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## house4hack: STIMULATING TECHNICAL AND PRACTICAL INNOVATION FOR SOCIAL GOOD<sup>1</sup>

*How can we stimulate more active involvement and valuable partnerships in creating more relevant mobile apps, engineering or other technical artifacts for South Africa and Africa?*

John Burger, the founding member of house4hack, despite his passion for social good using practical innovation, was fully aware of the cost of getting people and organizations actively involved in social enterprises. The successful electrical and electronics engineer with a number of academic (PhD and Masters – cum laude) and corporate accolades (executive in a top firm) had already been at the top of the corporate ladder. But despite the success, his stronger desire to see South Africa become a net producer of IT and technical artifacts rather than a net importer had led him to rethink his entire life strategy. After deep discussions on the merits of free and open source software development with two friends, they decided to start house4hack as a non-profit organization. The main purpose of house4hack was to provide an innovative environment, a *hacker space*, where members could conceptualise and create innovative technical artifacts which are well suited for the South African and African environment. The emphasis of house4hack was on making available technical equipment and working space so that members had an environment in which they could experiment and develop technical artifacts. An example of a technical artefact that emerged from house4hack is Robohand. Robohand is a mechanically driven artificial hand printed using 3D technology. Robohand has depended exclusively on donations to develop and distribute artificial hands to people who cannot afford them, such as in the war torn areas of South Sudan.

It was now three years since house4hack started. The hacker space was exciting, new ideas and opportunities kept emerging at the Tuesday meet ups where members and visitors networked and collaborated on new techniques or technology they had come across. But despite the liveliness, there were some key questions and critical decisions on John's mind:

1. How do we get more people involved in creating artifacts?
2. Where do we find seed funding to support house4hack?
3. Are we serving Africa well enough with relevant artifacts?
4. Am I falling right back into the corporate work lifestyle trap?

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## Hacking, The Hacker's Manifesto, and The Hacker Space Manifesto

For many people, the concept of hacking is first picked up from movies and from news media. The image projected of a hacker is often of a super-intelligent young person with unkempt hair, working in a dark room, living off energy drinks and 5-day old or near-rotten pizzas. The hacker is heart-and-soul absorbed on a computer keyboard doing nothing but infiltrating people's or government security systems without their knowledge.

That is the general public image of the hacker and what hacking is all about. Hacking in public discourse generally carries the sense of breaking into systems and doing something without authorization. That image of hacking is not altogether true. Crackers, and not hackers, are the ones who carry out illegal and unauthorized infiltrations on systems. Hackers are different. Hackers are stimulated by curiosity and creativity, and the challenge of extending the technical capabilities of what exists. Hackers often form alliances and compete against one another, their main incentive being winning a challenge. In fact, the popular *The Hacker Manifesto* which inspires many hackers was created by a hacker who had been arrested by the FBI for hacking into bank and phone systems. Exhibit 1 shows the hacker manifesto. The hacker manifesto stirs within hackers the core spirit of curiosity and adventure.

*The Hacker Space Manifesto* extends the spirit of hacking to provide for a physical space where hackers can express themselves through creating new technologies in an open and free environment. Exhibit 2 includes The Hacker Space Manifesto upon which house4hack was founded. When hackers formally meet in an organized manner to accomplish a specific task, it is called a hackathon.

## Hackathons and app development in South Africa: RHOK (Random Hacks of Kindness)

A hackathon is an event of intensive collaborative software development to create a software solution to any challenge within a short time, usually between 24-72 hours. In some cases, such as in house4hack, hardware was encouraged to be used as part of any hackathon. Typically, the developers would meet with non-developers who understood the challenge (or opportunity) and its context, and together create a solution to the problem. To stir up enthusiasm, the specific challenge was usually kept a secret until the day. The challenges came from different sectors as diverse as business, not-for-profit organisations and even government agencies. The owner of the challenge would pick up the softer side of the hackathon such as providing refreshments, a physical space, prizes, and others of the like.

