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Science and Technology Parks as Catalysts for Inclusive Innovation and Service Delivery: The In[...]

PARALLEL 2

Factors of location in city-STP relationships

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The Innovation Hub, South Africa

Science and Technology Parks as Catalysts for Inclusive Innovation and Service Delivery: The Innovation Hub STP, Gauteng Province, South Africa

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ABSTRACT

Science and technology parks (STPs) are regional species, established to play a role in catalysing innovation within the region in which they are located. In developing countries, these 'high tech' hubs are often situated in a context of relatively severe underdevelopment and inequality. As a result, to remain relevant, there is a need to reflect on how STPs in these regions can support more inclusive innovation and development. This includes adopting a broader view of innovation and examining the relationship between STPs and various other regional development stakeholders, particularly within local and provincial government, given their broad social responsibility. This paper examines the role played by The Innovation Hub STP in the Gauteng Province of South Africa, as it implements a portfolio of innovation support programmes, underpinned by a philosophy of inclusiveness and endogenous innovation, with a focus on meeting immanent needs defined by citizens and municipal government. The Innovation Hub STP, hosted by one of three metropolitan municipalities in the province, has had to develop mechanisms to cooperate with the other metropolitan municipalities and smaller municipalities in the province, to ensure that innovation plays a role in service delivery *across* the region. The implementation of provincial innovation competitions and a regional open innovation platform is linked to incubation programmes run by The Innovation Hub, with a specific focus on growing mobile and green economy innovations. The experiences of The Innovation Hub in running these programmes demonstrates that a successful mix of innovation stimulation and networking initiatives coupled with an intensive enterprise development programme ensures that STPs can enhance the prospects for the emergence of clusters within an STP, and ultimately build a credible pool of solution providers for local government, whilst contributing towards broader participation in the economy of the region and reducing unemployment levels..

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1. INTRODUCTION

Science and technology parks ("STPs") are a new and increasingly growing phenomenon not only in South Africa, but in most of the developing world. The major drive for the establishment of the STPs would appear to be linked to the transition to knowledge based economies and the need to create areas of competitiveness for the regions by supporting the commercialisation of research and technologies generated by universities and other research centres. On the basis that STPs are regional species, established to play a role in catalysing innovation within the region in which they are located, context is important in terms of each STP. Accordingly, no STPs are identical. Each has to adapt its programmes and operations to serve the needs of its region for it to remain relevant. Severe underdevelopment and inequality as well as low technology based research and development ("R&D") and innovation intensity are characteristic of most developing countries, particularly in Africa. As a result, these countries cannot simply adopt existing STP models from the developed world, as the latter have more mature R&D and innovation systems. Notwithstanding, the fundamentals of STPs are the same, namely, regional based enablers comprising both strategic infrastructure and socio-economic development directed initiatives or programmes directed at ensuring the competitiveness of firms within the region and socio-economic development and competitiveness of the respective regions, within the context of national innovation systems.

Before discussing our work at The Innovation Hub (TIH), a science and technology park located in the Gauteng province of South Africa, some context related to African and South African development is important, in order to better understand the emerging role of African STPs. Africa as a continent is home to 70% of the world's fastest growing economies[2], Table 1.

Table 1: World's fastest growing economies, annual average GDP growth (%)

Worlds 10 fastest-growing economies, annual average GDP growth (%)			
Country	2001 – 2010	Country	2011 - 2015
Angola	11.1	China	9.5
China	10.5	India	8.2
Myanmar	10.3	Ethiopia	8.1
Nigeria	8.9	Mozambique	7.7
Ethiopia	8.4	Tanzania	7.2
Kazakhstan	8.2	Vietnam	7.2
Chad	7.9	Congo	7.0
Mozambique	7.9	Ghana	7.0
Camboida	7.7	Zambia	6.9
Rwanda	7.6	Nigeria	6.8

Source: Economist, IMF, January 2011

Most of these countries are classified as Least Developed Countries ("LDC") and are characterised by fledgling innovation systems. For these LDC countries to sustain their growth there is a need for them to increase their investments in R&D as well as innovation in general, to transform their economies to become more knowledge based. The current growth is driven by commodities as well as infrastructure development.

Moreover, the demographic profile of Africa is unlike most regions of the world, as illustrated by the large proportion of youth in Figure 1. South Africa's population profile comprises 49.4% people under the age of 25.[3] At the same time, urbanisation in Africa is expected to grow to 50% by 2030, Figure 2.

