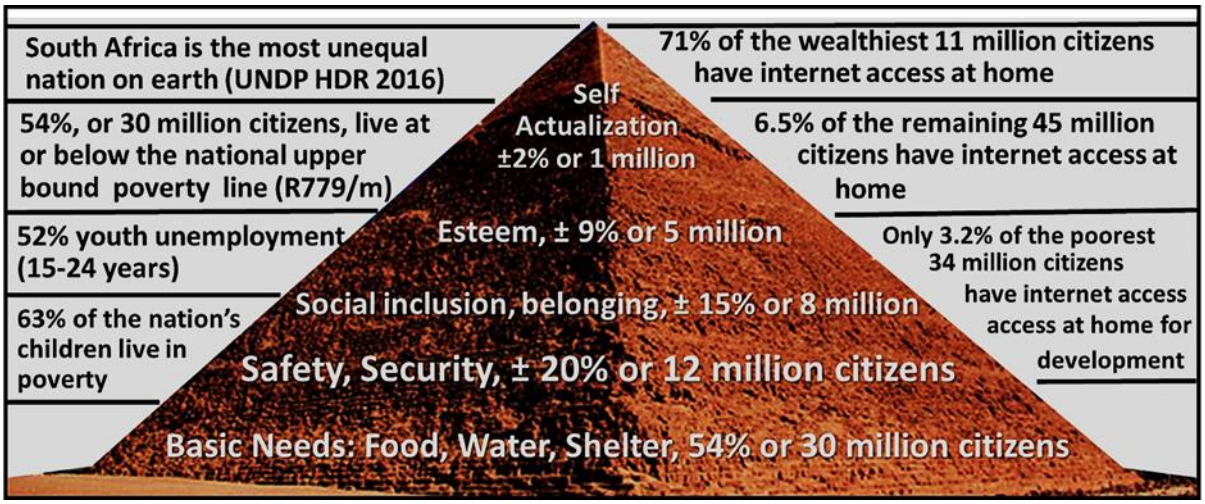
Concept Paper Cover Page

Tackling South Africa's Inequality, Poverty, Unemployment

From the base of the nation's development pyramid



Derived from Maslow's Hierarchy of Needs

Concept outline:

1. This concept paper adds to the numerous national efforts aimed at reducing South Africa's three major threats: Inequality, Poverty and Unemployment.
2. The proposed strategy focusses exclusively on the economically marginalized citizens, their children and youth, and is intricately linked to South Africa's National Development Plan.
3. The concept proposes the extension of ICT access and usage to the base of the development pyramid, with special focus on children and youth, reinforcing the following features of ICT:
   - ICTs are both enablers and change agents for and of development. This is reflected in the inclusion of ICT in all 17 of the Sustainable Development Goals (SDG) adopted by all nations as guidelines for development;
   - The very significant commercial value of ICT, and the rapidly changing base of the technologies they use, has tended to position them beyond the access and affordability of the economically marginalized populations, thus fuelling further the inequalities between the information-rich and the information-poor;
   - The concept recognizes, and suggests a response, to the rapidly changing technologies used in ICT, the principal drivers of the Forth Industrial Revolution, and its immense disruptive impact on the traditional structures of society and the world of work.

Consequences and expected outcomes: The concept paper argues that the consequences of doing nothing can be devastating on the nation's economic growth, global competitiveness, and socio-political stability. The expected outcomes include rapid technological appropriation, digital literacy acquisition, and job creation, at the base of South Africa's development pyramid where these features of development are needed most.

Prepared by: Walter Brown, CEng. MIET | Johannesburg July 2017 | Contact: walterbrown@afrihost.co.za

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Concept Paper

Tackling South Africa's Inequality, Poverty, Unemployment: How can ICT help? The role of ICT SMMEs

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Concept summary:

Inequality, poverty and unemployment are intricately linked human factors that combined, represent the greatest threats to both developed and developing nations. South Africa is particularly vulnerable to the extreme consequences of these triple threats due to its socioeconomic history over the last three centuries. The triple threats are fuelled further by the nation's multi-cultural, multi-ethnic, and multi-lingual demographics, all of which emphasise differences amongst citizens, rather than the common interests that bind them as a nation. South Africa ranks amongst the most unequal nations in the world today.

This concept paper proposes a new addition to the numerous initiatives aimed at reducing South Africa's triple threats: the intensive use of ICTs at the base of South Africa's development pyramid where these triple threats reside. It outlines a highly scalable South African Local Area Network, which extends all current and planned public and private sector ICT growth initiatives into the communities that need them most. The primary users of these community based local area networks (LAN), which for convenience in drafting this concept paper, will be named SA-LAN, are the 30 million citizens who can barely afford even the survivalist information services they need for self-development. The proposed SA-LAN adds to the numerous economic, technological and social tools already in place and in use for the reduction of inequality, poverty, and unemployment.

The SA-LAN's target market are the 30 million South Africans that live below the national poverty line, and their children. South Africa's child population living in poverty amounts to 63% of the national child population. This 63% cohort are the primary focus of the SA-LAN, although equal attention must be given to their intricately linked older peers (youth), parents, caregivers, and community/national elders. Children cannot live in isolation from their elders. The primary objective of the SA-LAN concept is to use ICTs as tools to impart the technological appropriation and digital literacy needed by South Africa's children living in poverty, as they grow to become adult citizens of the unfolding and highly complex Fourth Industrial Revolution (4IR), which is changing the way humans live. The SA-LANs proposed are also the essential pre-school "digital" learning facilities for the nation's children living in poverty. Through the concept, ICTs will be positioned to impart critical digital user skills through playful learning, emulating the best early childhood development (ECD) models preferred by leading global child and youth development experts, including the Government of South Africa[1]. Learning through play and peer group engagement is recognised as one of the most valuable child development instruments available to our species. The community's youth and unemployed adults will benefit greatly from this initiative through the broadband access the SA-LANs provide, and the community jobs that they create.

The proposal that follows, and the statistical data used to support it, draw directly from South Africa's National Development Plan (NDP) and its 2030 objectives and targets, and from the significant quantity of locally

[1] *The National Development Agency: The central theme is ECD: http://www.nda.org.za/home/Early_Childhood_Development-23.html*

generated and internationally published demographic, economic and ICT statistics. The guiding principle upon which the concept is anchored draws directly from the NDP, and from its logical off-shoot, the National Integrated ICT Policy now in its final stages of completion:

> *"By 2030, we seek to eliminate poverty and reduce inequality. We seek a country where all citizens have the capabilities to grasp the ever-broadening opportunities available. Our plan is to change the life chances of millions of our people, especially the youth; life chances that remain stunted by our apartheid history" (NDP 2030)*

The NDP further proposes that for the ICT sector, South Africa's ICT performance should be benchmarked against South Africa's peer emerging economies[2]. This concept paper extends this invaluable recommendation to benchmark South Africa's triple threats of inequality, poverty and unemployment against similar emerging economies. This helps to clarify the depth, nature, and size of each threat, suggesting possible solutions based on the experiences, successes and failures of South Africa's peers. From such understanding and examination of the successes and failures of South Africa's peers, useful measurable performance indicators for programme design, evaluation, monitoring and control, can be developed and used locally.

The proposed concept is simple: build numerous cyber cafés, LAN Houses à la Brazil, owned and operated as community-based SMME businesses, which provide affordable massively shared broadband access to economically marginalized communities for: (a) entertainment; (b) play with integrated self-motivated and peer-driven learning; (c) access to information as a driver of SMME development; (d) technological appropriation and digital literacy acquisition by the communities' children and youth; and (e) immediate expansion of SMME jobs in the communities concerned. The jobs so created will vary from ownership and operation of the SA-LANS; ICT maintenance and support services to the target communities by those SA-LAN owners who acquire the requisite knowledge and skills[3]; and of direct national economic benefit through information support for SMME traders as has been done by several of South Africa's developing country peers[4] (read the success story of China's 23-year-old Yang Fugang). The SA-LAN owners will also be encouraged to introduce and sell a wide range of goods and services to supplement their incomes, following the traditions of most global Cyber Cafés. An excellent example of business creativity in this business segment is the Russian Ziferblat[5] concept recently exported to the United Kingdom: a fixed hourly fee to be in the LAN House; every other service, including snacks, coffee and internet access, are covered by this fee.

As in every well-intentioned human endeavour, Internet cafés are sometimes abused by their customers and communities. Some have attracted the attention of drug dealers and gangs, and various forms of cybercrime. Numerous studies, including the ethnographic studies of Brazil's LAN House phenomenon, have suggested that the community spirit engendered by the LAN Houses has discouraged such anti-social behaviour, reducing its impact greatly. A few unexpected social behaviour outcomes of Cyber Cafés have been reported, which defy classification as advantages or disadvantages: low cost overnight accommodation with access to connected computers for Japan's growing homeless and jobless population; new challenges in China for Internet addicted children; short-term safe havens for children escaping abuse in Brazil's favelas. These are just a few examples that suggest that the added value of LAN Houses far outweighs the human tendency towards abuse of anything that is good, the well-researched theories of "the tragedy of the commons".