One of the most popular hackathons was organized by a group under the global RHOK (Random Hacks of Kindness) initiative. The mission of the RHOK is to "create a self-sustaining global community of innovators building practical open technology for a better world, and to ensure their work creates impact in society". In South Africa, cellphone access exceeded the 100% mark in 2012, making the cellphone the practical IT platform. The RHOK group in South Africa therefore predominantly focused on creating mobile apps for social development and humanitarian challenges.

Mobile apps are small pieces of code which are written to run off a mobile device. There were four dominant smartphone device platforms in South Africa in 2014: BlackBerry, iOS (from Apple), Android (from Google), and Windows 8 (from Microsoft). In 2012, BlackBerry enjoyed more than 60% of the mobile device market in South Africa but had since suffered the same challenges it faced globally. Nonetheless, BlackBerry devices still enjoyed the greatest market in South Africa mainly because of their affordable monthly unlimited internet package. Because of the BlackBerry market challenges, Apple and Android devices (especially the Samsung brands) were seeing an increased South African market share. The Microsoft Windows 8 market was only beginning to pick up pace.

It was usually the same names involved in organizing hackathons in South Africa, and it was also mostly the same hackers involved in most of the hackathons. The majority of hackathons were held in South Africa's three largest economic cities: Johannesburg (and Pretoria), Cape Town, and Durban. The hackathons were often done as partnerships between industry, government, international donor organisations (e.g., Google, Microsoft, World Bank, the UN, IBM), academia, and social / not-for-profit organisations. It was the same people one would find on the Tuesday meet ups at house4hack. It seemed that the hacker community in South Africa was not very large after all.

### **e-Skilling South Africa (iNeSI)**

The South African government, like many other governments in the world, recognized the technical skills gap in the science, engineering, and IT sectors. The two areas were as such part of the scarce-skill areas where the government was willing to import skilled workers. There was a history to the technical skills shortage in South Africa.

South Africa is located at the southern coast of Africa (Exhibit 3) and by 2014 had one of the highest rates of income and social inequality in the world (Exhibit 4). The UNDP indicators of development were in sharp contrast to the more familiar development indicators of the World Bank based on the Gross National Income (GNI) per capita. The World Bank considered South Africa as an upper-middle income economy with a GNI per capita of US \$12,240. The United Nations, which measured development in terms of a broad view about the quality of life, placed South Africa as a medium developing country, ranking at 122 among 187 countries.

South Africa had one of the highest economic and social disparities in the world with a semblance of two economies: a highly developed economy where middle and high income individuals lived in environments with world class infrastructure, and a highly underdeveloped economy where many lived 'below the poverty line' of \$1 in despicable conditions. These disparities were manifestations of the apartheid history that shaped South Africa.

In apartheid the all-white government had consciously enacted and actively implemented repressive and discriminatory policies of legalized and forced segregation between races. Segregation spanned all levels of society and governance; from where a person was allowed to walk to the type of education he received. Segregation meant that areas which were purposed for whites (10% of the population) were developed significantly while those meant for Africans, called Bantustans, received very little attention. Apartheid also forcibly resettled many Africans from their ancestral homes to Bantustans. It was estimated that 3.5 million people were resettled between the 1960s through the 1980s. In terms of education, apartheid mandated that the African majority (80%) was not allowed to study science related subjects such as mathematics, chemistry, or physics but rather attempted to force Africans to learn the Afrikaans language in order for them to become better employees. Many ascribed the technical skills shortage today to the apartheid era.

Despite the great strides that had been made in the educational sector to date, South Africa had over the last few years been losing its international ranking in terms of its e-readiness compared with other African countries such as Kenya and Nigeria. E-readiness (in other literature networked readiness, or digital readiness) refers to the degree to which a country is ready, able, and willing to realize the benefits that accrue from investing in IT.