[2] Economist, IMF, January 2011
[3] http://www.indexmundi.com/south_africa/demographics_profile.html (last accessed 4 June 2013)

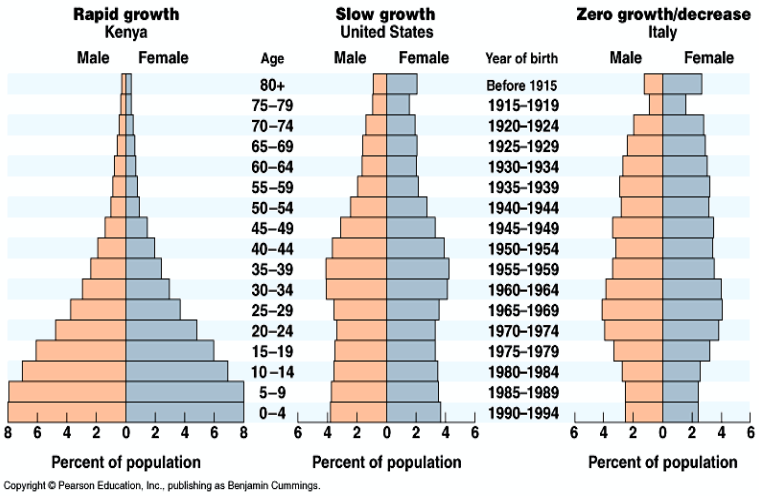
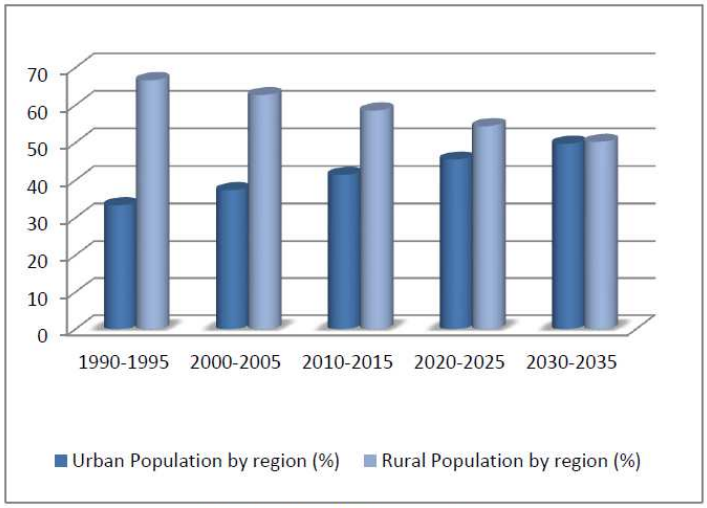


Figure 1: Population distribution profiles for Kenya, USA and Italy
(courtesy Pearson Education Inc. publishing as Benjamin Cummings)



Source: AfDB based on UN Population Division data.

Figure 2: Rate of Urbanisation in Africa

The growing youthful population and increasing degree of urbanisation coupled with constrained resources present challenges to governments in the developing countries in respect of unemployment and service delivery related to water, health, energy, food, transport security, as well as safety, which innovation could solve. This paper discusses some approaches taken by The Innovation Hub STP, Gauteng Province, South Africa in using innovation to start to identify solutions to some of these challenges, within the context of the Gauteng Global City Region.

In developing countries, there is significant growth in the number of science and technology parks but these 'high-tech' hubs are often situated within a context of severe underdevelopment and inequality. As a result, there is a need to ensure that these parks serve the innovation needs of their host regions but also ensure development of society as a whole. Whilst innovation is often narrowly associated with technology innovation, in developing countries it is necessary to adopt a broader definition of innovation to ensure that it is inclusive and directed at addressing the challenges faced by unequal growth and increasing urbanisation. A focus on technological innovation has the danger of creating islands of excellence whilst increasing disparities in society. A broader definition of innovation has the prospect of increasing awareness of the benefits of innovation across all sectors and classes, thereby improving the participation of citizens in innovation eco-systems. Within these ecosystems, local governments have a key role to play in leveraging innovation for broad developmental impact, and with the increase in urbanisation, there are severe challenges and constraints placed on municipalities to ensure service delivery to all its citizens. Innovation programmes

and science and technology parks have the potential not only to contribute towards addressing these service delivery challenges, but also ensure that the citizens participate in development of endogenous innovations that easily find application in society. In particular, small business incubators, open innovation platforms and innovation competitions, implemented appropriately, have the potential to play an important role in promoting inclusive innovation. Science and technology parks as effective intermediates need to enter into strategic collaborative relationship with local governments so that they become the conduit between entrepreneurs, academics, and citizens. Such relationships must be based on science and technology parks gaining a better understanding of the priorities of local government, and using these partnerships as tools for fostering demand-driven entrepreneurship and innovation. Structured on a win-win basis, these relationships ensure appropriate funding for science and technology park initiatives that in turn support local development. When science and technology parks are active stakeholders in regional innovation policies linked to growth and development strategies, there is much higher potential for effective and impactful innovation initiatives.

The following sections explore the innovation environment within the Gauteng Province of South Africa and then examine how The Innovation Hub STP seeks to support the goal of inclusive innovation through a number of unique collaborations, particularly with local government and demand-driven innovation programmes within the Gauteng Global City Region.

2. GAUTENG PROVINCE AND GAUTENG INNOVATION AND KNOWLEDGE ECONOMY STRATEGY

The Gauteng province is South Africa's smallest province by geographical area and yet the largest by population, accounting for 23.7% of South Africa's 52million population. The province is characterised by a high degree of urbanisation, and ranks amongst the fastest growing city regions in the world. It is also the wealthiest economic region in South Africa, at 33.4% of South Africa's GDP, and 11% of Africa's GDP, making it almost the 5th largest economy in the African continent. With the highest concentration of research institutions and higher education institutions in South Africa, Gauteng is a leader in R&D, accounting for 52.2% of total national expenditure on R&D in 2008-09 Gauteng[4]. The province is also Africa's financial capital with a strong services and financial sector. The province is host to three of South Africa's eight metropolitan municipalities, namely Ekurhuleni, City of Tshwane and City of Johannesburg.