As community social centres, the ultimate use of SA-LANs will be directly influenced by the creativity and imagination of their owners and users. In Brazil, several LAN Houses have become known for their artistic creativity – artistic content production, including the dance routines that shape the image of Brazil, all taking place at the community level in the LAN Houses.

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[2] *NDP page 119/489, available at: http://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf*

[3] *See the productive chaos of skills acquisition and technological appropriation by Brazil's favela residents at: https://www.epicpeople.org/digital-favelas/*

[4] *See the case study of Yang Fugang from China at http://www.nytimes.com/2009/08/10/technology/start-ups/10taobao.html*

[5] *Russian Ziferblat model expands to several U.K. metros: http://www.ziferblat.co.uk/ and http://metro.co.uk/2016/10/27/introducing-the-6p-a-minute-cafe-6216709/*

Many developing nations have initiated similar programmes, intentionally or unintentionally, and have prospered from the technological appropriation and digital literacy growth amongst their poor and information excluded populations. The Republic of Korea offers particularly useful lessons concerning the use of these facilities (PC Bangs) – they were actively promoted by South Korea's government during the Asian financial crisis of 1997, as a way of developing new skills to find or create new jobs. The South Korean model was emulated by Brazil to initiate its LAN House phenomenon. Numerous social scientists who have studied the Brazilian model classify it as a true social development phenomenon. The photographs below provide a very small sample of the surveys into the phenomenon undertaken by the authors of this document.

From Brazil's favela children acquiring digital skills, through the Chinese baby born in a LAN House, Myanmar's very young preparing for the 4IR, to the Kansas City USA mom seeking a better life for her children, many nations use the LAN House model to prepare for the disruptive Fourth Industrial Revolution

The paragraphs that follow explain how South Africa can cost-effectively build such facilities for the country's economically marginalized communities, and especially, it's future generation of citizens who are at present excluded from the opportunities available from today's expanding information society. The Brazilian "LAN House" nomenclature for the phenomenon is expanded for use in this concept paper to the South African LAN House (SA-LAN). The choice of name, which may change to reflect the preferences of specific user communities, has been chosen in recognition of the economic and societal similarities between Brazil and South Africa, both countries face very similar challenges.

A short introduction of the Brazilian LAN House phenomenon has been produced by Brazilian Researcher Dr David Nemer: "Beyond Internet Access: a study of social and cultural practices in LAN Houses"[6]. The link to David's dissertation on the subject, which earned him his Doctor of Philosophy degree, is also provided in footnote 6.

[6] *Beyond Internet Access: a study of social and cultural practices in LAN Houses: http://spir.aoir.org/index.php/spir/article/download/808/392 and https://scholarworks.iu.edu/dspace/bitstream/handle/2022/20349/Nemer%202015.pdf*

1. INTRODUCTION: SOUTH AFRICA'S INEQUALITY, POVERTY AND UNEMPLOYMENT METRICS

This section provides a general outline of the size of South Africa's inequality, poverty and unemployment challenges, using data from various sources, with data compiled and collated by Statistics South Africa (STATS SA), the preferred local source. The internationally published data from e.g. the United Nations family and the World Bank enables comparison with other emerging economies to enable benchmarking as recommended by South Africa's NDP.

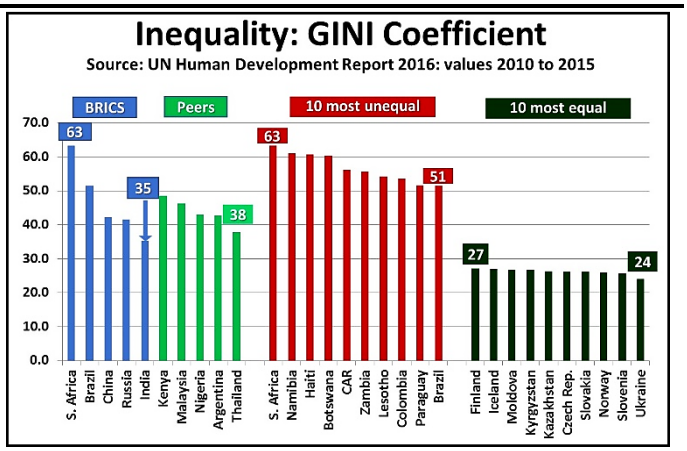
For the purpose of this concept paper, detailed analyses of the available statistics will not be undertaken within the concept paper, only the results of analyses are presented in the charts that follow. The charts represent the primary problem statement that the concept seeks to address, the "human face" of the triple threats of inequality, poverty and unemployment. This section intentionally dominates the concept paper, so that resolving the "challenges" remains the end objectives, and the administrative, business, and technological solutions remain the means to those ends, and not the ends themselves. This latter "techno-centric" focus has been the major cause of the +80% failure rates of the similar global Multipurpose Community Telecentres (MCT) initiatives that include Telecentres. The comparison between the sustainability of MCTs versus that of the LAN House concept is fully described, with numerous local anecdotal and empirical evidence, in David Nemer's ethnographic studies of Brazilian favelas, footnote 6 in the concept summary.

1.1. INEQUALITY: South Africa hosts one of the most unequal societies in today's world, a fact that is known and acknowledged widely across the "information rich" South African society; the "information poor" segments of the nation merely respond to the fact, often violently. The challenge seems to be building a national consensus on how to deal with this threat. This national dialogue is at present extremely divisive, often reduced to socio-political ideologies, racial politics, or economic ideologies. This concept paper avoids engagement with the current debates, presenting instead the known facts, and focusing on how the SA-LAN concept can help reduce the threat under any economic, political and social ideology.

South Africa's inequality levels are represented in this concept paper by (a) the Gini Coefficient, a measure of statistical wealth distribution in which a Gini of 100 represents absolute inequality (one individual consumes total national wealth), and a Gini of 1 represents perfect equality, in which all citizens share national wealth equally; (b) the Palma ratio, a ratio of the richest 10% versus the poorest 40%, illustrates the contribution of national middle-income groups; (c) the Quintile ratio, the cumulative earnings of the top 20% earners compared to the poorest 20%. In each case, South Africa is benchmarked against its BRICS partners Brazil, Russia, India and China, five developing nations selected for their regional representation and demographic and economic similarities with South Africa, the ten most equal nations, and the ten most unequal nations.

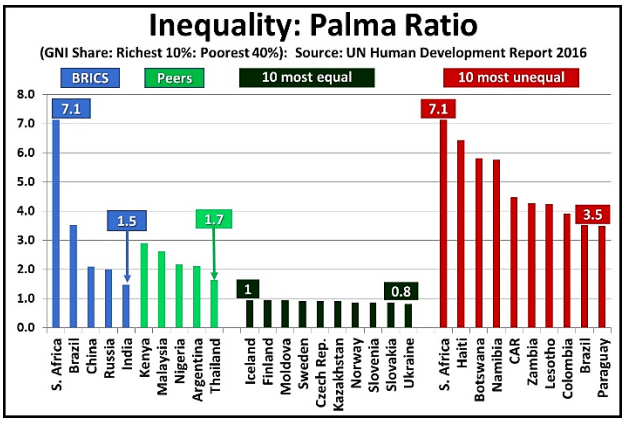
1.1.1. **The Gini Coefficient** (Gini of 100 = absolute inequality; Gini of 1 = perfect equality)

GINI Coefficient: The statistical distribution of income or wealth within a nation. In this United Nations Development Programme measure, South Africa is the most unequal nation in the world, with Ukraine ranked first in equality.



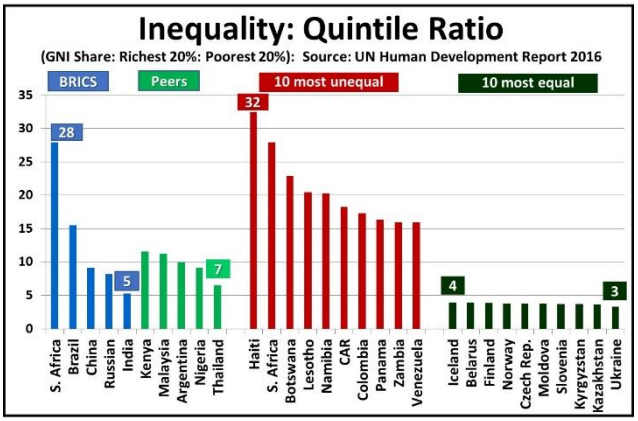
1.1.2. The Palma Ratio**:** (Cumulative income of the richest 10% compared to the poorest 40%).