Hence, in a bid to stimulate job creation and increase the internal capacity of technical, engineering, and IT skills, the government had tasked a number of government agencies to consider how to spur these skill sets. In particular, the government had tasked the iKamva National e-Skills Institute (iNeSI) with the

challenge of promoting an e-literate society that could harness the power of ICT within the unique socioeconomic developmental context of South Africa.

iNeSI had since sponsored a number of hackathons and the creation of application factories across South Africa in a bid to increase the number of app and software developers. iNeSI defined an application factory as an innovative space in which apps and software development could be stimulated, and from where graduates could go on to establish themselves as entrepreneurs and job creators in the IT market.

### **The Economics of house4hack**

The operations of nonprofit organisations may appear the same as profit making organisations yet the way each treats surpluses or deficits from revenue is legally different. The main difference is that the owners of nonprofit organisations may not take or share in any profit that arises from the revenues but must re-invest the profit towards the goals of the organisation.

John did not take any income from house4hack, he actually used his personal funds as seed capital to start up the organisation. As a way of generating revenue to sustain the running of the house, (these expenses included paying a worker to clean up once a week, the rent, light, water, and municipal bills), house4hack rented out space to entities which emerged from members, or entities which shared the same vision of open innovation. Some of these entities were commercial while others were not.

A commercial example is MicroSmart which specialized in the *internet of things*. Internet of Things refers to the interconnectedness of the embedded hardware in automated devices over the internet. MicroSmart specialized in integrating hardware, embedded hardware, software and enabling easier decision support. One of the more successful creations of MicroSmart was interconnecting the intercom systems in gated communities with the cellphones of the owners.

An example of a noncommercial entity is Robohand (see Exhibit 5). Robohand began when the founder, Richard, lost all the fingers of his right hand in a woodworking accident. Richard embarked on a journey of creating a device to replace his fingers before finding out how prohibitive the costs are. With assistance from a partner in Europe, and the donation of 3D equipment, Robohand was born. Robohand had received good media publicity, won the Rockefeller Innovators Award, and had exhibitions in the Science Museum of London and the Youngstown museum. Robohand now assisted people to create affordable replacement fingers at cost.

The two other entities that were run out of house4hack were 3D printing and the Quadcopter. Quadcopter specialized in making unmanned aerial vehicles (UAVs) such as drones. There were individuals who also used the house4hack office space while starting out as entrepreneurs. Many of these were mobile app developers.

Training was offered occasionally to individuals who would like to become members and participate in creating practical innovations. Some example trainings offered were on embedded hardware, 3D printing, and Android app development.

One of the objectives of house4hack was to stimulate the creation of new companies. For example, another 'internet of things' company would soon be groomed at the largest incubator in South Africa, the Innovation Hub. The partnership house4hack had with Innovation Hub generated some income.

There had been one corporate sponsor who had picked up some operational costs such as the rent, high speed internet access and contributed towards some infrastructure acquisition. However, the sponsor had been purchased by another company, and that purchase had led to the end of the sponsorship. The

withdrawal of sponsorship however had worked out favourably: house4hack needed to become entirely self-funded.

*“The advantage of this is that it forces us to depend on ourselves rather than external funding. There is not a lot of funding for seed funding in South Africa. The principle is that if we can self-maintain, we will live.”* retorted John.

John considered there were challenges of getting a venture capitalist to invest in house4hack.

*“If you can make 3 million (about \$300,000) you can take it to 30 million. VCs (venture capitalists) know that if you can prove yourself with 3 million, you can take the business to 30 million. So why get a VC to take away our effort when we can bootstrap and do it ourselves?”*

But because house4hack was self-funding, it meant John had to spend a great deal of time consulting. The money he made from the consulting jobs, he used to build his own products. So he often had to stop and ask himself some critical business questions:

*“Where are we? Are we serving our customers? Are we investing in our products?”*

All operational costs were therefore now met by the companies that rented out space in the premises. One of the business mandates of these companies was to help keep the house economically afloat.