Figure 3: South African map showing the Gauteng Province

In a conscious step to accelerate its transition to a knowledge based economy, in February 2012, the Gauteng Provincial Government, in South Africa, adopted the Gauteng Innovation and Knowledge Economy Strategy[5] ("GIKES, 2012"), as a regional innovation instrument directed at promoting inclusive innovation.

[4] OECD (2011), *OECD Territorial Reviews: The Gauteng City-Region, South Africa 2011*, OECD Publishing. *http://dx.doi.org/10.1787/9789264122840-en*

[5] http://www.saine.co.za/wordpress/wp-content/uploads/2012/10/gauteng_innovation_and_knowledge_economy_strategy.pdf (accessed 5 June 2013)

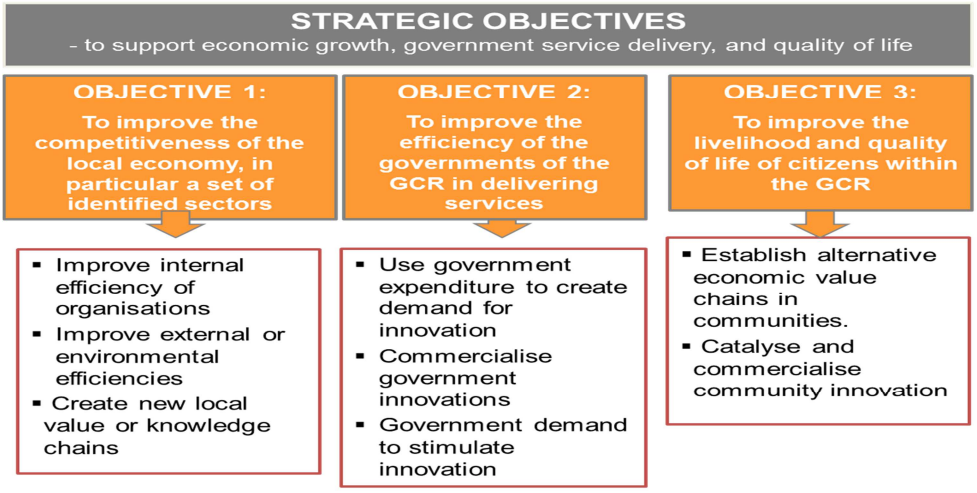


Figure 4: Schematic illustration of the strategic objectives of GIKES, 2012

As illustrated in Figure 4, the strategy's priorities or goals are to (i) improve the competitiveness of the Gauteng economy by focusing on a set of identified strategic sectors, (ii) improve the efficiency of the public sector in delivering services and (iii) promote the sustainable livelihood and quality of life of citizens within the Gauteng City Region. Accordingly, the strategy recognises community based or so called social innovations as being important, to ensure the inclusiveness of innovation, In what some may see as a departure from strong proprietary knowledge system, but is in essence not the case, GIKES, 2012, sees open innovation as a tool that can be used to create a more inclusive economy and innovation system. As will be shown in Section 4, a linkage of innovation to entrepreneurship, with particular emphasis on local conditions enhances the prospects of successful innovation[6].

3. THE INNOVATION HUB SCIENCE AND TECHNOLOGY PARK – CATALYSING INNOVATION

The Innovation Hub Science and Technology Park, South Africa's first and full member of the International Association of Science and Technology Parks ("IASP") is located in the City of Tshwane (Pretoria), Gauteng Province. Nestled between the University of Pretoria[7] on the one end, and the CSIR[8] on the other end, within South Africa's knowledge axis, it was established by the Gauteng Government as a concept in 2001and incubated at the CSIR between 2001 and 2005, during the infrastructure construction phase, before being operational in its current location in 2006. The Innovation Hub is managed by The Innovation Hub Management Company ("TIHMC"), a subsidiary of the Gauteng Growth and Development Agency[9] established under the Gauteng Department of Economic Development. TIHMC is also responsible for the implementation of the GIKES, 2012.

TIHMC's core business is to **establish and manage an enabling environment and initiatives to support innovation, enterprise development and human capability development, in targeted sectors, in order to contribute towards growth of Gauteng economy, creation of decent jobs and poverty reduction**.

TIHMC has established mechanisms, as detailed in **Section 4** below, to foster collaboration with the private sector including SMEs, national and provincial government as well as local government which includes the three metropolitan municipalities located within a 60km radius of The Innovation Hub, to ensure that innovation plays a role in government service delivery within the province as well as supporting the competitiveness of firms.