The Palma ratio illustrates the share of national wealth by the middle-income groups ("Black Diamonds" in South Africa), who, under average inequality conditions, consume about 50% of national income, while the richest 10% and the poorest 40% share the remaining 50% equally. In countries with high levels of income equality, the ratio is heavily skewed in favour of the rich.



1.1.3. **The Quintile Ratio:** (cumulative income of the richest 20% compared to the poorest 20%)

Also referred to as the 20:20 ratio, this inequality metric is considered by many statisticians, as more revealing of the actual impact of inequality in a population. In economies with low levels of inequality, this ratio is within the range of 1:4. It is in the range 1:7 in the countries with average levels of inequality, and much higher in countries with high levels of income inequalities: 1:28 in South Africa.



1.2. POVERTY: Poverty on its own is a major challenge for any nation, but poverty with extreme inequality is a sure recipe for societal disruption. South Africa has both; the combination poses a major threat to socio-political stability in the country. We are reminded of the dangers of inequality by history itself, described eloquently by the ancient Greek Philosopher Plato:

"The form of law which I propose would be as follows: In a state which is desirous of being saved from the greatest of all plagues—not faction, but rather distraction—there should exist among the citizens neither extreme poverty nor, again, excessive wealth, for both are productive of great evil. Now the legislator should determine what is to be the limit of poverty or of wealth" Plato qualified this further with the statement: *"We maintain that if a state is to avoid the greatest plague of all - I mean civil war, though civil disintegration would be a better term - extreme poverty and wealth must not be allowed to arise in any section of the citizen-body, because both lead to both these disasters"* Plato, Greek Philosopher (427-347 B.C.)

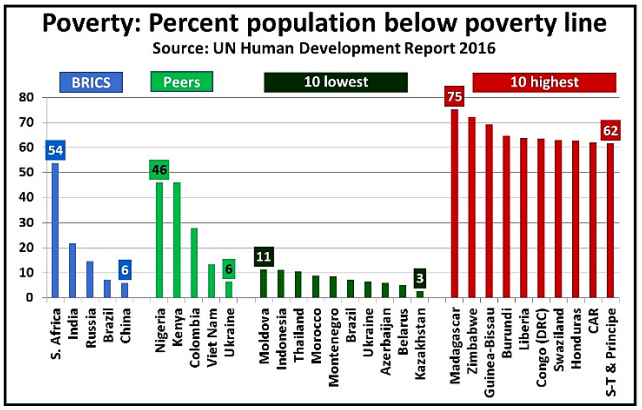
South Africa's poverty is exacerbated by its impact on children. Numerous studies have shown that children living in poverty are prone to reduced cognitive achievement that stunts their intellectual development. Thus, irrespective of the potential brilliance of a child born into poverty, the most likely outcome is reduced brain development and therefore low scholastic achievement (Farah[7] et al, 2006; and Pilyoung[8] et al, 2013).

[7] *Childhood poverty: Specific associations with neurocognitive development:* http://neuroethics.upenn.edu/wp-content/uploads/2015/06/Development-povertyassociation.pdf

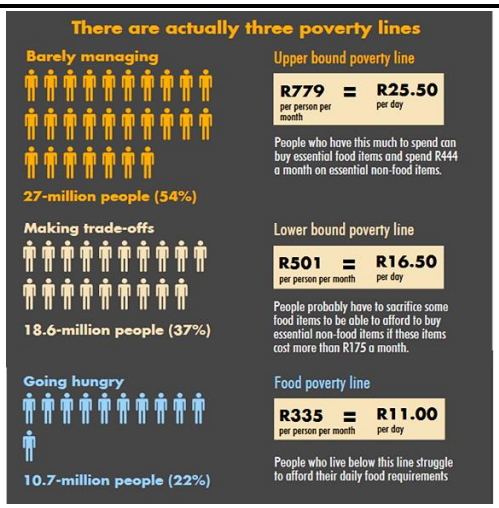
[8] *Effects of childhood poverty and chronic stress on emotion regulatory brain function in adulthood:* http://www.pnas.org/content/110/46/18442.full.pdf

1.2.1. International poverty benchmarks**: South Africans living below the national poverty line**: The charts associated with this section, and brief discussions that follow, review South Africa's poverty metrics benchmarked against the nation's peers, and enable a closer look at the nation's internal poverty dynamics.

Nationals living below the national poverty line constitute major drains on the national economy and its growth. High proportions of nationals living below the poverty line also represent a measure of inequality, and the potential for societal instability and decay that this represents.



1.2.2. Poverty in South Africa: Half of South Africans live below the poverty line[9]. Can they afford to use ICT as tools to lift themselves out of stubborn poverty traps?



Poverty and ICT Affordability

- Average poverty line for the three groups (27 million citizens) = R522 per month;
- The global target for cost of communication is 5% = R26 per month;
- Which mobile operator, or any other operator, can provide the same services as those enjoyed by average South Africans at R26 per month?
- Answer, NONE: Traditional operators cannot provide services at this price, and remain competitive and economically viable, even with WOAN!
- SOLUTION: Shared broadband services by many – e.g. LAN Houses;
- 100 hours per SALAN House per day at R3.00 per hour, 30-day turnover = R9,000 per month, enough to lift SMME family businesses out of poverty traps and meet operational costs;
- Potential for viable SMME business model, and new market for traditional broadband providers.

Note: The Wireless Open Access Network (WOAN) is a component of the Integrated National ICT Policy nearing finalization that seeks to set up a single wholesale wireless open access operator serving the whole national ICT Industry. One of the major objectives of this policy is to render ICTs accessible and affordable for all South Africans. The levels of poverty portrayed in this infographic extend beyond the capacity of even the proposed WOAN. New innovative applications of ICT are needed to resolve this national dilemma.

1.2.3. Estimated cost to communicate for South Africa's poor**:** The cost to communicate for each of the above poverty lines, has been estimated based on the International Telecommunication Union's (ITU) ICT Price Basket for South Africa of R213 per month (IPB - a composite indicator of the average national cost to communicate across all ICT services, derived from data compiled by national statistical bureaus and regulators)[10]. Using the infographic above, the cost to communicate for the different categories of poor is estimated at 33% of the median disposable income for the population living at or below the upper bound poverty line but above the lower bound poverty line (8.4 million persons); 51% for the population living at or below the lower bound poverty line but above the food poverty line (7.9 million persons); and 64% or more for the 10.7 million South Africans living at or below the food poverty line.

[9] *Infographic: Poverty in South Africa:* http://mg.co.za/data/2015-02-05-infographic-poverty-in-south-africa

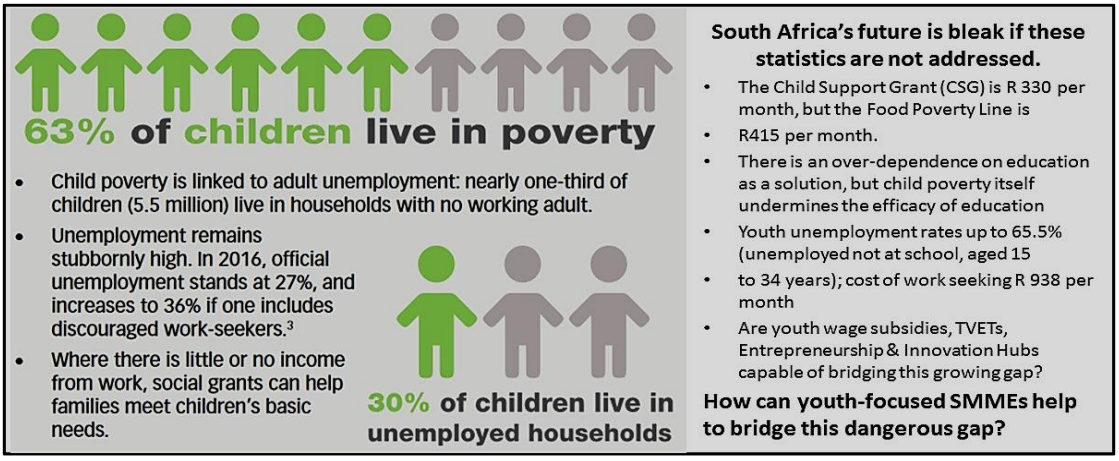
[10] *Table 4.11 in ITU:* http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf

This 27 million population of South Africa's poor has expanded to 30 million according to the latest population statistics. They are clearly the victims of information exclusion: they cannot participate in the modern information society for self-development as their wealthier compatriots can.

1.2.4. **South African Child Poverty:** The Children's Institute based at the University of Cape Town publishes an annual *Child Gauge*[11] report using empirical data to describe the life-situation of South Africa's children. The most recent report, that for 2016, has been used to derive the first chart in this section. The second chart depicts the racial characteristics of child poverty in South Africa, and is derived from the 2014 study "*Poverty traps and social exclusion among children in South Africa*"[12], commissioned and published by the South African Human Rights Commission (SAHRC) and the United Nations Children's Fund (UNICEF).