## Being African

John was an evangelist in the ability of South Africa to create many new technologies that suited its local conditions better.

*“... only Africans understand African conditions - only South Africans understand South African conditions... South Africa is a net importer of IT and as a result IT in South Africa is mainly a support function. We do not make IT... we have all the skills we need... we should not be importing the technology, we can make it ourselves here better than anyone in the world”* says John. *“There is an excellent military industrial complex that may be fading but the brilliant minds are still in South Africa... is it possible to get such minds and brains in South Africa excited about this?”*

*“We already have the skills but there is the facade that people from other places are better. Being pro-African means enabling people to believe that we are as good as the next guy - and if we put in the effort, we can do similarly well. By getting more people get involved and playing with the technology, they can get the skills upgraded and build their own drones. The tech is not terribly... (un)understandable. Open hardware tech, free education online and open source technologies are enabling more of us have access to things and knowledge and skills. With such free things and open platforms, there is nothing stopping us from doing things as well. Our emphasis is on self-emancipation. For every person who makes a company, there are as many families and jobs created. We only need to teach and empower people. A lot of technology such as the drones is not that complicated and yet these overseas companies come to South Africa and sell it to us for millions of dollars which can be made here for thousands alone... by marketing to large government agencies and large firms, they are able to make sales and the money exits South Africa.”*

John felt frustrated as to why South Africans continued to watch money flow from South Africa to Europe, USA, and China – “... *nothing stays here and that is really crazy*”.

## **Stirring up activism**

A number of activities had been attempted to get more people involved.

Initially he and the founders went to existing developer user groups such as Python and Google. At the user groups, the concept of a free, open, and innovative space had been introduced to the users. Some had participated. The hack4house founders had also participated in competitions. The attitude was that winning a competition immediately told people that there was something that was practically being done and house4hack was not all talk. House4hack members had since won many of those competitions, often coming in first or second place. The other advantage of participating in the competitions was that winning also brought in some money.

There was a blog which was kept alive with new content. Every time something interesting was done, it was posted. There were high visibility sites that pointed to house4hack. The links had increased the site's internet presence and credibility. The high visibility sites included Hack a Day, IT Web, myBroadband (big international and South African brands), which visibility gave house4hack more credibility and drove more traffic to them. The sites told readers and followers what house4hack was doing. The added advantage of having such leading sites point at house4hack meant that the *PageRank* at Google and other search engines was increased. *PageRank* is an algorithm used by Google and other search engines to determine the search engine ranking.

Some other means that had been used to increase user involvement was the use of the public media such as the free-to-air public national TV broadcaster and a South African pay-TV station.

John and the members also participated and organised training. The training that was done was often offered for free, and if there was a cost involved, it was only to cover the costs of setting up the training or providing snacks. Sometimes the training was very important and a specialist needed to be drawn in to talk on the new technology. That extra need sometimes cost money. For example, when training on creating drones, specialists were needed to do those demonstrations.

*“I participate a lot in hackathons and give talks and demos wherever I can”* John remarks.  
*“It is difficult to stir up the enthusiasm because we depend mainly on volunteers and individuals in their private capacity.”*

## **The rat race**

Running a nonprofit may not be as demanding as a commercial entity but it still requires a great deal of personal investment. One of the reasons John had left the corporate life was because he had reached a point where he expended most of his waking time working for what did not feel like it was adding real value.

*“Are people valuing my time - for example I sometimes have to wait 5 hours for a meeting - this is 5 hours which has been stolen! Why should I do business with someone who does not value my time and steals my time? Time with my family is important to me.”*

The biggest trigger that got John to leave the corporate life had centred on time and the way corporations assign value to individuals based on external monetary measures.