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[6] Drucker, P.F. (1985) *Innovation and Entrepreneurship Practice and Principles*, Harper & Row, New York
[7] www.up.ac.za
[8] www.csir.co.za
[9] www.ggda.co.za

4. FOSTERING INNOVATIONS FOR A SMARTER, GREENER AND MORE EFFICIENT CITY-REGION

According to the OECD Territorial Review of Gauteng[10], *"innovation in South Africa is hampered by low levels of entrepreneurial activity, when compared to both advanced and developing countries"*. In addressing this challenge, the Innovation competitions and open innovation platform being implemented by TIHMC to stimulate innovation and build innovation linkages, are closely linked to enterprise development and incubation programmes run by The Innovation Hub. The specific focus has been on growing mobile and green economy innovations and technology based companies in the province and South Africa.

TIHMC has identified enterprise development based on inclusive innovation as an important tool for ensuring the relevance of science and technology parks in developing countries. When coupled with innovation stimulation and linkage initiatives, incubation programmes are important tools to support local government priorities and ensure infusion of innovations in the public sector. A successful mix of innovation stimulation and networking initiatives coupled with a comprehensive enterprise development programme strengthen STPs contribution towards growing the economies of the regions in which they are located. In addition, such a mix has the potential to foster the creation of clusters within the STPs and surrounding areas.

4.1 Gauteng Innovation Competition / Gauteng Accelerator Programme

In 2012, following the adoption of GIKES in 2012, TIHMC launched the Gauteng Innovation Competition with a specific focus on stimulating service delivery innovations in the mobile information and communication technology (ICT) and Green Economy sectors. This has now been rebranded as the Gauteng Accelerator Programme (GAP: ICT/Mobile and GAP: Green). This initiative sought to address the problem of generally low entrepreneurial activity[11] as well as source innovations that could be nurtured and piloted to address service delivery challenges within the public sector, whilst creating sustainable new enterprises.

The competition process involved the identification of focus themes in consultation with representatives from municipal government, who then also formed part of the project advisory committee and adjudication panels. Following a public call for proposals, a number of submissions were received and screened to identify top innovations with potential for proof of concept, piloting and scalability. These are summarised in Tables 2 and 3.

Some of the innovations in **Table 2** have formed the basis of start-up companies which are being incubated at the mobile applications laboratory (mLab) and Maxum Business Incubator at The Innovation Hub. eGov Connect, Vela Tsotsi, Gov+Me and Mobiguard are all currently being supported in the development of prototypes, for piloting within target communities. GoMetro has been implemented at South Africa's urban passenger rail company, Metrorail. Discussions are at advanced stages to use this as the basis for a province-wide intermodal transport management and passenger information system, supporting local government and Gauteng Provincial Government's 25-Year Integrated Transport Master Plan objectives.

Sowertech, the startup company behind Q-tools which is currently being piloted with a training company in Gauteng, has since developed a mobile application called AftaRobot, a USSD and Android-based application that allows minibus taxi commuters to view arrival times and occupancy of minibuses on their route, as well as enabling the management of minibus operations by owners and queue marshals at taxi ranks. This application is currently being piloted on one of the busiest minibus taxi routes in South Africa

[10] OECD (2011)
[11] OECD (2011)

Table 2: Summary of Top Innovations in GAP: ICT/ Mobile theme

ICT / Mobile Innovation	Brief Description
Web Text Simplification	A patented technology that automatically simplifies any mobile web text, enabling people of different reading levels to communicate with government easily
Police Vehicle Verification System	Use of mobile phone to automatically log interactions between police and driver when a car is pulled over, allowing road users to verify the legitimacy of a police stop
eGov Connect	Pulls citizen-government communication, fault reporting and social media into a unified user experience, enabling easy interaction with public officials
TrafficMapp	Combines cellphone location-based knowledge, a mobile application, and traffic modeling algorithms to give all citizens access to a traffic prediction tool on their handsets
'Wellness TV' & Mobile Q&A Interface	Enhances the 'Wellness TV' channel currently broadcast in public clinics by allowing people to ask questions via their mobile phone and see answers on the screen
Gov + Me	Uses mobile location information to connect citizens with government information specific to their area of residence
MobiPad Dispenser	Allows women to purchase napkins and pads from dispensers situated in public facilities using their mobile phone
Vela Tsotsi	Allows people to report crimes anonymously using a USSD-based application which informs the police about incident details such as the place, type of crime and number of assailants
Mobiguard	Uses location information on cellphones to reduce the response time for emergency services and automatically assist users to avoid and exit dangerous areas
Infomerger Community	Enhances an existing community interaction platform by enabling the mobile reporting of incidents and issues, and expanding access to useful statistical analyses in the form of charts, maps and timelines for planning
Q-Tools	Mobile training application to enable continuous reinforcement of learning by public officials through intuitive exercises whilst inside or outside of the training room
GoMetro	A mobile platform that integrates different real-time data into a meaningful and personalized experience for public transport users, delivering personalized, relevant, real-time public transport arrival and departure information.

GAP prize money comprises a cash award and seed funding amount to enable the entrepreneurs to establish a start-up company and develop a prototype for their ideas. A specific requirement to access the seed fund portion of the prize is that the entrepreneur must actively participate in TIHMC and mLab pre-incubation programmes, where they also receive mentored business plan development support. GAP: ICT/ mobile takes advantage of South Africa having *"one of the highest users of mobile technology and mobile social networking on the continent"*.[12]

Of the Green innovations shown in Table 3, Handy Power Chargers has been the basis for the establishment of a start-up company, Nabidi which has in addition to the prize money, also received additional seed funding from TIHMC's Start-Up Support Programme. This technology also addresses the issue of inclusivity in respect of the green economy or climate change, as it can easily be deployed to areas with poor infrastructure.