The charts, and the related theoretical foundations of the impact of child poverty on children's brain development provided in footnotes 7 and 8, will not be discussed at any level of detail in this concept paper. The charts are largely self-explanatory, predicting a very high level of uncertainty for South Africa's future if they are not addressed urgently.

1.2.4.1. The Child Gauge 2016 summary:



1.2.4.2. Addressing poverty-driven child exclusion in South Africa: In the 2010 State of African Cities[13] report by the United Nations Habitat Organization, the following recommendation was proposed (page 25/279):

> **Recommended Intervention Areas in Southern Africa**
> As part of development policies, public authorities must mobilise urban young peoples' potentials and energies with proper training in entrepreneur skills and information/communication technologies, in order to enable them to set up and run their own businesses. Some urban authorities have tried to foster inclusive cities, but none have fully considered children and youth in their service provision and governance strategies. Cities should make more efforts to deliver broadband Internet to all urban neighbourhoods, rather than reinforcing existing inequalities in services delivery.

This concept paper is about mobilizing the energies and potentials of South Africa's youth to enable them to set up and run their own ICT SMME businesses within their own communities, creating new jobs, advancing digital literacy, and improving community cohesiveness and collaboration.

1.2.4.3. **Child poverty by ethnicity and/or racial classification:** While it may be a mainstream conclusion amongst scientists that race and ethnicity are social constructs without biological meaning[14], the concept of race differences remains a highly divisive, emotive and provocative socio-political construct, globally and in South Africa. The impact of this social construct in South Africa runs deep throughout all segments of society,

[11] *South African Child Gauge 2016:* http://www.ci.org.za/depts/ci/pubs/pdf/general/gauge2016/Book_Child_Gauge_2016_lowres.pdf

[12] *Poverty traps and social exclusion among children in South Africa:* https://www.sahrc.org.za/home/21/files/Poverty%20Traps%20Report.pdf

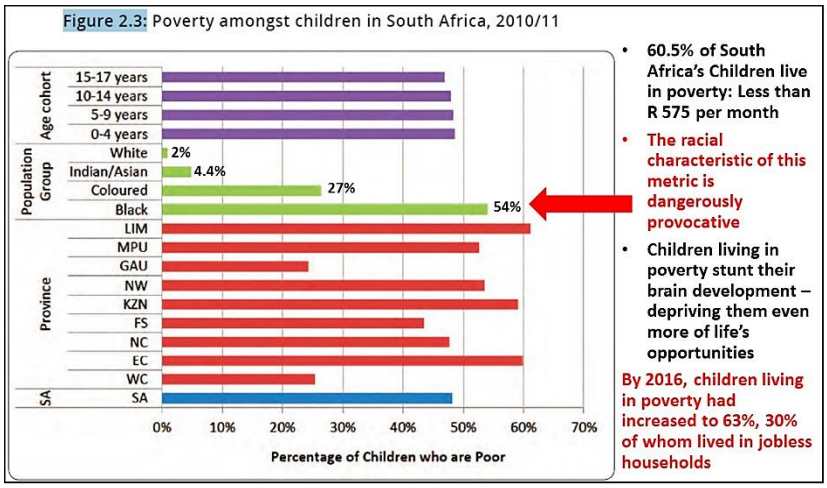
[13] The State of African Cities 2010: http://mirror.unhabitat.org/pmss/getElectronicVersion.aspx?nr=3034&alt=1

[14] *See e.g. 2016 Scientific American article at:* http://www.scientificamerican.com/article/race-is-a-social-construct-scientists-argue/

and has led to the formal classification of the whole South African population into four distinct "race" groups based on perceived pigmentation levels and ancestral parent origins (Black African, Coloured, Indian/Asian, White). Most demographic statistical analyses by STATS SA use these "colour" classifications to present critical development data for the country.

The statistical measures of child poverty by race classification in South Africa is stark: 81% of South Africa's poor children are Black African and/or Coloured, a historically proven recipe for societal dysfunction. Irrespective of its non-scientific basis, the social impact of race needs to be addressed urgently.

The chart below, derived from the SAHRC and UNICEF report of 2014 (footnote 12), illustrates the "racial characteristics" of South Africa's child population, and suggests a strong sense of urgency to address the racial imbalance in the interests of South Africa's future stability and growth under the leadership of the future generations.



1.3. UNEMPLOYMENT: Employment and unemployment levels in all countries and societies are strongly influenced by several macro socio-economic-political factors, details of which are beyond the scope of this concept paper. The most immediate factors that determine the scope of South Africa's high levels of unemployment, measured and published regularly by Statistics South Africa and other competent authorities, are:

1.3.1. **The preferred national economic model:** The prevailing macro-level free market economic model, anchored in the belief that high levels of economic growth as measured by Gross Domestic Product (GDP), will in time "trickle down" to the poorest levels, creating jobs for their upliftment, reducing inequality and poverty, and further fuelling economic growth;

1.3.2. **Education:** the popular belief that mass public education will in time equip the economically marginalized children with the skills they need to lift themselves out of poverty, and to participate fully in the economy and its growth;

1.3.3. **Socio-political history**: The broad recognition that the nation's socio-political history of apartheid excluded the majority "Black African" population from nearly all human development opportunities, especially those related to education and economic participation. This historical legacy has spawned constitutionally supported race-based transformational or rebalancing growth models, designed to ensure that Historically Disadvantaged Individuals (HDI), representing 92% of the population (Black South Africans, sub-classifications: "African" (80.7%); "Coloured" (8.8%); "Indian/Asian" (2.5%))[15], are fully integrated into the national economy and society. Such transformational programmes are governed by legislation under the Broad-Based Black

[15] *STATS SA population data 2016: http://www.statssa.gov.za/publications/P0302/P03022016.pdf*

Economic Empowerment Act of 2003 (B-BBEE), amended regularly to set codes of good practice for each national economic sector.

1.3.4. **The Fourth Industrial Revolution (4IR):** The impact of technological advances across all economic activities and scientific disciplines has had, and will continue to have, devastating impact on the traditional world of work and the role of labour. The technological advances associated with the 4IR, the Artificial Intelligence (AI) that enables machine replacement of labour, demands new forms of work and labour utilization that have little direct relationships with traditional models. New forms of education and training will be needed to equip the 4IR generation, sometimes referred to as the "Internet Generation" or "Net-Generation", with the skill sets needed to participate in this unfolding 4IR world. New models of societal arrangements are already under discussion or at an early stage of implementation by some countries (e.g. Canada, Finland, endorsed by Brazil and India). These include concepts like the Universal Basic Income (UBI)[16] model, a state-provided subsistence level income for all citizens, irrespective of their employment status or current income, so that no citizens will be confined to poverty traps. The dilemma of countries such as South Africa with pre-existing deep inequalities in income and skills, facing even greater technologically-driven challenges that will add to these divisions, are daunting at best.

The limited unemployment data provided in the charts below suggest that much more than policy interventions are needed to address unemployment in modern South Africa. The most recent labour force data released by STATS SA[17] reinforces this observation: "official" unemployment rose to 27.7%, the highest level since 2003. The "expanded" unemployment rate, which includes unemployed work seekers who have been discouraged by numerous failures to find work, has risen to 36.4% of the total work force. Of deeper concern is the impact on youth in the age group 15 to 34 years; 58% of young South Africans within this age group joined the ranks of the unemployed during the first quarter of 2017.

1.3.5. **Youth unemployment[18]:**

World Bank 2017 derived from International Labour Organization (ILO) definitions and data.

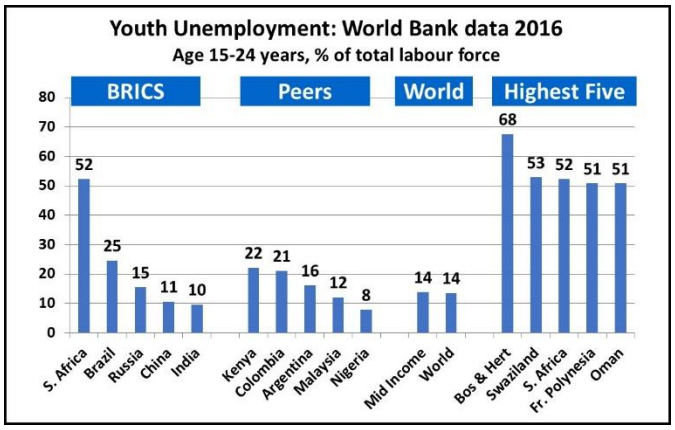
Numerous studies have linked youth unemployment to rising levels of socio-political instability and violence[19]: rising crime and substance abuse; South Africa's frequent service delivery protests (e.g. #FeesMustFall, #DataMustFall); the Arab Spring of 2010 which is said by many to have triggered the current round of Middle-East instability; the tragic 21st century "Out of Africa" migrations that results in tens of thousands of poor mainly African people perishing annually through starvation and violence, or drowning through their use of overcrowded rickety boats in turbulent seas as they seek a better life in foreign lands. Their attempts to find a better life for themselves and their children are deadly.