*"In the corporate world, time is not valued as yours but belongs to the company. The expectation is that my time belongs to the company. There is this general belief that a company is more than an individual. This means that the individual's time is subordinate to the company's time. The company rules all, and effectively owns the individual. The company takes away people's time, their freedoms, their ability to act, the ability to influence themselves and their environments. The trap part comes with the money! Because the company has your time, they can milk you and feed it to you. And you can never leave because you are now used to a certain lifestyle and income stream every month. You can never leave. The challenge is that after sometime, you start to believe that this is the reality. That this is the only possible reality. But this is not really true, there is a whole other world. When I left I was scared - I thought it was going to be the most scary thing but it was actually the most liberating thing. I began to realise my own worth. In a corporate environment, worth is measurable and the individual begins to see themselves based on that company's measure of value. This reality means that the individual starts to value themselves not based on what he is able to do or who he is but according to what the company wants them to do. This is exactly where I need to be right now, and I'm doing exactly what I should be doing."*

### Going Forward

His passion had always been to help people who cannot help themselves. He was literally energised by changing the lives of people, and was enjoying himself a great deal at house4hack.

But he also has some genuine personal concerns:

*"Am I spending time doing what I love? Am I falling right back into the same corporate trap? Am I able to maintain the lifestyle which does not require me to earn, earn, earn, and I can relax when I feel like it?"*

While he was debating his options, he pondered on how companies such as Google with the open innovation philosophy had started out and now thrive. He could clearly see a future when South Africa was exporting IT to the rest of Africa, and Africa exporting IT to other parts of the world. IT skills in South Africa are scarce and the few IT specialists are extremely well paid. It was inconceivable trying to compete with industry on finances, besides, house4hack does not pay employees. On the other hand, there were quite a number of fresh University and tertiary institute graduates battling to get jobs, yet not all unemployed graduates make good employees after all. South Africa had some strategic advantages. It has for long been seen as a launching pad into Africa. Most of the well-known global IT firms started out in South Africa. Perhaps he should create partnerships with such IT firms, or even still, move house4hack to a "silicon valley" type of area where all these IT firms are. A partnership with government might be in the cards, yet the speed of IT is often faster than government red-tape. There was certainly the option to market more aggressively on other media platforms. But for now, doing more consulting work might bring the greater exposure. He had successfully made corporates work well, might house4hack be better off serving a profit motive after all? Perhaps, he was looking in the wrong places for the right answers.

Should he move to another part of town which is more IT active, to a "silicon type valley" of environment in South Africa with a large concentration of IT firms?

## Biographies



**Hossana Twinomurinzi**, BSc (Mathematics), Masters (IT), PhD (IT) is an Associate Professor with the College of Science, Engineering and Technology at the University of South Africa. He is a semi-professional facilitator and is involved in a number of social enterprise activities. His primary research interests are in mobile apps, e-government and ICT for development. He has a passion for creativity and innovation as manifested in entrepreneurship and the creative industries.



**Schalk Heunis**, BEng (Electrical and Electronics Engineer), MEng, PhD (Eng) is a data scientist and software developer at Heunis Solutions. He is a social entrepreneur who has been involved in the energy sector of South Africa. He actively applies the data science and spatial techniques in the energy sector to understand consumer energy needs.



## Exhibit 1: The Hacker Manifesto

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The following was written shortly after my arrest...

The Conscience of a Hacker by +++The Mentor+++ Written on January 8, 1986

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Another one got caught today, it's all over the papers. "Teenager Arrested in Computer Crime Scandal", "Hacker Arrested after Bank Tampering"... Damn kids. They're all alike.

But did you, in your three-piece psychology and 1950's technobrain, ever take a look behind the eyes of the hacker? Did you ever wonder what made him tick, what forces shaped him, what may have molded him? I am a hacker, enter my world...

Mine is a world that begins with school... I'm smarter than most of the other kids, this crap they teach us bores me... Damn underachiever. They're all alike. I'm in junior high or high school. I've listened to teachers explain for the fifteenth time how to reduce a fraction. I understand it. "No, Ms. Smith, I didn't show my work. I did it in my head..." Damn kid. Probably copied it. They're all alike.