Another start-up company is being established for the Smokeless Coal concept. The development of this innovation has potential for rural upliftment and empowerment. As with the Number One Button, TIHMC is in discussions with local government for large-scale piloting of this technology.

[12] Berger, G., Sinha, A., Pawelczyk, K. South Africa mobile generation: Study on South African young people on mobiles, UNICEF, 29 May 2012, available at www.unicef.org/southafrica/SAF_resources_mobilegeneration.pdf (last accessed 21 May 2013)

Table 3: Summary of Top Innovations in GAP: Green theme

Green Innovation	Brief Description
Mellowcabs	High-tech, electrically assisted human-powered vehicles that facilitate first and last mile transport solutions in a variety of contexts
SavvyLoo	An easy to assemble, easy to clean, safe, odourless, low cost, waterless toilet which is a sustainable alternative to polluting water through waterborne sanitation and pit latrines
Landfill Waste to Bioethanol	A commercial cellulosic bioethanol plant utilising acid mine drainage waste, soft agricultural waste and landfill mass as input to generate ethanol as an output for the medical, fuel, and cosmetics sectors
Solar Powered Aquaponics	Integration of three different technologies (aquaculture, hydroponics and solar power generation) to produce high-quality vegetables and fish in a soilless environment
Low Energy LED Lighting	Locally designed and developed LED lights which are drop-proof with very low heat emission, designed for solar or low-power environments such as informal settlements and rural areas or on-grid replacements
Handy Power Chargers	Kinetic chargers that are simple and affordable plug-in solutions for keeping laptops, desktops, cell phones, lamps and radios working when there is no electricity
Smokeless Coal	A combination of waste coal, clay and water to produce a smokeless energy source which burns for longer than normal coals
The Leak-Less Valve	A mechanism that can be easily retrofitted to existing toilets within low-cost housing developments to reduce installation on existing toilets and stops the entry of water into the cistern when a leak is detected
Water Purification & Conservation	A portable water treatment plant that converts raw water into high quality drinking water and includes a mechanism to ensure that only a controlled amount of water is released at one time, preventing wastage
Number One Button	A low-flush mechanism that can be easily retrofitted to existing toilets in low-cost housing developments to reduce water usage
Waste-to-Energy Plant	Combined Turbo Compressor and Turbo Generator units, using waste heat produced from woody biomass to generate 0,2 to 2 MW per unit electricity, allowing total plant potential up to 20 MW
Grid cars	A peddle assist or pure electric bicycle platform with applications in both urban and rural settings

Savvyloo has been developed by a start-up company in collaboration with a local university, and this innovation was subsequently a top 10 finalist in the 2013 Innovation Prize for Africa 2013. One Green Engineering is the company behind the Waste-to-Energy plant technology and has now produced a working prototype that will be used for demonstration purposes. They continue to work closely with another local university to improve efficiencies and prepare for the development of a commercial prototype.

The innovations and start-up companies emerging from GIC/GAP are oriented to improving the lives of citizens living on lower-income areas of the province by seeking low-cost ways for sourcing and contextualising information and managing energy and water usage. In many cases the innovations are being developed by entrepreneurs from these communities, emphasising the potential importance of endogenous innovation.

4.2 Open Innovation Solution Exchange

In 2012 The Innovation Hub launched a pilot Open Innovation Solution Exchange ("Solution Exchange")[13] with the aim of connecting 'Solution Seekers' or innovation consumers in industry and government with 'Solution Providers' or innovation producers in the form of researchers at universities, research institutes, SMMEs and in some cases, established businesses. The Solution Exchange is a virtual platform on which Solution

[13] http://www.exchange.theinnovationhub.com/site/ (last accessed 4 June 2013)

Seekers post detailed 'Challenge' briefs outlining specific problems to be addressed and then gather responses from prospective Solution Providers.

The rationale behind the Open Innovation Solution Exchange is anchored in GIKES, 2012 which suggests that open innovation can play a key role in increasing community participation in, and application of innovations, to address social issues. This concept evolved and was ultimately conceived as a broader demand-driven innovation project aimed at connecting emerging entrepreneurs and innovators with well-defined business opportunities in the form of Challenges. The virtual platform is open to all citizens and supported by on-the-ground workshops and promotion of Challenges at The Innovation Hub Science Park, through telephone calls, community media, and targeted emails. Responses to challenges are filtered and packaged for the Challenge owners. As an innovation mediation platform the Solution Exchange enables inclusive innovation and development by reducing the cost and increasing the trust associated with engaging with large numbers of smaller entrepreneurs, and creating a new channel for innovators to present their ideas to an often reluctant audience.

TIHMC has sought to develop an active community around Open Innovation and this requires a critical mass, diversity and momentum of Challenges to sustain interest from Solution Providers, which then increases the probability of innovative responses and value for Challenge owners in a virtuous circle.