The popular South African description of this phenomenon, favoured by politicians, civil society, and a significant number of commercial and industrial leaders, is "a ticking time bomb". The nation's National Development Plan 2030 recognises these threats and positions them at the centre of the development plan for all sectors of the economy and society (see for example, the story of Thandi at https://www.youtube.com/watch?v=pIiRsFYsRcg).

[16] *Universal Basic Income (UBI) discussion at WEF 2017:* https://www.weforum.org/agenda/2017/01/why-we-should-all-have-a-basic-income/
[17] *STATS SA Quarterly Labour Force Survey – QLFS Q1:2017: http://www.statssa.gov.za/?p=9960*
[18] *World Bank Youth Unemployment data: http://data.worldbank.org/indicator/SL.UEM.1524.ZS*
[19] *African Development Bank: http://allafrica.com/download/resource/main/main/idatcs/00070334:9a3cc3ad4e3c7fc71edd1c3fa8d7a9be.pdf and: Harvard International Review: http://hir.harvard.edu/article/?a=7296*

Definition (ILO):

Youth unemployment refers to the share of the labour force ages 15-24 without work but available for and seeking employment. The preferred "official" South African definition excludes unemployed persons who have not searched for employment within the previous four weeks, resulting in a much lower unemployment rate.



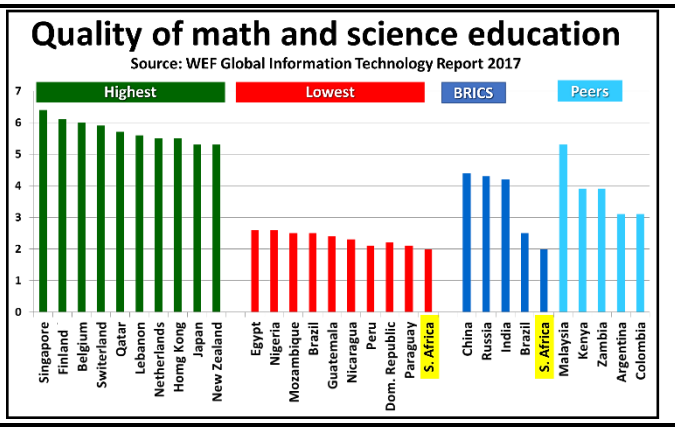
1.3.6. **Quality of Education: Math and Science:** Critical foundations for 4IR employment creation.

Media Coverage December 2016:

"South Africa's grade nines were ranked second-last out of 39 countries in maths last year — and were also placed at the bottom of the global pile in science. Only a fraction of grade five and grade nine learners at no-fee schools performed exceptionally well in maths.

The study found that about 80% of learners at independent schools, 60% of those at public fee-paying schools and 20% of learners at public no-fee school achieved maths scores above the minimum level of competency".

The inequalities in education will perpetuate poverty and joblessness, fuelling further the inequality gap. Urgent attention is needed at the base of the educational pyramid – 63% of the nation's children.



Jobs of all descriptions, and especially the new still-to-be-identified jobs required by the Fourth Industrial Revolution, depend greatly on Science, Technology, Engineering and Mathematics (STEM) knowledge, generally acquired through national education systems. The chart above, derived from the World Economic Forum's Global Information Technology Report of 2017[20] positions South Africa as the country with the lowest quality of education in math and science, and therefore engineering and technology. While this is clearly of great concern, more importantly, it stresses the need for concerted corrective actions at all layers of the national education system, especially at the lowest formative levels that build the critical and creative thinking required for the STEM subjects in this 4IR era.

1.3.7. **Employment in the South African ICT Industry[21]:**

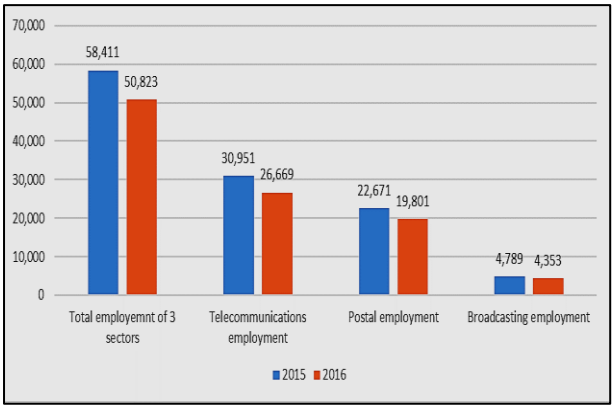
Since the birth of electronic forms of information and communication technologies in the mid-19th century, new forms of employment were needed to build the ICT networks, only to be followed by employment reduction in response to the productivity gains resulting from the very same ICT networks. The rising intensity of ICT usage fuels economic development but reduces traditional employment levels. This decline in employment levels has been, and will continue to be, offset by the growth of new jobs outside the ICT industry itself, as the intensity of ICT usage creates new opportunities for creative entrepreneurs.

[20] *WEF GITR 2016: http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf*

[21] *ICASA Report 2017: http://www.ellipsis.co.za/wp-content/uploads/2017/05/ICASA-Report-on-State-of-SA-ICT-Sector-2017.pdf*

ICASA Graph 5: Total employment of 3 sectors, as of 30 September 2016

As technology advances, ICT networks increasingly depend on automated software control for functionality, operations, and maintenance. Immense ICT growth is enabled, but with very significant changes in the required workforce and skill sets. New skills are needed for these expanded networks, traditional skill sets become obsolete. Balancing these conflicting factors is vital, failure will result in higher levels of unemployment.



"As of 30th September 2016, the total number of employees reported for the three sectors that ICASA regulates has decreased significantly by 13.0%" (footnote 21). All three sectors have experienced a significant 4IR impact: increasing automation in the networks, rapid convergence and integration of the information products and services delivered by the networks, and rapid miniaturization and automation of the network expansion components, and less staff to operate the networks and deliver the services.

The greatest impact of the 4IR will be its disruptive feature: traditional networks and the operational and management systems they need are rapidly being disrupted through automation, technological convergence, and miniaturization through massive circuit integration. One of the leading global technology companies, *Intel*, has published prolifically on this phenomenon: "*the Top 20 of every industry will be disrupted by digitally transformed competitors by 2018 alone*"[22]. Even the vast mobile networks that underpin South Africa's ICT industry today will be subjected to extreme disruptions: the growing range of Wi-Fi and the evolving 5G networks are already offering improved mobile information services connectivity at much lower costs than the traditional mobile networks. The growing range of "Over-the Top" (OTT) software products that enable the full range of ICT services, including those traditionally provided by broadcasters, are rapidly disrupting the business models of traditional ICT networks. The impact of these disruptive effects on employment levels in the ICT industry as currently structured will be profound.

On Friday 7th April 2017, STATS SA released its latest employment statistics[23], summarised as follows:

1.3.7.1. Total national employment in the formal non-agricultural business was approximately 9,690,000 by end 2016. With 50,823 persons employed in the "telecommunications" sector at end September 2016 as reported by ICASA (footnote 21), the ICT sector contributed just 50,823/9,690,000 or 0.52% of total employment. The ICASA reported 13.0% decrease of employment in the ICT sector is ominous.

1.3.7.2. If we exclude the postal sector but include the broadcasting sector, based on the comparative levels of technological skills required by each sub-sector, the telecommunications and broadcasting sectors reduces to just 0.32% of total national employment.

1.3.7.3. The above is not unexpected – the ICT sector's major contribution to the economy is much more than the sum of its direct contribution to the economy, or even to employment: The added value of ICT usage, which impacts every economic and social sector of all economies, far outweighs the direct contribution of ICT networks themselves to both the economy (GDP) and employment. This is the reason why the ICT sector contribution is included in every one of the 17 Sustainable Development Goals (SDG) today.

The 4IR, with its unstoppable race towards automation and job replacement, will most likely add to the short to medium term decimation of jobs in the ICT sector, while at the same time increasing massively the worth of ICTs in overall economic and social development in the long term.

[22] *INTEL 2016: http://www.intel.co.uk/content/www/uk/en/it-managers/industrial-revolution-vortex-of-change.html*
[23] *STATS SA P0277: http://www.statssa.gov.za/?p=9775*

1.3.7.4. Massive expansion of the ICT user base is thus the most effective way of deriving the full value-added potential of the ICT sector, and especially leveraging the opportunities presented by the 4IR, while at the same time reducing its negative social impact on jobs in countries that have not prepared for the 4IR eventuality.

