadband plans

The City of Joburg has set out an ambitious plan to improve broadband infrastructure in the city in the Johannesburg Broadband Network Project (JBNP).¹⁶ The project has resulted in a 900km fibre optic cable network. The City has targeted low income areas, including the inner city and Orlando, as priorities for the rollout of wifi infrastructure.¹⁷ The network was initially

¹⁶ See, for example, 'Broadband network transforming Johannesburg into "Digital City"', 2014, http://www.joburg.org.za/index.php?option=com_content&view=article&id=8996:31-01-2014-broadband-network-transforming-johannesburg-into-digital-city&catid=217:press-releases-2013&Itemid=114

¹⁷ See 'Broadband comes to Joburg', 2009, http://www.joburg.org.za/index.php?option=com_content&task=view&id=3554&Itemid=241

planned to support wireless and power-line communications: the CoJ's plans for broadband were first published in 2007.¹⁸

The CoJ's broadband network project was intended to be operational by the middle of 2013 but has subsequently been delayed by contractual disputes: once these disputes have been resolved, the CoJ proposes to form a Municipal Owned Entity to house the broadband network.¹⁹ The CoJ plans to establish 1,000 wifi hotspots in total²⁰ and is considering extending the current 900Km network to households. All 85 libraries are planned to be connected by the end of 2014. An important feature of the plan is training of students to pass on their knowledge to their communities: 1,000 students are to be trained. The CoJ's broadband network already connects and supports the Tshimologong Precinct (see Box 3 below).

Box 3: Tshimologong Precinct

The City of Joburg (through the Johannesburg Development Agency, JDA) has partnered with the Johannesburg Centre for Software Engineering (JCSE) and Wits University to develop the Tshimologong Precinct. The precinct is designed to be a hub for digital technology businesses located in Braamfontein West (between Smit St, Empire Rd., Bertha St, and the M1). The principles that Tshimologong is based on are as follows:

1. Technology cluster based in an existing business hub (banks, mining companies, local and provincial government all located nearby);
2. Proximity to where skilled people live;
3. Good infrastructure (transport, telecommunications);
4. Proximity to universities (combined population of Wits and UJ is 80,000); and
5. Policy support from local and provincial government.

The Tshimologong Precinct already comprises the Microsoft App Factory (a group of developers working primarily on Microsoft apps), the JCSE high-maturity (Hi-Mat) units and the digital games and content hub, all housed at 45-47 Juta St. The Tshimologong precinct recently hosted the Fak'ugesi digital festival which attracted a significant number of people from different fields, including developers and artists, who were able to collaborate on a number of projects. There are plans to build on this success and extend Tshimologong to a number of adjacent buildings. The CoJ (through the JDA) has committed to upgrading Braamfontein West to make the precinct more viable.

Source: Interviews with Prof. Barry Dwolatsky, Director, JCSE and JCSE annual report, 2013-2014; See also the Fak'ugesi digital festival video, available at: <http://youtu.be/MF-vYdFyZbU>

The CoJ's broadband plans are at a relatively advanced stage of development and implementation. A key missing feature, however, is an indication of how the CoJ plans to facilitate the implementation of fixed line broadband to households, which is required if SA's national broadband plan, SA Connect, is to be achieved. We provide suggestions for how this could be achieved, based on experience in other countries, below.

¹⁸ See, for example, 'Joburg's broadband plans speed up', 2007, available from: http://www.joburg.org.za/index.php?option=com_content&task=view&id=1727&Itemid=195 . And see also: 'Charter, economic development', http://www.joburg.org.za/index.php?option=com_content&task=view&id=1845&Itemid=49#access

¹⁹ See 'The smart city is coming to a hotspot near you', 2014, http://www.joburg.org.za/index.php?option=com_content&view=article&id=9186:the-smart-city-is-coming-to-a-hotspot-near-you&catid=88:news-update&Itemid=266

²⁰ See 'Log on at Rea Vaya stations', 2014, <http://www.reavaya.org.za/news-archive/september-2014/1082-log-on-at-rea-vaya-stations>

First, we discuss international experience with the development of clusters.

7.2 Experience internationally with the development of clusters

7.2.1 Key success factors for clusters

The main features of a successful cluster include:²¹

- Skills;
- Community collaboration;
- Strong research base and knowledge transfer;
- Access to finance;
- Sound infrastructure;
- Hub organisations;
- Local leadership; and
- Specialisation.

Successful clusters need access to a good source of skilled people. This is one of the reasons why clusters are often located near universities. Collaboration is required between investors, entrepreneurs, universities, research organisations and local governments, among other types of entities, in order to make clusters a success. Universities located near clusters are an important source for knowledge transfer and provide formal means of translating research into a business. They also provide national and international linkages that support cluster development. Access to venture capitalists is also an important source of success for clusters. Finally, clusters need good infrastructure to succeed, including transport links, office space and broadband.

Hub organisations, including large enterprises, provide important anchors for clusters. They spin off smaller 'non-core' businesses and buy up successful start-ups. They therefore attract and grow start-ups and support the reputation of a local cluster. Local leadership from the public and private sector is also important: rather than government attempting to develop interventions in isolation it should rather find ways to support the cluster with existing businesses in the area.

Clusters compete with one another internationally, and therefore need to specialise in a specific area. This area of specialisation may evolve over time. Successful clusters leverage local strengths to develop this specialisation. In developing this level of specialisation, clusters need to reach critical mass: there needs to be a significant number of firms locating in the area working in the same field.

Finally, an important feature of clusters is that they are hard to plan: according to Horowitz and Hwang (2013), successful clusters are more like rainforests in facilitating the growth of an ecosystem of firms, skills and capabilities relying on chance interactions to spur innovation, rather than being like planned farms.²² This suggests that governments may have less of a role to play in 'planning' a tech cluster but rather should support the creation of these ecosystems of firms, skills and capabilities.

7.2.2 The development of an ICT hub in Bangalore, India

²¹ This section is summarised from: Policy exchange, 2013, 'Silicon clusters', <http://www.policyexchange.org.uk/images/publications/silicon%20cities.pdf>

²² Horowitz & Hwang, 2013, 'The rainforest: the secret to building the next silicon valley', February 2013.

Bangalore is located in Karnataka State in India. Often called India's ICT capital, Bangalore is home to over 1500 IT firms and more in other sectors. The ICT cluster in Bangalore, India was developed in part as a result of a pro-active State government.²³ Indian authorities were willing to accept foreign investment in the sector if that could lead to further development. Educational institutions and research centers located in Bangalore were a good source of skills but did not play a critical role in the development of the cluster.²⁴ For example, the Indian Institute of Science was (and is) an important source of skills.

The Karnataka government was the first Indian State government to announce a comprehensive ICT policy and created at an early stage a separate Department of Information Technology. There are a number of other initiatives taking place in Karnataka State, including a Software Technology Park in Bangalore and Mysore and new clusters in Manipal and Mangalore. There is also an 'electronic city' on the outskirts of Bangalore and an Information Technology Park at Whitefield, Bangalore. In addition, the government and industry are co-operating to develop an Indian Institute of Information technology (IIIT-B) at Bangalore.

Policies at city and local government level that facilitated the development of the ICT cluster in Bangalore include:

- **Policies related to incentives:** such as tax incentives for IT companies in Bangalore (though at a limited scale) and education and training from the large number of education and training institutions in the city.
- **Providing marketing support:** government actively promoting Bangalore as the capital of software in India and the region.
- **Industrial policy:** incentives were offered to industries that agreed to set up themselves in Bangalore.
- **Prices and subsidies:** availability of cheap water and electricity and regular supply of both of these inputs.
- **Physical support from the government:** provision of space for ICT companies. In addition, industrial areas in Bangalore are better serviced than other parts of the state.
- **Stimulating cooperation** through organizations that promote interfirm relations.

The development of the ICT cluster in Bangalore is an important example of where the government played a significant role in facilitating the development of the cluster. Important features of these interventions included **incentives** and **marketing** support, and the development of **educational** institutions. This is in contrast to the development of other clusters described in this section, which largely do not emphasize the role of government.

An evaluation of the development of the Dutch ICT sector is discussed next.

7.2.3 Experience with agglomeration of the Dutch ICT sector

Economies of agglomeration (clustering) has an impact on both new firm growth and on incumbent firm growth.²⁵ Van Oort & Stam (2005) evaluate the impact of economies of agglomeration on new firm and incumbent firm growth in the Dutch ICT sector, using data on all firms in 580 municipalities between 1996 and 2000.²⁶

²³Van Dijk, 2002, available from: http://www.eadi.org/fileadmin/WG_Documents/Reg_WG/vandijk1.pdf

²⁴ Van Dijk, 2002, cited above.

²⁵ Van Oort, Stam, 2005, 'Agglomeration economies and entrepreneurship: testing for spatial externalities in the Dutch ICT industry', available from: <https://ideas.repec.org/p/egu/wpaper/0508.html>

²⁶ Their data was collated from the Yellow Pages and from firm level employment statistics.

The first hypothesis explored is simply that more densely populated regions generate more entrepreneurship and therefore more employment. Some studies have found that sector diversification has had an important impact on firm dynamics and employment, while others show that sector specialisation plays an important role. Additional spillover effects arising from education, R&D and learning by doing may also play a role. Marshall (1890), Arrow (1962) and Romer (1986), collectively referred to as 'MAR', contend that knowledge spillovers are derived from sector specialisation and therefore local / regional specialisation will lead to growth.

It is important to understand the role of competition in fostering or undermining firm growth. If there are significant knowledge spillover effects, then firms with market power will have greater ability and incentive to invest in R&D and training. An alternative hypothesis is that greater competition drives innovation and therefore spurs firm development (Porter, 1990). Sector diversity may be desirable since knowledge developed in one industry can be applied in another (Jacobs, 1969).

Fingleton (2004) finds that competition and industry diversity do not affect employment growth in the ICT sector, while spatial concentration of firms and university presence do. There is relatively little interaction between universities and SMEs in the ICT sector in the Netherlands, which means that spillovers from universities to firms can only be partly assessed there.

It turns out that R&D intensity did not impact on employment growth in the Dutch ICT sector in general, although in two urban areas incumbent growth was positively linked to R&D. Incumbent firm growth was negatively related to levels of ICT firm competition, while new firm growth was positively related to competition. New firm formation and incumbent growth are both positively related to other (non-competition) indicators of agglomeration, including spatial density of ICT firms. However, these indicators of agglomeration had a greater impact on new firm formation than on incumbent firm growth. Finally, the simple agglomeration hypothesis (larger cities have more firms and stronger growth) was also found not to apply: medium sized cities fared better than the largest cities in generating jobs.

The key insights that emerge from economies of agglomeration in the Dutch ICT sector are that new firms benefit from clustering and competition more than incumbents do, and that city size does not necessarily matter: medium sized cities can enjoy higher economies of agglomeration than large cities. Policies that support clusters and competition are therefore likely to support the growth of SMEs.

7.2.4 Policies that supported the development of the ICT cluster in Singapore

Singapore is a regional ICT Hub for Southeast Asia. It has a manufacturing base that produces skill and technology-intensive goods for both regional and global markets.²⁷ The government of Singapore actively supported the development of ICT services in 5 phases:

- A national information technology drive was embodied in a National Computerization plan and outlined 3 objectives: computerization of the civil service, training of software professionals and building the local ICT industry to expand software and services.
- A National IT Plan outlined a long term approach to ICT strategy in Singapore: developing IT professionals and experts, improving the information and

²⁷ Yue & Lim, 2003, 'Singapore: a regional hub in ICT. Towards a Knowledge-based Economy', available from http://www.nomurafoundation.or.jp/data/20010201-02_Siow-Yue_Chia_-_Jamus-Jerome_Lim.pdf

communication infrastructure, promoting the ICT industry, coordinating and collaborating between various ICT promoting organizations, establishing a culture that welcomes ICT, encouraging creativity and entrepreneurship and increasing ICT applications in workplaces.

- IT 2000 Plan which provided a vision of an “intelligent Island” based on an advanced National Information Infrastructure (NII) which would interconnect computers in virtually every home, school and workplace.
- A converged approach to regulation of the information technology, broadcasting and telecommunications sectors was adopted. The legal and regulatory framework was made more ICT-friendly and brought in line with international standards and models.
- Existing laws were fine-tuned to support the development of Singapore as a telecommunications hub and a clear legal and policy framework was put in place concerning mainly security and privacy in e-commerce.

The government of Singapore aims to increase competitiveness in software, content and intellectual property by stimulating the development and growth of a cooperative broadband and multimedia industry.²⁸

The commitment to **ICT use** within government, **marketing** and **skills** development elements of Singapore’s approach are useful policy approaches that the City of Joburg could consider.

7.2.5 The development of Nollywood

Nigeria is home to a large and vibrant film and media broadcasting industry, known as “Nollywood”. It has grown relatively quickly over a short period of time, having started developing in the early 1990s.²⁹

The Nigerian film industry has its roots in a Yoruba tradition of public performances that included storytelling, music and dance. This became very popular in the 1980s. In the 1990s, when digital recording started to replace analogue, these performances began to be recorded and made available for distribution via VHS cassette tapes. The first major film distributed in this way was “Living in Bondage”, produced by a VHS video tape trader who had excess stock, in 1992.³⁰ By 2006, Nollywood had released 872 major feature films (compared to 485 in Hollywood).³¹ By 2012, Nigeria was estimated to produce more than 1,000 films a year³², and by 2014 the film industry contributed approximately 1.4% of Nigeria’s GDP.³³ While much of Nollywood’s output is pirated, the industry manages to generate approximately \$500m per year in revenue.³⁴ There is now a Nollywood streaming TV application that works on Panasonic TVs, called iRoko. iRoko has more than 5,000

²⁸Lim, 2002, ‘Singapore’s role as ICT hub in Asean: A view from the new economic geography’ available from: <http://www.jamus.name/research/id3.pdf>

²⁹This section is adapted from Chowdhury, M., Landes, T., Santini, M., Tejada, L., & Visconti, G., 2008, ‘Nollywood: the Nigerian film industry’, Harvard University Kennedy School of Government / Harvard Business School, available from: http://www.isc.hbs.edu/resources/courses/moc-course-at-harvard/Documents/pdf/student-projects/Nigeria_Film_2008.pdf

³⁰See Chowdhury *et al*, 2008, cited above, and Obhafuoso, P, 2012, ‘Nollywood and its economic impact’, available from: <http://www.nigeriafilms.com/news/16783/42/nollywood-and-its-economic-impact.html>

³¹See Liston, E., 2014 (The Guardian), ‘Hello Nollywood: how Nigeria became Africa’s biggest economy overnight’, available from:

<http://www.theguardian.com/world/2014/apr/10/nigeria-africa-biggest-economy-nollywood>

³²Rice, A., 2012 (NY Times), ‘A Scorsese in Lagos’, http://www.nytimes.com/2012/02/26/magazine/nollywood-movies.html?pagewanted=all&_r=0

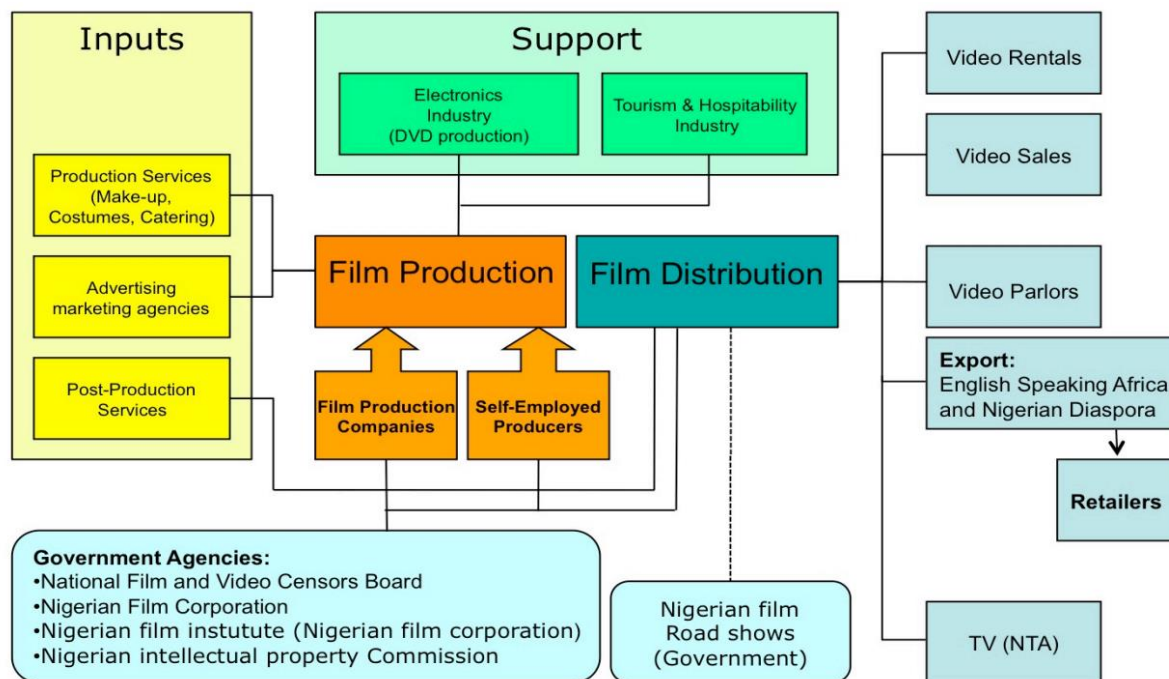
³³See Liston, E, 2014 (cited above).

³⁴See Rice, A., 2012, (cited above).

Nollywood titles, and costs between \$0 and \$5 per month, depending on the service selected.³⁵

The film cluster in Nigeria is mapped on Figure 7 below.³⁶ The main employer is the production services segment of the cluster, which includes a significant informal sector. The Nigerian film industry also has strong links with other industries, including a DVD manufacturing industry and a growing tourism industry. While the government has sought to intervene in the film industry through the Nigerian Film Corporation and the National Film and Video Censors Board (among others), its most successful intervention has been in respect of marketing road-shows. State-operated TV, the Nigerian Television Authority (NTA), also shows a significant amount of Nollywood content.

Figure 7: Mapping of the Nigerian film industry cluster



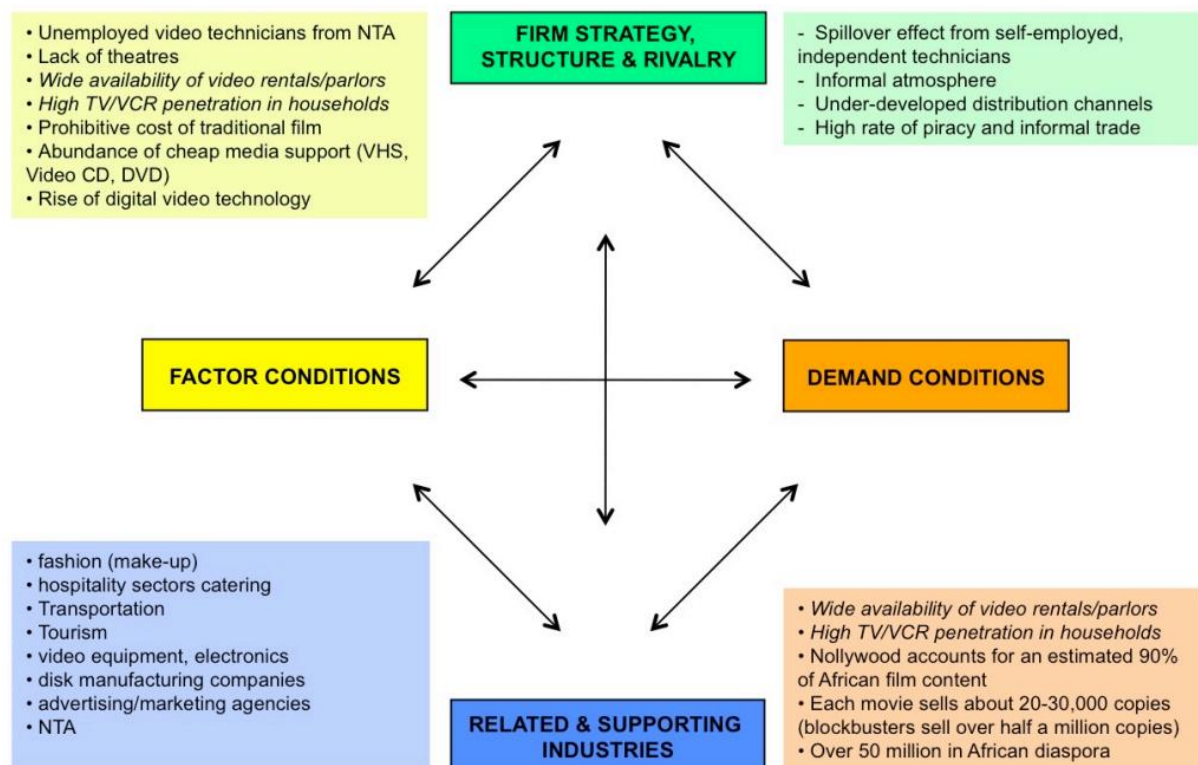
Source: Chowdhury et al, 2008, cited above

The success of the Nollywood cluster is due to a range of factors, described on Figure 8 below. These factors include significantly lower costs of production having been introduced in the early 1990s through digital video recording technology and the creation by the NTA of a skilled production workforce in the 1970s and 1980s. In the early 1990s, the NTA switched to importing foreign content, which made available to Nollywood a large number of skilled local film production workers. The cluster itself is located in Surulele in Lagos, which allows for spillovers of knowledge and skills between the various firms competing in the cluster.

³⁵ See Balancing Act, 2014, 'New smart TV app for 'Netflix of Nollywood: iROKOTv'', [available from: http://www.balancingact-africa.com/news/broadcast/issue-no172/technology-convergen/new-smart-tv-app-for/bc](http://www.balancingact-africa.com/news/broadcast/issue-no172/technology-convergen/new-smart-tv-app-for/bc)

³⁶ See Chowdhury et al, 2008, cited above.

Figure 8: Nollywood ‘cluster diamond’ developed by Harvard Business School and Kennedy School of Government researchers



Source: Chowdhury et al, 2008, cited above

The Nigerian film industry developed without significant government support. This favours the ‘ecosystem’ or ‘rainforest’ hypothesis of cluster development (discussed above), and suggests that the potential role of government is relatively limited. Nonetheless, a key area where the government did successfully support the development of the cluster was in **marketing** Nollywood.

7.2.6 Clusters in UK Cities

The Cambridge High-tech cluster is an example of a highly successful cluster: it is home to 1,400 technology based firms that employed 41,000 people in 2010.³⁷ The presence of an internationally-renowned university and access to the Intellectual Property developed by students are some of the main sources of the Cambridge cluster’s success. Among the reasons for the success of the Cambridge High Tech cluster is the development of a network where members of different communities within the same cluster can meet and share ideas, provide mentorship for new businesses, share office space for startups and provide funding. Organisations like the Cambridge Network facilitate introductions, provide networking sessions and seminars where ideas on specific topics are shared, and provide training courses for CEOs of start-ups. Training programs for managers are also facilitated by the Cambridge Network.

³⁷ Reported in a study of 48 ICT clusters in the EU and 10 outside the EU. Source: Digital Agenda for Europe, 2013, ‘Strategies for Innovative and Effective ICT Components & Systems Manufacturing in Europe’, prepared for the European Commission by IDC and FORA, <http://ec.europa.eu/digital-agenda/en/news/strategies-innovative-and-effective-ict-components-and-systems-manufacturing-europe>

While the role of government in the development of the ICT clusters in the UK was limited, marketing was an important feature of government support.³⁸ For instance the UK government has marketed the London 'Tech City' cluster as 'one of the world's great technology centres' to both domestic and international investors.

There is no single policy instrument that governments can use to support the development of technology hubs.³⁹ Nonetheless, successful clusters in the UK have been supported by government **marketing** the cluster's brand, which helps to attract an ecosystem of skills, investors and entrepreneurs.

7.2.7 The development of 'Silicon Savannah' in Kenya

A number of technology businesses have been set up on the Ngong Road in Nairobi, Kenya, including the Nairobi Garage (home of 88mph), iHub and m:Lab.⁴⁰ This followed to some extent from the enormous success of M-PESA in Kenya, a mobile money platform that has since been replicated in many other countries.⁴¹ The success of M-PESA, which commenced its operations 2007, was followed up by the Ushahidi platform, which mapped (using Google Maps) evidence of violence reported via SMS in the Kenyan presidential elections in 2008. This platform was used in other emergency related events in 2008, including in New Zealand during the earthquake in Christchurch and in the Gaza war. Ushahidi's success led one of its founders, Erik Hersman, to found iHub in the Bishop Magua Centre on the Ngong Road. Currently, the same building houses a variety of start-ups.⁴² For example, the Praekelt Foundation, which houses Jozihub (discussed below), has offices in the same building in Nairobi. Large corporates, including Microsoft and Google, have also established offices in Nairobi. Technology firms located in Nairobi are mapped on Figure 9 below. The Kenyan technology sector is also benefiting from significant growth in fibre optic cable rollouts (see Box 4 below.)

³⁸ See Policy exchange, 2014, cited above.

³⁹ Policy Exchange, 2014, 'Silicon cities', available from:

<http://www.policyexchange.org.uk/images/publications/silicon%20cities.pdf>

⁴⁰ See, for example, Mbote, K., 2014, 'Kenya: 88MPH to Rebrand to Nairobi Startup Garage', available from:

<http://allafrica.com/stories/201405280195.html>

⁴¹ This section to a large degree is adapted from Manske, J., 2014, 'Innovations out of Africa', available from:

http://whiteafrican.com/wp-content/uploads/2014/05/1404_VFI_Report_Innovations_out_of_Africa.pdf

⁴² See Manske, 2014, cited above.

Figure 9: Technology firms in Nairobi, Kenya



Source: Manske, J., 2014, 'Innovations out of Africa', available from: http://whiteafrican.com/wp-content/uploads/2014/05/1404_VFI_Report_Innovations_out_of_Africa.pdf

Box 4: Technology sector in Kenya supported by broadband, such as Wananchi 'Zuku TV' and Jamii 'Faiba'

The technology sector in Kenya is supported by a growing network of high speed fibre optic broadband connections. The number of fibre optic data/broadband connections grew from 851 in 2008/2009 to 58,197 in 2012/2013.⁴³ At the same time, DSL connections grew at a relatively more sedate pace from 7,822 to 11,512 over the same period. While mobile data internet subscriptions (2012/2013: 12.3m) dwarf these fixed line connections, high capacity fixed line networks are required by high usage small businesses in the technology sector.

There are a number of competing high speed fixed line access networks in Kenya including Wananchi (Zuku TV), Jamii (Faiba), Kenya Data Networks, Access Kenya and Telkom Kenya.⁴⁴ While these networks are relatively small at the moment, they are growing quickly, as is indicated by the growth in high speed fixed line connections described above. These networks are an important part of the infrastructure required to support the development of the technology sector in Kenya.

⁴³ See Communications Commission of Kenya, Annual report 2012/2013, available from: <http://ca.go.ke/images/downloads/PUBLICATIONS/ANNUALREPORTS/Annual%20Report%20for%20the%20Financial%20Year%202012-2013.pdf>

⁴⁴ See Research ICT Africa, 2012, 'Understanding what is happening in ICT in Kenya', available from: http://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/Policy_Paper_9_-_Understanding_what_is_happening_in_ICT_in_Kenya.pdf

The M-PESA platform itself has allowed for the development of a range of solutions, including M-Kopa-Solar (www.m-kopa.com), which provides solar power using M-PESA payments, and M-farm (www.m-farm.co.ke), which farmers can use to collectively negotiate lower prices for inputs, and pay via M-PESA. There is therefore an ecosystem of innovative start-ups that has developed in Nairobi.

The government of Kenya has supported the development of the technology industry partly by taking risks and allowing private enterprise to flourish. For example, the M-PESA money transfer product was permitted by the banking regulator when other countries, including South Africa, require a banking licence for this type of service.⁴⁵ The Kenyan government has also adopted an open data initiative, making available information on water points, school exam scores, census data, and health facilities for example.⁴⁶

While there are a number of ways in which the Kenyan government supports technology firms in Kenya, much of the success of the technology sector there can again be attributed to private enterprise. The government's **open data** initiative and **light touch regulatory approach** to innovations such as M-PESA nonetheless supported the development of the technology sector there.

7.2.8 Synopsis of potential interventions in support of ICT clusters

The main themes that emerge from existing research on the development of clusters include that:

1. ICT clusters largely evolve organically through the development of an ecosystem of entrepreneurs, investors, skilled workers and supporting adjacent industries.
2. Successful government interventions are confined to a relatively narrow area, and include:
 - 2.1. Skills development (including support for educational institutions);
 - 2.2. Marketing of the cluster (including through events, branding, official visits, etc.);
 - 2.3. Providing sound infrastructure (including in respect of broadband, transport networks and electricity); and
 - 2.4. Proving access to government data.

We discuss the results of our interviews with ICT businesses in Johannesburg next.

7.3 Requirements of ICT businesses in Johannesburg

7.3.1 Overview

In total we conducted twenty interviews with ICT sector start-ups and established ICT firms in Joburg. Ten of these interviews were conducted with software developers at Tshimologong (Johannesburg Centre for Software Engineering, Wits University, see Box 3 above) and ten at Jozihub in Auckland Park. We also interviewed five broadcast media firms in the Auckland Park and Sandton areas.

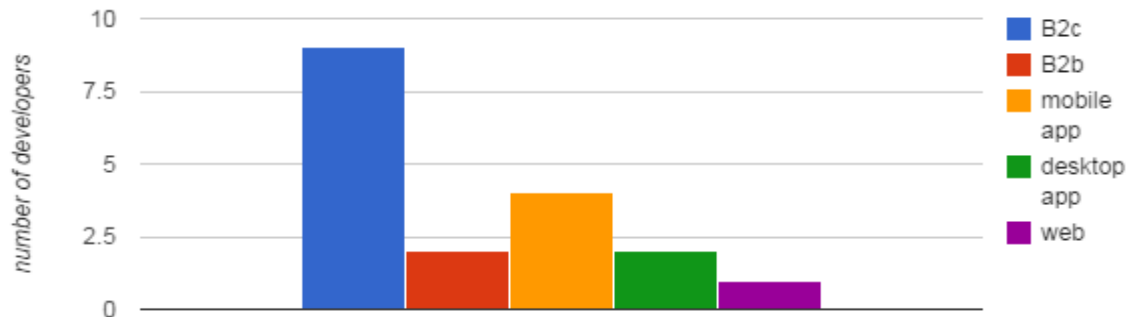
Most of the software developers interviewed at Tshimologong and Jozihub develop business to consumer (B2c) applications (9), followed by mobile apps (4), desktop applications and web applications (2) (see Figure 10 below). Only two of the start-ups were focused on

⁴⁵ Source: Speech by Michael Joseph, former CEO of Safaricom and head of mobile money at Vodafone, at Mondato conference (Johannesburg), 2014.