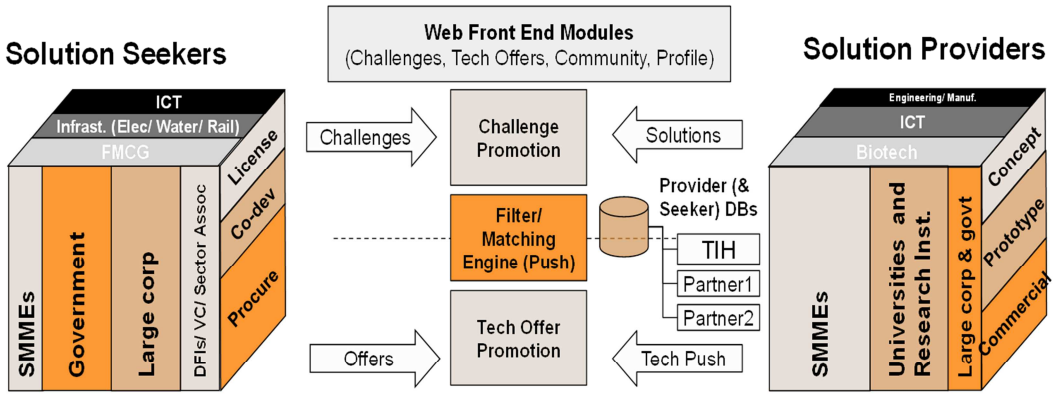

Figure 5: Conceptual model for The Innovation Hub (TIH) Solution Exchange

The Challenge process used in the pilot followed a similar to that adopted by Innocentive[14], NineSigma[15] and other Open Innovation intermediaries.[16] This involves four main actions: Challenge definition, promoting the Challenge within solution provider networks, evaluating responses to the Challenge, and contracting with the solution provider.

The pilot was guided by a multi-stakeholder advisory committee including representatives from the municipalities in Gauteng, and the six Challenges posted on the platform during the pilot were sourced from a mix of sectors. The Challenge owners comprised the City of Tshwane (one of the three Metropolitan Municipalities in Gauteng), Sappi (multinational paper and pulp company whose research centre is located at The Innovation Hub), Transnet (a State-owned public entity responsible for rail

[14] www.innocentive.com
[15] www.ninesigma.com
[16] Lüttgens, D., Antons, D., Pollok, P., and Piller, F. 2012. *Implementing Open Innovation Beyond the Pilot Stage: Barriers and Organizational Interventions*. RWTH-TIM Working Paper, RWTH Aachen, Technology and Innovation Management Group, Germany, 1-24

transportation), an SAPS (South African Police Services) branch in the City of Johannesburg, the CPSI (Centre for Public Service Innovation, a government agency responsible for stimulating innovation within the public sector), as well as an anonymous challenge owner.

Using the classification in Figure 6[17], the challenges can be mapped according to the specificity of the task (more specific challenges are likely to draw fewer responses as the boundaries are more clearly defined) and the required degree of elaboration of user input (more detailed technical requirements are likely to draw fewer responses as a more detailed understanding of the problem is needed).

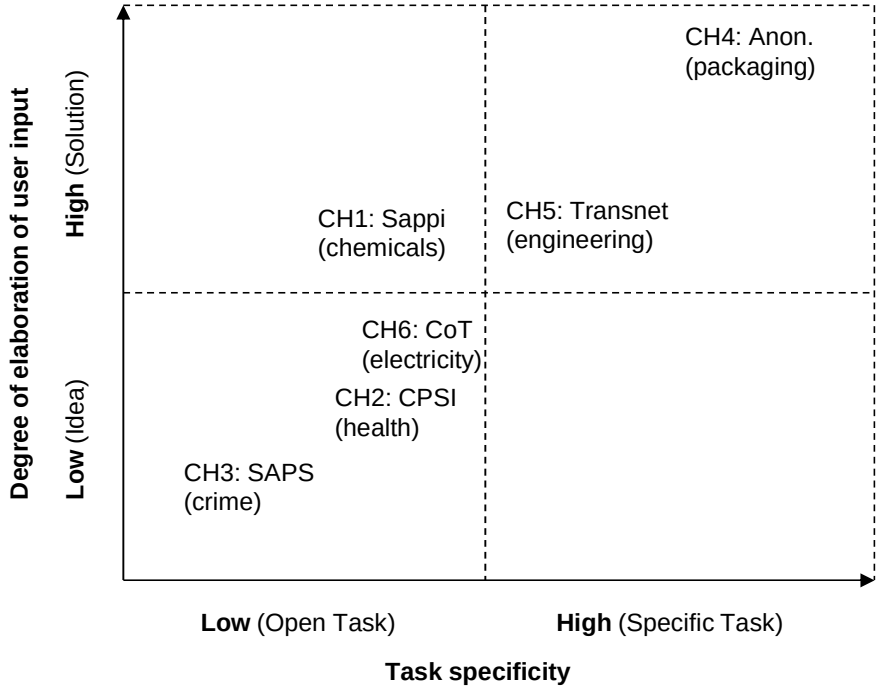

Figure 6: Mapping the types of Challenges on the Solution Exchange

CH1 and CH4 in the figure are more industry-oriented Challenges. The Sappi challenge (CH1) was relatively open in seeking proposals to co-develop downstream products using fine chemicals coming from their woody biomass or pulp mill processing streams. However, there was an expectation that the responses would be detailed enough to convey the size and type of market opportunity that the solution providers were looking to exploit. In contrast, the Anonymous challenge (CH4) was more specific in its requirements in seeking proposals for intelligent packaging of fruit and vegetables that adhere to clearly defined temperature and time limits.