1.4. The Role of SMME in Inequality, Poverty and Unemployment: All economic and social segments of South Africa recognise the critical role of SMMEs in alleviation of the nation's triple threats, the challenge remains how SMMEs can be supported to fulfil this role. The ICT sector's response to this challenge is the DTPS recently launched public consultation on its draft SMME Support Strategy[24]. The authors of this concept paper responded to the DTPS invitation to submit written comments. Although the final strategy has not yet been released by DTPS, the key comments raised in this written response were:

1.4.1. The proposed ICT SMME Support Strategy tends to be overly techno-centric; a more citizen-centric approach was recommended in which the key objectives of the national SMME support strategy must be the nation's triple threats of inequality, poverty and unemployment;

Towards this, the strategy should recognise the massive failure rates of new SMME entrants, estimated to be in the order of 90%, and build within the strategy an SMME support environment that positions failures as learning curves, "recycling" failures towards long-term success. Failure rates of start-ups at Silicon Valley, the innovation home of the 4IR, are also in excess of 90%, but Silicon Valley recycles failures as learning curves for long-term success, retaining its position as the centre of ICT innovation. Norway, ranked #1 in human development, has a museum to celebrate failed ideas, learning from them in a virtuous cycle that leads to long term success;

1.4.2. Concerning the contribution of SMMEs to the South African economy and employment, the available statistics[25] are far too imprecise to enable firm conclusions:

1.4.2.1. Informal SMMEs account for 67% of all SMMEs, but statistical data is extremely difficult to compile and collate for informal SMMEs, hence any representative statistics for the whole SMME ecosystem must be deemed imprecise;

1.4.2.2. The median annual turnover of formal SMMEs is R276,000 (R23,000 per month), whereas that in the informal SMME sector is R4,200, or R350 per month, a survivalist income that is far too low to drive SMME employment growth in general;

1.4.2.3. SMME owners represent 14% of total national employment. Given the median annual turnover data above, it is most likely that the majority of SMMEs are single employee owner or family run businesses. With the telecommunications sector providing just 0.52% of the national workforce, a conclusion that ICT SMMEs contribute just 14% of this low level, or 0.07%, can be drawn. It is vital therefore that any intervention in SMME support must target their value add potential: their service to all other growth segments as identified by the SDGs, and the SDG predecessor the Millennium Development Goals (MDG). Both the MDGs and SDGs recognised that the ICT industry, and now the 4IR networks that converge all uses of science and technology onto a common information platform, have far greater value as enablers of all other development, much more than their own intrinsic contributions to growth.

The brief data provided above suggest that there is much room for growth in the South African SMME sector.

1.4.3. The proposed definition of ICT SMMEs needs expansion to include intensive users of ICT in sectors external to the ICT sector itself. In the proposed strategy, the definition of ICT SMMEs was considered too restrictive, thereby discouraging new entrants that developed intensive usage of ICT that spanned all growth sectors of the economy. The recognition by the global Sustainable Development Goals (SDG) process, that positions ICTs as vital support services for all 17 SDGs[26], must be recognised and adhered to;

1.4.4. In pursuance of the development of ICT SMMEs, the response strongly recommended the reservation of significant parts of the Digital Dividend radiofrequency spectrum bands in the 450MHz, 700MHz, and

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[24] *Draft ICT Support Strategy: DTPS 31st March 2017: http://www.gov.za/sites/www.gov.za/files/40756_gon307.pdf*

[25] *See Research Note 2016 No 1 compiled by Stellenbosch University on behalf of the Small Enterprise Development Agency: shortened hyperlink here.*

[26] *Sustainable Development Goals: ICT4SDG Tools: http://www.itu.int/en/sustainable-world/Pages/default.aspx*

800MHz frequency bands for SMMEs. This would enable them to provide backhaul and last mile ICT connectivity to underserviced rural and urban poor communities at prices that their users could afford, thus providing commercial sustainability for the SMME operators through massively shared broadband access as recommended in this concept paper. The response to the draft DTPS SMME Support Strategy is available for scrutiny should this be desired, wide circulation remains restricted pending the final decisions by DTPS.

2. THE SA-LAN CONCPEPT

2.1. Problem statement: The Challenges:

South Africa is not at war with itself, but the hopelessness of inequality, lack of housing and jobs, pervasive poverty, crime and drug abuse, are driving poor citizens closer to desperation, and violence. The seething anger amongst South Africa's economically disadvantaged majority must be staunched urgently, before the "ticking time bomb" that South Africa's politicians prefer to call it, explodes into national chaos and societal decay. The illustrations and video links that follow provide powerful visual summaries of the societal challenges that the SA-LANs will be designed to address.

Protests over poor service delivery: anger; housing; jobs; law and order policing

8 May 2017: Metro police take cover in Eldorado Park (Simon Sonnekus, Network 24)

27 May 2016: Angry Ennerdale resident: (Greg Nicolson, Daily Maverick)

SABC Video at: https://www.youtube.com/watch?v=e45B6sdrYPM

Massive inequality in schools and learning opportunities for children

"Although I see the tragic education stats on a daily basis, it really hits home when you see the pain and anguish of black parents who see and understand that education is the route out of poverty for their kids and are trying their hardest to get their children into "good" schools but failing at every turn. Watch the documentary and ask yourself "What can I do to change this tragic, dangerous and deeply unfair situation?": Nic Spaull, 18th February 2015: Please see the moving video at:
http://www.youtube.com/watch?v=hiEUu-Is0Ao

63% children living in poverty often leads to crime and drug abuse

Nyaope addicts talk about their painful experiences: "I need help; education; to make my parents proud": Ages 12 to 17 years

Nomsa Mahlangu says her family no longer wants her because of her addiction. Crime for survival led to the massive scar on her face.

2015 Nyaope children's Video at https://www.youtube.com/watch?v=o7lTdTWHv_8 :
Nomsa's story told by the BBC at http://www.bbc.com/news/world-africa-31620569:

Oupa Segone, the former mayor of Delmas, is trying to help these children and youth: "We can't turn a blind eye and watch as this generation destroys itself," says Mr Segone after receiving a 20-year-old man at the farm desperate to give up smoking nyaope. He mixes farming, meditation and group therapy - there are no doctors or social workers, and the addicts encourage each other to quit

Can the SA-LAN concept help Oupa Segone's efforts? Can they provide both a distraction from the drug habits, and at the same time enable self-learning, digital literacy acquisition, and productive technological assimilation at relatively low costs, in ways that the youthful "victims" of South Africa's social development challenges can enjoy?

2.2. DEFINITION OF A LAN HOUSE:

The "LAN House" is a simple extension of the Internet Café (also Cyber Café and Net Café) concept with the following major differences:

2.2.1. The LAN House focusses exclusively on poor communities, especially children and youth;
2.2.2. Capital and operational costs are drastically reduced through public/private sector support and massively shared broadband services that enable fast unlimited connectivity at commercial prices to each LAN House, as will be described in the set-up details that follow;
2.2.3. They must be built and operated as sustainable private micro, small and medium business enterprises by residents of the target communities, to provide the following: (a) time-limited fast uncapped broadband access to users in the standard internet café model; (b) a sustained income level for their owners based on service prices that the community, especially its children, can afford. The LAN House model stands in stark contrast to the typical South African Internet Café, generally located in middle income neighbourhoods or up-market shopping complexes, with internet access prices in the order of R60.00 per hour. The target prices for SA-LANs will be less than R10.00 per hour, targeting the R3.00 per hour that some mainly immigrant-owned internet cafés[27] offer;
2.2.4. User restrictions will be minimised to encourage mass utilization by local communities and their children: entertainment with learning, and digital literacy acquisition that attracts children and youth participation; access to broadband on demand for local students that may require such access; community participation and peer-driven technological appropriation commensurate with the demands of the Fourth Industrial Revolution, for whole communities and especially children and youth. LAN Houses used by South Africa's peer countries have become useful distractions from anti-social behaviours such as drug abuse and crime. The only restrictions on usage will be any usage that breaches prevailing criminal laws on public gatherings and cybercrime;
2.2.5. They encourage self-learning of related technical skills that include maintenance and technical support of all ICT equipment used by the community. The experience from many of South Africa's peers, especially

[27] *Immigrants offer affordable internet access to the poor: http://www.htxt.co.za/2014/04/10/how-immigrants-are-helping-to-get-south-africa-online/*

Brazil, is the amazing innovative spirits fostered by the LAN House phenomena (see e.g. footnote 3 on page 2).