⁴⁶ See Kenya Open Data, available from: <https://opendata.go.ke/>

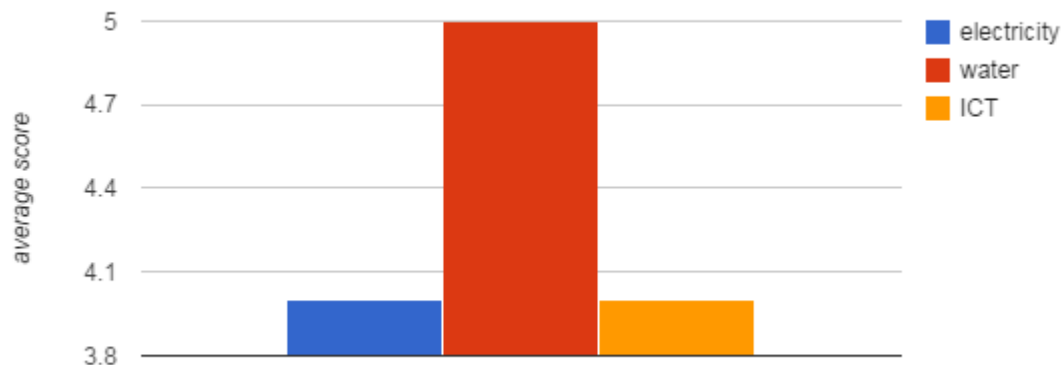
business to business (B2B) applications. This suggests that many of the start-ups located at Tshimologong and Jozihub, in order to succeed, need to reach very large consumer audiences. This is important in the context of the need for greater marketing and branding for the nascent technology cluster in the Braamfontein / Auckland Park area, discussed in more detail below.

Figure 10: Types of applications that businesses develop.⁴⁷



On average most respondents found the water infrastructure to be great in Johannesburg (see Figure 11 below). Electricity and the ICT infrastructure were found to be good but a few pointed out that their business would benefit if their broadband connectivity were improved.

Figure 11: Average infrastructure scores⁴⁸



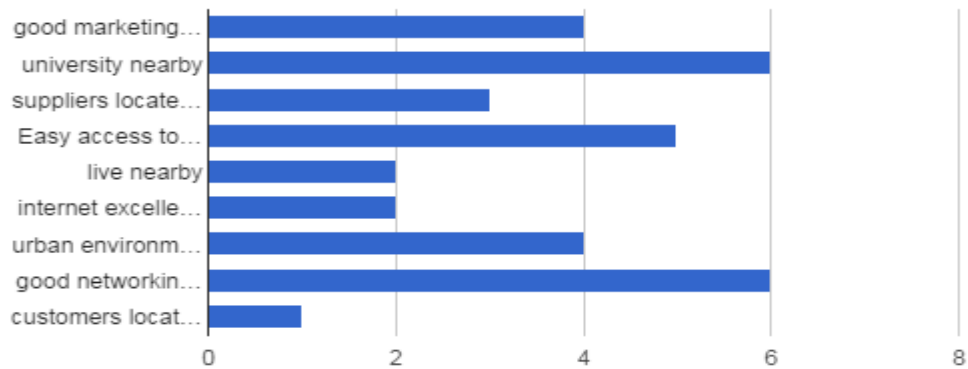
Good networking opportunities and the availability of a university nearby were the most important reasons for these firms being located where they are (see figure 12 below). Easy

⁴⁷ [Survey question: If applicable, what kinds of applications do you / does your business develop?](#)

⁴⁸ Survey questions: How would you rate the quality of the electricity infrastructure in your business's location?
 How would you rate the quality of the ICT infrastructure in your business's location?
 How would you rate the quality of the water infrastructure in your business's location?

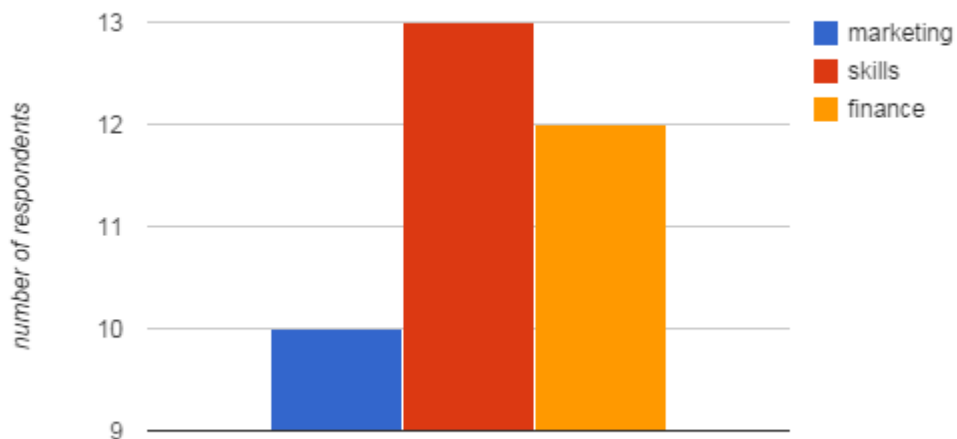
access to skilled staff, good marketing opportunities and the urban environment also contributed substantially to their location.

Figure 12: Reasons for location⁴⁹



Many interviewees had problems with marketing, skills and finance (see Figure 13 below). Each of these issues is discussed in turn in the sections that follow.

Figure 13: Respondents had problems with marketing, accessing skills and finance.



⁴⁹ [Survey question: Why did you choose this location for work or why did your company choose this location for its office space?](#)

7.3.2 Access to skills for developers

Access to skills is an important feature of a successful ICT cluster, as discussed above. The most significant obstacle to growth for start-ups interviewed is skills: 13 out of 25 interviewees (more than 50%) indicated that skills was a problem. For example, the LEAN startup offering was identified by one of the developers as a good place to attend talks but they are R900 per session which is expensive, making it difficult to follow each and every session. The CoJ could consider organizing free or affordable talks where startups can get advice from experts.

Furthermore interviewees also indicated that access to skilled employees was difficult. This was attributed to the fact that skilled employees are more inclined to join established businesses and to the poor quality of tertiary education graduates. Furthermore, firms that import skills from other countries face challenges with getting permits for foreign workers.

In addition, the Microsoft App Factory developers at Tshimologong complained that they receive Windows training after their competitors in other countries, such as the US. They are therefore always behind their international counterparts. They add that to be competitive they have to stay up to date in their knowledge base but cannot always afford to do so.

Skills development is therefore an important area in which the CoJ could consider intervening to support the nascent ICT cluster in the Braamfontein / Auckland Park area.

7.3. Marketing

A key problem for start-ups is marketing: linking their idea and product with customers. Ten out of 25 interviewees (40%) indicated that marketing is a constraint for their business (see Figure 13 above). For example, several Microsoft App Factory interns at Tshimologong develop four apps per month but they don't know how to earn revenues from the apps they are developing and they would like to build relationships with customers. This is an area that the CoJ could potentially intervene in as a large buyer of ICT services itself. One interviewee built an application for teachers, for example: their potential customers are teaching facilities but they don't have exposure to potential school customers. The CoJ could consider how such a developer could access procurement officials at the CoJ responsible for its training services.

Another example is Global Girls' Media: Global Girls Media noted that it is struggling with funding and the City could assist by sponsoring exhibitions of the work they are doing to promote art.

Game developers at Tshimologong are part of a wider developer community in South Africa, called MakeGamesSA.⁵⁰ They explained that potential clients, including large corporates, were simply not aware that there is a game developer community that they could use to build games that they could in turn use for marketing purposes. The CoJ could consider a marketing strategy to support the game developer community, including events that could showcase local game developer productions.

The CoJ need not build out a marketing organisation from scratch but could rather lend support, including funding, space and permissions, to existing initiatives. The Fak'ugesi

⁵⁰ See <http://www.makegamesa.com/>

festival is a great example of an event that markets Johannesburg as a tech hub, and that the CoJ supported.⁵¹

7.3.3 Access to finance for developers

Access to funding is one of the key constraints that App factory developers at Tshimologong face from starting and in other instances, growing their own businesses. Twelve (50% - see Figure 13 above) of the interviewees had difficulties accessing finance for their businesses.

While the CoJ might not be able to offer financial support in the form of start-up capital, it could find ways to support developers financially through reduced office rental, for example, or through broadband vouchers (discussed below).

7.3.4 Access to the City as a supplier

To improve their competitiveness, interviewees noted that the City could provide office space where startups companies can be located, and provide better access to the City as a service provider. For example, Global Girls Media at Tshimologong suggested that the CoJ could provide them with access to sites to take pictures.

In addition, some developers in Jozihub are finding that as their businesses grow the place cannot accommodate them anymore as it can only accommodate two people per business. Thabo Mphelo Films highlighted that their main obstacle to growth was a lack of studio space. The company produces approximately six television shows in a month but they are of the view that if they had the right facilities they could be producing more content at a cheaper rate and faster. Their view was that the city could rent out a building to them at a low rate. They added that they had identified a building downtown not far from the Market Theatre which has been abandoned for more than 10 years.

The CoJ could therefore consider reviewing its property portfolio to assess which, if any, of its properties are suitable as studio space and make these available to media production companies.

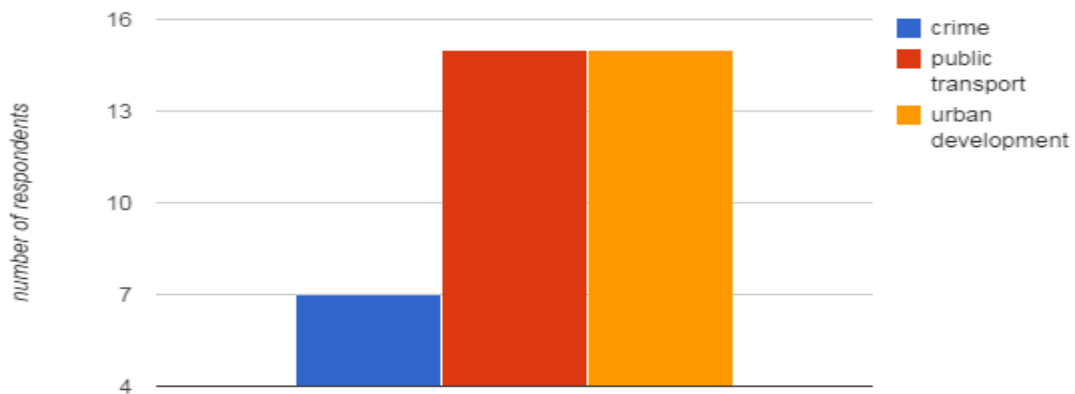
7.3.5 Upgraded city environments and crime

According to interviewees, Braamfontein needs a significant revamp and security needs to be tightened in Auckland Park. As shown in figure 14 below, fifteen (63%) interviewees rated the urban environment bad or terrible and they added that the area is unattractive and not safe. They mentioned that it is hard for serious business people to agree to meet there. As a result, networking and growth are affected.

Furthermore, many of the employees in start-ups come from Soweto, Alexander and Tembisa and they use public transport: they do not find it safe to walk from the Bree St. taxi rank to Tshimologong. Interviewees were concerned that a lot of robberies take place along the Nelson Mandela Bridge. Some developers would like to work at night but the streets in Braamfontein and Auckland Park are too dangerous for walking at night and most places have no street lights.

⁵¹ See, for example, the Fak'ugesi promotional video here: <http://youtu.be/MF-vYdFyZbU>

Figure 14: Respondents that had problems with crime levels, public transport and urban environment



7.3.6 Improved transport for suppliers, employees and stakeholders

In total 15 (63%) of the respondents both in the ICT and broadcast media sectors had problems with public transport. The 25% that do not have problems with the transport system have their own cars. In the Tshimologong and Jozihub communities, 70% of the interviewees indicated that they had problems with public transport for their employees. Transport problems were related to both safety and costs. Most of the interviewees indicated that they would like to work late but both the Rea Vaya and Gautrain do not operate for 24 hours and neither are available to all suburbs. Furthermore, as discussed above, it is dangerous to walk in Joburg at night either to a Gautrain or Rea Vaya station.

In addition, most ICT startups with no income yet and no salaries for their employees find the Rea Vaya fares expensive (employees have no incentive to come to work they rather have a cost, which most cannot afford) and think it would be best if the City provided coupons for the Rea Vaya to start-ups. Some of the respondents feel that information on how taxis work and where to find them should be made more public because finding a taxi going to a particular place is difficult. Others commute long distances, from places as far as Vosloorus, where public transport is limited. Interviewees added that business would be much better if the Rea Vaya buses operated more frequently (every 15-30 minutes) like the Gautrain buses that are available eight minutes after the train departs.

As a result of the lack of public transport, media companies end up paying for metered taxis to transport guests coming in for interviews as buses are not reliable.

The CoJ already has available to it considerable public transport infrastructure, particularly in nascent technology hubs in Braamfontein and Auckland. Additional work is required to make these transport networks safe.

7.3.7 Access to CoJ data⁵²

Nine interviewees (out of 20 interviewees at Jozihub and Tshimologong) pointed out that if the City provided open access to its data they would be able to use it to plan their businesses better, develop applications that are customer centric and design solutions for

⁵² [Survey question: If the City of Joburg were to provide open access to its data \(relating to topics such as transport, electricity use etc.\) what, if anything, would you be able to do with it?](#)

the City itself. They added that information on Rea Vaya bus locations and a 'parking space system' is very vital for their day-to-day businesses. At least one developer interviewed was already in the process of developing a Rea Vaya application.

There is therefore an opportunity for the CoJ to provide open access to its data. Examples of how this could be achieved are set out in Appendix B.

We summarise our interview results next.

7.3.8 Summary of interview results

We interviewed 25 ICT sector participants: 10 at Jozihub, 10 at Tshimologong and 5 broadcast media organisations in the Auckland Park and Sandton areas. These hubs could benefit significantly from interventions by the City of Joburg, particularly in respect of upgrading the urban environment, making transit corridors safe, providing access to the City as a customer, and providing access to the City's data. Broadband was not mentioned as a significant problem partly because at least Tshimologong already benefits from a fibre optic connection from the CoJ. A key feature of the interviews, which resonates with the experience of government support for clusters in other countries, is the role that the CoJ could play in marketing the ICT cluster in Johannesburg. Finally, the CoJ could review its property portfolio to assess which, if any, of its properties might be suitable for studio space in order to support the media production industry.

Next, we provide overall recommendations as to how the CoJ could support the development of an ICT cluster in Johannesburg, in the context of international experience and the requirements of local ICT businesses.

7.4 Recommendations

7.4.1 Marketing Joburg as a technology hub

An important outcome of initial interviews and the literature surveyed is that technology clusters rely on a common brand in order to attract an ecosystem of skilled workers, entrepreneurs and investors. In the case of Tech City (Silicon Roundabout) in London, the government invested significantly in promoting the cluster.

Interviews with developers at Tshimologong and Jozihub suggest that the wider community, including potential customers, start-ups, entrepreneurs, skilled workers and investors are simply not aware that, for example, there is a significant game developer community in Johannesburg (as discussed above in section 3.3). This community, among other developer communities, would benefit from marketing interventions by the CoJ, including hosting events (such as hackathons, discussed above) and conferences to attract an ecosystem of people, skills and resources that could develop an ICT hub in the CoJ.

7.4.2 Upgrading of targeted cluster areas

Technology hubs require an attractive urban environment and interviewees largely rated the urban environment as poor (see section 3.6 and Figure 11 above). The City has agreed to upgrade Braamfontein West to make it a more attractive place to work, in the case of

Tshimologong.⁵³ This is clearly needed given the state of the City's infrastructure (see left image on Figure 15 below), including pavements, parking and street lighting, compared to Tshimologong's aspirations (see image on the right below).

Figure 15: Tshimologong now and in the future



Sources: Google Maps and Tshimologong, available from: <http://openwits.co.za/>

The upgrade of the urban environment in West Braamfontein (around Tshimologong) is a good example of an intervention that the CoJ could implement to support the development of an ICT cluster in Johannesburg.

7.4.3 Transport and office space

Transport and access to office space are key areas that the City of Joburg could improve to reduce the costs of doing business. Transport was also an important problem area for Tshimologong, Jozihub and media interviewees (discussed above in section 3.7). Residents of the city commute long distances from a range of locations (see Figure 16), yet public transport is considered to be slow and unreliable. Transport links are an important feature highlighted in the literature for the development of technology hubs. No matter how much the CoJ improves Braamfontein, if it does not improve transport into and out of Braamfontein the technology cluster there will struggle.

Furthermore, an interviewee in the media sector suggested that he was targeting an ideal site in the inner city of Johannesburg, which is currently derelict and appears to be state owned property, for new broadcast studios but was unaware of how to go about leasing or buying this property. While the CoJ has made available its process for accessing city properties (see Figure 17 below), this process might be streamlined. This might also be linked to the community liaison suggestion for the ICT sector, recommended above in section 4.4.

⁵³ See, for example, 'Tshimologong', <http://openwits.co.za/>.

Figure 16: Movement within the CoJ

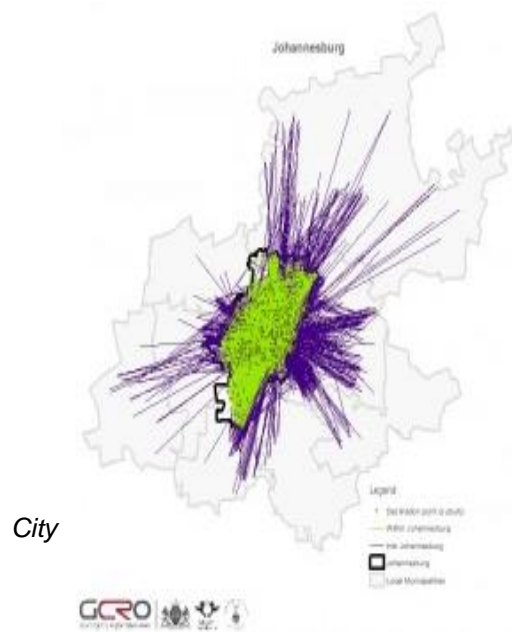
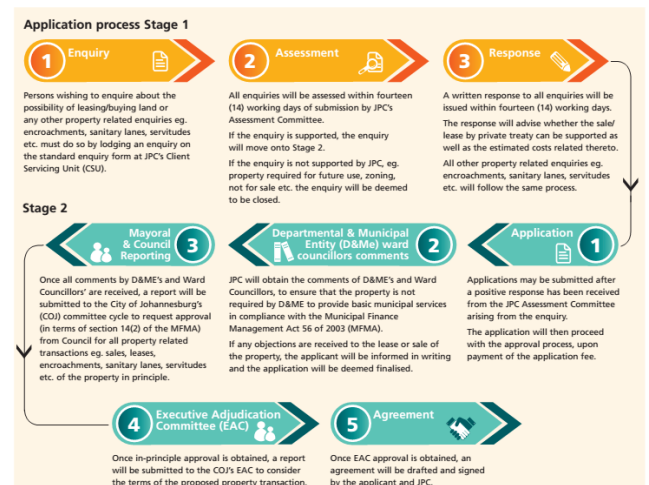


Figure 17: CoJ property process



Sources:
Gauteng

Regional Observatory, available from:

<http://www.gcro.ac.za/> and City of Joburg, available from:

<http://www.joburg.org.za/>

7.4.4 Improving the City's infrastructure through better access to broadband

7.4.4.1 Providing access to City Infrastructure for broadband

As discussed above in section 2, access networks, and fixed access networks in particular, are the main constraint for access to broadband services in South Africa. In particular, fixed line networks are the only reasonable means for achieving the ambitious broadband targets set in the government's South Africa Connect policy, which requires that more than 50% of the population experience speeds of more than 100Mbps by 2020.

The City of Joburg has a critical role to play in the implementation of this policy, in that the CoJ's infrastructure can be used to dramatically lower the costs of rolling out broadband networks. The Google Fiber networks rolled out in cities in the USA make use of municipal infrastructure, for example, to roll out Gigabit (1,024Mbps) internet speeds there (see Box 1 above). The CoJ not only owns critical infrastructure that could be used for broadband but also plays an important role in setting the rules for permissions (wayleaves) and municipal zoning that are also critical to the rollout of networks.⁵⁴ There are many areas in which Google Fiber recommends that Cities improve regulations and access to infrastructure, set out on Table 3 below and in Appendix A.

⁵⁴ Available from: <http://www.forbes.com/sites/joeharpaz/2014/07/02/will-google-fiber-make-kansas-city-provo-and-portland-the-new-tech-meccas/>

Table 3: Audit of available infrastructure and rights of way

Network design and planning	Minimise disruption
Addresses	Existing spare conduit available for lease
Streets	Existing spare fibre available for lease
Rights of way / servitudes / easements	Infrastructure maintenance plan
City boundaries	Potential sites for lease
Parcel or lot lines	
Poles: City owned, operated or controlled	
Street lights	
Overhead strand	
Existing underground utility routes	
Pavement condition	
Zoning	
Building footprint	

Source: Google Fiber city checklist, available from:

<https://fiber.storage.googleapis.com/legal/googlefibercitychecklist2-24-14.pdf>

It is hard to overstate the importance of an accessible and responsive city government where the rollout of networks is concerned. Google Fiber points out a range of supportive regulatory frameworks in its requirements for cities, set out in Appendix A. For example, Lee County, Florida, USA requires that:

“To enhance the public convenience and to minimize the placement of poles and wire holding structures within public ways, the franchisee shall enter into agreements for the joint or common use of poles or other wire holding structures where poles or other wire holding structures already exist for the use in serving the county or serving the public convenience. Where reasonable terms and conditions cannot be negotiated with the owners of such poles and wire holding structures, the franchisee shall demonstrate the unreasonableness of the negotiations and terms, to the county administrator’s satisfaction, and request waiver of this provision.” Ch. 20, § 22-70.13(h)(1)

We recommend that the CoJ considers the Google Fiber model as it develops and implements its broadband plans for the City.

7.3.1. Prioritising under-serviced areas for rollout

The CoJ is targeting low income parts of the city in its broadband plan, as discussed above. As it turns out, the densest parts of the City of Joburg co-incide with the lowest income parts of the city (see Figure 18 below). The inner city (CBD), Alexandra and Soweto have relatively high population densities and also house the poorest of the city's residents. Telecommunications infrastructure costs are sensitive to population density: it is cheaper to connect households that are clustered together than it is to connect households that are further apart.

Furthermore, high income suburbs are likely to be well-served by network operators, and the CoJ should de-prioritise these suburbs. For example, Vumatel's plans to connect 200,000 houses within the next five years:

"Our ambition is to roll out to 200 000 houses over the next three to four years, which equates to about 100 suburbs," says Schoeman. "We're not trying to solve a national problem. [Television] white-spaces spectrum, Wi-Fi and mobile will also play a big role."

Niel Schoeman, Vumatel, <http://www.techcentral.co.za/vumatel-eyes-billions-for-sa-home-fibre/48784/>

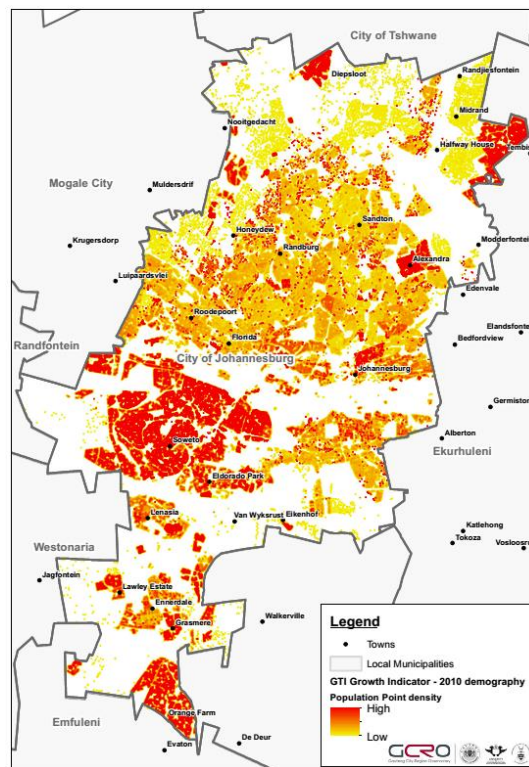
Further high income area fibre rollout initiatives include the 'Join the Fibrehood' initiative by SA Digital Villages⁵⁵ and fibrehoods.co.za.⁵⁶ Telkom has also selected a number of high-income suburbs for fibre to the home services.⁵⁷ These initiatives are likely to result in fibre broadband being provided to high income households.

⁵⁵ See SA Digital Villages 'Join the Fibrehood' campaign, available from: <http://www.jointhefibrehood.co.za/>

⁵⁶ See the Fibrehoods.co.za initiative, available from: <http://fibrehoods.co.za/>

⁵⁷ See, for example, MyBroadband, 2014, 'Telkom 100Mbps Fibre to the Home rollout areas', <http://mybroadband.co.za/news/broadband/104225-telkom-100mbps-fibre-to-the-home-rollout-areas.html>

Figure 18: Population densities in different parts of the CoJ



Source: Gauteng City Regional Observatory, available from: <http://goo.gl/xFxa7y>

In implementing its plan for the rollout of fixed line broadband in the city, the CoJ should therefore focus on high density, low income parts of the city.

We discuss ways in which the CoJ could stimulate demand for broadband next.

7.3.2. Stimulating demand

7.3.2.1. Education

The CoJ is targeting education as an important feature of its broadband plan, with the training of 1,000 students to pass on their knowledge of the internet to their communities (as discussed above in section 1.7). These efforts should be reinforced and extended.

According to a recent survey by Wits University researchers, 66% of South Africans still do not have access to the internet - 60% say it is too expensive, but even more (76%) say they don't know how to use it (see Figure 19 below). This is still the case even though access to mobile broadband is extensive in the CoJ and there is reasonably wide coverage.⁵⁸ In Kansas City (where Google Fiber was rolled out, see Box 1 above), the 25% of the population that did not have broadband access to the internet also said that they did not have it because it was not relevant to their lives. In response to this Google took the initiative to educate people about the benefits of the internet.⁵⁹ For example, during the course of the Google Fiber rollout, in order to spread the word about its new Google Fiber service in

⁵⁸ Source: <http://www.networksociety.co.za/infographics.php>

⁵⁹ Available from: <http://business.time.com/2012/09/14/with-google-fiber-search-giant-issues-public-challenge-get-up-to-speed/>

Kansas City, Google sent out a “field team” of about 60 employees to places such as community centers, churches and schools to educate people about broadband.

Thus to access ICT one not only needs access to broadband but also education.

Figure 19: Why do City of Joburg residents not access the internet?



Source: <http://www.networksociety.co.za/infographics.php>

Education should therefore be a priority area for the City of Joburg to focus on during the implementation of its broadband project.

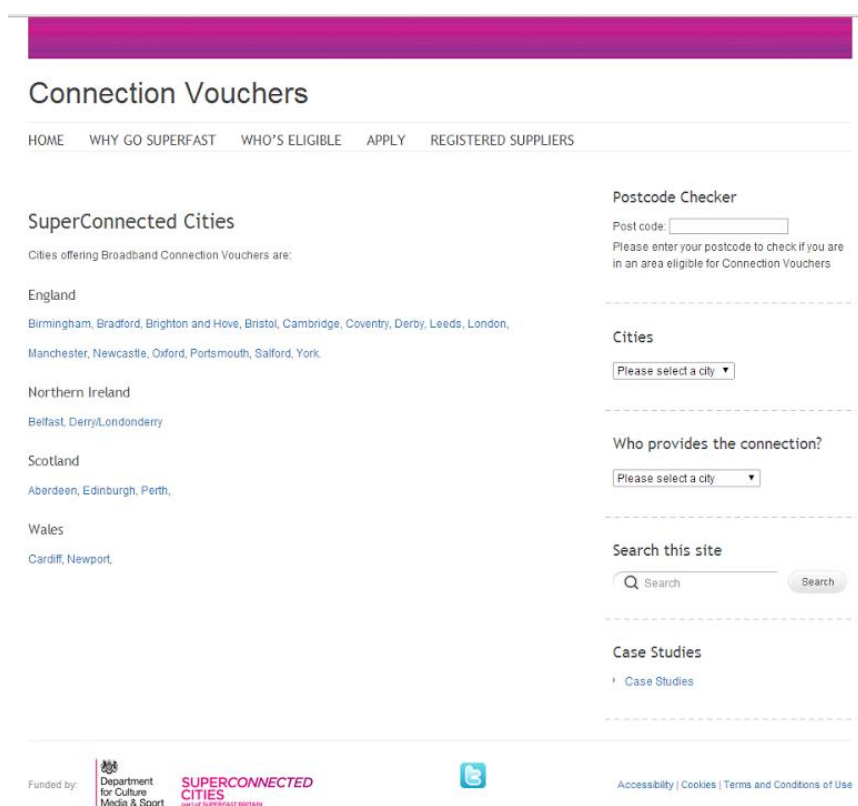
7.4.4.2 Broadband vouchers

The City of Joburg could consider offering vouchers for broadband access to targeted households and individuals. This is currently the approach in the UK, for example, in cities where broadband is generally available but where businesses may not have the resources to take advantage of it. The UK SuperConnected Cities initiative provides funding of up to approximately R50,000 to Small and Medium Enterprises (SMEs) for broadband access. SMEs sign up for this in a range of cities using the form shown on Figure 20 below.

Similarly, broadband vouchers could be provided to buyers of prepaid electricity that are eligible for 50 free kWh per month. The CoJ could put out a tender for mobile and wireless

operators to bid to provide a data package that would be free for consumers and paid for by CoJ up to a certain amount of data / value per month.