The Transnet challenge (CH5) had a stronger public benefit orientation in looking to prevent accidents at railway crossings. However, the solution needed to comply with technical standards set by the rail industry with similar specificity to CH4. The SAPS challenge had a more explicit focus on improving the lives of citizens in marginalised areas in seeking to improve the detection or reporting of crime in informal settlements. Finally, the City of Tshwane sought to reduce revenue leakage through illegal meter bypass on the electricity network.

As far as possible the Challenges were presented in an open, accessible language to increase opportunities for innovation from 'adjacent' sectors which may not use the same terminology as the target sector; but also to encourage a more diverse community

[17] Piller, F. and Walcher, D. 2006. Toolkits for idea competitions: a novel method to integrate users in new product development. *R&D Management*. 36, 3, 307-318

of potential innovators to participate. At the same time Challenges needed to be specific enough to ensure that the real problem is being addressed.

In recruiting Solution Providers, a key aspect of the platform was the 'activation' of the local research and innovation community in Gauteng to respond to challenges. Although the focus of the platform is on promoting regional economic development and creating opportunities for the local innovation community, rather than placing negative restrictions on where responses to challenges could come from (and potentially frustrating Solution Seekers looking for the best solution), a more positive campaign approach focused on enrolling and empowering researchers, inventors, and innovators around The Innovation Hub and across the Gauteng region. In addition to social media, electronic newsletters and advertising to tens of thousands of readers, the campaign included public workshops at The Innovation Hub in which the first six Challenges were presented to an audience of more than one hundred potential Solution Providers. Potential Solution Providers were also invited to meet with the project team at The Innovation Hub to clarify challenge requirements and get assistance with the response process.

The initial packaging of solutions was conducted by the project team with support from sector specialists, and was based largely on the criteria defined in the challenge brief. Importantly, the challenge owner then managed the process of procurement which differed significantly between public and private Challenge owners. For public sector institutions, the piloting and adoption of innovations is often limited by established procurement rules and a somewhat risk averse culture within government departments. This project has sought to manage the transition to procuring innovation by encouraging participation from supply chain officials at an early stage of the process and aligning the open innovation process evidence to public procurement rules. The responses received for each Challenge are summarised in Tables 4-6 below.

Table 4: Challenge responses – maturity of response

No.	Sector	Total	Concept	Proto-type	Commercial
CH1	Chemicals	6	2	1	3
CH2	Health	24	6	9	9
CH3	Packaging	4	2	1	1
CH4	Crime	12	2	9	1
CH5	Engineering	12	4	2	6
CH6	Electrical	10	4	4	2

Table 5: Challenge responses – type of entity

No.	Sector	Total	SMME	Univ./ RI	Large corp.
CH1	Chemicals	6	4	1	1
CH2	Health	24	23	1	0
CH3	Packaging	4	2	1	1
CH4	Crime	12	10	2	0
CH5	Engineering	12	8	1	3
CH6	Electrical	10	10	0	0

These tend to align with the expectations from the Challenge mapping above which suggests the more technical, clearly specified challenges draw fewer responses (CH1 and CH3), and the large numbers from Gauteng reveal point to the focus of the campaign

effort (as well as the concentration of innovation resources in Gauteng). Relatively few responses were received from citizens or communities, suggesting limited local inclusion, although the proportion of SMMEs is high pointing to relatively accessible Challenges.

Table 6: Challenge responses – location of response

No.	Sector	Total	Gauteng	West Cape	Other
CH1	Chemicals	6	4	1	1
CH2	Health	24	21	1	2
CH3	Packaging	4	4	0	0
CH4	Crime	12	9	2	1
CH5	Engineering	12	9	2	1
CH6	Electrical	10	8	0	2

Going forward, it will be critical that The Innovation Hub (through the Solution Exchange) more effectively brokers the codification and exchange of knowledge between South Africa's traditionally fractured social and economic groups.

The pilot virtual platform demonstrated TIHMC's ability to play a key role in both extending the reach and openness of innovation through electronic media with potential for growth amongst the youth through social and mobile media as well as in supporting future online collaboration as a way to reduce the cost of interaction and barriers to participation. However, it is recognised that communication around complex topics or 'radical' innovations is dependent on more tacit exchanges of knowledge which are not easily supported in a virtual environment[18]. Face-to-face interaction is also an essential final part of any procurement of solutions in order to establish a degree of familiarity and trust, to ensure that specific and confidential information is exchanged. The public workshop hosted at The Innovation Hub to present the challenges to potential solution providers gave both sides a chance to meet in a relatively informal setting, thereby complementing the virtual process.