The SA-LAN concept is very closely aligned to the Brazilian Lan House model. An elegant definition of this model has been proffered Dr David Nemer, a leading researcher of the Brazilian phenomenon:

> *LAN Houses are privately owned establishments where customers can pay to use a computer with a local area network (LAN) and Internet access. LAN Houses along with other technology access establishments, such as Telecentres and Libraries, are considered community technology centres (CTCs)*

2.3. South Africa's encounter with the LAN House concept.

On 27th February 2010, a Brazilian delegation led by the then Brazilian President Lula da Silva visited South Africa, and were hosted by the South African Department of Trade and Industry (DTI) at the Sandton Convention Centre. The Brazilian delegation included a high level technical team, discussing a broad range of potential technical partnerships which included digital television migration, and the comparative broadband development strategies of each country. The partnerships discussed were within the framework of the BRICS economic community comprising Brazil, Russia, India, China and South Africa. One of the keynote presentations by the Brazilian technical team comprised an outline of Brazil's experience in building Brazil's Information Society[28], the full presentation is available in the link provided in footnote 28. The Brazilian technical team outlined the Brazilian LAN House concept, summarised in the section "*Axis of the Digital Inclusion Policy*", from page 16 of the presentation.

2.3.1. The Brazilian Digital Inclusion Committee with its seven sub-committees and specialist groups, recognised very early that traditional computers were vital for the inclusion of youth in the overall development strategy. There was clear recognition of the popularity of modern user terminals such as smart phones and tablets, and the limitations of these devices for fully fledged digital literacy acquisition. The committee also recognised the role of networked and online games to attract children, youth and some adults, to the online world of the Information Society. These recognitions led to the strategy outlined below.

2.3.2. A national strategy to seek donations of computer equipment from entities engaged in upgrading their ICT networks, and the development of public sector (especially local authorities) distribution networks to collect and warehouse such donated second-hand computer systems. The warehouses, "donated" by local authorities, doubled up as computer refurbishing centres (CRC). At the time of the presentation, 5 large CRCs had been established, 2 were in the process of being established; more than 40,000 second-hand and 9,000 refurbished computers had been received. Second hand refurbished computers were preferred because the target communities could not afford new ones;

2.3.3. Thousands of young people from the target communities were recruited and given basic training in computer refurbishing and computer usage, tuition on LAN House business practices, and following graduation, assisted to set up LAN Houses in their own communities, using all and any available premises to reduce overhead costs. At the time of presentation, the success of Brazil's Digital Inclusion Policy was described as follows:

> *A Lan House is a commercial business similar to a cyber café, where people can pay to use a computer to access internet or a Local Area Network, to access fast information in the Web and entertainment with network games or online. According to Internet Management Committee in Brazil, CGI.br, 47% of the urban population accessed the Internet in a Lan House. In the rural area, the number reaches 58% - the majority are male, classes C, D and E. 90 thousand Lan Houses in Brazil. Lan Houses are the big Digital Inclusion engine in Brazil, involving 2/3 of the young internet users. The number of internet users in Lan Houses doubled in the last year, reaching 25 million people. 82% are workers receiving the minimum wage*

[28] *The Brazilian Experience in building Brazil's Information Society: http://www.sakan.org.za/Brazil%20Presentation%202010.pdf*

The Brazilian statistics quoted in this 2010 summary are impressive. In contrast, the most recent household survey by STATS SA (2015) reports the following points of internet access for South African household members:

Where South African citizens access the internet			
At home	**At Work**	**Via Mobile**	**Internet Café or school/university**
9.6%	15%	47.6%	9.3%

The relatively high average use of mobile broadband should be viewed against the cost to communicate discussions of sub-paragraph 1.2.3, and the limitations of handheld devices.

2.3.4. **Summary of the Brazilian LAN House experience:** The highly informative ethnographic research on the Brazilian LAN House phenomenon conducted by Dr David Nemer (footnote 6), serves to summarise this section of the SA-LAN concept well:

> *LAN houses are places where locals socialize; game players often yell at each other and Internet users walk around reading others' screens. The computers are arranged side by side without partitions between them, unlike cybercafés that are targeted for private and discreet Internet access rather than online gaming. They are also different from the Telecentres, which are places intended for silent, individual computer use without disturbing others. LAN houses have become the main place for updating and checking social networking sites, such as Facebook, playing games and socializing, and this has transformed these spaces into a hotbed of activity for youth and others (Pereira, 2007; Silva & Gushiken, 2011).*
>
> *Horst (2011), who studied LAN houses in São Paulo, Brazil, observed that "this face-to-face socialization surrounding new media use, coupled with the sociotechnical support provided by many of the LAN house owners and workers, has led many to characterize the social and digital inclusion provided in these spaces as The LAN Revolution" (p. 446). The growing use of LAN houses sheds light on the debate regarding the role of the State and market in the dissemination of digital technologies. On the one hand, following the critical theories of communication (e.g., Gabler, 1999; Gonçalves, 2007), there are those who deny the LAN house as a digital inclusion space. They believe that only centres managed and maintained by the State, such as Telecentres, are effective because their goal is not to be profitable but to promote the technology appropriation and democratization. On the other hand, there are those who believe that, given the ineffectiveness of governments, LAN houses promote the true digital inclusion and community wellness in Brazil since Telecentres are few in number and are tied to government policies rather than local needs (Carvalho, 2009; Pereira, 2007)*.

3. Building the SA-LAN in South Africa.

The SA-LAN concept has been discussed in South Africa in several forums and private discussions, and a few implementation attempts have been made, but success remains elusive.

3.1. Scalability issues: This is perhaps the central weakness of all efforts to drive technological appropriation and digital literacy acquisition for the future generations of South Africans:

3.1.1. The strategy for empowering children and youth for the uncertain technologically-dependent future has correctly been identified as high-quality education. The natural tendency has thus been to direct maximum attention and funding to the educational institutions responsible: the department of Basic Education for entry level digital literacy acquisition, and the Department of Higher Education and Training for the technological skills required to build the networks and services needed, and the capacity for intensive use of ICTs for holistic national development. Evidence suggests that the system of education itself needs urgent development, as illustrated by South Africa's very low global ranking in the critical STEM subjects (section 1.3.6 of this paper). The highly publicised and costly failures of mass school computerization programmes such as the Gauteng Online Schools Project, and the doubt surrounding its replacement (Gauteng digital school initiative 'doomed to fail'), verifies that the nation's education system itself is in great need of development. Furthermore, the global recognition that traditional systems of education at all levels are inconsistent with the needs of the unfolding Fourth Industrial Revolution add to the uncertainty of relying on the national education systems alone.

3.1.2. In recognition of the limitations of the traditional school systems and related budgets, numerous international and local entities have developed strategies to fill the gap. One such international initiative is the

One Lap Top per Child (OLPC) initiative, launched in 2005 to distribute connected personal laptops to schoolchildren in the developing world. Global media abounds with early news of successes, followed by news of its 2014 demise. However, significant coverage of its life after its predicted demise continues into 2017 and beyond. The Republic of Rwanda has been one African country that benefited greatly from the initiative, fully supported by the State President to the extent that children's laptops were also used to impart digital literacy to their parents[29]. There is a small but effective presence of the OLPC project in South Africa, but even this fails the ultimate test of scalability.

3.1.3. There are numerous successful government entrepreneurship development initiatives in progress, high level state-run and academia supported Innovation Hubs, and street level locally-driven ICT training centres, some with public internet access facilities. A few relevant examples are provided in footnote[30]. All such initiatives are vital compliments to the national education system in imparting the critical national e-skills, but are they scalable to the extent of slowing down the growing poverty-driven inequalities and the resulting societal disruptions? Can they stem the growing unemployment levels that are themselves driven by the lack of scalability and "massification" of these initiatives?

3.1.4. In considering the above national ICT skilling initiatives, there is a real danger to national stability if equal, preferably more, attention is not given to the 30 million South Africans and the 63% of the nation's children that reside at the base of the nation's development pyramid. A success skewed in favour of these high-level interventions will in fact fuel further the inequality levels, leading to a growing cycle of societal upheaval. The SA-LAN concept is designed to address this real danger of a one-sided success story adding to the national malaise instead of mitigating it.

3.1.5. The SA-LAN concept must not be assigned to the national education process in any way, even with the close collaboration necessary between the process itself and the integrated national educational system. The SA-LAN must be absolutely free from the concept of teaching, which must be left to the education system itself and the numerous public and private complimentary activities in progress and planned. The thinking of LAN Houses as educational centres of learning has been the major cause of the ineffectiveness of their Telecentre equivalents, and the lack of scalability of related private and public initiatives. Experience gained by those nations who have used the concept, like Brazil, all agree that LAN Houses must be centres of fun and enjoyment for children, secure community "hangouts" where they play and learn through peer group engagement. This is approach is well summarized by Brazil's researcher David Nemer (see page 112 in footnote 6):

> Gabriel, 17 years old, summarized the residents' frustrations:
>
> *"Now you can see what it means to be marginalized. If you get hurt, you can't even go to the hospital right next to your house because they won't take you in because you don't have money… My school, which is public, of course, is a joke. Anyone can get good grades. The teachers don't really care about us and we don't really care about school. It becomes a vicious cycle. The only thing that works here is this [LAN House/Telecentre]."*

3.2. Investment attractiveness and profitability: The concept has been dogged by the same triple threats of inequality, poverty and unemployment that it seeks to mitigate: business plans that target this community are considered unattractive by many investors and supporters; "you can't monetize poverty" has been a popular response. "Social services such as this are the sole responsibility of government", and "Government must connect uneconomic areas first, before handing over the networks and services so built to the competitive private sector as soon as their operations become economically viable and sustainable". These diverse opinions continue to impose barriers to development at the base of South Africa's development pyramid.