Figure 20: Broadband vouchers for SMMEs in designated cities in the UK



Source: <https://www.connectionvouchers.co.uk/superconnected-cities/>

7.4.4.3 Open data

A further means of stimulating demand for broadband while at the same time improving the CoJ's other services and improving access to the CoJ, is to provide open access to its data. These data include:

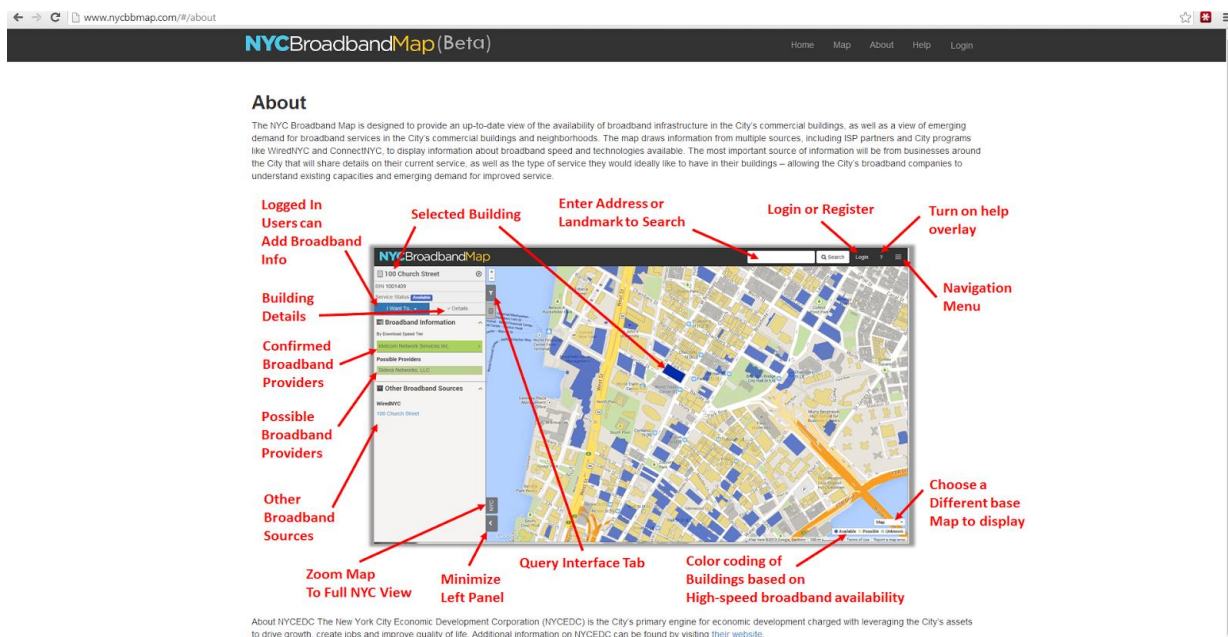
1. Passenger trips on the Rea Vaya;
2. Bus locations of Rea Vaya and Metrobus buses;
3. Electricity use by time of day, area, customer type;
4. Road infrastructure quality;
5. Traffic light outages; and
6. Traffic patterns recorded on CoJ cameras and from other sources.

These data could be provided on an open access basis to the public via a website, as is the practice in Kenya, for example (discussed above in section 2.7). Access to more sensitive information or information that is difficult to disseminate on a website could be provided on a more limited basis to developers at tech hubs, such as Jozihub and Tshimologong. For example, developers at Tshimologong have suggested useful means of using the CoJ's data, including on bus locations (discussed above in section 3.8).

The City’s data could also be provided to participants of hackathons, for example, where developers collaborate in large spaces over a specific period of time to develop solutions to problems that the CoJ faces. See also Appendix B for further details on how and what data should be made open.

An open data initiative is an important way in which developers could improve their skills and the CoJ could develop its profile as a connected, high tech city. This might be linked, for example, to mapping existing broadband infrastructure (as New York City did, see Figure 21 below). This could in turn be linked to the process of developing information on and making available CoJ infrastructure for broadband use, set out in section 4.4.1 above.

Figure 21: New York City broadband map



Source: NYC Broadband Map, available from: <http://www.nycbbmap.com/>

7.4.5 Access to the City for developers and media players

During the course of interviews with software developers and media houses, it became clear that a point of contact for ICT businesses within the CoJ would be valuable. The CoJ is not considered as particularly accessible by media houses and software developers. There are a variety of circumstances in which ICT firms need to interact with the CoJ, including for access to office space, broadcast media space, access to CoJ entities as potential customers, marketing events through the CoJ, and accessing the CoJ’s data, as discussed above.

7.5 Conclusion and summary

Johannesburg is a natural location for an ICT cluster: it has good infrastructure, two internationally renowned universities, a large business community, a pool of skilled workers and an ecosystem of existing ICT firms. The City of Joburg (CoJ) already has a number of initiatives in place to support the ICT sector: examples include the CoJ’s broadband network

connecting the Tshimologong precinct and support from the CoJ for the Fak'ugesi digital festival at Tshimologong.

Technology clusters are more like a rainforest than a planned farm: they rely on informal interactions, networks of trusted partners and an ecosystem of skilled people, investors, and entrepreneurs. The role for government in the development of clusters is therefore limited. Nonetheless, there are areas in which city governments can support tech cluster developments. We have developed a set of policy recommendations from interviews with ICT businesses and from the experience of successful ICT clusters in other cities.

The first set of recommendations relate to improving infrastructure:

- Facilitating the rollout of broadband by making the CoJ's infrastructure (such as poles, ducts, equipment rooms) available for use by network operators (the Google Fiber model);
- Transport links to and from technology and media hubs, including security for transport routes;
- Office / studio space, particularly for media production houses; and
- Upgrading the urban environment (including parking, pavements, roads and street lights).

The second set of recommendations relates to stimulating demand for broadband. This could be facilitated by:

- Education: a significant proportion of Johannesburg residents do not access the internet at least partly because they don't see the value in it. Education played a key role in the rollout of Google Fiber, for example.
- Broadband vouchers provided to SMMEs (implemented in the UK, for example) and low income households.
- Open data initiatives to support the growth of the developer community (implemented by the Government of Kenya, for example).

Other obstacles to growth for ICT firms interviewed include a lack of skilled employees and limited or no access to finance. Education interventions were important features of government support for the ICT clusters in Singapore and Bangalore, for example. Nonetheless, education and access to finance relate more to national rather than local government policy, and it is not clear how the CoJ could intervene in these areas.

A number of interviewees suggested that their businesses could be supported by greater access to the City of Joburg as a customer. This includes non-IT related areas of the CoJ, such as libraries, clinics, transport and electricity, all of which could benefit from greater interactions with developers at Tshimologong and Jozihub.

Finally, an important area for intervention relates to marketing the City of Joburg as a technology hub. This was successfully employed in Nigeria for example in support of Nollywood and was an important feature of the UK government's support for Tech City in London.

8. Industrial nodes report

8.1 Background

The Department of Economic Development (DED) at the City of Johannesburg (The City) is concerned with economic development and transformation in Johannesburg. The City accounts for 17% of South Africa's economic output and is the leading metro for most of the country's key sectors (City of Johannesburg Economic Strategy Roadmap, 2014). However, the character of economic activity in Johannesburg has been shifting over time; away from primary and secondary sectors and towards services. Economic activity is very unevenly spread across the city and not well aligned with areas where the majority of the population lives (City of Johannesburg Economic Strategy Roadmap, 2014). Furthermore, the challenges of poverty, unemployment and inequality are acute. The City recognizes the need to increase competitive local production as a basis for exports, jobs, and sustainable services growth.

The City has appointed the Centre for Competition, Regulation and Economic Development (CCRED) to conduct research to provide a deeper understanding of the economy of Johannesburg and the ways in which City can best use the tools at its disposal to drive the city towards an inclusive, job-intensive, resilient and competitive economy.

It is well recognised that the purpose of local economic development is to build up the economic capacity of an area. It is a process by which public, private sector and not for profit organisations work collectively to create better conditions for economic growth and employment generation. Cluster development is one of the channels that local economic development initiatives can use to encourage and support inter-firm collaboration, institutional development and support in targeted industrial sectors. Johannesburg already has a number of industrial nodes that offer economic development potential, however, there is much to be understood about what is required to improve economic development activity in these areas. A better understanding of these areas will allow the city to have a targeted approach to interventions and leverage resources in the direction of greatest potential return.

A focus on the organisation of production underpins frameworks that explain the dynamic of local economic development and the collective development of company competencies at the local level. This approach highlights the gains from collective learning in an evolutionary framework, with informal networks, common understanding, and trust all enabling the realisation of collective gains. The 'learning' of companies in developing production capabilities and research and development (R&D) activities is an area in which collective action by government and companies has an important role to play. Such action can result in institutions which provide services and training, so enabling positive externality effects (or 'spill-overs') to be built on. For example, there may be common elements in the development of a process technology by two companies in different sectors. Investment in training by companies contributes to a pool of skilled labour upon which all may draw.

There are strong collective benefits (positive externalities) from developing a pool of skilled labour and facilities including testing and research facilities for design and product development. These all mean cumulative causation at work in patterns of growth and decline. These factors help explain why, despite international trends towards liberalisation and increased international flows of goods and capital, industrial activity is more and more concentrated in local regions or districts (Helmsing, 2001). Different conceptual frameworks exist to explain these phenomenon and their implications. The 'new economic geography'

associated with Krugman emphasises externalities, such as those associated with labour markets and skills development, specialist inputs required by companies, and technology spill-overs (see, for example, Krugman, 1998a and b). Since companies locate close to markets, specialisation in a particular location can be a result of historical accident and can persist after the initial demand stimulus has receded in significance. This further implies that purposeful action is required to develop new industrial districts, and that the company groupings will need to get to a scale where there is division of labour within the cluster (Helmsing, 2001). The realisation of agglomeration effects associated with externalities also implies the need for co-operation between companies.

This role for the public sector is also highlighted by Best (2001) as one of the important features of developing production systems and more dynamic business models. International experience in the development of industrial districts and local industrial clusters demonstrates the importance of the public sector in creating appropriate institutions (see, for example, Best, 2001; Sheehan & Grewal, 2000; and Park, 2000). Successful industrial clusters and districts are often underpinned by the coming together of different factors including basic conditions such as working public infrastructure.

Drawing on these frameworks, industrial policy can be approached through understanding company production capabilities and performance, company strategies and decisions (e.g. in relation to training), the nature of inter-company relationships, and the role of government. In this approach, we recognise the potential for positive externality effects and spill-overs, which drive processes of cumulative causation in the returns to companies from location decisions. Also, the orientation of companies and their relationships with government are influenced by the historical development of capitalism in a country (Chandler et al., 1997 and 1998).

The role of government in fostering clusters is discussed extensively in literature and there has been substantial experience in South Africa which provides learnings (see Morris et al. 2005 for review of literature; Gwynne-Evans, 2014 for cluster experience in Western Cape). Though there is debate on the extent of government's involvement in fostering clusters, there is agreement on the importance of its role. Fundamentally, there is a critical need for a lead to be taken in supporting programmes with collective gains which cannot be reaped by any individual firm, and for the catalytic steps needed to organise the clusters. There may be heavy government involvement in the initial set up stage and government can then withdraw slowly during the operating and sustaining phase. Local government (at the Metro and Provincial level) has been most effective in championing this as they are close to the groups of firms in their area and are responsive to their needs. For example, the Western Cape has supported clusters through 'special purpose vehicles' to ensure the administrative and organisation core is provided. Interestingly, the microeconomic support programmes in this province have been built and adapted under successive administrations.

As part of the scope of the research, we map out the economic activity in Aeroton and Industria West. The aim of this area of work is to collect and analyse primary data on patterns of economic development and performance at the firm level, to understand constraints to entry, growth, and employment creation.

In Section 2 of the report we discuss the approach and methodology for the study and Section 3 profiles the three relevant nodes. Section 4 describes the firm survey including the methodology used, results and analysis. Section 5 presents the analysis of the firm interviews. Finally, Section 6 provides conclusions and recommendations and suggests a possible way forward for the City.

8.2 Approach and methodology

The study involves a firm level survey and in-depth firm interviews to map economic activity in 3 industrial nodes - Industria West, Aeroton and Wynberg - understand firm performance and locational decisions and key challenges that the city can address. Aeroton, Industria West and Wynberg are the pilot areas for the research and a discussion on how the areas were chosen follows in section 2.1. The survey was sent to all firms in Industria West and Aeroton, while the in-depth Interviews were conducted with 10 firms in Aeroton and Industria West and 5 firms in Wynberg. Wynberg was not surveyed. The purpose of the interviews was initially to get a sense of the issues in the area to enable better calibration of the survey, however, the interviews also gave more detailed responses to questions and in some instances firms sent follow up information as further inputs into the study.

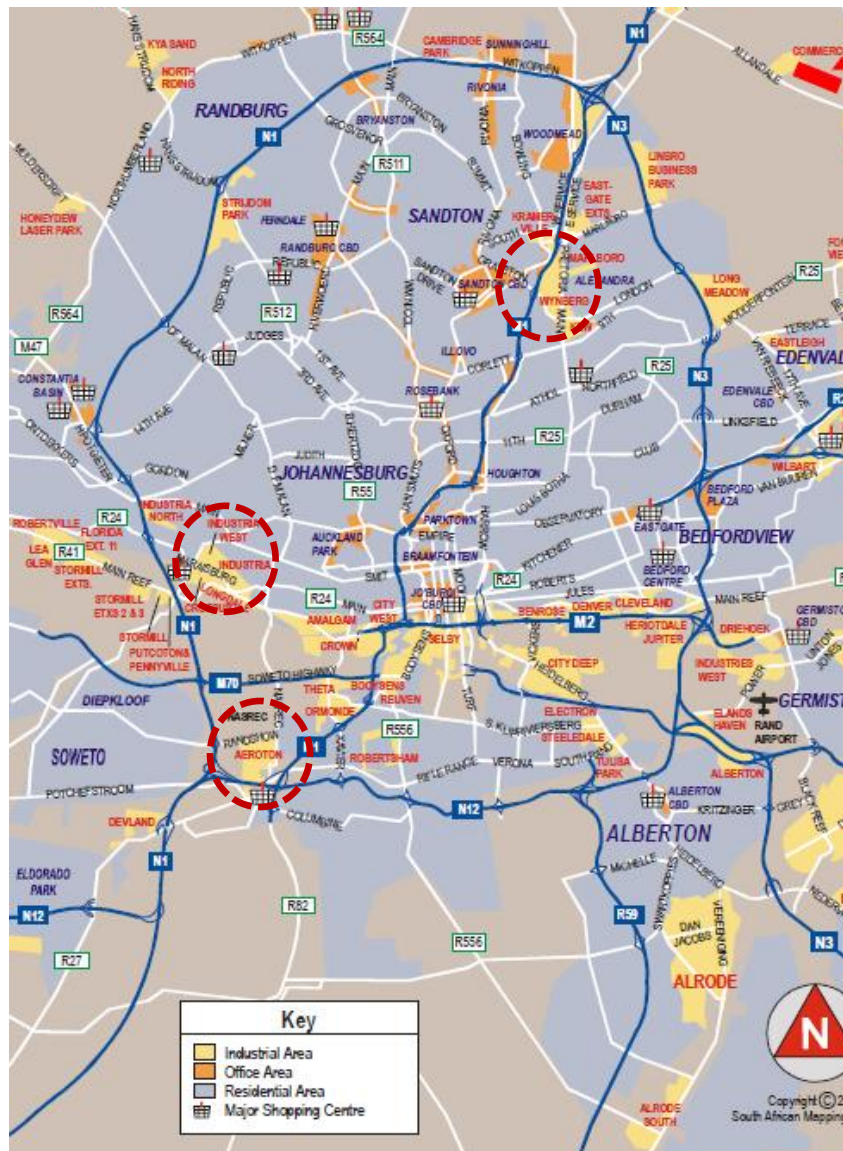
There are 73 firms in Industria West and 49 firms in Aeroton. In Industria West the firms were identified through a street-by-street field investigation. This includes any informal or unregistered activity. In Aeroton the firms were identified using google maps and verified by street by street investigations. Once firms were identified, 10 firms were selected such that the interviews would cover firms in different sectors and of different sizes.

8.2.1 Choice of industrial hubs for pilot study

Johannesburg's main industrial areas are highlighted in yellow on the map below with the areas chosen for the pilot study circled in red. The City selected three areas based on the following:

- The concentration of industrial activity
- Contribution to gross value added in labour-intensive industrial activities
- The proximity to public transport routes ('Corridors of Freedom')
- Ability to aid understanding of under-researched areas

Figure 5: Map showing areas chosen for the pilot study



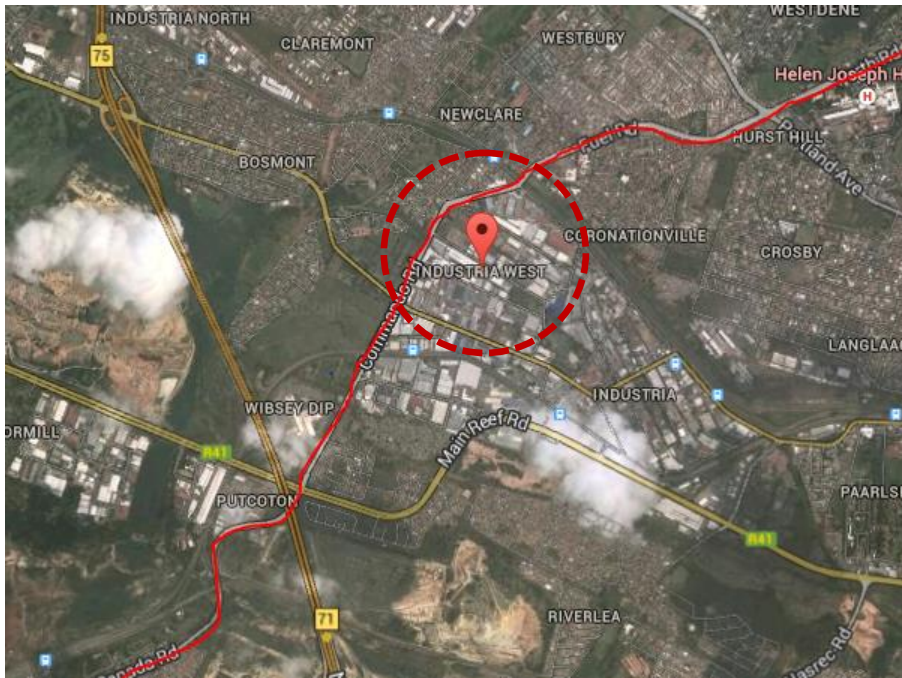
Source: Authors' adaptation

Each of the areas chosen is discussed in turn below.

Industria West

The map below illustrates the concentration of industrial activity in Industria West, with the city's planned Corridor of Freedom highlighted in red.

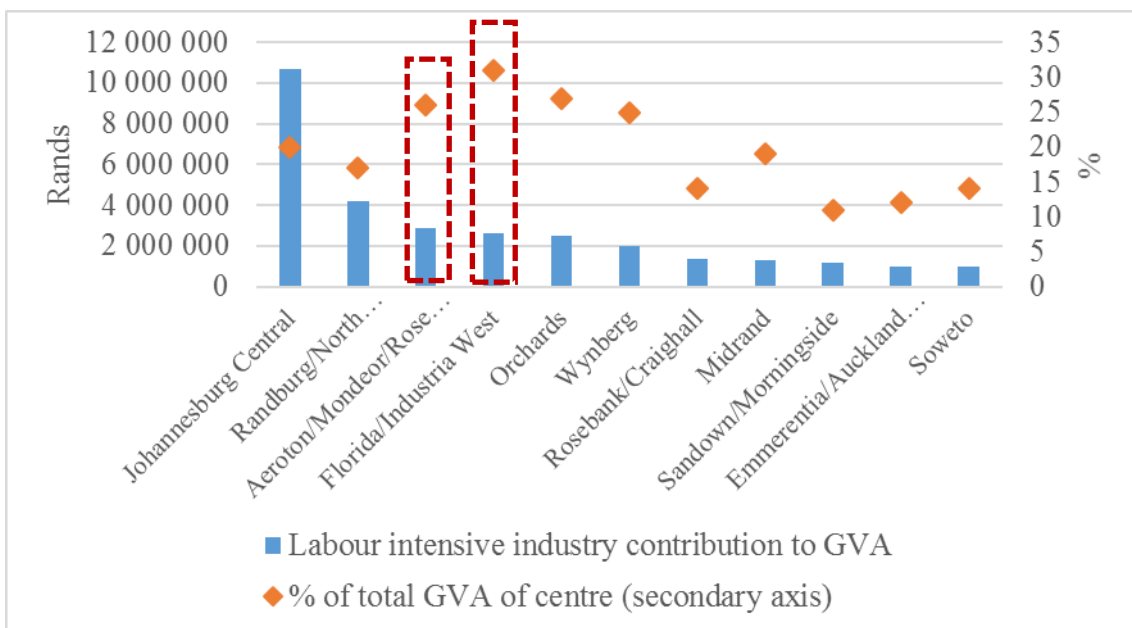
Figure 6: Satellite image of Industria West



Source: google maps

As illustrated in the figure below, Industria West has one of the largest contributions of labour intensive industry to Gross Value Added (GVA) in Johannesburg in absolute terms, following only Johannesburg CBD, Randburg and Aeroton. Furthermore, Industria West has the highest contribution of labour intensive industry as a proportion of total GVA (31%). Similarly, Industria West has one of the highest contributions of high-value manufacturing to GVA (13%), second only to Wynberg (City of Johannesburg, 2010). For this reason, it is a useful pilot area in which to get a sense of the challenges being faced by labour intensive industry and particularly by manufacturing industry.

Figure 7: Labour intensive industry contribution to GVA in different suburbs



Source: City of Johannesburg Growth Management Strategy: Growth Trends and Development Indicators Report 2010/2011.

In addition, as illustrated above, Industria West is adjacent to one of The City's Corridors of Freedom which connects Soweto to Auckland Park. It is also therefore a good pilot area in which to get a sense of the types of industrial activity taking place around the Corridors, as well as to better understand the way that industrial nodes interact with transport corridors and link up to other parts of the city.

Aeroton

The map below illustrates the concentration of industrial activity in Aeroton.

Figure 8: Satellite image of Aeroton



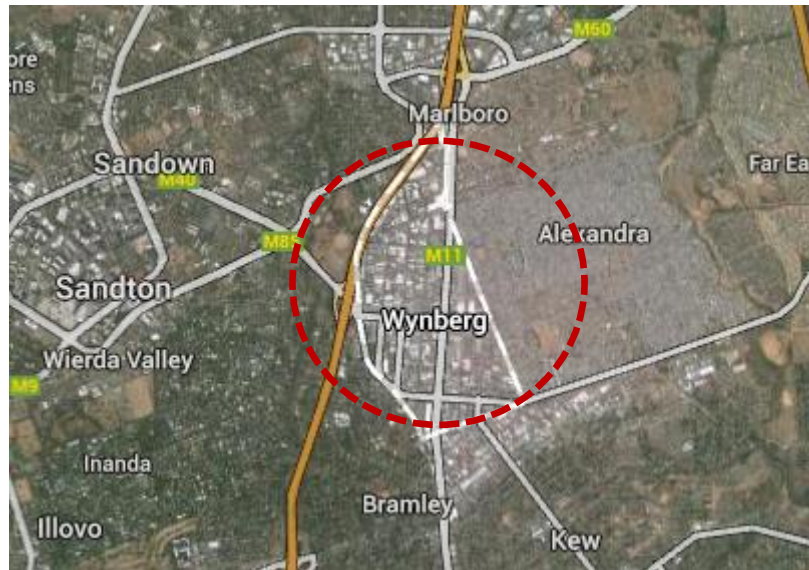
Source: Google Maps

As is shown in the graph above, Aeroton is also a key area of the city in terms of the contribution of labour intensive industry to GVA. It performs slightly better than Industria West in terms of absolute contribution, and slightly worse in terms of the proportion of GVA. It is also in the top 5 areas in terms of the contribution of high value manufacturing to GVA.

Wynberg

Wynberg is also an important industrial area of the city and, as illustrated in the Figure below, is adjacent to the Corridor of Freedom running from Sandton past Alexandra, down Louis Botha into central Johannesburg.

Figure 9: Satellite image of Wynberg



Source: Google Maps

Due to time and resource constraints, the full survey could not be implemented in Wynberg, however, five in-depth interviews were carried out in order to get a sense of the challenges facing businesses in the area.

8.3 Profiles of the nodes

8.3.1 Aeroton

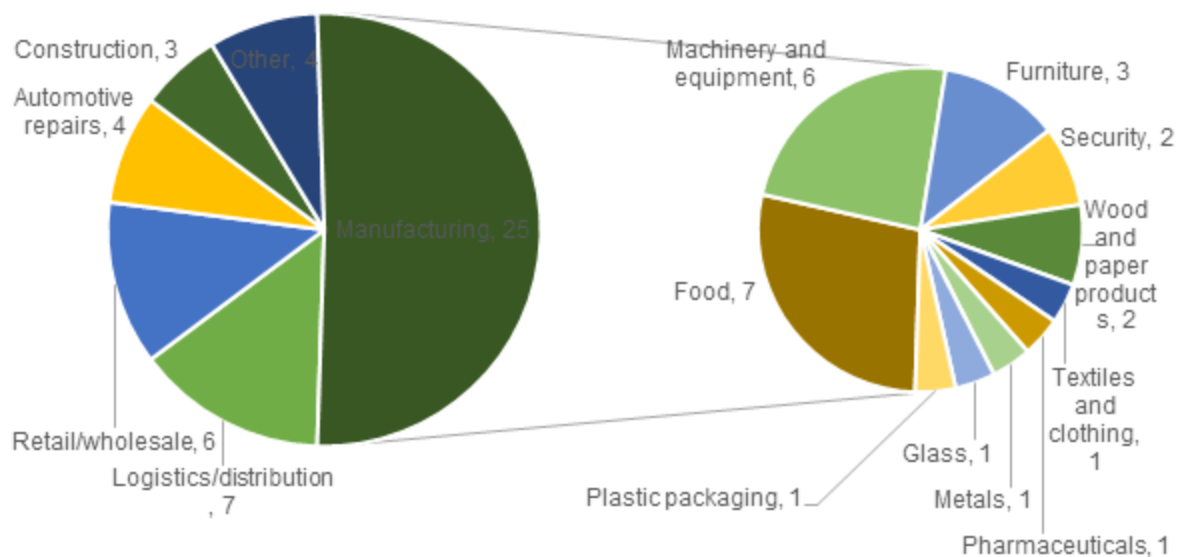
Aeroton is an industrial area located south of the Johannesburg CBD. It is bound by Nasrec Road to the east, Rand Show Road to the north, Aerodrome Road to the west and Old Potch Road to the south. The area is well connected to the rest of Gauteng as it is situated near a highway network formed by two branches of the N1 and the Southern Bypass (N12). The accessibility for firms is therefore excellent in terms of accessing inputs and customers. The area is also well located near the large, under-employed population base in Soweto. Most firms in the area pull the majority of their labour force from Soweto. From a public transport perspective, however, Aeroton is not so well connected, as will be discussed later in this document.

Aeroton is also located adjacent to undeveloped property which may be suitable for expansion. If developed with sufficient room to expand, this area could become more competitive for attracting medium-sized firms that need good highway access and relatively low-cost land over the long-term.

The main land use in the area is labour-intensive industry and there are a wide variety of industrial activities taking place. There are a number of manufacturing firms present and the products being manufactured include food, packaging, pharmaceuticals, mining equipment, glass, bricks and greetings cards. Another major area of activity is in distribution where there are firms distributing imported and locally manufactured products such as forklifts, trucks and construction equipment. There are also logistics and transport companies in the area. Finally, there are a small number of firms in the construction sector focussed on waterproofing and painting and four which conduct automotive repairs. This is illustrated in the graph below.

There are also a range of sizes of firms from very small enterprises with less than 10 employees to large manufacturing plants with 500 or more employees. The largest firms in the area are Adcock Ingram Critical Care and Sasko, who manufacture sterile fluids and bags and bread respectively.

Figure 10: Distribution of 49 firms identified in Aeroton



Source: Authors' compilation

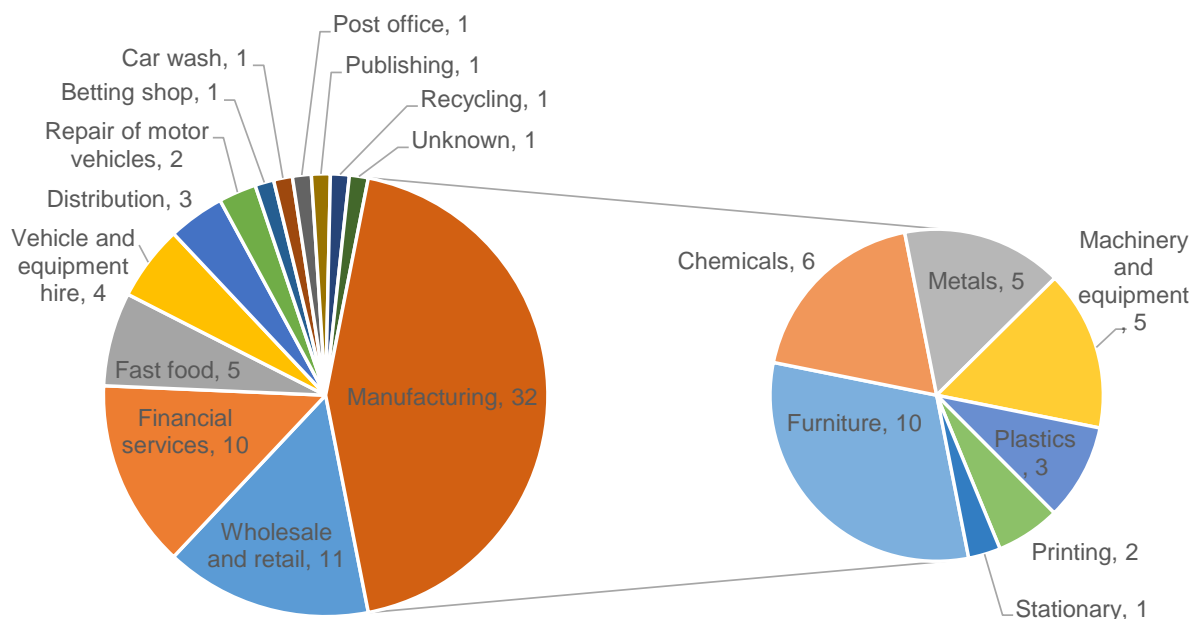
The interesting insight drawn from the scoping exercise is that contrary to the City of Joburg's Industrial node profile of Aeroton as focusing on warehouse and distribution, the most dominant activity in the area is manufacturing. Given Aeroton's good location and opportunities for growth due to relatively cheap rental, proximity to labour and land availability there is an expectation that the area should be attracting firms to locate in the area. However, there have been very few firms moving into the area and the land adjacent to it still remains empty. In the following sections we try to unpack the advantages and disadvantages of locating in Aeroton by evaluating the experience of the firms that are currently located in Aeroton.