I made a discovery today. I found a computer. Wait a second, this is cool. It does what I want it to. If it makes a mistake, it's because I screwed it up. Not because it doesn't like me... or feels threatened by me... or thinks I'm a smart ass... or doesn't like teaching and shouldn't be here... Damn kid. All he does is play games. They're all alike.

And then it happened... a door opened to a world... rushing through the phone line like heroin through an addict's veins, an electronic pulse is sent out, a refuge from the day-to-day incompetencies is sought... a board is found. "This is it... this is where I belong..." I know everyone here... even if I've never met them, never talked to them, may never hear from them again... I know you all... Damn kid. Tying up the phone line again. They're all alike...

You bet your ass we're all alike... we've been spoon-fed baby food at school when we hungered for steak... the bits of meat that you did let slip through were pre-chewed and tasteless. We've been dominated by sadists, or ignored by the apathetic. The few that had something to teach found us willing pupils, but those few are like drops of water in the desert.

This is our world now... the world of the electron and the switch, the beauty of the baud. We make use of a service already existing without paying for what could be dirt-cheap if it wasn't run by profiteering gluttons, and you call us criminals. We explore... and you call us criminals. We seek after knowledge... and you call us criminals. We exist without skin color, without nationality, without religious bias... and you call us criminals. You build atomic bombs, you wage wars, you murder, cheat, and lie to us and try to make us believe it's for our own good, yet we're the criminals.

Yes, I am a criminal. My crime is that of curiosity. My crime is that of judging people by what they say and think, not what they look like. My crime is that of outsmarting you, something that you will never forgive me for.

I am a hacker, and this is my manifesto. You may stop this individual, but you can't stop us all... after all, we're all alike.

+++The Mentor+++

## Exhibit 2: Page 1 of the house4hack manifesto

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Page 1 of 5

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# house4hack

*founding document and by-laws*

This document is the founding document & initial by-laws of the house4hack, a *hacker space* which was conceived on the 31<sup>st</sup> July 2011 and which is currently based at 4 Burger Avenue, Centurion, South Africa.

## Article I: Why We Exist

### Section 1: General Purposes

**house4hack** is a not-for-profit self-organising collective, which loosely subscribes to the *hacker space manifesto* (included below), and which aims to pursue member education, technical & scientific endeavours, as well as provide an innovative environment in which to operate member driven think-tanks and to incubate promising member driven projects to economic existence in their own rights.

**house4hack**, while not yet being incorporated as a Section 21 not-for-profit company, will operate as such and will invest all proceeds it may derive from it's activities to the achieving of its stated purposes spelled out herein.

#### The Hacker Space Manifesto

Hackers create. We build unique devices to interact with our environment. We write code to do new and interesting things. We learn about systems, and we help make them better. We educate those willing to learn. We view the human pursuit of knowledge as inherently good.

We believe that to further our ideals, we must reach beyond the electronic communication medium and establish a physical presence. Personal interaction and collaboration are valuable opportunities. To realize our full potential within the physical world, we require physical space. With this space we contribute to both the hacker community and our local communities.

Our space is governed by a respect for individual sovereignty. We value both the intellect and property of each individual. We encourage individuals to pursue the constructive outlets of their choosing, as long as those outlets do not restrict those of another.

As a collective, we guard our reputation. We consider each individual responsible for maintaining our values when dealing with the public on our behalf. We consider constructive communication and action our method for demonstrating our ideals; we consider belligerence and destruction to be their antithesis.

We, The Hackers, in order to forge a union of creativity, curiosity, and individual expression through technology, establish this as our Manifesto.