Challenges posted on the current Solution Exchange are visible not only to local but also to global actors and a number of enquiries were received from international solution providers. In a number of cases, a local partner of an international vendor was proposing a solution that integrated both local and international IP and skills. As noted above, a decision was made not to limit the responses to Gauteng but rather focus on activating (and through incubation, equipping with knowledge and technical skills) the provincial solution provider community. This approach runs counter to more protectionist models that could undermine the long term competitiveness of local companies, and aligns with Torkkeli et al[19]who suggest that, to *"counter the limiting, 'regionalising' effect of high levels of public contribution on SMEs, the regional open innovation system should be designed from the outset to extend itself also to actors and networks, perhaps other regional open innovation systems, outside the region"*. By supporting local SMMEs, whilst encouraging engagement (through collaboration, but also competition) with external actors, the incentives and opportunities for accessing new knowledge amongst SMMEs is higher, leading to more sustainable growth.

Within the public sector there are nonetheless certain preferential procurement conditions which may favour local providers or require that global solution providers partner with a local company. From a platform design point of view, TIHMC is looking at facilitating matchmaking between global providers and suitable local partners by

[18] Lundvall, B.-Å. 2010. *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning*. London: Anthem Press

[19] Torkkeli, M., Kotonen, T., and Ahonen, P. 2007. Regional open innovation system as a platform for SMEs: a survey. *Int. J. Foresight and Innovation Policy*. 3, 4, 336-350

supporting certification and secure exchange of limited intellectual property (IP). The process may also be reversed by matching local companies looking to respond to a challenge with a global technology provider who would be willing to license or co-develop IP around the challenge.

5. TOWARDS AN ENABLING INNOVATION ECO-SYSTEM

A number of lessons have been learnt from the implementation of the above initiatives. The sourcing of the innovations inevitably must be an inclusive process that taps into the networks of partners within the national and provincial innovation systems. In ensuring commercialisation of each of the innovations identified from the GAP competition, it became clear that our role as an STP was to ensure an enabling innovation eco-system that would understand the nuances of implementation of innovations in government, cities / municipalities as well as in society at large.

A holistic innovation support and enterprise development programme needs to be implemented through an integrated eco-system approach. In our case, both initiatives detailed above, involved extensive consultation with all spheres of government, private sector and the community of knowledge workers and generators. There was a realisation that for effective implementation of any government service delivery, local government or municipalities would have to be engaged through partnerships that seek to understand their challenges whilst at the same time demonstrating potential benefits of innovation to them. In this regard, the City of Tshwane has now established a Research and Innovation Unit that is working more closely with TIHMC. The City of Johannesburg has been an important partner in respect of defining ICT / mobile related challenges and as a key stakeholder in the competitions, as well as improving insights into implementation of potential innovations in local government as part of Smart City initiatives. The Ekurhuleni Metropolitan Municipality has been partnered with TIHMC on these programmes and in further refining and supporting green innovations to be piloted in the metropolitan area.

In implementing GAP and the Solution Exchange, the importance of seed funding as an enabler to drive the prototyping of innovations has been important, as there is lack of funding in terms of the thresholds typically required by innovators and entrepreneurs wanting to produce a prototype. Most available funds are in excess of ZAR1m per concept. By establishing a seed funding mechanism, the Start-up Support Programme, TIHMC has also been able to strengthen its positioning within the innovation eco-system and be regarded as a pipeline generator for the more established public and private funds, thereby accelerating the development of early-stage concepts to commercial viability.

The place-based anchoring of the virtual Solution Exchange, in addition to learning opportunities associated with the 'cluster' environment of spaces within The Innovation Hub such as the mobile applications laboratory ("mLab"), and the role of the public workshops in building trust and supporting tacit exchanges, highlights the importance of physical proximity as an enabler for the platform. Here we recognise the importance of both local 'buzz' and global 'pipelines'[20]. For developing countries, these pipelines are well-supported by a virtual platform and may include relationships with multinational enterprises but also accessing in diaspora in developed countries who are often sympathetic to the cause of their home regions, and can play an important role promoting local technologies in global markets.

When it comes to the adoption of innovations emerging from the above process by Challenge owners, adopting new technologies or processes can have significant benefits, but the cost is relatively high when collaborating with small innovators due to their inexperience with delivery. Given these challenges, an incubator and seed funding play a critical role in developing attractive concepts or prototypes and start-up companies to a level at which they can deliver innovations reliably, and have the business skills to support adoption and minimise administrative costs for the user company.

[20] Cumbers, A. and MacKinnon, D. 2004. Introduction: Clusters in Urban and Regional Development. *Urban Studies*. 41, 5-6, 959-969

6. CONCLUSIONS

The experiences of The Innovation Hub demonstrate that a successful mix of innovation stimulation and networking initiatives coupled with an intensive enterprise development programme ensures that science and technology parks can contribute towards the stimulation and implementation of innovations by emerging local entrepreneurs, thereby growing the base of endogenous innovation, supported by the exchange of knowledge with external innovation consumers and external technology partners, as well as enhancing the prospects of creation of clusters within the parks, and ultimately building a credible pool of solution providers for local government. In this way, an STP in a developing country can support inclusive innovation, economic participation, reduce unemployment levels and ensure that local government is able to deliver services in a sustainable way with maximum social impact.