8.3.2 Industria West

Industria West is a well-established industrial area located west of the Johannesburg CBD. It is bound by Commando Road, Albertina Sisulu Road and Nobel Street. The area is well served by public transport with access to the Rea Vaya, Metrorail and bus services nearby.

The main activity taking place in the area is again manufacturing. The main products being manufactured are furniture, chemicals, machinery and equipment and metal products. There are also a small number of stationary, packaging and foam products firms. There are several financial services firms in the area as well as a number of wholesale and retail firms. The remainder of the firms are engaged in printing and publishing, transport, motor repairs and recycling. This is illustrated in the graph below.

Figure 11: Distribution of 73 firms identified in Industria West



Source: Authors' compilation

8.3.3 Wynberg

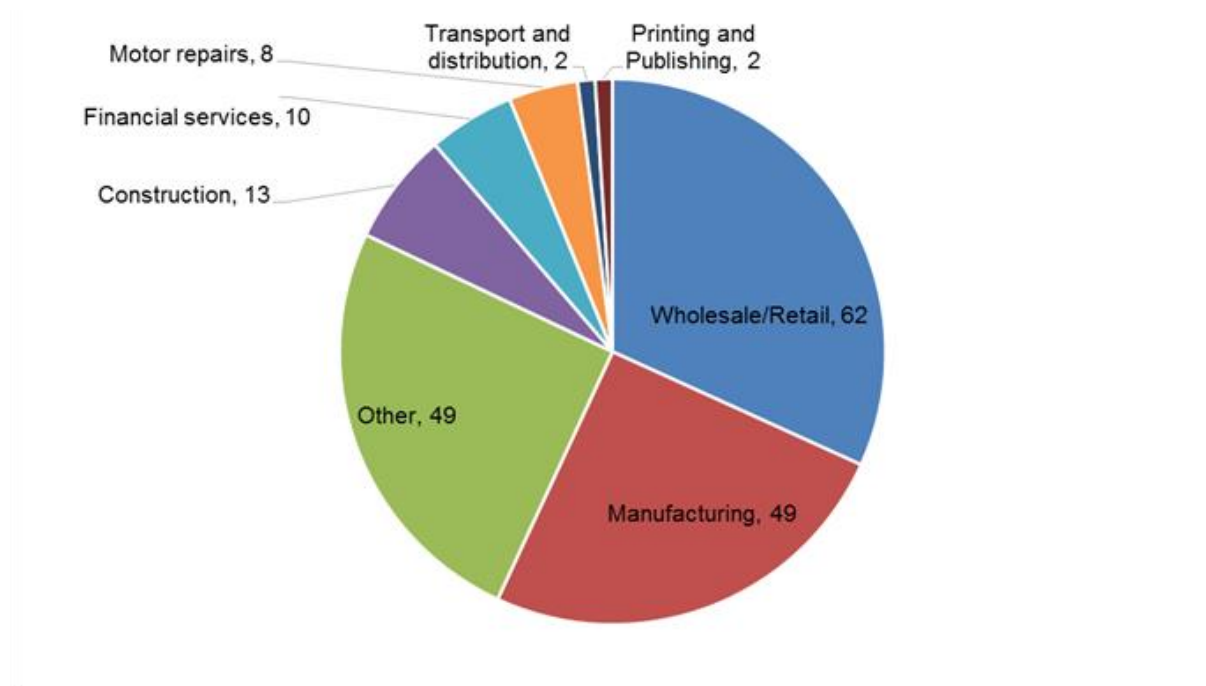
Wynberg is situated between the Alexandra Township and the Sandton business centre. It is well located in terms of access to the highways and proximity a large labour force in Alexandra. It is just off the M1 highway with access to the N3 via Marlboro drive. The main road running through the industrial node is Louis Botha Avenue.⁶⁰

⁶⁰ http://www.joburg-archive.co.za/2010/pdfs/sdf/final/annc_wynberg_marlboro_kew.pdf

The area is approximately 212 hectares. The Wynberg Improvement District (to be discussed below) has a directory of 33 firms⁶¹ which is substantially lower than the number of firms in the area as recorded in the Lightstone Business database which lists 385 firms.

The area is dominated by wholesale and retail, labour-intensive light industry including manufacturing, distribution and services. The common manufacturing firms are shop fitters, air conditioners, packaging, pharmaceuticals, mining equipment, glass & aluminium products, metal products.

Figure 12: Distribution of 195 classified in Wynberg



Source: Lightstone Business Database

Unlike Aeroton and Industria West, Wynberg has a business association, the Wynberg Improvement District.

8.4 Firm survey

The aim of the survey was to collect and analyse primary data on patterns of economic development and performance at the firm level and to understand constraints to entry, growth, and employment creation. This will assist the City to design interventions that will more effectively stimulate dynamism and growth in the Gauteng City's economy.

The required interventions will vary depending on sector and area. Different sectors require different enabling conditions and, therefore, different interventions. Activities that work well in one sector/area may not be appropriate in another due to, for example, differences in land use patterns, and access to key inputs and transport links.

The results described in this report are the findings from a pilot study that was conducted in two specifically selected areas. As discussed above, the two areas selected were Industria West and Aeroton.

⁶¹ [Wynberg Improvement District Directory](#)

The pilot study served two purposes. First it served to test the methodology, and second, it generated data that could be used (in congruence with other available data) to inform policy-making and decision-making in the City, as it pertains to the development and management of the city's industrial areas.

8.4.1 Survey methodology

8.4.1.1 Identifying firms

The boundaries of the survey target areas coincide with the formal boundaries of the two chosen suburbs. Once the areas to be targeted for the firm survey were chosen, it was necessary to identify and gather contact details for all the firms in the area in order to create a sample frame. Firms were identified through a street-by-street scoping activity/observation procedure which gathered information on the name, address and contact details of each firm. Where possible, the main activity of the firm was also captured by the field workers. Three firms refused to provide their details to the field workers and in these instances the field workers were only able to note down the name and any details of the firms displayed on the street.

A total of 122 firms were identified in the two areas, 49 in Aeroton and 73 in Industria West. Given the small sample size in the two areas, the decision was made not to sample the population of firms but rather to contact all the identified organisations with the exception of bank branches, fast food outlets, a betting shop and a post office.

8.4.1.2 Questionnaire design

The questionnaire was designed to gather information on a number of themes. The full list of survey questions is included in Annexure 1 to this report, but the key themes of the survey are described here. Firstly, the survey aimed to gather basic background information on firms such as their main activities, size (in terms of sales revenue), number of employees and tenure at the current site. The next category of questions was around understanding firms' operations and performance over the past two to three years. This included questions on operating shift patterns, location of customers, age of equipment, sales growth, investment and challenges faced by firms. Thirdly, a series of questions were asked to solicit respondent's perceptions of the advantages and disadvantages of locating in Aeroton or Industria West. This was followed by questions seeking perceptions on the quality of local infrastructure available in the area. Specific indicators for electricity, water and roads were used. The fifth section sought to measure the availability of skills and training. The penultimate section of the survey questionnaire included indicators for research and development and sought to measure the types, and availability of, public transport in the area. Finally, firms were asked about their experiences of interacting with the City and were encouraged to list any interventions that they felt the City should make to improve the competitiveness of their business and to encourage growth in the area.

Aside from the final questions which were more open ended, the survey was made up of multiple choice questions. Efforts were made to provide a realistic range of possible responses and a series of pilot interviews with firms in the two areas were held in order to inform the questionnaire design. Options were offered for firms to answer "other" or "not applicable" wherever relevant. Where they entered "other" they were required to specify an answer. Where relevant, questions were preceded by a qualifying question in order not to lead responses.

The survey questionnaire was piloted in an area outside the study area by experienced fieldworkers and refinements were made to the instruments as a result. In total, the survey

was made up of 45 questions. The questionnaire was administered in English only which is a limitation of the study.

8.4.1.3 Data collection

An email was sent to each firm introducing the survey and containing a link to an online survey questionnaire which firms were requested to complete. The survey generally took around 15-20 minutes to complete. Each email generated a unique survey link such that when the response was collected, the researchers were able to see which individual had completed the survey.

An email was sent to 44 out of the 49 firms in Aeroton. For the remaining 5 firms, a contact number and/or email address could not be found. In Industria West, 47 firms were emailed out of 55 eligible firms (as noted above, bank branches, fast food outlets, a betting shop and a post office were excluded). Of the remaining 8 firms 5 indicated that they were not prepared to participate in the study and contact details could not be found for 3 firms. Furthermore, 2 emails were not able to be delivered to firms in Industria West. Thus in total, the survey was successfully sent to 89 firms.

The first round of emails were sent between 6 and 10 October 2014. Following the emails sent to firms, researchers called each firm to explain the survey and check that the emails had been received. Where necessary, emails were resent, either to the same email address or to a different employee within the company. Reminder emails were sent and follow-up phone calls were made at regular intervals for four weeks. Where firms indicated that they would prefer to meet with a researcher to complete the questionnaire, field visits were conducted.

8.4.1.4 Possible sources of bias in the survey data

Whilst efforts were made to identify every firm in Aeroton and Industria West and to ensure they were given the opportunity to participate in the survey, there are some potential sources of bias in the data, largely arising from self-selection by firms. As the survey was administered by email and online, this could have prevented the participation of smaller businesses or less IT literate firm owners. However, the vast majority of firms identified were able to provide an email address, suggesting that they were comfortable with the approach. Only two of the firms contacted indicated that they had no email address.

The complexity of the questions in the survey was deliberately minimised and, as discussed above, most of the questions were in the form of multiple choice. This was intended to increase the ease of responding to the survey and therefore reduce the chance of people giving up half way through if they were confused by the questions. In order to ensure that the respondents completed the survey truthfully, sensitive questions were structured in broad categories. Categories ensure that the data was collected without influencing the respondent to overstate or understate their response.

Nevertheless, there were a number of incomplete responses, ranging from respondents who had missed one or two questions, to those who had started the questionnaire but given up after only a small number of questions. The table below indicates how many responses were received for each survey question. In the analysis which follows, the number of respondents to each question is also clearly specified.

Following data collection, the subsequent step was to clean the data. This was done by verifying if the firms had selected the appropriate activity according to the SIC codes based on the description they had provided in response to Question 2 which asked each firm to

describe the key products and services that the company produces/provides. Additionally, Lightstone data was used to verify some of the information provided by firms as an independent check.⁶²

Table 1: Number of responses per survey question

1	46	11	35	21	30	31	34	41	33
2	43	12	36	22	32	32	30	42	8
3	45	13	36	23	32	33	35	43	7
4	38	14	35	24	32	34	34	44	30
5	40	15	35	25	34	35	34	45	23
6	36	16	36	26	5	36	33		
7	38	17	30	27	35	37	13		
8	9	18	36	28	34	38	34		
9	36	19	31	29	34	39	33		
10	14	20	37	30	22	40	33		

Source: survey responses

Self-selection bias on the part of firms is also possible which may result in more firms who are unhappy with the current state of infrastructure in the area and services provided by the City choosing to fill in the survey than those who are satisfied with the area and services. This seems unlikely, however, since the researchers experienced resistance from a number of firms who were unhappy with the services provided in their area and cynical regarding the ability and appetite of the City to work to improve the situation. Such firms often felt that the survey was a waste of their time from which no benefit would be derived. Thus there is no reason to believe that unhappy firms would be more or less predisposed to complete the survey than satisfied firms.

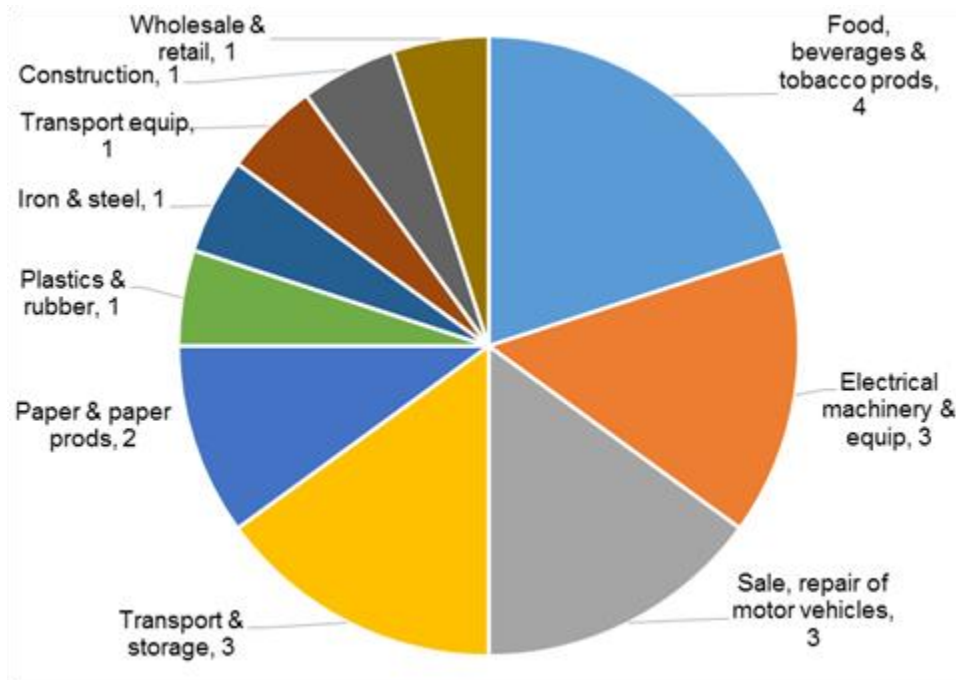
8.4.2 Overview of respondents

The survey was successfully sent to 89 firms of which 47 firms responded, resulting in a response rate of 53%. Of the 47 participating firms, 20 were from Aeroton, while 27 firms were from Industria West which shows that 42% and 58% of the responses are from Aeroton and Industria West respectively. These firms' activities were distributed among transport and storage, sale, repair and maintenance of motor vehicles, wholesale and retail, construction and manufacturing. The greatest proportion of activity among participating firms is derived from manufacturing, with 32 firms being in this category. Manufacturing is a rather broad category and figures below elaborate on which sectors are present in each area.

The responses from Aeroton report that most of the economic activity is in the manufacture of food, beverages, and tobacco products and transport and storage and plastics and rubber where they have 4, 3 and 3 firms respectively.

⁶² Lightstone Business database. However, we note that the database has aggregated sic code descriptions of firm activities and a substantial number of firm activities are not classified.

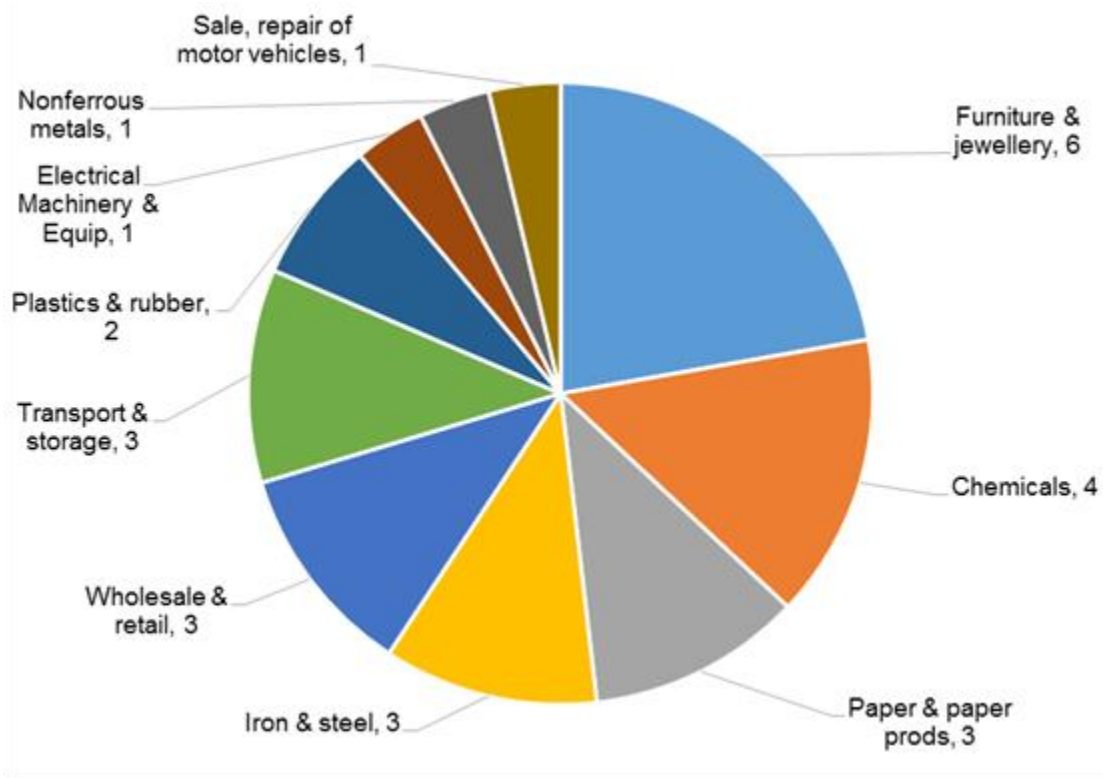
Figure 13: Aeroton Firm Distribution



Source: survey data

On the other hand, the respondents from Industria West are involved in quite different activities. The Figure below illustrates that the focus is on furniture and jewellery, chemicals, iron and steel, paper and paper products, plastics and rubber and wholesale and retail where there are 6, 4, 3, 3, 3 and 3 firms respectively.

Figure 14: Industria West firm distribution

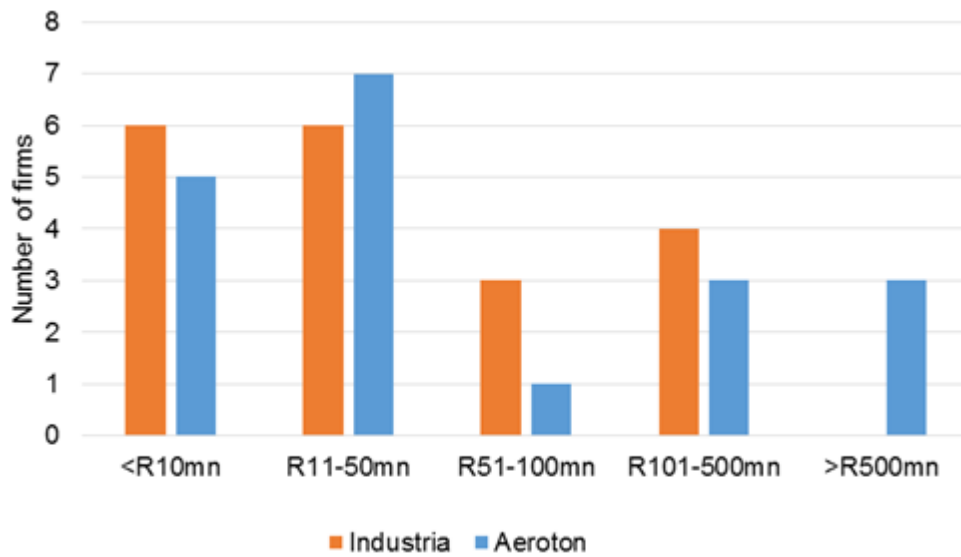


Source: survey data

The difference in the composition of firms in Aeroton and Industria will be important in drawing on the challenges that firms in the two areas face, and the likely recommendations.

In the survey the previous years' sales turnover were consulted in order to assess the size of the firms. 24 firms reported annual sales revenue of less than R50 million, which indicated that they fall into the category of micro to medium scale firms. The remaining 23 firms indicated that they earn more than R50 million, hence they are large firms. These are the thresholds stipulated by the National Small Business Amendment Act of 2003. Aeroton, however, tends to be comprised of larger firms compared to Industria West: Aeroton has twice as many firms that earn more than R100 million.

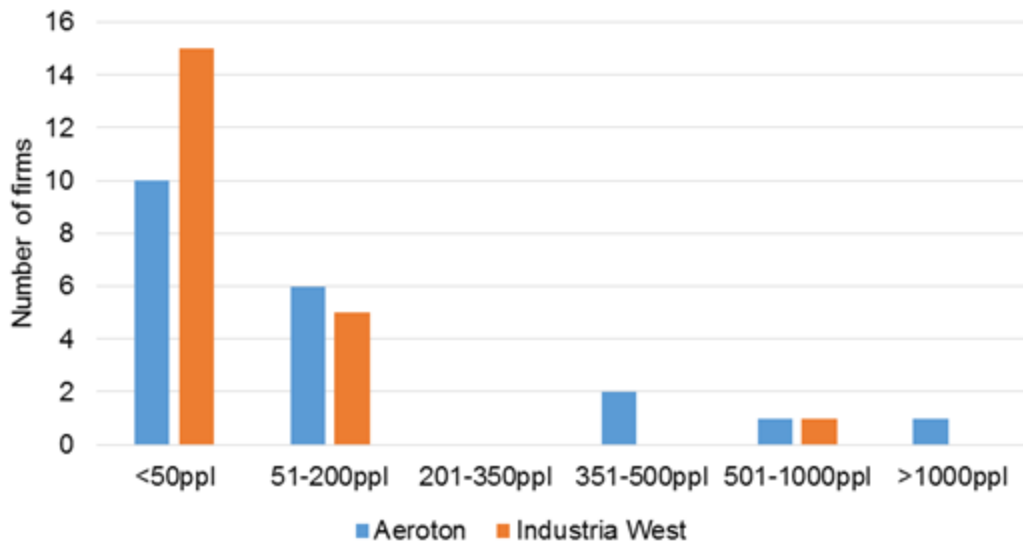
Figure 15: Total value of sales in 2013



Source: survey data

On the other hand according to the number of employees, most of respondents range from micro to medium scale firms. Out of 47 firms, 25 firms had 0-50 employees, while 10 had 51-200 employees. This shows that more than 74% of firms had less than 200 employees which indeed qualifies them as micro to medium scale firms. The remaining 5 firms had greater than 350 employees, with the exception of one firm which had more than 1000 employees. These figures are illustrated in Figure 5 below. This illustrates the importance of small and medium firms in both areas.

Figure 16: Employees at the current site (part-time and full-time)



Source: Survey data

8.4.3 Detailed survey results

8.4.3.1 Interpreting the survey results

Before discussing the survey results in detail, some comments on the interpretation of the data are required. As noted above, the survey was designed as a census of firms of firms in each area, and so all firms were surveyed rather than a sample of firms. This, combined with the dedicated resources directed at gathering responses resulted in a high response rate in terms of the proportion of firms in each area which responded to the survey. However, in terms of statistical confidence, the fact that the number of responses overall is still quite low in statistical terms means that the confidence intervals required to interpret the data are relatively wide. For example, 47 responses out of a population of 110 at a 95% confidence interval gives an 11% error rate. This means that if 60% of respondents said that they had less than 200 employees for example, the correct way to interpret this proportion is that we can say with 95% confidence that between 49% and 71% of firms in the two areas have less than 200 employees. The confidence intervals become still wider if cross tabulations are imposed on the data, as the number of respondents who fall into each category declines still further.

Of course, 95% confidence (the threshold typically used in statistical analysis) is setting quite a high bar and may be more than is required for these purposes. It may be that a 70% or 80% confidence interval is appropriate in looking at the views of firms in these areas. We take a pragmatic approach in the data analysis below, and rather than sticking rigidly to one threshold, rather explain in each case how the data can and should be interpreted and where caution should be applied. We have, however, refrained from breaking down the data into more than two or three categories in any cross-tabulation, particularly where the number of responses was low, as beyond this point any results become meaningless. All results reported should therefore be interpreted as holding only for the firms surveyed or, at the most, for the firms in Aeroton and Industria West. The results of the survey should not be applied more broadly to other areas in Johannesburg or Gauteng, and further research would be required in order to find out whether similar statements can be made for other areas.

A final point to note here is that technically if the number of responses is below 100 (as it is in this case), it is not correct to talk about percentages; fractions or proportions should be used instead. However, for ease of reference we use percentages in the report as it makes comparison much easier and therefore this is a caveat which applies to the analysis throughout.

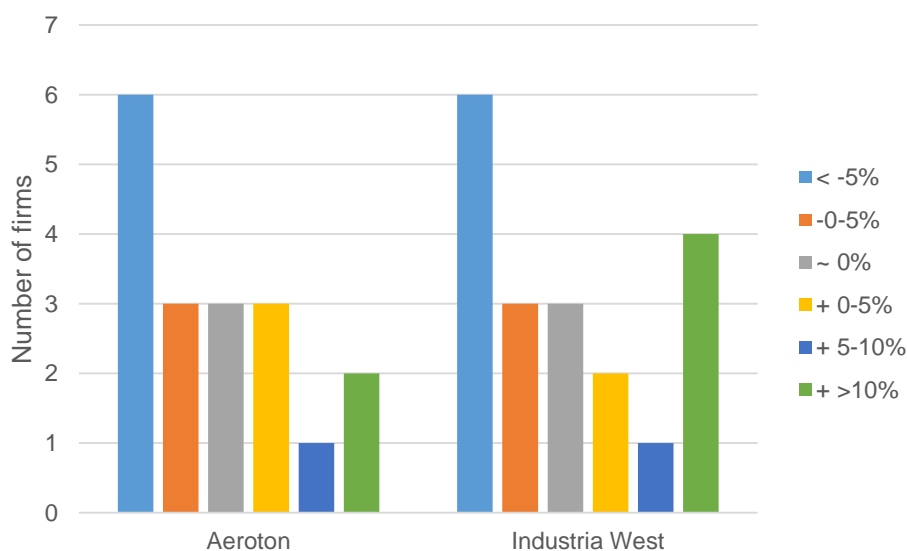
8.4.3.2 Company performance

Sales growth

Firms were asked to report whether their average annual sales over the past three years had increased (by 0-5%, 5-10% or 10%+), decreased (by 0-5% or 5%+) or stayed the same. 37 respondents answered the question, 18 from Aeroton and 19 from Industria West. The figure below illustrates the responses received. The majority of firms in both areas are not growing and an alarming proportions are shrinking by more than 5% per year in terms of sales volumes. One third of firms have seen their sales shrink by more than 5% per year on average for the past three years. Half of firms have seen their annual sales shrink on average for the past three years. Firms which are shrinking are likely to also be employing fewer people and are less likely to be able to make investments in developing new products or expanding capacity.

The responses for Aeroton and Industria West were very similar as illustrated below. The results correspond to the insights from the firm interviews, where the majority of the firms claimed to be facing difficult economic conditions and low levels of customer demand. However, two firms in Aeroton and four firms in Industria West reported growing at more than 10% per year on average for the past three years which is an exceptionally good performance. Therefore, whilst the overall picture is quite negative, there are still some firms which have been able to grow strongly despite difficult circumstances.

Figure 17: Annual average growth in sales volumes, 2012 – 2014 (n=37)



Source: Survey data

The table below reports firm growth cross-tabulated with whether firms are manufacturing or non-manufacturing firms. Interestingly, the responses in terms of growth were identical in terms of proportions for manufacturing and non-manufacturing firms. Thus when evaluating the null hypothesis that firm growth is independent of manufacturing, it was not possible to reject the null at the 5% level. There appears to be no relationship between whether firms are manufacturing and whether they are growing, based on the responses received. Two thirds of firms are not growing across both categories of firms.

Table 2: Manufacturing vs. growth

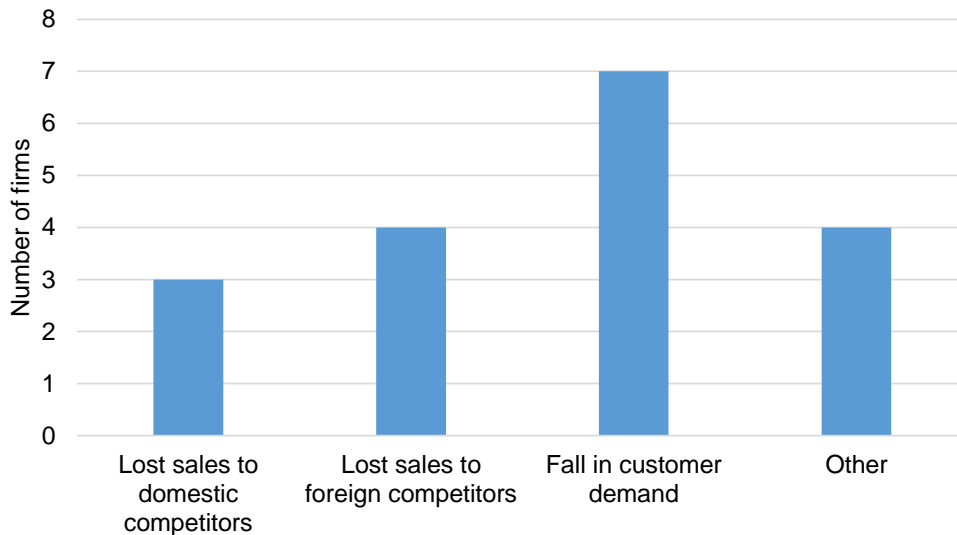
	Growing	Not growing	Total
Non-manufacturing	4	8	12
Manufacturing	9	16	24
Total	13	24	37
		X ² P-value	0.8445

Source: survey data, own calculations

Those firms who reported declining sales were asked to explain the main reason for the decrease in sales. Most (seven out of the eighteen responses) answered that falling customer demand was the main reason for falling sales as illustrated below. This is in line with the firm interviews where a number of firms complained of poor economic conditions

and a lack of customer demand. This is particularly in terms of domestic demand, and a number of interviewees noted that they have been expanding into regional markets in order to try to mitigate the impact of low demand from local customers.