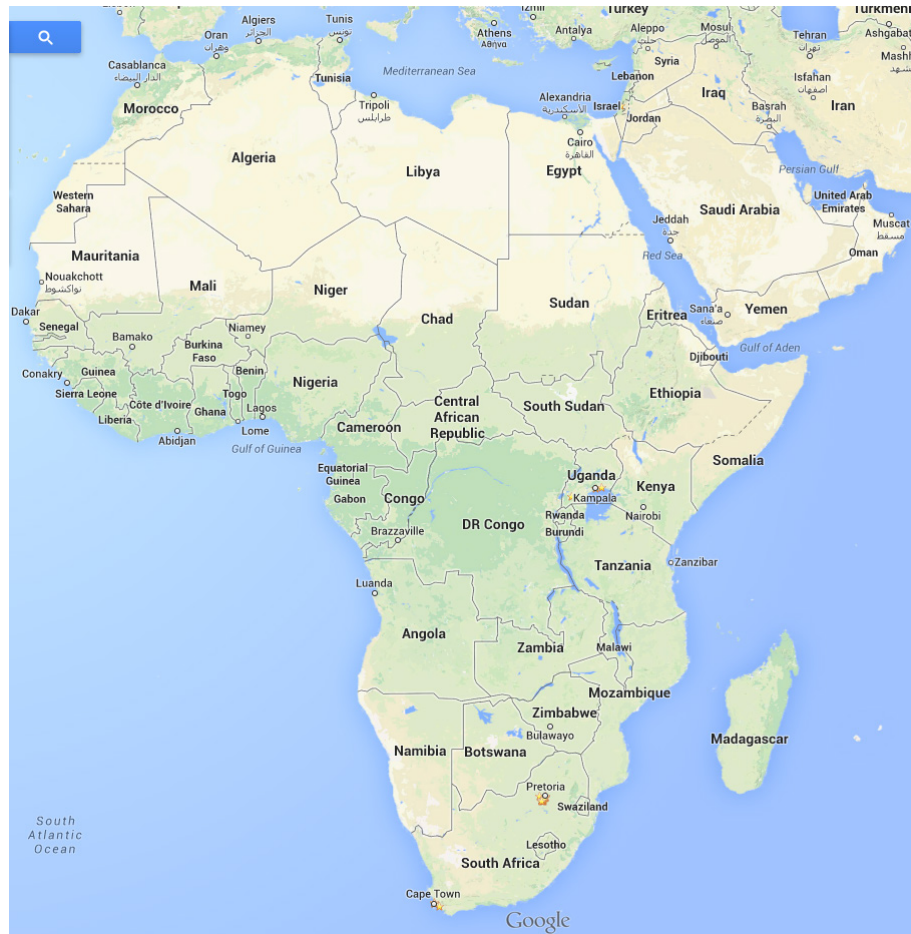
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[www.house4hack.co.za](http://www.house4hack.co.za)

<http://groups.google.com/group/house4hack>

### Exhibit 3: Map of Africa

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Source: Africa, Google Maps – [maps.google.com](https://maps.google.com)

## Exhibit 4: South African Economic Indicators

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South Africa Socio-Economic Indicators (as at 22 July 2014)

Measure	Estimate	Year / Source
<b>Population</b>	52.98 million people (mid year estimate 2013)	Statistics South Africa, 2014
<b>Administrative provinces</b>	9: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North-West and Western Cape.	Republic of South Africa, 2014
<b>Poverty</b>	Poverty headcount: 58.6% females, 54.9% males.	Statistics South Africa, 2014
	43.2% of population live below poverty line of R3,000 or US \$425 per capita per annum	SA Presidency, 2009
<b>Unemployment</b>	25,2% of the population (Quarter 1 – 2014)	Statistics South Africa, 2014
<b>Life expectancy</b>	59.6 years (57.7% males and 61.4% females)	Statistics South Africa, 2014
<b>Adult literacy rate</b>	93%	CIA World Factbook, 2014
<b>Combined primary, secondary &amp; tertiary gross enrolment ratio</b>	76.6%	UNDP, 2007
<b>Developing country rank - Poverty</b>	122 in 187 total countries having moved up 2 places since 2011.	UNDP, 2014

## Exhibit 5: Robohand

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A proud kid gets his robohand in the house4hack workshop