Figure 18: Main reason for the decrease in sales (n=18)



Source: Survey data

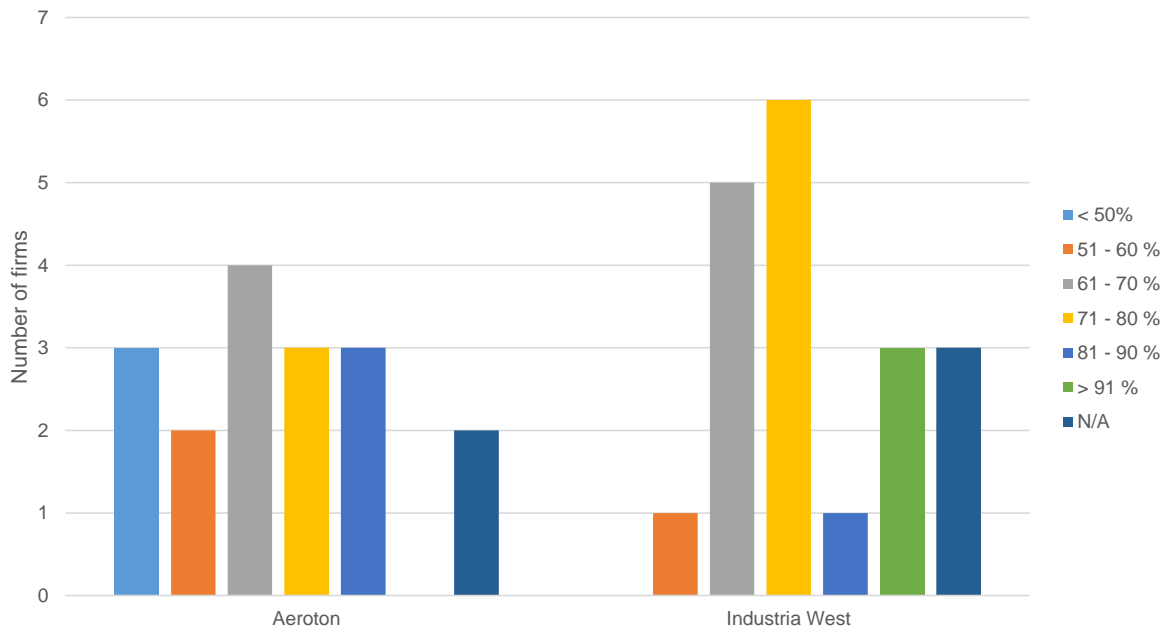
The firms that answered “other” offered a variety of explanations for their poor performance. However, most cited general economic conditions, giving answers like “business outlook has gone down”, “political reasons”, “macro-economy, exchange rate”, “recession”, “Closure of companies, companies moving” and “market instability”. This presents further evidence that the economic conditions in the country and consequent low levels of customer demand are largely responsible for the observed poor performance of firms.

In addition, one firm mentioned an influx of Chinese-made products as the reason for its sales decline. Another cited a lack of productivity. Finally, one firm noted that a shortage of raw materials was to blame.

Capacity utilisation

Firms were asked to report their level of capacity utilisation relative to total installed capacity. There were 36 responses, 17 from Aeroton and 19 from Industria West. As illustrated in the figure below, in Aeroton more than 50% of respondents reported utilisation rates of under 70%, with three firms indicating that their utilisation rate was below 50%. In Industria West, however, the majority had utilisation rates of over 70%, and no firms had utilisation rates of below 50%. Respondents from Aeroton thus appear to have lower rates of utilisation than those from Industria West.

Figure 19: capacity utilisation (n=36)



Source: Survey data

Low levels of capacity utilisation are what would be expected given the poor sales performance described above. The table below reports a cross-tabulation of capacity utilisation with whether firms are growing or not growing. The null hypothesis that capacity utilisation is independent of firm growth was rejected at the 1% level, suggesting that there is a relationship between growth and capacity utilisation, as would be expected. Firms that are not growing are more likely to have low capacity utilisation than firms that are growing and vice versa.

Table 3: Growth and capacity utilisation

	60% or less	60-80%	More than 80%	Total
Growing	1	3	6	10
Not growing	5	15	1	21
Total	6	18	7	31
			X ² P-value	0.000843

Source: survey data, own calculations

Shift patterns

39 firms answered the question on shift patterns, of which only nine firms do run shifts. Seven of these reported that they run two shifts per day and the other two reported that they run three shifts per day. The seven respondents who run two shifts per day all reported that the availability of public transport does affect their ability to run optimally, e.g. to optimise shift patterns. The two firms running three shifts per day on the other hand did not feel that the availability of transport affects their ability to run optimally. This suggests that the firms running three shifts have managed to find a solution to the problem of worker transport for late/early shifts, perhaps due to necessity. This ties in with the interview responses where firms reported having to organise their own transport for workers after hours in order to run

three shifts. The firms running two shifts may be doing so sub-optimally, due to the difficulty of getting workers to and from the plant for the early/late shift.

Main markets

Firms were asked to indicate what proportion of the company's sales (in %) from production at the site is sold to customers in Gauteng, South Africa including Gauteng and the rest of the world (i.e. exports). 35 firms responded to the question, but of these, 10 did not make sense since South African sales plus exports did not add up to 100%. The 10 responses were therefore excluded from the analysis. The reported proportions were then averaged in order to calculate an average proportion of sales to different markets across all firms. On average, firms supply 62% of their sales to Gauteng, 29% to the rest of South Africa and 10% to the rest of the world⁶³.

Averages were then calculated for firms in Aeroton and Industria West separately, for manufacturing and non-manufacturing firms and for firms which have been growing and firms which have not been growing. These are reported in the table below. The number of firms which fell into both categories is indicated in the column on the far right.

Table 4: average proportion of sales to different markets

	Gauteng	Rest of SA	Exports	Number of firms
Total	62%	29%	10%	25
Aeroton	60%	31%	10%	11
Industria West	63%	27%	10%	14
Manufacturing	59%	29%	12%	16
Non-manufacturing	66%	28%	6%	9
Growing	61%	30%	9%	8
Not growing	59%	29%	11%	16

Source: survey data, own calculations

As illustrated in the table above, there was not a lot of variability in the proportion of sales that firms sell to customers in different regions depending on their characteristics. Firms in Industria West sell a slightly higher proportion of sales to customers in Gauteng (3%) than firms in Aeroton do. Firms that are not growing appear to export slightly more than firms that are growing which is counter to what was expressed in the interviews as will be discussed in more detail below. This is unlikely to be a significant difference given the small sample size, however. The biggest difference is observed between manufacturing and non-manufacturing firms where manufacturing firms export a much larger proportion of sales than non-manufacturing firms (around double).

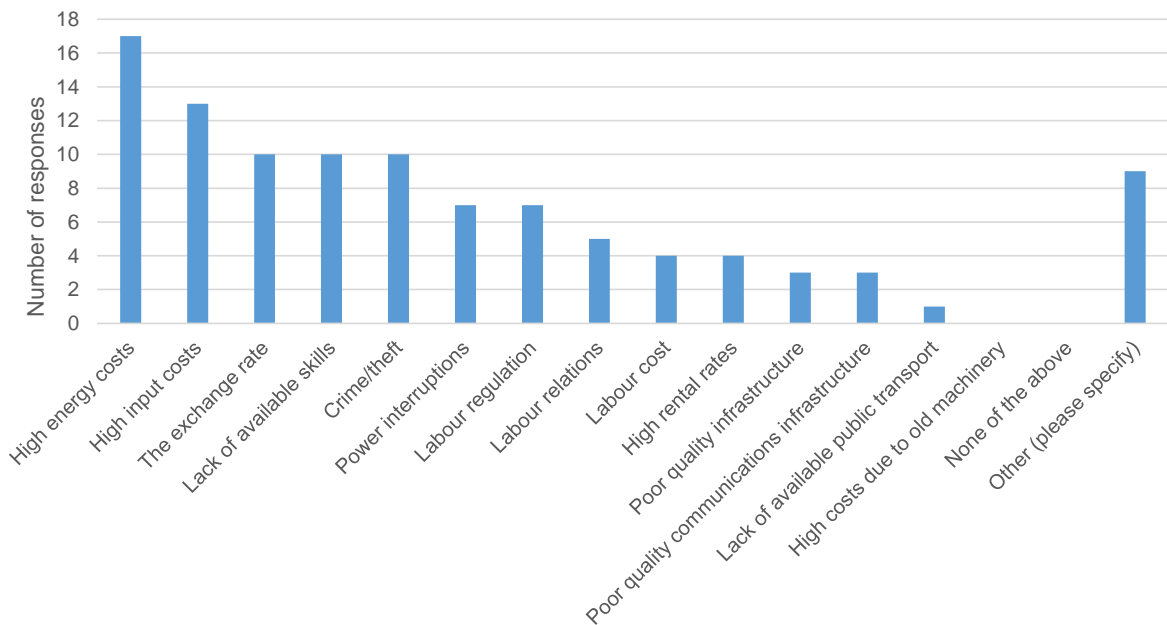
Challenges faced

Respondents were asked to choose up to three key challenges facing the business from a list provided. They could also mention additional challenges which were not listed. 36 firms responded to the question. The number of times each possible answer was chosen is shown

⁶³ Note: percentages do not add up to 100% due to rounding.

in the figure below. High energy costs and high input costs are the most commonly identified challenges, followed by lack of available skills and crime and theft.

Figure 20: key challenges facing the business (n=37)



Source: survey data

The firms that answered “other” suggested that they faced a variety of challenges. Once again, poor economic conditions were cited as a challenge by some as well as key costs such as fuel, rates, road tolls and product development and ISO grading. One firm cited a lack of competitiveness with established firms as a key challenge and another lack of infrastructure. Finally, one firms noted a shortage of raw materials.

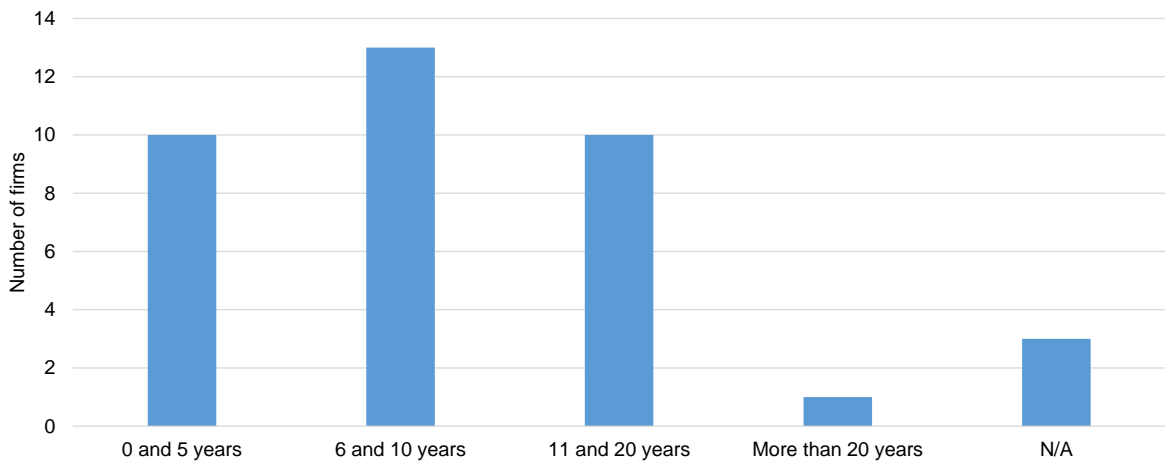
The survey results in terms of company performance suggest that many firms in Aeroton and Industria West are facing poor economic conditions and consequently are running at relatively low levels of capacity utilisation. On average, around 90% of sales are to customers in South Africa, and given the weak economic environment domestically, this explains why firms are facing low levels of demand. High energy costs and other input costs are seen as challenging in this environment.

8.4.3.3 Technology and investment

Plant and equipment age

Firms were asked to report the average age of their plant and equipment. 37 firms responded to the question, 20 in Industria West and 17 in Aeroton. The results in the two areas were very similar. The largest number of respondents reported that the average age of the plant and equipment was between 6 and 10 years old.

Figure 21: average age of plant and equipment (n=37)



Source: survey data

The table below reports a cross-tabulation of whether firms are growing or not growing with the average age of plant and equipment. The null hypothesis that whether the firm is growing is independent of the age of its plant and equipment could not be rejected at the 5% level so we cannot say with 95% confidence that there is a significant difference in results for firms with older or younger plant and equipment. From the table, it does seem as if firms with very old equipment (11 years old or more) are much more likely not to be growing, and with confidence of 81% we can conclude that there is a relationship between firm growth and equipment age.

Table 5: Growth vs. plant and equipment age

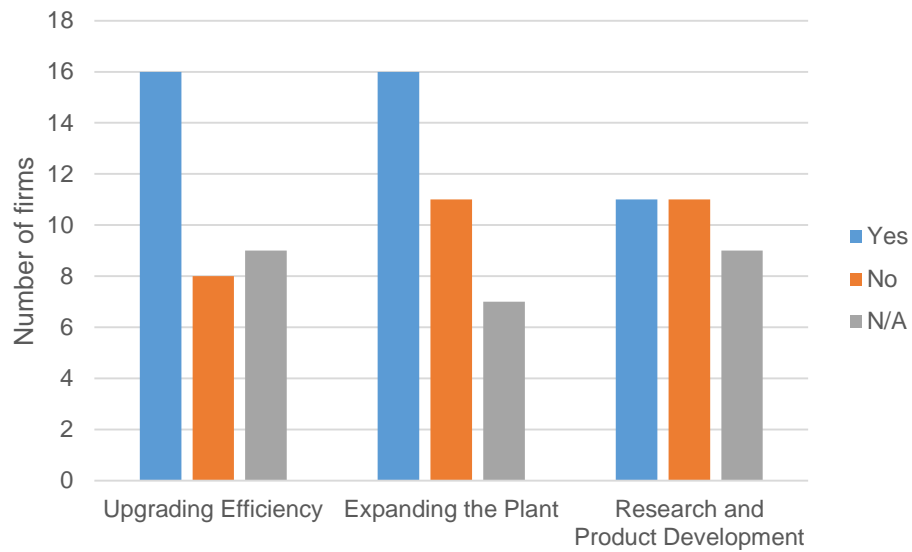
	Not growing	Growing	Total
0 and 5 years	4	5	9
6 and 10 years	7	6	13
11 year +	9	2	11
Total	20	12	33
		X ² P-value	0.19

Source: survey data, own calculations

Investments in the plant

Firms were asked whether the company had made substantial investments in upgrading efficiency, expanding the plant or in research and product development in the past two years. 36 firms responded to the question, 19 from Industria West and 17 from Aeroton. The greatest number of firms (almost half of respondents) had made substantial investments in upgrading efficiency and expanding the plant. Only 11 of the 36 firms (31%) had made substantial investments in research and product development. 21 firms out of the 35 (60%) had made a substantial investment in at least one of the three categories. This is consistent with the fact that many firms seem to be struggling in difficult economic conditions and with falling customer demand. Firms are mainly investing in cost-cutting efficiency measures, and fewer firms are investing in product development and innovation. However, a substantial number have invested in expansion, which is more positive.

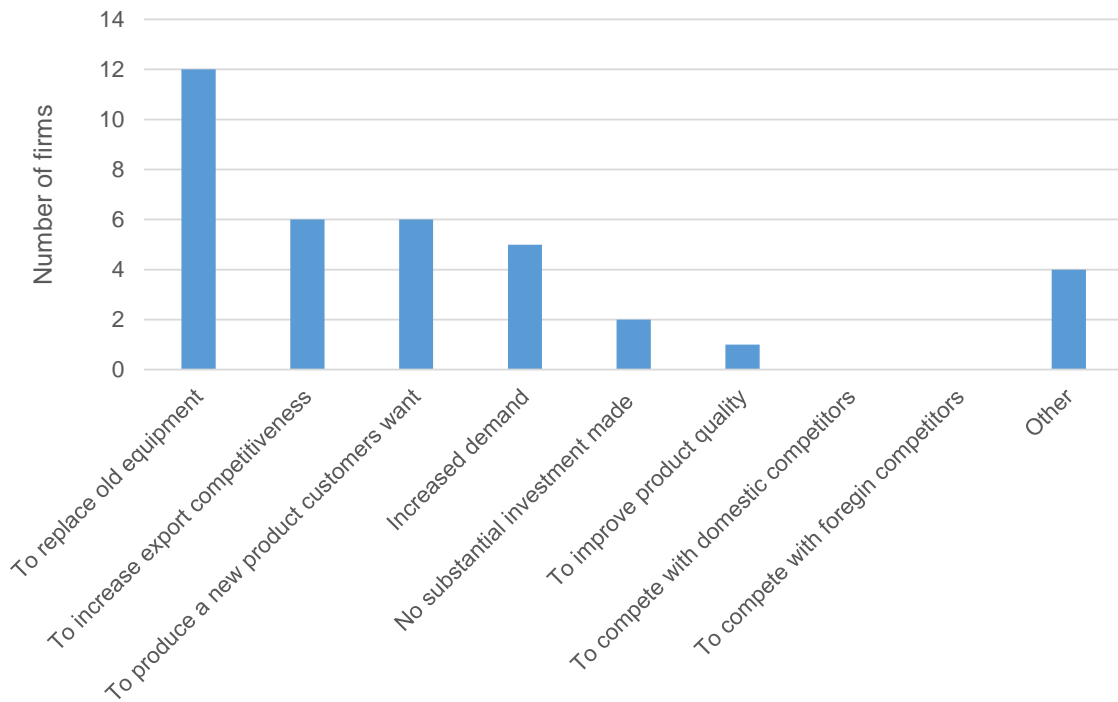
Figure 22: investments in the plant in the past 2 years (n=36)



Source: survey data

Firms were then asked, if the company had made any substantial investments in the past two years, what the most important motivation for the investments in machinery was. 36 firms responded to this question and by far the most common response was that they had invested in order to replace old equipment. Once again, this is consistent with firms trying to cut costs and improve efficiency in tough times, rather than with development and innovation. Increasing export competitiveness and producing a new product that customers want by contrast were only cited as reasons for investing by half the number of firms. Four firms answered “other” of which two were new firms whose investment was in setting up the plant, one had invested in reducing labour intensity and the fourth cited efficiency improvements as motivation for the investment.

Figure 23: reasons for investments in the plant in the past 2 years (n=36)

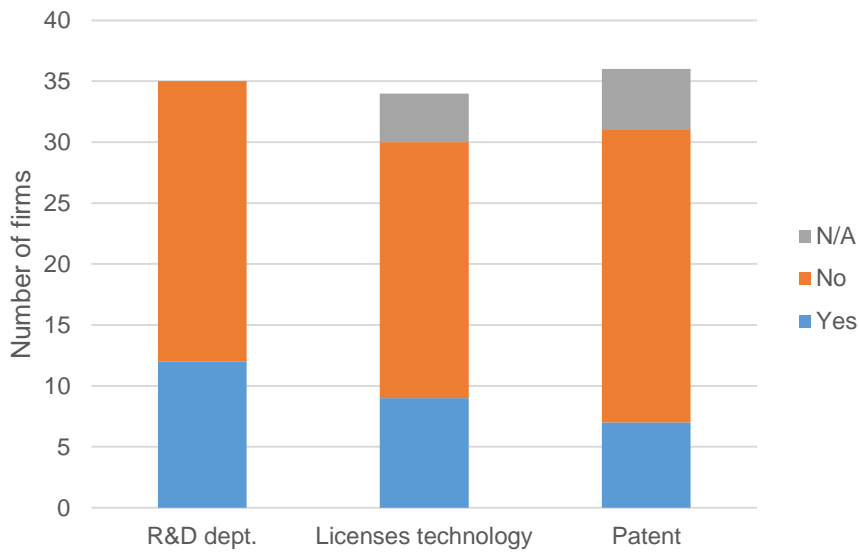


Source: survey data

Research and development

Respondents were asked whether the firm has a research and development department, whether it currently licenses technology and whether it currently holds a patent. 35 firms responded to the first question, of which 12 reported that they have an R&D department (34%). 35 firms answered the question about technology licensing, of which 9 reported that they do currently license technology (26%). Finally, 36 firms answered the question about holding a patent, of which only 7 reported having a patent (19%). For the most part, therefore, the firms which responded do not seem to be high-tech firms but about a third of firms surveyed do at least have some kind of research and development team.

Figure 24: levels of research and innovation (n=35, 35, 36)



Source: survey data

In terms of a comparison of the two areas, the only substantial difference between the two is that twice as many R&D departments were reported in Aeroton as in Industria West. This suggests that firms in Aeroton tend to be more technology and research-driven which makes sense since the size of firms in Aeroton tends to be higher, and the types of products being manufactured is more complex.

Table 6: Level of research and innovation by area

	Patent	Licenses technology	R&D dept.
Aeroton	4	4	8
Industria West	3	5	4

Source: survey data, own calculations

The table below reports a cross-tabulation of whether firms have an R&D department or not and whether they are growing or not growing. The table illustrates that firms with an R&D department are more likely to be growing, whilst firms without an R&D department are much less likely to be growing. The null hypothesis that whether the firm has an R&D department is independent of whether it is growing was rejected at the 5% level so we can conclude that there is a significant difference in results for firms which have an R&D department and firms which do not have an R&D department. Firms with an R&D department are more likely to be growing.

Table 7: Level of research vs. growth

	R&D dept.	No R&D dept.	Total
Not growing	4	17	21
Growing	8	5	13
Total	12	22	34
		X ² P-value	0.012

Source: survey data, own calculations

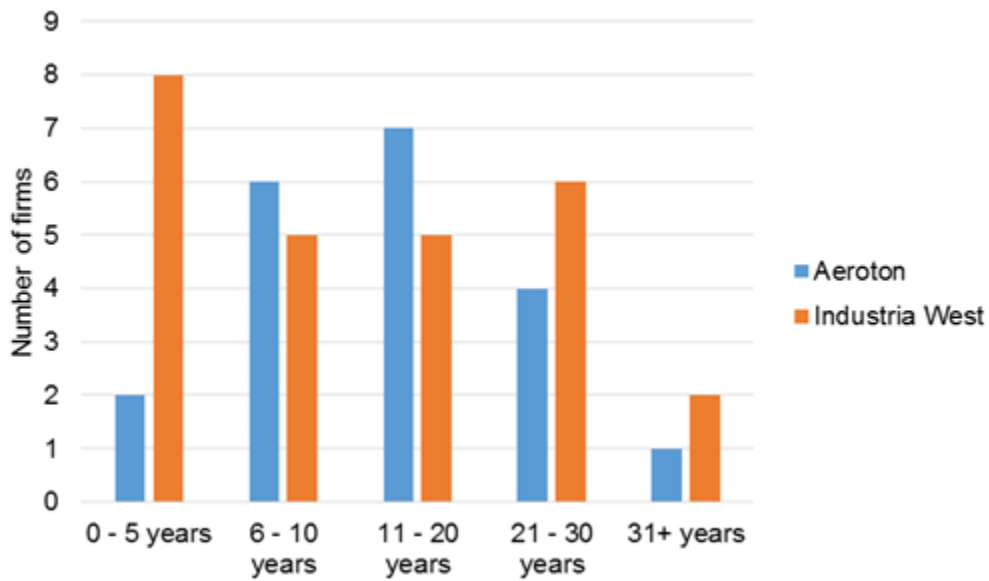
The results of the survey in terms of technology and investment suggest that there is relatively little research and innovation going on in Aero-ton and Industria West, although there is slightly more in Aero-ton, perhaps due to the size and activities of firms in the area. Where firms are making substantial investments, they are most often doing so in order to increase efficiency and cut costs. This is consistent with the view presented above of firms facing a challenging economic environment and low levels of domestic demand. The results also show, however, that firms which conduct higher levels of research and development (proxied by the existence of a research and development department in the company) seem to have been less affected by the slowdown and are more likely to be growing their sales. This indicates that there may be a counter-productive cycle where firms are not investing and innovating, but as a consequence are less able to react to declining demand by seeking out new products and markets.

8.4.3.4 Location decisions

Tenure at current site

The respondents were asked to indicate the number of years that the firm had been located in the current premises. 45 firms responded to the question, of which 20 were located in Aero-ton and 25 were located in Industria West. The most common overall response was 11-20 years, but when Aero-ton and Industria results are separated we see that the majority of Industria West firms have recently located in the area (0-10 years). While 65% of the Aero-ton firms have been operating in current premises in the range of 6-20 years.

Figure 25: Number of years operating in current premises (n=45)

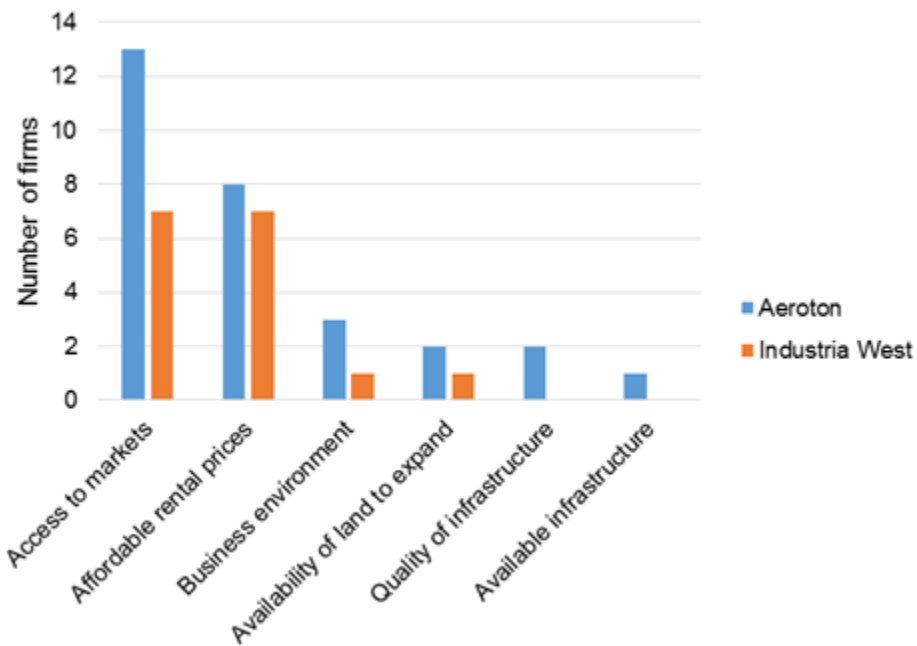


Source: survey data

The scoping study revealed that the Industria West firms are generally smaller than the heavier manufacturing Aeroton firms and this may explain why firms had been located in Aeroton for longer periods. Small firms may find it easier to relocate as it is easier to find small rental spaces.

The firms were then asked to indicate if there were advantages to the firm's current location. 36 firms responded to the question, of which 30 were indicated that there were indeed advantages to the firm's current location. The remaining responses indicated that there were no advantages to the firm's current location. The firms were given options of potential advantages and asked to choose up to 3 advantages. 33 firms responded to the question with respondents choosing a between 1 and 3 advantages amounting to 44 selections. The most common advantage identified by the firms was the access to markets followed by affordable rentals with 61% and 47% of firms selecting the advantages respectively.

Figure 26: Advantages of current location (n=33)



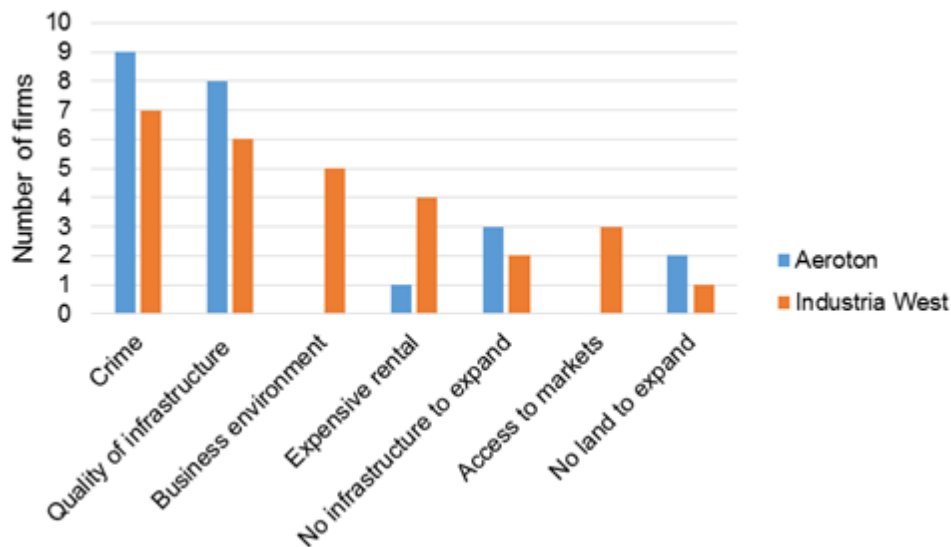
Source: survey data

The firms in both Industria and Aeroton value the location of the industrial areas, the main advantage of which is access to markets. Both Industrial areas are well located in terms of proximity to customers, suppliers and labour with Aeroton also being close to highways. This means that firms can keep transportations cost down.

Firms were given an option to identify other advantages not provided as options and 5 firms identified additional advantages. The most commonly cited additional advantage was access to labour with 90% of the respondents identifying it as an advantage to firm location. Other advantages identified by firms were access to sufficient amount of power to run machinery and proximity to suppliers.

The respondents were also asked whether there were disadvantages to locating in the firm's current industrial node. 81% of the responses indicated that there were disadvantages to the firm's current location. The survey results show that firms in Aeroton believe that there are disadvantages to the location, all the Aeroton respondents answered in the affirmative to the question. While 68% of Industria West respondents stated that there were disadvantages to the firms location, 6 identified that there we none. The firms that answered the question in the affirmative were asked to select up to 3 disadvantages from 7 options. The disadvantages that were cited by most respondents were quality of infrastructure and crime. This is the case in both industrial areas.

Figure 27: Disadvantages of current location (n=37)



Source: survey data

The survey results also show that some respondents believe that the business environment in Industria West disadvantages the firms and rental in Industria West is more expensive. In Aeroton the third most commonly cited disadvantage is lack of infrastructure to expand. Though only represents 3 firms it is noteworthy as the 3 firms may have been those that attempted to expand but would also mean that firms that want to relocate to Aeroton would face similar challenges.

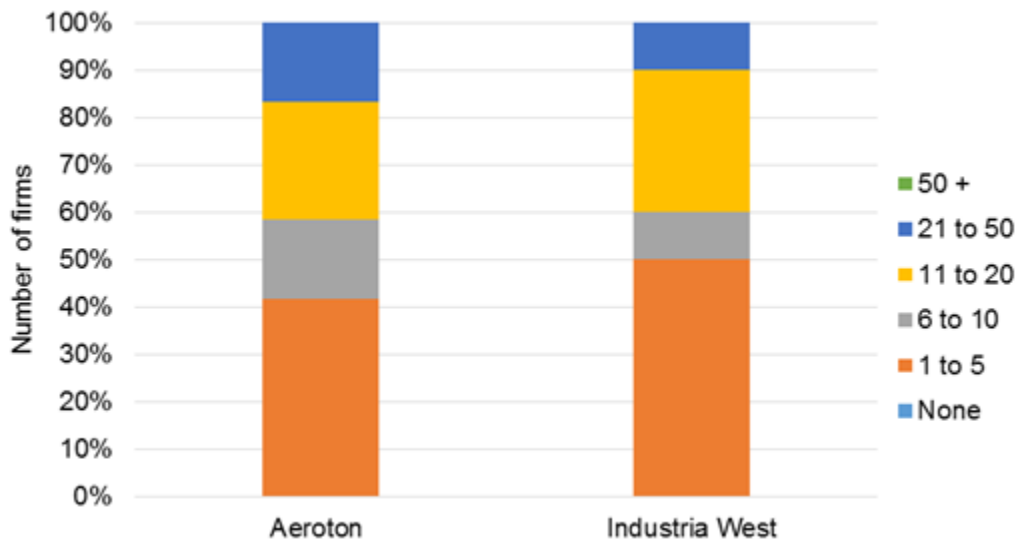
Overall the firms operating in Aeroton and Industria West have been in current premises for varied periods of time. The expectation was that the Industria West firms would have been in their premises for longer periods as this is a well-established industrial node, however, the survey shows that there are more new firms locating in the area than Aeroton. The bad business environment may mean that firms relocate to other areas or close down creating space for new firms to move to the area. What the survey shows is that firms' location decisions are mainly informed by access to markets, rental prices, quality of infrastructure and the state of crime. In the next section the survey attempts to tease out the issues related to the quality of infrastructure.

8.4.3.5 Infrastructure

Power

The next issue that the survey sought to understand was the quality of the infrastructure including electricity, water and roads in the industrial areas and the potential impact on the businesses. The first question in this section sought to determine whether firms in the area experienced power outages. Respondents were asked whether or not the firm had experienced a power outage in the last 12 months. 94% of the respondents indicated that the firm had experienced power outages and or voltage fluctuations. The respondents were asked to indicate the number of days that the firm experienced power outages in the past 12 months. The results show that firms experience more days with voltage fluctuations than power outages. However, some respondents indicated that they have not experienced voltage fluctuations. The results indicate that the most firms experienced power outages in 5 days in the last 12 months while experiencing voltage fluctuations in 6-10 days.

Figure 28: Number of days in a year with power interruptions



Source: survey data

Interestingly, 4 respondents have indicated that the firms have experienced more than 50 voltage fluctuations in last 12 months. It is surprising that firms experience significantly more voltage fluctuations than others in the same area. The data does not offer any explanations for this with these responses being evenly distributed between Aeroton and Industria. It may be that other firms have implemented measures to limit the impact of the voltage fluctuations and would then either not notice them when they occur or would only to a lesser extent.

The number of responses on the number of days with power outages are similar in both industrial areas with the only slight differences arising from the differences in the number of responses by industrial node.

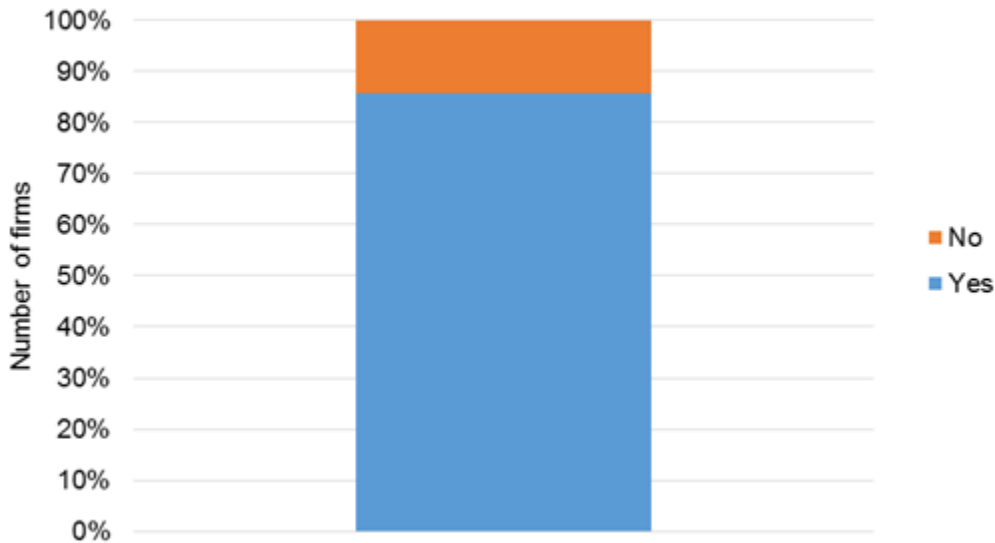
The survey data shows that City Power provides power to the firms in both Aeroton and Industria West. Respondents identified City Power as the firm's power provider. Those respondents that did not know the firm's power provider are likely those that are renting premises and utility accounts are handled by the landlord. The in-depth interviews will shed further light on this. The last question on power was whether firm's had received advanced warning about the power outages. 97% of responses indicated that their firms had never received advanced warning of power outages.

At least for Aeroton and Industria West, the quality of the power infrastructure is mainly under the control of the City as the provider and actions can be taken to reduce the number of power outages, provide advance warnings about power outages and provide stable power.

Water

The survey results show that firms in both Aeroton and Industria West are generally happy with water supply. 15% of respondents indicated that the water supply in the area does not meet the needs of their firms. Dissatisfaction with water supply is not unique to a particular industrial area. 3 of the 5 dissatisfied firms are located in Aeroton while the rest are in Industria West. The in-depth interviews explored in more detail in what ways the water supply is not sufficient for firms' needs and this will be discussed below.

Figure 29: Satisfaction with water supply (n=35)

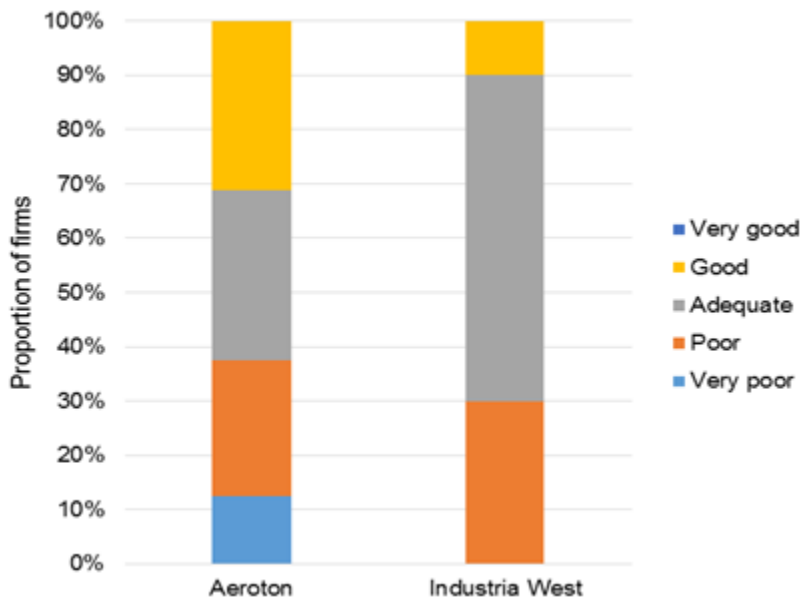


Source: survey data

Roads

Road infrastructure in both the industrial areas appears to be adequate for the firms in these areas. Respondents were asked to describe the road infrastructure in the industrial nodes. The road infrastructure in Industria West appears to be adequate or good with 70% responses indicating as such. In Aeroton 63% responses indicated that the roads were either adequate or good.

Figure 30: Quality of road infrastructure (n=36)



Source: survey data

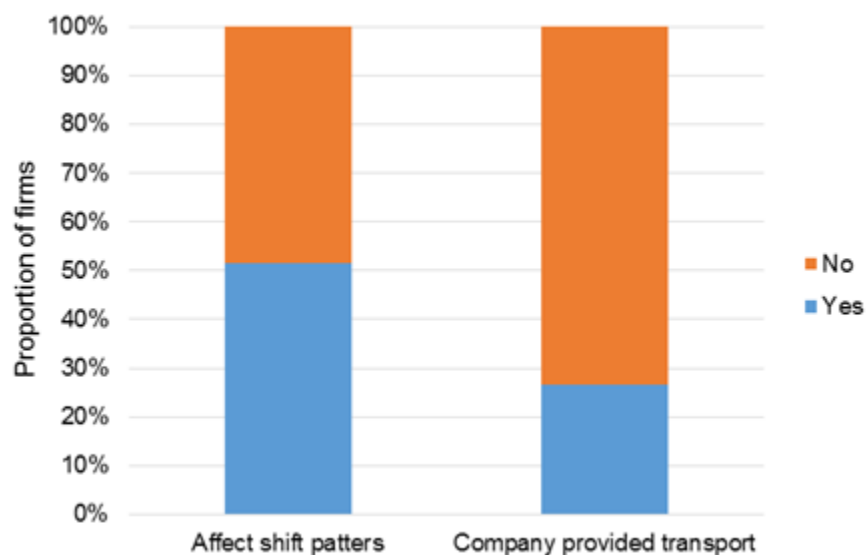
However, maintenance of the existing infrastructure is important as 33% of the survey respondents were unhappy with infrastructure and with time the roads could deteriorate. The

main issues with the roads that were identified by firms during the interviews were potholes and open manholes.

Public transport

To ascertain whether the Aeroton and Industria West were well serviced by public transport a series of questions were asked about transport to and from these area. The hypothesis was that availability of public transport particularly after hours would impact the shift patterns of firms. Recall that 9 firms indicated that they run shifts. The firms that run shifts are likely to be operating 24 hour days. Respondents were required to indicate whether availability of transport affects the firm's shift patterns. 51% of responses indeed indicated that this is the case. To determine the importance of this issue to firms, respondents were asked to indicate whether the firms provide transport for employees. 26% firms provide transport to employees.

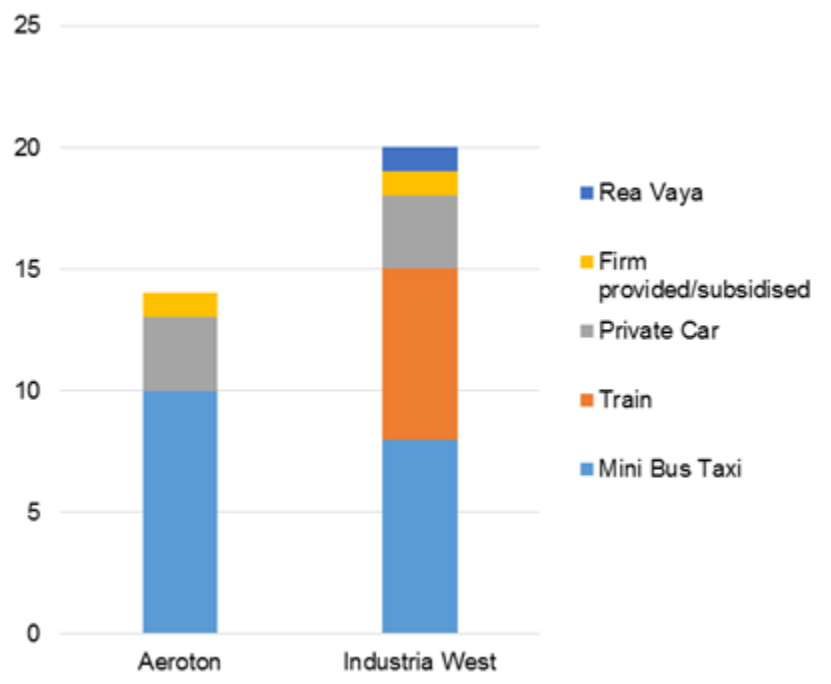
Figure 31: Transport for employees (n=33,34)



Source: survey data

To understand whether the industrial areas are serviced by public transport at least during the day, respondents were asked to indicate the most frequently used mode of transport by the majority of employees of the firm. Overall responses show that the majority of employees use mini bus taxi's to get to and from work. This may be a consequence of the lack of public transport in the areas. Looking as the industrial nodes separately, one observes that Aeroton is not covered by public transport. Employees use mini bus taxis, private cars or firm provided/subsidised transport. Industria West on the other hand also has the Rea Vaya and the train. The in-depth interviews also indicated that public buses are available in Industria West. It may be that this has not been identified as it is used by the minority of employees in firms.

Figure 32: Most frequently used mode of transport (n=33)



Source: survey data

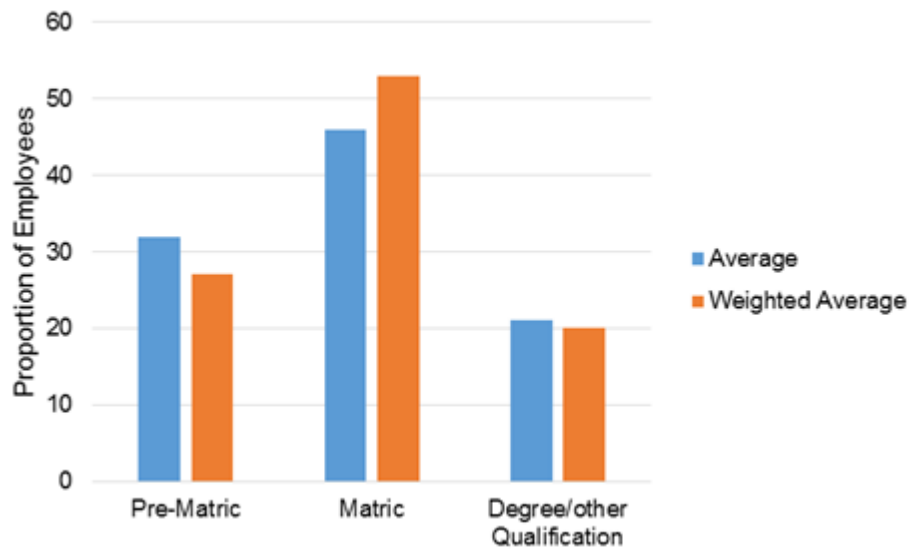
The survey results show that the power and public transport are not provided optimally for firms. There are power interruptions in the form of unplanned power outages and voltage fluctuations and Aeroton is not serviced by public transport. The firms do not receive advanced warning of power interruptions which may lead to interruptions productions particularly for the manufacturing firms. Though the Rea Vaya is available in Industria West the surveyed firms do not seem to be making much use of it. The lack of availability of transport after hours also impacts on the shift patterns of firms which may choose to run less than optimally or provide own transport at additional cost to the firm. Water supply and road infrastructure appears be is satisfactory. Seeing as quality of infrastructure is important for a firm's location decisions, there may be motivation to address the challenges with power and public transport.

8.4.3.6 Skills and training

Education level

The respondents were asked to estimate the proportion of their employees that had not acquired a matric certificate, acquired one, and those who had a degree or another qualification. 27 firms responded to this question, and the responses illustrate that on average the firms in Aeroton and Industria West have more or less the same proportions of employees in each category. The proportions of the levels of education were averaged out in order to determine the mean proportion of employees with pre-matric, matric and matric in both areas. A weighted average was also calculated based on the number of employees that each firm has.

Figure 33: Level of Education (n=27)

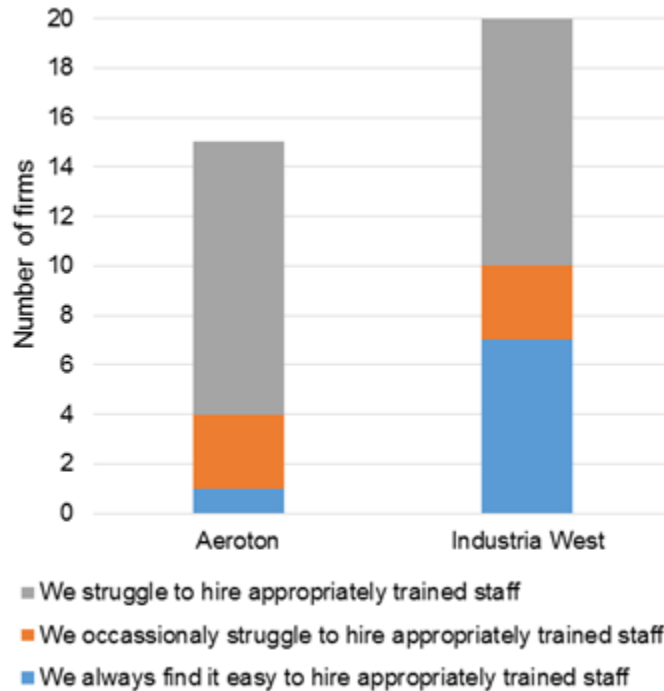


Source: survey data

The data analysis reveals that the largest component of employees have a matric certificate, with the lowest component having acquired a degree. This may be attributed to the fact that the greater proportion of firms that took part in the survey are manufacturing firms which may require a large proportion of unskilled labour to perform some of the menial work, while a smaller proportion of employees need to be qualified. Further analysis employing the weighted averages reveals that proportion of firms that have pre-matric students are lower and the proportion with Matric is higher when the weighted average is used. This suggests the smaller firms employ a greater proportion of employees with lower qualification levels.

The low levels of education is closely linked to the difficulty faced by firms in hiring experienced staff. The firms in Aeroton and Industria West reported that they encounter some level of difficulty when hiring appropriately trained staff even though Industria West reported lower levels of difficulty. From the figure below, one firm in Aeroton reported that they find it easy to hire appropriately trained staff, versus seven firms in Industria West who find it easy. The difficulty of hiring appropriately trained staff may be due to the different skills that the respondents were making reference to. In the in-depth interviews it was identified that it is less difficult to hire employees who carry out business administration and management posts, versus technical work. This will be discussed in greater detail in the interview analysis later in the report.

Figure 34: Company’s experience of attracting employees with relevant skills and experience (n=25)



Source: survey data

In the table below, the hypothesis that the ease of hiring is independent of number of the employees was tested and could not be rejected at 5% level of significance. This reveals that there is no relationship between the number of employees and their difficulty to hire employees. This implies that regardless of the size of the firms all firms do struggle to hire appropriately trained staff.

Table 8: Number of Employees and Ease of Hiring

	Easy to Hire	Struggle to Hire	Total
<200 Employees	9	21	30
>200 Employees	1	3	4
Total	10	24	34
		X ² P Value	0.836670

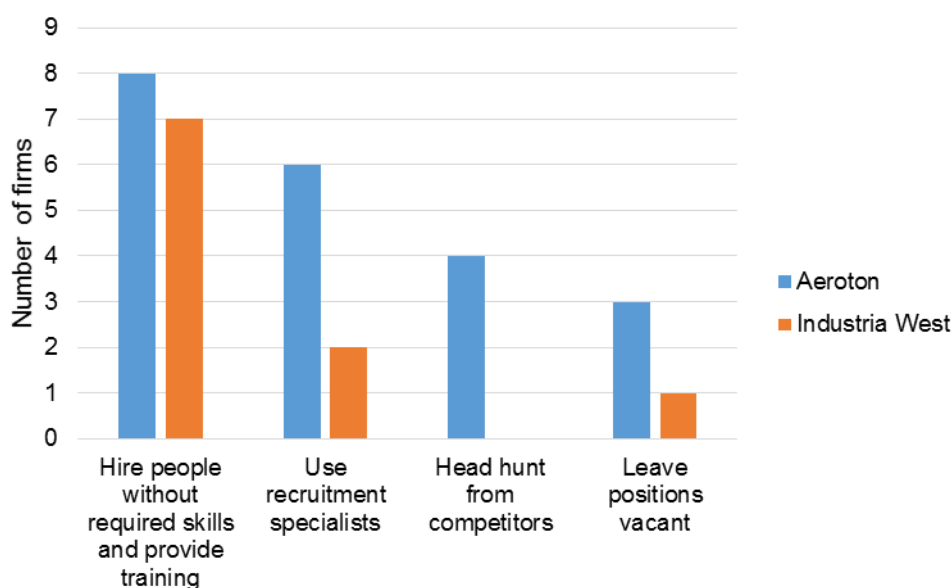
Source: survey data, own calculations

Hiring

The 24 firms that reported that they struggled to hire appropriately trained staff were asked how they usually rectify this issue. They were given the options listed in the figure below, and selected the relevant responses. In light of the inability to hire appropriately trained staff, the most common response in both areas was that “firms hire people without required skills and provide training”. This was followed by the “use of recruitment agencies”, with three times as many firms in Aeroton having reported this as an option. Interestingly firms in Aeroton seem to “head hunt from their competitors”, while this practice was not reported in Industria West. It is worrying that some of the firms noted that they “leave the positions

vacant”. Firms may leave the positions unfilled due to the inability to find a candidate with the relevant skills and experience.

Figure 35: Methods used to hire employees (n=22)



Source: survey data

Training

Unsurprisingly, given that most firms reported that they hire employees without the appropriate skill-set and provide training, 36 firms reported that they offer their employees some form of training (which may be a combination of two options) as shown in the table below. In-house training was the most popular option as most firms noted that they offer new or in-experienced employee’s on-the-job training so that they can grapple with the machinery and equipment operation particularly in manufacturing firms. A lower proportion of the firms out-source training as this is a costly and timely exercise.

Table 9: Forms of training (n=34)

Forms of training	Number of firms
In-house training facility	26
Private training schools	6
Vocational/technikons	2
Business partners (other firms)	2
University	1
Total	37

Source: survey data

It is evident from the data analysis that there are high levels of employees who do not possess a matric certificate which may call into question their knowledge of basic numeracy and literacy, machine operation and health and safety measures among other competencies of the employees. The firms therefore offer on-the-job training in order to equip their employees with the necessary skills to perform the tasks at hand.

However, firms in the survey identified other approaches of dealing with inadequately equipped employees. The firms noted that they poach employees from their rivals or leave the positions vacant. Poaching from rivals may deter firms from investing in resources for training for fear of losing to their competitors. This may ultimately have detrimental effects on the productivity and competitiveness of firms, which will ultimately decrease further investment and expansion. Leaving the positions vacant also echoes the inability of firms to hire employees with relevant skills. Implementing schemes that can provide centralised training schools of skills such as machine operation and health and safety may provide a pool of labour for the firms, allowing them to divert resources towards research and development and expansion strategies.

8.4.3.7 Interactions with the City

Have respondents interacted with the City?

The survey reported that 9 firm's interacted with the City, with more or less the same proportions from Aeroton and Industria West as tabled below. The level of interaction with the City may not be due to the strong opinion that the City is unreliable and unhelpful as discussed in the selection bias above, but can be attributed to the fact that some of the companies rent the properties, and thus the property owner communicates with the City on their behalf.

Table 10: Interaction with the City

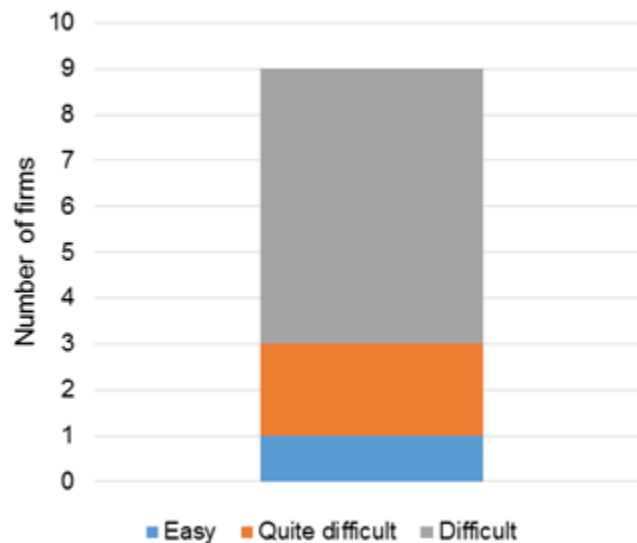
Interacted with the City	Aeroton	Industria West	Total
Yes	5	4	9
No	9	15	23

Source: survey data

How easy was interaction with the City?

Despite the small proportion of firms that interacted with the City, seven out of nine (78%) firms stated that they experienced some level of difficulty when communicating with the City as illustrated in the Figure below. The major issue was that the firms struggled to get in touch with the appropriate contact. For example, one of the respondents stated that after having spent 30 minutes battling to get hold of the right person, their conversation was simply terminated without having been offered any assistance. Another issue which customers struggled to resolve were around water and electricity billing queries where after issuing a complaint, they were not did not receive any form of assistance.

Figure 36: Ease of Interaction with the City of Johannesburg (n=9)



Source: survey data

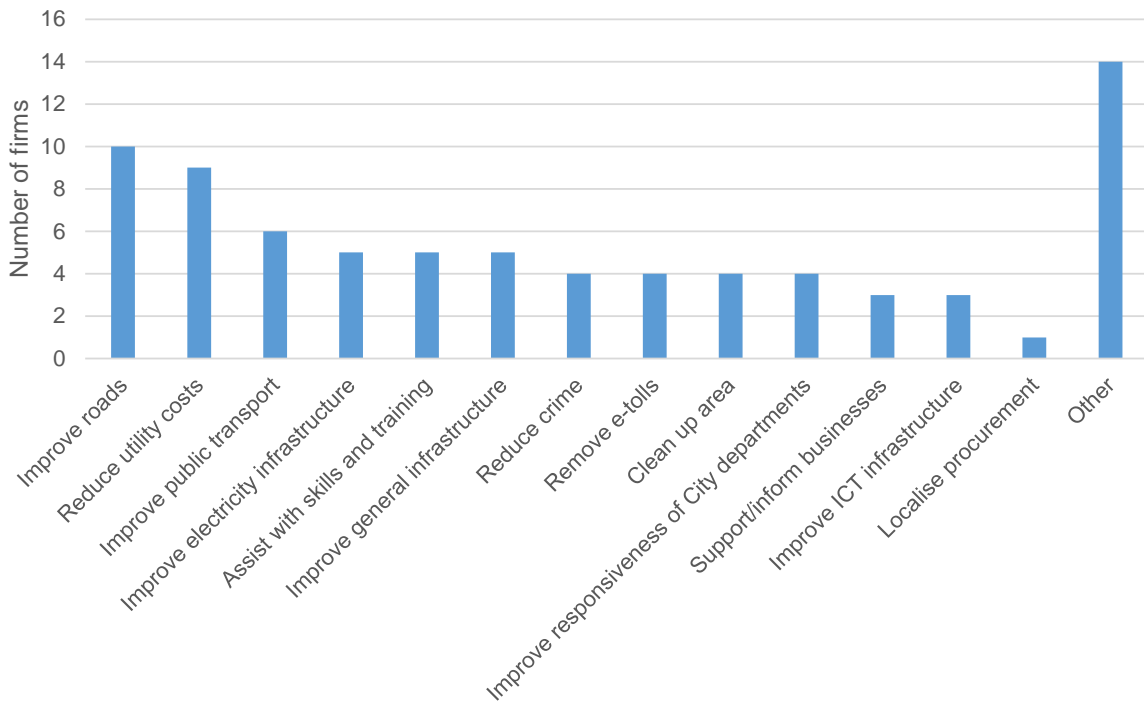
The firms in the survey reported that their interaction with the City is quite low since their property owners may interact with the City on their behalf. Furthermore, the firms that did interact with the City found it very difficult to get their issues resolved. The in-depth interviews, which are discussed in more detail below, reveal that the call centre and the website were not user-friendly and did not provide a source of credible information or assistance with respect to billing enquiries, power interruptions, water stoppages and any other City-related queries.

8.4.3.8 Recommendations for the City

At the end of the survey, firms were asked two open-ended questions in order to give them an opportunity to make recommendations to the City directly. For these questions no categories were provided and firms had the ability to make any answer they thought was appropriate. Responses were then grouped into themes to assist in the analysis of the responses.

The first questions asked firms to make three suggestions for things the City could do to help improve the competitiveness of their business. The responses were quite wide-ranging, but the most common response was to improve the quality of roads in the area, closely followed by reducing the cost of utilities, especially electricity. Next came improving public transport and electricity infrastructure, assisting with skills and training and improving general infrastructure. Those who wanted better quality roads mentioned a general need for improvements in quality as well as pothole repair, traffic light repair and better road signage. In terms of training, requests were made for the City to set up technical training centres and facilitate or assist with the training of technical staff and artisans in particular. This is in line with the interview responses where the category of skills where the shortage is most acute appeared to be in technical skills like machine operation.

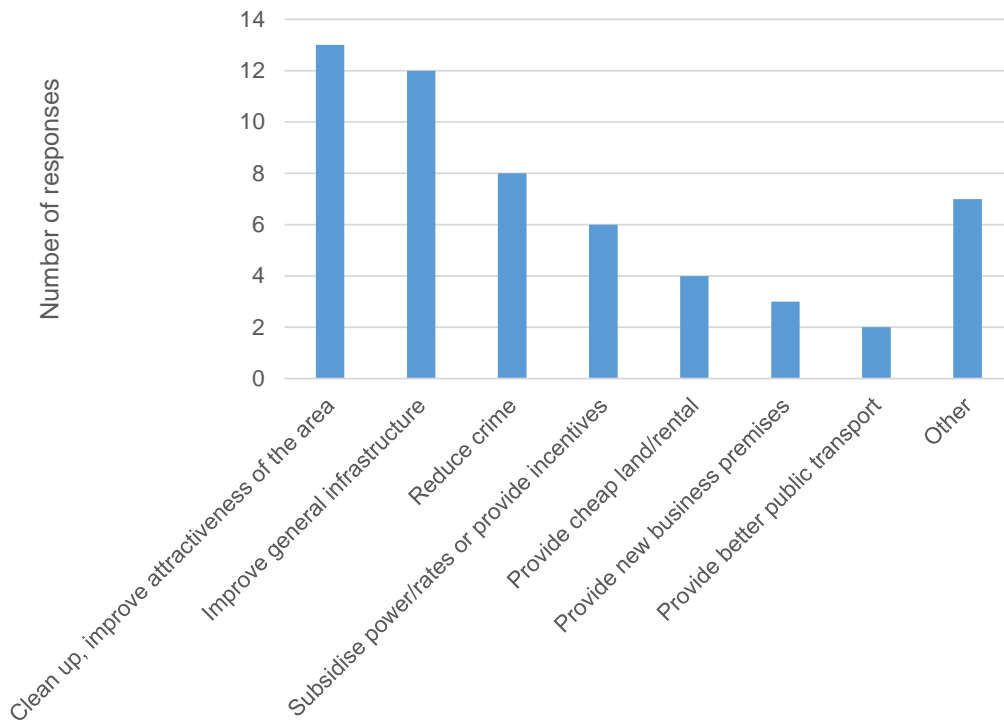
Figure 37: what can the City do to help improve the competitiveness of your company?



Source: survey data

The second open-ended question that firms were asked was how the City can attract, retain and grow businesses in the area. Again they were asked to make three suggestions. The most common response was that the city should clean up the area and improve the attractiveness of the area to firms and their customers. Secondly, firms felt the City should improve the quality of infrastructure in the area. Reducing crime was also seen as important, and several firms suggested that the City could attract new firms by providing subsidies or incentives and by providing cheap land and reduced rentals. Again, the most common responses are all areas in which the City can effectively intervene to improve the attractiveness of the areas.

Figure 38: how can the City attract/retain/grow businesses in the area?



Source: survey data

Overall, the key issues for the City to address in order to improve firm competitiveness appear to be infrastructure (particularly roads, public transport and electricity infrastructure), skills and training, cleaning up the area and dealing with crime and providing assistance for small businesses. In terms of attracting new firms to the area, the key interventions are to improve infrastructure, clean up the area and reduce crime.

8.4.3.9 Conclusion

The survey results suggest that many firms in Aeroton and Industria West are facing poor economic conditions, declining demand and low levels of capacity utilisation. Most are selling predominantly to the domestic market which has been under pressure, particularly in industries such as mining and construction. Perhaps partly due to these challenges, the results suggest that there is relatively little research and innovation going on in Aeroton and Industria West, although there is slightly more in Aeroton, perhaps due to the size and activities of firms in the area. Where firms are making substantial investments, they are most often doing so in order to increase efficiency and cut costs. This is consistent with the view presented above of firms facing a challenging economic environment and low levels of domestic demand.

Overall the firms operating in Aeroton and Industria West have been in current premises for varied periods of time. The survey shows that firms' location decisions are mainly informed by access to markets, rental prices, quality of infrastructure and the state of crime. In the next section the survey attempts to tease out the issues related to the quality of infrastructure.

The survey results show that the power and public transport are not provided optimally for firms. There are power interruptions in the form of unplanned power outages and voltage fluctuations and Aeroton is not serviced by public transport. The firms do not receive

advanced warning of power interruptions which may lead to interruptions productions particularly for the manufacturing firms. Though the Rea Vaya is available in Industria West the surveyed firms do not seem to be making much use of it. The lack of availability of transport after hours also impacts on the shift patterns of firms which may choose to run less than optimally or provide own transport at additional cost to the firm. Water supply and road infrastructure appears to be satisfactory. Seeing as quality of infrastructure is important for a firm's location decisions, there may be motivation to address the challenges with power and public transport.

Firms in both areas struggle to employ appropriately skilled workers, particularly for technical positions. Solutions used are to train on the job, poach employees from their rivals or leave the positions vacant. Poaching from rivals may deter firms from investing in resources for training for fear of losing to their competitors. This may ultimately have detrimental effects on the productivity and competitiveness of firms, which will ultimately decrease further investment and expansion. Leaving the positions vacant also echoes the inability of firms to hire employees with relevant skills. Implementing schemes that can provide centralised training schools of skills such as machine operation and health and safety may provide a pool of labour for the firms, allowing them to divert resources towards research and development and expansion strategies.

The firms in the survey reported that their interaction with the City is quite low since their property owners may interact with the City on their behalf. Furthermore, the firms that did interact with the City found it very difficult to get their issues resolved. The in-depth interviews, which are discussed in more detail below, reveal that the call centre and the website were not user-friendly and did not provide a source of credible information or assistance with respect to billing enquiries, power interruptions, water stoppages and any other City-related queries.

Key issues for the City to address in order to improve firm competitiveness in Aeroton appear to be infrastructure (particularly roads, public transport and electricity infrastructure), skills and training, cleaning up the area and dealing with crime and providing assistance for small businesses. In terms of attracting new firms to the area, the key interventions are to improve infrastructure, clean up the area and reduce crime.

8.5 In-depth firm interviews

As discussed above, a series of in-depth interviews were conducted in Aeroton and Industria West in order to probe some of the findings of the firm survey in more detail. Ten firms in each area were interviewed. In addition, five firms were interviewed in Wynberg in order to get an overview of the node and understand at a high level if it faced the same challenges as the other areas. For each area, we report the key insights arising from the interviews according to key themes. In general these build on the results of the survey, providing greater depth and more detailed insights.

8.5.1 Aeroton

Some of the Aeroton interviews were conducted with firms in manufacturing. The specific sectors covered were plastic packaging; food; steel fabrication; telecoms equipment for mines; heat control equipment and sterile fluids. One distribution company was also surveyed which specialises in the distribution of forklifts.

The interviews were semi-structured to explore the key issues systematically and to inform the design of the firm survey. The aim was to first of all map the activity taking place, the types of firms in Aeroton and the size of firms and then to understand their performance in recent years, the reasons for growth or decline in sales and how competitive firms are in relation to domestic and foreign competitors. Questions then aimed to understand the key challenges being faced by firms and how these impact on their competitiveness. In particular, the influence of factors under the control of the City were probed in order to understand how intervention by the City could assist firms in improving their competitiveness. Key areas of discussion under this heading were electricity supply and public transport. Firms' approaches to research and development were probed, as well as the nature of investments being made into the business. Finally issues of skills and training were explored. A detailed list of the interview themes used is provided in Annexure 1.

The firms interviewed ranged in size from 12 employees to 700 employees and most of the firms interviewed have been in Aeroton for more than 20 years with one having been there since the 1950's. The firm that had been in Aeroton for the shortest period had been located in Aeroton for 10 years. About half these firms are operating below nameplate capacity. In terms of turnover, the smallest of the interviewed firms makes approximately R15 million a year and the largest makes about R1 billion.

In addition to providing information on the firms themselves, some of the interviews also provided valuable insights into the operations of other branches of the same companies in other areas, giving insights to the state of Johannesburg municipal services versus other municipalities.

8.5.1.1 Performance, competitiveness and market conditions

The firms interviewed generally cited a challenging operating environment. In general, manufacturing firms tended to have similar concerns. The manufacturing firms identified the factors which have a significant impact on their competitiveness as operational efficiencies which are in turn dependent on input costs such as labour, electricity and water, raw materials. Though some of these factors are not in the control of the municipality it is important for firms that the different factors work together for them to be able to achieve world class efficiencies and competitiveness.

The area was affected by the recent metalworkers strike. Although not all the firms' employees were involved in the strike, the area in general was disrupted. Even those not

directly affected sometimes suffered indirectly as they were unable to source required inputs from suppliers who were directly affected.

A number of firms noted that they had reduced their staff complement in the past 3 years. One firm had actively retrenched and others had reduced the number of employees by not replacing those who left the organisation. Two firms cited mechanisation as the reason for employing fewer people. This was done to reduce costs. One particularly successful manufacturing firm noted that it had grown employment by 100% over the past 10 years. In the time that employment had doubled, sales had tripled. Another said that it had hired more people in the past 3 years but only because it had moved into new product areas, as there had been no growth in its traditional product areas.

Another trend that was evident from the interviews was that in general demand from customers in South Africa has been flat or declining. This was for a variety of reasons. Firms supplying to the mining sector have been affected by the difficulties in the sector over the past year. Manufacturers supplying to other sectors noted the influx of cheap imports as a challenge affecting their performance. On the other hand, demand from the southern African region has generally been growing. A number of firms noted that they have been trying to grow their customer base in the region in order to reduce the impact of stagnant domestic demand on the business. Others had counteracted the decline by moving into new product areas in order to grow sales. One firm noted that since it was not expecting much growth in demand it was focussing on winning business away from competitors.

In this context, a number of firms cited problems with the local infrastructure in Aeroton as key challenges affecting their competitiveness and the performance of their business. The following section discusses these issues in more detail.

8.5.1.2 Public Infrastructure

8.5.1.2.1 Electricity

Electricity outages, surges and dips and cost were cited by many of the firms as a challenge to doing business in Aeroton. Though firms noted electricity cost as a challenge, the manufacturing firms were most concerned about power outages, surges and dips. The consequence of the power outages is lost productivity and production for the duration of the outage, this is especially the case for manufacturing firms. Firms interviewed indicated that the outages usually last for several hours and on average seven hours at a time. The impact of the outage is compounded by the lack of advance warning which would allow firms to plan. Firms have noted that the losses in production could be minimised if firms were given a few days' notice of the outage and the expected duration. A number of the manufacturing firms hire a combination of permanent and temporary employees, so on a day where there will be an outage lasting several hours they could save on costs by not calling on their temporary employees if they were given warning. For example one of the firms has 650 employees of which 350 are wage earners. The lack of information about the duration of the outage often means that employees are on stand-by at the cost of the firm even though there is no production taking place.

The firms that are involved in plastic manufacturing either through injection moulding, blow moulding or extrusion and those producing sterile products are most vulnerable to losses due to power outages. In plastic manufacturing, plastic pellets are melted and then fed into machines that will mould or extrude into the design of the product. When the power goes out the product that is in the machines will harden and have to be scraped from the machines. There may be granules left in the machines and when the process is restarted when the

power returns the first batches may have impurities from the hardened granules and may need to be thrown away. One of the firms discarded product worth R44 509 during the last power interruption and in the period August 2013 to July 2014 the same firm discarded product to the value of R1.7 million. Another firm quantified the cost of lost hours at R2.2 million. This is a cost item for firms that would not necessarily be incurred by competitor firms elsewhere.

All the manufacturing firms indicated that the production losses incurred due to outages were not limited to the duration of the outage but also delay and lost time incurred in resuming production as well as when equipment malfunctions. An outage that lasts 30 minutes can cost a firm approximately 3 hours of downtime. Most of the manufacturing firms have continuous operations and power interruption affect efficiency and performance of the firm.

The power surges also pose a challenge to the production processes of firms as the surges sometimes lead to equipment failing and the firm will have to repair or replace damaged components. Power fluctuations also have an adverse impact on equipment over the long term, causing higher rates of wear and stressing electronic components and systems. This will result in a shorter than normal life for these components.⁶⁴ One of the firms submitted that power interruptions also causes equipment to malfunction post event and setting up production after an interruption contributes to under recoveries.

Another firm interviewed, indicated that they wanted to expand their premises and were informed that they would have to pay the cost additional power infrastructure themselves. The same firm paid R2 million to get a new line for a previous expansion of their plant. Limits on power provision and forcing firms to pay for infrastructure to connect them to the public grid increases the cost of investing in the plant and therefore impacts on firms' decisions to grow.

One of the firms interviewed, also experiences interruption to water supply when there are power interruptions. The firm indicated that water pressure is also a problem. They receive water at pressure of five bars from the Municipality, but require six bars for the processes of the plant. The firm then uses supply tanks to pump water to achieve the extra pressure required. This means that when there is no power the pumps are not effective and the water pressure is too weak for the plant's requirements.

Power outages are such a critical challenge for firms that most of the interviewed firms and all the manufacturing firms interviewed have invested in generators. Some of the firms do not have sufficient generator capacity to run their whole plant but just the critical processes. A generator can cost up to R5 million per generator to install and all the manufacturing firms interviewed had more than one generator. The bigger firms can afford to purchase generators although this diverts resources from more efficient use. Smaller firms are not in the same position as they have limited access to capital. Some of the generators were reaching the end of their useful lives and firms need to replace them.

⁶⁴ Firms have noted that they make every effort to put in reasonable additional components to protect equipment from the impact of unreliable power.

Box 1: Example of Malfunctioning of equipment post power interruption

In Adcock Ingram's extrusion department, the Sheetline 80 PLC was corrupted due to high voltage which results in spikes when the power returns. Also, damage to the communication card of the Heatseal Kiefel 70 during an interruption resulted in six days of down time and under recoveries.

In one month, the extrusion department lost approximately R275 000 of recoveries during power interruptions and incurred material losses of approximately R445 000 for 2014 as well as external software expenses of approximately R20 000.

The power interruptions impact the competitiveness of firms in Aeroton as the direct and indirect costs make firms less efficient and competitive. For the marginal firms in tough markets (e.g. supplying to SA mines, competing with cheap foreign imports) - this is a cost that they can ill-afford. Continuous power is an important factor in firms' location decisions. Some of these firms need to produce 24 hours a day for 7 days a week to be able to compete with imports locally or have competitive exports and due to the power problems instead they produce 6 days a week to allow for catch up in case of production disruptions. On-time delivery is very important to customers and any delay may have an impact on relationships with customers. One of the firms is considering moving some machines to another plant in Cape Town where there are less power interruptions.

8.5.1.2.2 Public transport

The lack of available public transport for employees was noted as a problem by every firm interviewed. Aeroton appears to be particularly poorly located in terms of the city's public transport infrastructure, despite being located fairly close to a major source of labour in neighbouring Soweto. There are no train or Rea Vaya links into Aeroton and only some of those interviewed appeared to be aware of a public bus route running through Aeroton. For most firms therefore, the form of transport most frequently used by employees was minibus taxis. In general, employees would take a taxi to the taxi rank at Southgate Mall and then either take a connecting taxi or walk the 1-2km to Aeroton. There are some security concerns around this route and muggings seem to be quite common.

There are a number of knock-on impacts of the lack of public transport. First of all, it makes it impossible for firms to ask employees to work overtime. This is since it becomes much more difficult for them to get home later in the evening as minibus taxis are generally not available and there are safety concerns after dark. This makes it difficult for firms to meet customer demand in busy periods.

For firms operating continuous shifts, however, it is an even bigger problem. All the firms operating 3 shifts per day noted that the lack of public transport is extremely challenging. It is impossible for employees to get to and from work for the shift change in the late evening (at 10 or 11 at night), even by minibus taxi. Firms have therefore had to come up with their own solutions at considerable cost. Two firms (both with hundreds of employees) have invested in staff buses in which they pick up and drop off employees at their homes. This involves driving employees from door-to-door which is time consuming and expensive. After dark, however, employees do not feel safe walking even a short distance to their homes. One firm estimated that this costs them around R500 000 per month in terms of fuel and maintenance.

Another firm set up an employee committee to negotiate with a taxi association to pick up employees and drop them at home. The firm subsidises the cost of this transport by 50% but the model means that the employees are responsible for all the administrative details such as negotiations with the taxi association, organisation of the routes etc.

Given that two thirds of the firms in Aeroton are manufacturing firms, it is likely that the lack of public transport is a problem for the majority of firms. This will be tested in the firm survey which is about to take place. Larger firms can afford to find a solution as described above, although at a substantial cost. Smaller firms are forced to avoid working after hours at all.

The situation is particularly inefficient since a large proportion of the workforce live in the same area. This means that each day, large numbers of employees are travelling to and from the same place but without any coordination of transport across companies. Again, the firm survey will clarify this further, but initial indications suggest that from three of the largest manufacturers in Aeroton alone, between 1500 and 2000 employees are coming in to Aeroton each day, many from the same areas. All of these three companies operate on a 24 hour basis and face the after-hours transport problems discussed above, and all are currently pursuing individual and costly solutions to the problem.

8.5.1.2.3 Other infrastructure and services

One firm noted that Aeroton is lacking in certain services. For example, the nearest fire station is 15 minutes away which means that firms have to have more costly on-site fire safety equipment. Similarly there is no clinic nearby that employees can use and when there is a need to visit a clinic staff would need to take the day off. Several firms also highlighted the poor quality of the roads in Aeroton.

Over and above the key areas discussed in the report firms raised concerns relating to safety and difficulty in communication with the City. The firms indicated that there were issues with crime several years ago but this has improved over time. However, there is an interest to have more police presence during strikes. The firms also complained about the dust from the mine dumps. On windy days the area is covered in dust and this dust has a negative impact on the products of firms that produce food, food packaging and sterile products as such some firms have installed filters to ensure against dust affecting their products. The mine dust also affects the health of employees.

A few of the firms interviewed indicated that they had attempted to contact the call centre to get assistance but had been sent from pillar to post with no resolution to their problem, the separation of the institutions has resulted in finger pointing. The proposed solution was for the City to have centralised business administration, where firms would be able to come to for help on problems whether it was a City Power or City of Johannesburg issue. Another firm complained about the City's website, indicating that it was not user friendly.

8.5.1.3 Technology, investment and research and development

Over all, firms did not report a large amount of investment taking place in recent years. A number of firms suggested that they had replaced some old machinery but none had made large scale investments in new technologies. One firm had invested in expanding its product range in response to declining demand in the market for its traditional products.

One firm noted that outdated machinery makes them inefficient and makes it harder to compete with imports. They would like to upgrade the machinery to reduce wastage and improve energy efficiency, however, it is difficult to make this investment when the business is barely profitable. Another firm explained that they had been thinking of investing in a

replacement machine that would make their products substantially cheaper, but given demand currently they are not willing to make such a large investment.

A small number of the firms interviewed stated that they had made investments in upgrading the energy efficiency of their plants. Unsurprisingly, these were mainly the energy-intensive manufacturing firms. Others had invested in new machinery in order to branch into new product areas.

Most of the firms interviewed did not have a dedicated research and development department. This was for a variety of reasons. Some firms were simply too small and noted that the directors of the firm worked on the product development aspect of the business. Others produced a relatively mature product where research and development was not such an important factor. Research and development was not relevant to firms importing or distributing products or with head offices elsewhere.

All of the firms interviewed conducted product testing in-house rather than outsourcing this function. The manufacturing firms generally produced products which adhered to quality standards, either domestic SABS standards, international ISO standards or both.

8.5.1.4 Skills and training

Another area which was cited as a challenge by almost all of the firms interviewed was skills and training. In general it was found to be difficult to hire people with the required skills and experience and a number of firms noted that they sometimes opt to leave positions vacant when they struggle to find someone to fill the position. The most difficult positions to fill appear to be engineers and production managers. However, even basic machine operation skills appear to be hard to find.

The most frequently cited way of solving this problem is for firms to hire a relatively inexperienced person and to provide them with training. While this can be a very effective way of producing a skilled workforce in the longer term, it does not immediately provide firms with the skills they need and requires planning and for more experienced employees to spend time training and mentoring those less experienced. A risk with this approach is that once the employee has gained sufficient skills and experience as to be useful, these same skills are highly marketable in a skills-scarce environment and the employee may choose to leave. This is a particular problem for small firms who cannot easily afford to invest in employees who will leave soon after.

Some of the smaller firms interviewed also noted that they struggle with levels of basic education in terms of literacy and numeracy as well as English language proficiency. In a factory environment this is problematic in terms of communication, basic machine operation, health and safety etc.

The firms interviewed provide their employees with a variety of training, both in-house and outsourced. In-house training provided includes health and safety training, on-the-job training in areas like machine operation and specialised product training. More advanced types of training will usually be outsourced although one firm noted that it has had internal training courses approved as national diploma courses. The larger firms have in-house training academies where they provide a range of training programmes, some of which are certified.

8.5.1.5 Opportunities for growth of Aeroton

The firms interviewed indicated in general that they think Aeroton is quite well located. This is mainly in terms of having good highway links which gives them easy access to suppliers

and customers. Aeroton is also in close proximity to a large labour force in Soweto. Those interviewed suggested that the rental in Aeroton is also relatively cheap.

Despite this, firms in general reported a lacklustre performance and one large firm mentioned the possibility of eventual closure if performance did not improve. In this context, frequent costly power outages and substantial transport costs to get workers to and from late shifts seem to be costs that firms can ill-afford and may well be hampering the growth of the area.

There seems to be vacant land in Aeroton which, combined with its locational advantages, suggests that more labour-intensive manufacturing could be attracted to the node if infrastructure and other challenges were resolved. In addition to potentially attracting new firms to the area, some of the existing firms interviewed indicated their willingness to expand. One firm confirmed that it is keen to expand operations in Aeroton but is constrained by the available power supply. After engaging with City Power around the possibility of acquiring extra power capacity to run an additional machine, they were informed that this was not likely to be possible.

Thus the evidence suggests that there are opportunities for growth in Aeroton and in particular for the area to attract more labour-intensive manufacturing. This, however, is unlikely to happen in the current environment. Such firms will not be attracted to an area where there are frequent and unpredictable power outages and where it is extremely difficult to run an efficient shift pattern due to public transport constraints. In addition to this, it is unlikely that new firms could be accommodated in terms of the available power supply in the area. Improvements to electricity and public transport infrastructure would make a substantial difference to the area's ability to capitalise on its good locational qualities. It is particularly important for these issues to be resolved in Aeroton because of the number of manufacturing firms in that industrial district. Manufacturing tends to be labour intensive, has multiplier effects and remains critical to growth in South Africa as a source of demand for other sectors thus playing an important role in pulling along growth.

The agglomeration in industrial districts and industrial clusters generally has 3 sources of benefits; linkages between intermediate and final goods, labour market interactions and knowledge spill overs (Manchester Innovation Investment Fund, 2008). This is important to firms as it is a way of reducing transportations costs, where transportation costs are interpreted widely to include difficulties in exchanging goods, people and ideas (Glaeser, 2007). Aeroton has the potential to be an attractive industrial district for firms that wish to benefit from agglomeration. As mentioned previously it has easy access to the highways, close to a source of labour and has relatively inexpensive rentals. However, the challenges related to basic municipal services that are critical for continuous production processes make Aeroton less attractive. Addressing these issues will not only improve the efficiencies and consequently competitiveness of existing firms in Aeroton but would also attract more firms.

8.5.2 Industria West

The firms interviewed in Industria West were also engaged in a variety of different activities. These were: steel rolling; import and distribution of metals; newspaper distribution; manufacture of foam furniture; manufacture of office furniture; manufacture of electrical equipment; wholesale and retail of electrical equipment and distribution of forklifts.

The same set of interview themes were used as in Aeroton. Most of the firms interviewed had less than 50 employees with the exception of 1 with 51-200 employees and most of the

firms interviewed have been in Industria West for 6 to 10 years with one having been there less than 5 years another for more than 10 and one for over 31 years. Many of the firms interviewed were not engaged in manufacturing so the issue of capacity was not relevant to them. However, of those for whom capacity utilisation is an appropriate measure, one stated that it was operating only at 61 – 70% of capacity and two were operating at close to 100% of capacity. In terms of turnover, the smallest of the interviewed firms less than R10 million a year and the largest makes between R101 million and R500 million.

8.5.2.1 Performance, competitiveness and market conditions

Some of the firms interviewed were experiencing challenging operating conditions with depressed levels of demand from domestic customers. The area was affected by the recent metalworkers strike, mainly in terms of difficulties in getting hold of inputs from suppliers whose workforces were on strike. Similar to the experience of firms in Aeroton, firms seem to have mainly experienced a slowdown in demand from domestic customers, while demand in the region is still strong. Some firms explained that they have therefore attempted to grow their business in the region in order to mitigate the effects of the slowdown in South Africa.

One South African firm which manufactures low-end mattresses and other furniture noted that it is losing ground to low cost competitors which are able to manufacture their own inputs (foam). The firm had lost 50% of its KZN business to Chinese competitors, and now low cost manufacturers have moved into Gauteng and are eroding that business too. The firm claims that these low cost competitors are able to produce very cheaply by avoiding compliance with rules and regulations, and by paying very low wages to workers.

However, 4 of the firms also reported strong growth of more than 5% per year. Most of these firms are relatively young and dynamic with one established firm. One firm explained that its strong growth was due to supplying niche products which are in high demand from foundries and car manufacturers. It also suggested that its small size and efficiencies achieved as a result have helped it to be successful in the market. The other firm explained its success as due to experience in the industry and the focus of management on the business. This firm has recently expanded its plant as a result of growing demand. The established firm experienced growth greater than 10% in the past three years and the growth was achieved through improved capacity output. 3 of the 4 firms that have been grown are also exporting to neighbouring countries.

8.5.2.2 Crime and security

All the firms interviewed noted that crime is a particular problem in the area, and this seems to be more of an issue in Industria West than in Aeroton where few firms mentioned security concerns. The types of incidents mentioned were hijackings, break-ins, muggings and robberies and one interviewee had a family member who was shot and killed in a robbery in the area. Firms who operate round the clock noted this as a particular problem, as it is not safe for workers to walk through the area after dark. This has resulted in one firm being forced to provide transport to its employees because of safety concerns. Interviewees reported very little police presence in the area even though the nearest police station is in Langlaagte which is not too far away.

This imposes a cost on businesses as well as being unsafe for their employees who have to travel to and from work in the area. Firms have to invest in expensive private security measures and transport in order to keep employees safe. They also suffer theft and shrinkage which imposes a further direct cost on the business. The lack of security also makes Industria West less attractive to new businesses and to potential customers who

might visit firms for meetings or to purchase products and services. There are a few retail and wholesale firms and distributors in the area who are most affected by this.

At first glance, the survey results do not seem to be consistent with the outcomes of the interviews as the survey results show that crime is more of an issue in Aeroton than in Industria West. However, some of the larger firms interviewed in Aeroton had indicated that crime used to be a big problem but over time this has been reduced. The respondents may have been referring to incidents in the past.

8.5.2.3 Public Infrastructure

8.5.2.3.1 Electricity

Firms generally cited an adequate electricity supply in Industria West, and all agreed that power outages are not a major problem in the area. This is quite a different story to Aeroton where firms find outages to be the biggest challenge to their business. In Industria West, even manufacturing firms did not report struggling with power outages.

However, two firms indicated that the challenge that has the greatest impact on their businesses is power interruptions. Both of these firms are manufacturers producing water meters and the office furniture. Another firm also noted that the power supply in the area is highly volatile, with constant voltage surges and dips. This is mainly problematic for electronic equipment firms whose products are sensitive to such fluctuations. The firm in question estimated that these surges and dips had cost the business R20 000 so far this year. Furthermore, when there are outages, most firms reported that this is extremely disruptive. Only one firm reported having a generator in place.

High electricity costs were mentioned by several firms as a major challenge for their businesses. One firm noted that it has had to absorb the increases in the electricity price as in the current environment it is not possible to pass the cost increases on to customers. Another firm noted that although it is not particularly electricity-intensive, the increases have been challenging for the business. The same firm also noted that its electricity bill is much higher in winter, even though it does not use more electricity in winter than in summer. Another firm indicated that City Power adds a 25% surcharge on their electricity bill in winter due to the general increase in electricity demand at this time of the year. One of the manufacturing firms noted that the manufacturing firms should not be subject to this increase as power is an essential component in production. The surcharge adds to the already high electricity bill.

The interviews suggest that either Industria West experiences less power outages than Aeroton or that the firms in Aeroton are more sensitive to the power outages given the nature of their business. The later argument is supported by the complaints about power outages from the manufacturing firms that were interviewed.

8.5.2.3.2 Public transport

As noted above, Industria West is well served with public transport options, with easy access to Rea Vaya, Metrorail and Metrobus services, as well as minibus taxis. The majority of employees seem to travel from Soweto to Industria, although a substantial group also come from Orange Farm. The only difficulty reported by firms is similar to the challenge experienced in Aeroton which is that public transport does not run after hours. This means that firms cannot easily run overtime or shifts which end or start after normal working hours or on weekends. Once again, firms have had to solve this problem by providing transport to their employees, at their own cost.

In terms of the various transport options available, firms described the costs and benefits of each. The relative price of the different forms of transport from Soweto to Industria West are listed in the table below. Taxis and the bus are the most expensive means of travelling from Soweto to Industria West at over R16 per day. Those interviewed noted that the train is the cheapest option by far and therefore many people use it even though it is very crowded and unsafe, with muggings commonplace. The train stations are also reportedly dirty and unsafe. Only a few firms reported that their employees use the Rea Vaya and it was generally believed to be too expensive for most people. One firm noted that employees find that the Rea Vaya bus drivers drive recklessly and cited this as another reason why employees do not use the service.

Table 11: Cost per day of transport from Soweto to Industria West and back

Form of transport	Cost per day
Train	R6/7
Rea Vaya	R14-16
Taxis	R18
Bus	R16+

Source: interviews with firms in Industria West

In general, the most commonly used form of transport is the train, which is cheap and convenient for employees but overcrowded and dangerous. No public transport options exist after hours.

8.5.2.3 Other infrastructure and services

Another commonly cited problem in the area is with littering and lack of refuse removal. All those interviewed noted that the area is dirty and littering is a problem. Several firms also complained that refuse removal is not regular and that this is unhygienic and attracts vermin. Stormwater drainage appears to also be a problem in some parts of Industria West and interviewees explained that when there is heavy rain, water overflows into the streets. This is consistent with the City of Johannesburg's assessment of the status of infrastructure in the area.⁶⁵ The node profile indicates that the road network needs to be upgraded and that there is a need to upgrade the electricity and storm water systems in the area. The assessment continues to say that there is adequate coverage of bulk sewer but some outfall sewers have insufficient capacity.

Though the node profile is in a document dated November 2010, the interview suggest that firms are still experiencing the same problems.

These problems influence the appearance of the area, making it less attractive to firms, employees and customers. Once again, this is most problematic for the retail/wholesale and distribution firms whose customers visit the premises. There is also a lack of amenities such as cafes and shops in the area which again influences its attractiveness to potential customers.

8.5.2.4 Skills and training

Firms in Industria West did not generally report severe difficulty in finding and employing adequately skilled staff. Similar to the firms in Aeroton, however, most firms reported their

⁶⁵ http://www.joburg-archive.co.za/2010/pdfs/sdf/final/annc_industria.pdf

main way of obtaining skilled staff is to hire people without experience and train them in-house. One firm noted that it needs employees to have an amount of industry experience and hence it usually is forced to poach people from its competitors. Several manufacturing firms stated that there is no external training programme which is tailored to their needs and so it is easier to train people on the job. One small firm explained that it would like to send employees to external training programmes, for example in machine operation and maintenance, however, it does not have sufficient funding available for this. Two firms noted the need to bring back apprenticeships. The shortage of artisans in the country poses a challenge to industry and in the past the apprenticeship programmes produced these artisans. The firms noted that it is less important for potential employees to have certificates and more important that they have some practical training. The firms further noted that the FET colleges have not been successful in producing graduates with practical skills. One of these firms uses a private service provider located in Pretoria to train staff. This poses additional challenges as the firm must transport the employees to and from Pretoria to attend classes.

8.5.2.5 Technology, investment and research and development

Most firms did not report having made investments in the last two years, mainly as a result of the poor economic conditions. One firm noted that they had considered investing in a new piece of machinery but had decided against it in the current conditions. One small manufacturing firm was interested in upgrading its machinery in order to be more efficient and reduce the time lost to break downs due to old machinery which they estimate to result in around 8 hours of downtime per week. The firm has had to train employees to conduct basic machine maintenance in order to deal with this problem. In order to make this investment the firm approached both DTI and SEDA for assistance but was not successful in accessing any grants or incentives. The process was described as extremely opaque and difficult to navigate and it was very difficult to get information on the relevant programmes and how to access them.

However, we note that this experience is not common to all the firms that were interviewed. Another relatively new firm entered the market for the production of office furniture using second hand machinery. The firm then applied for the Department of Trade and Industry's Manufacturing Competitiveness Enhancement Programme (MCEP) grant to update its machinery. Though the process took some time, 8 months, the firm received the grant and is currently upgrading their plant. The most obvious difference between the firm's approaches is that the one used consultants to apply for the grant while the other made the application internally. This is not to say that is the only difference between the circumstances of the firms but a previous study reviewing the take up of government incentives concluded that a firm was more likely to access grants and incentives if a consultant was used. This immediately places a bias in the types of firms that can have access to incentives as the bigger firms would be able to hire consultants while smaller firms may not be in the same position. The City may consider having people that can assist firms to access both City and other government agency grants.

8.5.2.6 Competing with informal businesses

One small firm explained that it is hard to compete with firms who do not comply with labour and buildings regulations. The firm pays UIF, complies with building regulations and its workers are unionised and covered by the industry bargaining council. In this environment it has to compete with locally based competitors who do not have these costs because compliance with the different regulations is not effectively enforced. The firm manufactures low end furniture for domestic use and therefore is very vulnerable to low cost competition.

8.5.2.7 Opportunities for growth of Industria West

Industria West has a good location with easy access for employees and customers and in general firms seem to like the area which is well established for industrial uses. The plots are large and there is some room for expansion in that there are some undeveloped or vacant plots. There are some very simple interventions which could drastically improve the attractiveness of the area to new businesses and customers alike. If the City could reduce the level of crime in the area and neaten up the surroundings, this would make an immediate difference to the area.

One firm interviewed suggested that the area could be further enhanced if the City could use reclaimed land from mine dumps to attract new businesses to the area. The City could offer cheap power to firms investing in the area and build good roads to link it to the rest of the province. With the right incentives and infrastructure this could turn into a high-end business park that would revitalise the area and attract new, cleaner, high-tech industries

8.5.3 Wynberg

The five firms that were interviewed in Wynberg engage in manufacture of chemicals and chemical products, transport and storage, manufacture of basic metals, manufacture of machinery and equipment, and manufacture of furniture and jewellery. The firms interviewed had employees ranging from 20 employees to 260 employees and have been located in Wynberg for an average of 20 years. However, it is important to note that 5 firms are not sufficient to generalise the experience of all the firms in Wynberg and there is need for further work in this area.

The firms informed us of the existence of an area industry association called the Wynberg Improvement District which has assisted in fighting crime and the establishment of a clean and safe environment for all stakeholders. Wynberg Improvement District has been in existence since 2006.

There may be some form self-selection bias in the firms. Manufacturing firms were more willing to take part in the in-depth interviews. This may not paint an accurate picture of what other firms in Wynberg are experiencing, and therefore there is need for a follow up survey.

8.5.3.1 Performance, competitiveness and market conditions

The firms interviewed in Wynberg reported that they are doing well despite the challenging environment that they experienced in the past couple of years. The improvement in company performance is largely owed to firms increasing their customer base through exporting their products to other countries in African, Europe, middle-East and South America as well as carving out niche markets.

One of the firms that was interviewed indicated that it has become more competitive than its rivals in order to attract more customers not only in South Africa, but in Southern Africa. This has been facilitated by offering 24-hour call-out services and increasing their carrying out advertising campaigns. Despite these efforts, they are still losing some of their customers to Chinese competitors that offer what they deem as inferior products at lower prices.

Of the five companies that were interviewed, the chemical manufacturer reported that they have increased their sales by approximately 400% over the past 3 years. This firm indicated that they involved from product development to the sale and application of the product for the end user. This company has managed to stay competitive through the development of a specialised chemical product. This firm also reported that they are operating at 80% capacity.

There is another firm in the manufacture of basic metals which has also been performing well. This is evidenced by the reported increase in their sales and occupying more land. They have even expanded their plant size by more than 100%. This firm has the largest space in Wynberg and imports to countries in Southern Africa, middle-East and Europe.

8.5.3.2 Public Infrastructure

8.5.3.2.1 Electricity

Electricity supply is a major concern that was highlighted by four out of the five firms that were interviewed, interestingly one firm reported that they had not experienced power interruptions in the past year. All the firms reported that they do not receive warning pre-empting the power outages. The firms that were interviewed noted that they experience on average at least 6 power outages per year which usually last from a few minutes to several hours. In order to rectify this issue the firms have resorted to installing generators. Generators are a substantial investment which increases operating expenses for firms and diverts resources from investment and future expansion plans.

Power outages disrupts production for a number of reasons. For example some of the equipment that is used in the production process are too heavy to be powered by generators. As such firms end up completely halting operations. In other instances, unexpected power outages result in the damaging of compressors and machines. If the power outages did occur at scheduled times, firms would be able to power down their machines properly, inform their customers of the likely delay in delivery and cater for unplanned losses in production. The firms reported that if they are warned of the power outages, they usually do not occur at the prescribed time, which defeats the purpose of warnings.

8.5.3.2.2 Public transport

There is one firm that reported that it had considered running shifts in order to increase its productivity but had failed to do so due to the unavailability of public transport at night and early in the morning. The lack of transport availability during the night and in the morning may also deter other firms from operating night shifts. Furthermore, there have been a number of cases that have been reported of crime and theft, and transport availability at these times is imperative.

Most of the firms that were interviewed noted that they do not operate shifts and do not deem public transport as a major concern. The majority of employees that work at the firms that were interviewed live in Alexandra Park and their public transport seems to not be a major concern since it is within walking distance from Wynberg. In addition there are PUTCO buses and mini bus taxis that the employees have access to as a source of transportation.

The proximity of the firms to Alexandra Park implies that it is a large source of labour. The firms can benefit from more efficient transport systems connecting the two places since they are about 2km apart. The firm that operates the 24-hour business noted that they provide company transport for the call-out services.

8.5.3.2.3 Other infrastructure and services

Water

One firm reported major distress that has stemmed from the erratic water supply. They manufacture chemical products that are water-based and as such water is a vital component of their production. This firm reported that water interruptions have been extremely severe

with the disruptions lasting from several hours to a day without pre-warning. After enquiring with the City, they were informed that the water interruptions were due to maintenance or a burst water pipe and that they were required by law to own a *Jojo* tank.

In order to mitigate the effects of the water interruptions the firm installed a *Jojo* tank that holds up to 10 000 tonnes of water. Nevertheless, the *Jojo* tank cannot meet all their needs due to its capped capacity. Such water interruptions have direct and indirect impacts on the production including remunerating employees for no production and delayed targets.

The rest of the interviewees in Wynberg noted that water is a not a major concern as they indicated that water interruptions are likely to affect water for their ablution facilities and human consumption. One firm noted that they once received warning of an up-coming water cut which did not occur, but conversely when they were not warned there were water cuts. Furthermore they experienced irregular water pressures which affected their manufacturing process. This has since been rectified.

Roads

One of the firms noted water interruptions are usually associated with road works. One firm reported that a burst water pipe on Grayston Drive resulted in road closures for a couple of weeks due to the delayed efforts to repair the water pipes. The firms noted that road construction occur for prolonged periods as firms noted that the City digs up holes and leaves them without refilling. One of the firms noted that the firms (or property owners) have resorted to repairing the roads within their vicinity at their own expense. Clearly this is another unnecessary expenditure which shifts resources from efficiency enhancing investments.

Crime

The firms noted that the lack of police presence in Wynberg has resulted in them feeling unsafe. This sentiment was echoed by other firms who reported that security may be an issue as there have been cases reported of “smash and grab” and hijacking. This reiterates the need for transport during the night and early morning so that if there are shift operations, employees can travel to and from work safely. One of the firms noted that there is a new security company that surveillances parts of the area 24/7. The security company has been linked to the Wynberg Improvement District.

The poor status of infrastructure and high rentals have resulted in two of the firms interviewed considering relocating out of Wynberg.

Strikes

The NUMSA strikes have affected four out of five firms surveyed as they use metal inputs during production. One of the firms that manufactures air conditioning units noted that the strikes occurred during winter when their demand was low. This enabled them to stock their inputs ahead of the strikes. Another firm that manufactures metal products noted that they had to close down for a month, and this had detrimental effects on the business.

8.5.3.3 Technology, investment and research and development

The firms reported that they have invested to meet the increase in demand and to improve quality and productivity. One of the smaller businesses noted that they have invested about R2 million to purchase equipment aimed at lowering costs, quality improvement and enhancing productivity. However, such investment has resulted in the elimination of unskilled

employees as the machine carries out the same function as the employees were performing previously.

Two of the firms also mentioned that they have invested in increasing their plant size through renting more land so that they can accommodate the increase in demand. However their land expansion has been restricted by the expensive rentals.

Two of the firms noted that they have research and development departments where they have their own technology to manufacture their products. Furthermore they conduct their own product testing in-house.

8.5.3.4 Skills and training

Lack of appropriate skills is an issue that resonates across all the areas and firms that were interviewed. The firms in Wynberg noted that they struggle to hire skilled artisans and technical staff such as welders and fitters and turners. As such they undertake their own on-the-job training. One firm noted that the government used to have training facilities for artisans and technical skills, but have since closed them down. When they advertise for such positions more mature citizens respond to the adverts who possess the required skills that they have attained over time, with the younger citizens being less equipped. This raises a concern as this signals that the pool of available skills is dwindling.

Two of the firms indicated that even though they do not struggle to hire employees they offer some form of off-site training to their employees. Training courses include health and safety training; hygiene and housekeeping training; first aid and book keeping. The firms raised the lack of specialised training as a concern in terms of machine operation.

The firms did indicate that their labour turnover is low, as they retain the employees that they have employed.

8.5.3.5 Area Industry Association

There is an area association called Wynberg Improvement District (WID), which falls under Urban Genesis and specialises in consulting, urban management and place management services. Three out of the five firms interviewed reported that they are members of the WID, with the other two firms indicating that they are aware of their existence, but not members. The WID mainly deals with property owners and not with tenants. It is a Not-for-Profit Organisation which is mandated to address the appropriate use of land; upkeep of the area; safety and security and any other issue around infrastructure that their members raise. The members pay a monthly subscription levy.

The WID interacts with the City at an operational level and monitors the overall operation of the firms including water and electricity issues. Urban Genesis has a software to track all the infrastructure upgrades and breakdowns in Wynberg. The WID noted that the City does not respond to water, road and power interruptions quickly, and they assist in hastening the process for their members.

The WID identified some of the issues that firms in Wynberg are likely to face. The design of the road infrastructure is poor as there are narrow roads that do not accommodate any expansion plans such as parking, even though it is nested by main roads. This has resulted in the conversion of roads to one-way, in order to make provision for public transport. There are road works that are underway to erect a Rea Vaya bus route joining Sandton and Wynberg.

The other concern is safety and security in the area. As such they have commissioned a Crime Prevention team that patrols the streets during the day and at night. The radius that the team patrols is not quite clear, as they are supposed to prioritise the safety of their members.

The role played by the WID was reported by the three firms that are members. They noted that when they have an issue around water and electricity, WID seems more informative than the City. In addition, the Crime Prevention team has increased the safety environment in Wynberg to some extent.

8.5.3.6 Opportunities for growth of Wynberg

The interviews revealed that Wynberg is a favourable location because of the closeness to the highways and access to labour. It is also located in passage ways to Sandton, Pretoria, the East Rand and West Rand which enables access to their national markets easier. The WID reported that this is a mature area, and any City intervention should be aimed at retaining the business that is present in Wynberg. There is evidence from the interviews that suggests that there is available land for expansion since one firm recently doubled its plant size.

There are a couple of firms that were considering relocating due to the poor and unreliable infrastructure. Furthermore the high rentals deterred firms from expanding as they would have wanted to.

8.6 Recommendations and way forward

The firm survey and interviews generated a wide range of recommendations for the City in terms of potential interventions to make Aeroton and Industria West more vibrant and attractive to firms and to assist firms to improve competitiveness. Most of the recommendations are cross-cutting, but some are more or less applicable to Aeroton or Industria West.

The recommendations can be broadly split into two main categories.

First there are a set of area-based recommendations which work towards removing the bottlenecks which are affecting firm competitiveness and setting up the enabling conditions for firms to grow and for the areas to become vibrant, modern, successful industrial nodes. These recommendations are mainly aimed at addressing the infrastructure challenges faced by firms in specific areas and solving existing problems. Key areas for possible intervention based on the research into Aeroton and Industria West (and to a lesser extent Wynberg) include upgrading and maintaining electricity infrastructure, increasing the availability of public transport, assisting firms to provide useful skills and training, improving safety and security and upgrading the business environment through more regular street cleaning and other initiatives. There is also a very important coordination role for the City with regard to tackling the above-mentioned challenges, where the City can act as a catalyst by engaging with firms to find common solutions to their shared problems. In this way, the City can ensure that economies of agglomeration are realised for each industrial node.

The second set of recommendations build on this to think about how the City can go further in terms of taking a more active role in helping firms to identify and take advantage of new opportunities for growth and expansion. This involves understanding what strengths exist in Johannesburg, patterns of existing industrial activity and where there are opportunities to grow different industries. This set of interventions is more sector-based and forward-looking. We recommend focusing on clusters of firms where champions can be identified for particular initiatives. The most important industrial sectors in Aeroton and Industria West are food products, machinery & equipment, furniture and chemicals. Cluster based interventions in these sectors can make a substantial contribution to improving performance. Key potential interventions include coordinating export promotion for firms into fast-growing regional markets, assisting them in understanding and applying for incentives and assistance offered by government, setting up joint facilities for research and testing and collectively tackling sector-specific skills constraints.

The sections which follow discuss the two sets of recommendations in more detail before concluding on the possible way forward for the City in terms of interventions and further research.

Removing bottlenecks

Upgrade and maintain electricity infrastructure

First and most importantly the City should prioritise the upgrading and maintenance of the electricity infrastructure in industrial areas, particularly in Aeroton, in order to minimise outages and power surges in future. This is an issue which is likely to be relevant to most industrial areas in the City, since industrial activities and manufacturing in particular are very dependent on a reliable power supply in order to be competitive.

Where power interruptions are unavoidable due to necessary maintenance, the date and time should be communicated to firms, ideally more than 24 hours in advance (but the earlier

the better) so that they can plan around the outage. Once warning of an outage has been given, the City should do everything in its power to ensure that the outage occurs at the time specified and not at a different, unexpected time. Through engaging with firms in each area, the City can try to better manage outages through understanding the impact on firms and how this impact can be minimised.

Consideration should also be given to planning for the future expansion of industrial areas, in order to ensure that firms who want to expand can access sufficient power for the expansion.

The cost of power was also a serious concern for firms, however, this issue is less likely to be within the City's control.

Improve accessibility of public transport especially after hours

Similarly, public transport is likely to be a cross-cutting issue and an important issue for labour intensive firms, particularly those involved in continuous production. In the daytime, the public transport infrastructure in Industria West and Wynberg appears to be adequate, notwithstanding some difficulties such as with safety at the local train stations. However, it is clear from the interviews in Aeroton that the existing public transport infrastructure does not meet the needs of firms or commuters.

In all three areas, public transport after hours is non-existent. This results in real costs to firms in terms of reducing their ability to optimise shift patterns and obliging them to provide transport for workers themselves. There is also a cost to employees as they spend longer travelling to and from work and face safety concerns during the journey. It is inefficient for each firm in the area to plan its staff transport arrangements in isolation, particularly given that a large proportion of the workforce appears to be travelling to and from the same areas. This is a clear area for intervention by the City to solve the externality associated with the lack of coordination across firms.

One way for the City to tackle this problem would be to conduct more in-depth research in industrial areas to understand commuting patterns in much more detail. This could be done through engaging with the firms in the area and their employees and either asking them about their needs or actually tracking their commuting patterns. This would enable the City to design a solution to suit people's needs, either through providing public transport, or at least coordinating the efforts of firms such that a solution is developed for the area as a whole rather than on a firm-by-firm basis.

Assist firms to provide useful skills and training

Another challenge which is common to most firms is the difficulty in finding suitably skilled staff in key areas. This appears to be a particular problem for manufacturing firms, where people such as plant managers and experienced machine operators seem to be hard to find. Most firms resort to hiring inexperienced people and providing them with training. While some skills are specific to each firm, particularly if the firm operates in a niche area, there are also some cross-cutting skills which are common to most firms. For example basic training in safety and risk management as well as basic science, electronics and machine operating may be required by employees of many firms in the area. Once again there is a coordination failure inherent in the way that firms deal with these shortages as each individually provides the necessary training to employees whereas it would be cheaper and more efficient to coordinate training in these common areas.

The City could therefore consider an intervention to encourage and possibly fund the coordination of basic training across companies. Once again, this would require engagement with the firms in the areas in order to better understand their needs and capabilities. Then training could be provided either through working with local FET colleges to design more appropriate syllabuses that meet firms' needs, or through a separate initiative for an industrial node or a group of nodes in close proximity. For example it may be possible for some of the larger firms to provide the facilities and even the syllabus and materials for training, with a financial contribution from the City to benefit all the firms in the area.

Improve safety and security in industrial areas

Crime appears to be a particular problem in Industria West, although it was also mentioned by respondents in Aeroton. One way in which safety and security could be improved which was suggested in the interviews is to increase the visibility of policing in the area, both during the day and at night. The nearest police station is not far from Industria West and the City should engage with the police in order to understand the feasibility of increasing patrols in the area. This would act as a deterrent to any criminal activity. Increased CCTV infrastructure in the area may also deter criminals. Particular attention should be given to the train stations and the areas around them where commuters pass through.

In addition, the City could encourage firms in the area to take a more pro-active approach to the security issue, perhaps facilitated through an area industry association. Firms could then coordinate their security activities in order to make them more effective. For example, one private security firm could be appointed for the whole area, making it easier to keep track of incidents. Through this mechanism firms could also share experiences, problems and solutions. This is the approach which has been taken in Wynberg, and those interviewed reported that incidents have since decreased due to the gating of the roads by the WID Crime Prevention team.

Upgrade the business environment

The City should conduct regular street cleaning and refuse removal in order to improve hygiene and upgrade the general business environment. Once again, this is an issue which was highlighted mostly in Industria West, but which was also touched on in Aeroton. This would assist firms in providing a professional environment for their clients and in particular may help retail and wholesale firms to attract more business. A further suggestion made by one firm was that recycling bins could be provided on each stand to assist with removing offcuts and other materials. This would assist in cleaning up the area and would also reduce the amount of waste in the area.

The firms in Wynberg stated that continuous road works are problematic. Scheduled and efficient construction and rehabilitation of roads would help make the area attractive and retain businesses. Secure parking spots are also an important aspect that attracts customers to an area. The parking in Wynberg is unsafe as customers are forced to park their cars on the side of the road. Erecting parking lots is a costly exercise, and the City can in the meantime assist with ensuring that the area is safe.

Ensure a consistent water supply

Consistent water supply is a public service that should be available at all times. Water is important for the functioning of ablution facilities, consumption and more importantly production. Water pressure was highlighted as a challenge in Aeroton and the availability of water supply was reported to be problematic in Wynberg where one firm noted that water supply is a huge issue and heavily disrupts production. The City can engage further in order

to understand the impact of the water interruptions in these areas, so that they can implement necessary measures to maintain water supply.

Facilitate coordination to achieve agglomeration economies in industrial nodes

As has been described above, most of the challenges that firms are facing are issues which could be addressed more efficiently through coordination, but at present firms are doing their best to resolve them independently. This means that the benefits of agglomeration that derive from being located in an industrial node are not being realised, and there is duplication of effort to resolve challenges in almost all areas. At present, there are few advantages to firms to being located in Aeroton or Industria West, aside from those which are a product of pure location (e.g. access to highways). Ideally what the City needs to work towards is providing an environment where firms can reap the benefits of the concentration of industrial activity in terms of shared solutions to common problems which lower firms' costs and allow them to be more competitive. The City is in a unique position to fulfil this coordination role and to catalyse the achievement of agglomeration economies in industrial nodes.

In Aeroton and Industria West, the first step would be to establish an area industry association with which the city could engage in order to understand the challenges that firms are facing and interventions which can effectively address these challenges. From the interviews it is clear that firms would welcome the opportunity for constructive engagement with the City around the development of the area.

Creating a forum for engagement with and between firms would enable the City to:

- Communicate directly with firms about issues that affect them and open a dialogue to better understand how their challenges can be addressed.
- Better understand the nature of the crime problem and its impact on firms and find ways to work with firms to improve safety and security in the area.
- Engage around firms' public transport needs and facilitate more efficient coordinated solutions, particularly to the after-hours problem. It would be useful for the City to understand which existing means of transport are being used and why, as well as how affordable the different options are for commuters.
- Help to coordinate and possibly fund training programmes which would be of benefit to firms in the area.
- Inform firms about programmes and assistance which could be of use to them and assist them in making applications for funding.
- Assist firms (especially smaller firms) to better market themselves and find new customers.

In addition to all of this, such an intervention would provide firms with a point of contact with the City which would enable them to seek assistance from the relevant person or department when they have problems. This would go a long way towards improving the relationship between firms and the City and would foster a more constructive dialogue around the best way for the City to support industrial activity in Johannesburg.

Assisting firms to take advantage of new opportunities

It is our view that the City should first remove the bottlenecks preventing growth and concentrate on providing an enabling environment in which firms can thrive. Once this has

been achieved, more thought should be given to shaping the future of Johannesburg's industrial nodes. The second set of recommendations therefore builds on the first and suggests interventions which involve a more pro-active approach by the City in fostering industrial development in specific sectors. It is clear from the research that, with a few exceptions, demand for industrial products is not growing in South Africa and is not likely to do so at least in the short to medium term. There is quite a different trend occurring in the rest of the Southern African region, however, where a number of countries are growing strongly and where demand as a result is also growing. Firms based in Johannesburg should be well-placed to capitalise on this expansion, given their advantages of location and sophistication, but appear to be doing so only to a limited degree. An obvious area of intervention by the City therefore, is to assist firms to diversify sales into the region and so become less dependent on the stagnating domestic market.

The research has shown that there are a number of sectors with a strong presence in Aeroton and Industria West which also happen to produce goods which are in demand in the region. In Aeroton there is a small cluster of food processing firms as well as a number of capital equipment firms. Both of these are areas which are in demand in the region as consumer demand grows (food products) and mining and construction activity expands (capital equipment). Capital equipment is also a strong sector in Industria West, as are chemicals and furniture manufacturing, both of which also have the potential to expand to satisfy regional demand. Thus it seems that in both nodes the key areas of manufacturing activity correspond to the types of products which should be seeing growing demand, but it seems that this opportunity is not being fully taken advantage of.

In this context, another possible area in which the City could assist firms is to coordinate export promotion efforts for the area. This would be especially useful for small firms with limited resources which cannot necessarily afford to market themselves individually. This would work best where there is a cluster of firms in the area serving common types of customers. For example, the firms providing products and services to mines could be grouped together and joint marketing materials produced to be sent to potential customers in the region or handed out at regional trade fairs. The firms in this area continue to invest in such efforts independently with limited assistance from government, which means that once again the cost to firms is greater than it could be if there was greater coordination in their activities. Ideally the City should coordinate these activities for firms across the City, but this would require a similar understanding of the activities being undertaken across Johannesburg's industrial nodes.

Very few of the firms interviewed were aware of any incentives or assistance programmes which they would qualify for or how to apply for these. This suggests that the City could do a better job of raising awareness of existing city programmes amongst existing firms and potential new investors. The City could also engage with firms in order to inform them of any assistance available from provincial or national government, such as the DTI's manufacturing incentives for example. In designing assistance programmes, the City should engage with firms to understand what would make a real difference to their competitiveness. A suggestion arising from the interviews is that assistance to upgrade machinery and equipment may be useful, given that several firms noted that their plants are less efficient than they could be due to outdated machinery.

Another possible area of coordination by the City is in setting up joint facilities and support for research, product development and testing for specific sectors. Johannesburg is well-located in terms of access to skills and proximity to higher education institutions which could lead to fruitful partnerships with local further and higher education institutions. This would

need to be investigated at a sector-specific level, however, as needs are likely to vary across sectors and even sub-sectors.

Way forward

We have proposed the key elements that can immediately be incorporated into the City's action plans which should have as its target removing the bottlenecks for firms in Aeroton and Industrial West. These bottlenecks include poor power infrastructure and public transport, where the key to solving these problems is ensuring that is coordination in finding solutions for issues faced by firms. This will establish private and public partnerships to create a conducive environment for firms to operate optimally and through firm growth achieve higher levels of employment.

The next step for the City is to design strategies for the identified opportunities for industrial nodes in Johannesburg. The research conducted on the pilot industrial nodes has revealed that there are some inaccuracies in the available information on characterisation of industrial nodes in Johannesburg. The City has industrial node profiles for all 28 nodes which characterise areas in terms of the nature of activity taking place, the status of public infrastructure, strategic opportunities in the area and node land size and land availability. The survey and firm interviews in Aeroton and Industria West have shown that the economic activity characterisation to be incorrect. For example the nodal profile indicates that Aeroton's primary activity is warehousing and distribution whereas we have found that 51% of firms in Aeroton are actually manufacturing. The survey results are in line with the relatively high gross value add that is recorded for the Industrial node. Aeroton is in the top 5 areas in Johannesburg, in terms of contribution of high value manufacturing gross value add.

This highlights the need to better understand the remaining industrial areas in Johannesburg in order to more precisely characterise the areas to inform interventions by the City to take up identified opportunities. The second category of recommendations (discussed above) focus on taking advantage of the opportunities that are open to Johannesburg as a city given its locational advantage for servicing the growth in demand in neighbouring countries. If the City is to appropriately identify the sectors where it can encourage clustering and where such clusters should be located it is crucial to have a more complete understanding of the special distribution of firms within the city.

We propose that following the pilot studies, the next research that is required by the City is a scoping of the remaining 26 nodes where fieldworkers can be sent to the industrial areas to conduct a mini survey that would seek to understand firm activities, size in terms employees and turnover and performance. This information will be used identify pattern of activities across the City to assist with design of sector clusters. We have found from the survey of Industria West and Aeroton that the more common economic activities are food processing, capital equipment manufacturing and to a lesser extent furniture manufacturing and chemicals.

We recommend that work starts on the clusters alongside extending the pilot studies. From the existing data on output and employment at the city level it is obvious that these sectors are large (aside perhaps from furniture, although this is more labour-intensive) and the trends analysis indicates that there is significant growth potential if there is improved competitiveness.

The scoping for the remaining industrial areas will be based on the Lightstone Business database which has contact information for firms in all the 28 industrial areas. The database will only be used as a starting point as a comparison of the Lightstone Business Database with the survey data showed that there are some firms not accounted for in the database.

This could create some biases in the characterisation of industrial nodes, as such it is still necessary to conduct the scoping study. In Aeroton the database does not have information on some of the bigger manufacturing firms such as Polyoak, Sasko and Premier Food (Blue Ribbon). The omission of firms could lead to mischaracterisation of industrial nodes. Two of the firms omitted from the Aeroton database are involved in large scale food processing and all the firms are important for employment as they employ in excess of 500 employees.

Post City-wide scoping exercise, the city can roll out full (revised) survey to a City-wide sample. This will test the results of the firm survey in other nodes which may be different from the pilot areas. The results of this exercise will assist the City to prioritisation, i.e. electricity is most problematic in certain nodes, whereas public transport may be more urgent in others.

The City could then repeat the firm survey annually in order to track firm performance over time and changes in nodes and assess the impact of City interventions.

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Appendix A: Google fiber city checklist

<https://fiber.storage.googleapis.com/legal/googlefibercitychecklist2-24-14.pdf>

Appendix B: Making data open

Which data should be public?

- Pro-actively release data online (e.g. New York City data is 'Open by default')
- Reference and build on existing public accountability and access policies
- Build on the values, goals and mission of the community and government
- Create a public, comprehensive list of all information holdings
- Specify methods for the prioritisation of data releases
- Stipulate that provisions apply to contractors or quasi-governmental agencies
- Appropriately safeguard sensitive information

How should data be made public?

- Provide comprehensive and appropriate formats for varied uses
- Remove restrictions for accessing information
- Mandate data to be explicitly licence free
- Charge data creating agencies with recommending an appropriate citation form
- Require publishing metadata
- Require publishing data creation processes
- Mandate the use of unique identifiers
- Require code sharing or publishing open source
- Require digitisation and distribution of archival materials
- Create a central location devoted to data publication and policies
- Publish bulk data
- Create public APIs for accessing information
- Optimise methods of data collection
- Mandate ongoing data publication and updates
- Create permanent, lasting access to data

How to implement the policy:

- Create or appoint oversight authority
- Create guidance or other binding regulations for implementation
- Incorporate public perspectives into policy implementation
- Set appropriately ambitious timelines for implementation
- Create processes to ensure data quality
- Ensure sufficient funding for implementation
- Create or explore potential partnerships
- Mandate future review for potential changes to this policy

Source: Sunlight Foundation, Open data policy examples,
<http://sunlightfoundation.com/opendataguidelines/examples/#proactive-release>

Appendix C: Questionnaire for interviews with ICT businesses

1	Timestamp
2	What is your name?
3	What is your email address?
4	What is your telephone number?
5	Do you / does your company have a website? If yes, please provide your website URL.
6	Where is your company located?
7	What is your company's turnover?
8	What is your company's profit after tax?
9	What percentage of turnover does your company spend on research and development?
10	Please describe your company's investments over the last year
11	How many employees does your company have?
12	How many customers has your company won over the last year?
13	How many customers has your company lost over the last year?
14	How many customers has your company retained over the last year?
15	What is the main reason for your company losing customers?
16	What is the single biggest factor that has contributed to your firm's success?
17	What is the single biggest obstacle that your firm faces for expansion?
18	What could the City do to improve the competitiveness of your business?
19	How long have you / has your company been located here?
20	Why did you choose this location for work or why did your company choose this location for its office space?

21	Has your company considered relocating in the last year?
22	If you have considered this, what are the reasons for this?
23	Is your company considering expanding your office space in the next year?
24	Do you have difficulties with public transport for your employees?
25	If applicable, please explain how the City could improve public transport
26	How would you rate the quality of the electricity infrastructure in your business's location?
27	How would you rate the quality of the ICT infrastructure in your business's location?
28	How would you rate the quality of the water infrastructure in your business's location?
29	How would you rate the quality of the urban environment (pavements, street lighting, etc.) in your business's location?
30	If you have recently interacted with any part of the City, how easy did you find it to get the assistance you needed?
31	If applicable, please explain why your experience with the City was bad
32	Please indicate whether your employees are:
33	How easy or difficult is it to find skilled employees?
34	If applicable, please explain why skills are difficult to find and whether the City could help with this.
35	Is your firm a member of a business association?
36	If applicable, please provide the name of your firm's business association.
37	Do you work from home?
38	If applicable, please explain why you work from home?
39	If applicable, please explain why you do not work from home?
40	What area do you live in?
41	How does your company market your business?
42	What kind of broadband connection do you use at work?
43	Approximately how much do you spend per month on broadband for your office?
44	What kind of broadband connection do you use at home?
45	Approximately how much do you spend per month on broadband for your home?
46	Does your company develop software?

47	If applicable, what kinds of applications do you / does your business develop?
48	How would you categorize your work?
49	Have you participated in any hackathons in Joburg? If your have, please indicate what the name of it was and whether it was useful.
50	If the City of Joburg were to provide open access to its data (relating to topics such as transport, electricity use etc.) what, if anything, would you be able to do with it?