3.3. Individual efforts: A few prospective entrepreneurs, some with the support of national academic or research and development institutions, have tried to provide affordable ICTs that go beyond survivalist usage.

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[29] *OLPC in Rwanda, 2008: https://www.youtube.com/watch?v=6jaGrvbQLhg*

[30] *Examples of local interventions: (1) http://silulo.com/#section-about; (2) http://www.jcse.org.za/hub (3) http://www.changetheworld.org.za/images/CTW_files/2015%20CTW%20Profile.pdf*

Groups of young entrepreneurs, after hearing of the concept, are known to have collected second-hand computers, refurbished them, stored them in container warehouses, then failed to find a way of selling them profitably to poor communities. In addition, a few non-profit organizations and socially minded entrepreneurs have attempted to supply refurbished computers to schools and individuals in marginalized communities, and to build low cost wireless connectivity networks to support them. They too failed the sustainability and scalability tests. The primary cause of failure in these initiatives has been the absence of an enabling environment that supports such innovations, and encourages their growth. The case of Dabba Telecoms[31] is a classic example of one such attempt that failed the test of mass application and sustainability, partly through deliberate public-sector intervention. "*ICASA – Stealing from AIDS Orphans*"[32] is one dramatic news headline that suggests the unwillingness of the regulator and some state institutions to support pro-poor connectivity.

3.4. Economic ideologies: A major stumbling block that has impeded previous attempts to introduce the SA-LAN concept is the national economic model adopted by South Africa. The free market economic model which virtually defines the national ICT sector, has been unable to coexist with the socialist philosophy needed to address the needs of the poor. The primary responsibility for national scale ICT infrastructure development must rest with the private sector, which is obliged to use the free market economic model to raise the investments needed to build the national ICT infrastructure, and to acquire and reward the advanced multidisciplinary skills required, while at the same time generating profits that secure the returns on investments that their shareholders demand and expect. As one senior representative of a major mobile operator recently commented: "*My company cannot be expected to service the 30 million plus economically disadvantaged South Africans at costs below market value, and remain economically viable and competitive; that must be the responsibility of Government*" This opinion is fully understandable and realistic within the prevailing national economic model, however, can the South African Government, or any emerging economy government for that matter, develop the skill sets and raise the huge investments needed to provide these technologically advanced social networks under the prevailing free market economic model? South Africa needs a mixed economic strategy urgently, one that embraces the free market growth model, whilst at the same time prioritizing the socialist imperatives that could undo the successes of the former. If a solution to this dilemma cannot be found, then South Africa must live with the political uncertainties and social upheavals that will arise from the triple threats of inequality, poverty and unemployment.

The SA-LAN concept promotes the establishment of numerous SMMEs to provide these social services at prices that the target communities can afford, while at the same time generating the revenues that secure the SMME businesses' sustainability with decent livelihoods for their owners. South Africa already has the beginnings of such SMMEs active in the national ICT sector. The Wireless Internet Service Providers (WISPs), and the smaller traditional Internet Service Providers (ISPs), comprise a relatively large number of profitable micro and small enterprises that provide vital information services alongside the much bigger ICT corporates. This ICT SMME model can be extended to the nation's poor through application of the SA-LAN concept, encouraging significant numbers of new entrant ICT SMMEs, and servicing whole communities of citizens that would not otherwise afford the information systems they need for their development.

3.5. Connectivity and Support: Institutional Arrangements: Given the full recognition of the triple threats on South Africa's growth, stability and sustainability by most segments of the nation, the South African Government set up various institutions to address the challenges in the ICT space. Nearly all these institutions received full or partial support from the private sector, which in many cases remains obliged to fund their activities through various forms of taxation, for example, contributions to the regulated Universal Service and Access Fund (USAF). There is growing national consensus that most of these institutions have failed to meet fully the national expectations, even with significant funding and high-level skills provided to them. While an in-depth analysis of these institutions is beyond the scope of this document, a brief summary follows, which serves to inform the strategic decisions needed for the SA-LAN concept to be successful:

[31] *Dabba Telecoms – the story of Rael Lissoos' efforts published by the Economist at: http://www.economist.com/node/11751167*
[32] *Icasa shuts down pro-poor Wi-Fi: https://manypossibilities.net/2009/02/icasa-stealing-from-aids-orphans/*

3.5.1. **The Universal Service and Access Agency of South Africa (USAASA):** At the dawn of South Africa's democracy in 1994, the African National Congress (ANC) led government "committed to redressing the grotesque inequalities in all aspects of life in the country"[33]. The information inequalities were addressed through the establishment of the Universal Service Agency (USA) in 1996, which evolved to today's USAASA. Twenty-one years later, the South African Government and the ANC, through the draft National Integrated ICT Policy nearing finalization, recognised the failure of this strategy, and plans to shut down USAASA, introducing a Digital Development Fund under the direct control of the Minister to replace the USAF. The primary reason for this major institutional reform is the recognition that USAASA, which invested heavily in Telecentres with little visible results, had failed to use the USAF to bridge the digital divide, and by so doing, begin to ameliorate the nation's triple threats. The key phrase published in the South African Government News website explains this strategic shift well:

> *The new Digital Development Fund will focus on the extension of infrastructure, end user and equipment subsidies, support digital literacy and skill development, funding to extend access to digital government services, and support for innovative use by SMMEs of ICTs to improve productivity, sustainability and competitiveness*.

There are numerous global studies on the efficacy of the Telecentre concept, most of which, like USAASA has done, cling to the notion that they will improve and become sustainable in time. A growing number of empirical studies[34] suggest that the failure of Telecentres is largely due to (a) their technological deterministic leanings; (2) their failure to attract the wider youth population with attractive products and services; (3) their "top-down" approach as an exclusive state responsibility; and (4) their lack of scalability and thus sustainability. Two useful analyses and opinions, based on extensive global evaluation by their authors, are provided in footnote 34.

The proposed SA-LAN is an extension of the Telecentre concept that channels the perceived techno-centricity of telecentres towards a citizen-centric approach, and encourages SMME participation from the base of the development pyramid. The primary focus, as stated in preceding paragraphs, is the population of citizens that cannot afford the full range of high quality information access that their wealthier peers enjoy. The wealthier segments of society do not need the support of the Digital Development Fund, the free market economic model provides all their information technology needs.

3.5.2. **State-owned Enterprises (SOE):** All state-owned enterprises in South Africa have a critical role in defeating the triple threats that face the nation. Those SOEs engaged in ICT service delivery have the infrastructure, capacities, and theoretical capabilities, to contribute greatly to the provision of ICT services to marginalized rural and urban communities, but to date, successes have been elusive.

This discussion of the SOE capabilities is intended to illustrate their collective capacities to provide the vital connectivity to the SA-LAN shared services network, even at prevailing commercial rates, but with the costs of such connectivity shared amongst many who cannot afford individual connectivity. The key SOEs in this category are summarised briefly below.

3.5.2.1. **Eskom and Transnet:** These two SOEs have the regulatory authorizations to build nationwide ICT networks for their own use: energy and rail transport control for efficient operations and safety. The SOEs are prohibited by regulation from providing ICT services directly to the public. Once built, the ICT infrastructure owned by both SOEs can be expanded at comparatively low cost, unleashing significant capacities for low cost ICT services to consumers. The question that the South African nation must ask itself is how such ICT capacities can be used without breaching the reasonable prohibitive regulations designed mainly to protect the ICT industry as a whole from the unfair competition that would arise? One practical solution raised during the process of ICT liberalization was to transfer these capacities as a 15% ownership stake for each SOE in the Second National ICT Operator (the SNO) that would compete with Telkom, the former monopoly ICT SOE.

[33] *Peter Benjamin 2003: http://www.hsrcpress.ac.za/product.php?productid=2062*

[34] *IDRC studies in South Africa and Uganda:* https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/30414/IDL-30414.pdf?sequence=19&isAllowed=y *AND:* Opinion *by Dr Michael Gurstein, Community Informatics activist (short hyperlink for editing elegance)*

Political considerations negated this arrangement, preferring instead to transfer all such capacities to a new SOE, Broadband Infraco (BBI).

3.5.2.2. **Broadband Infraco (BBI)**: Broadband Infraco was established in 2006, under the control of the Department of Public Enterprises. The regulatory protections of the mainstream ICT industry that applied to both Eskom and Transnet were partially transferred to the new entity; BBI's operations are restricted to providing wholesale broadband connectivity to the national ICT industry as a whole, but the SOE may not provide direct ICT services to the public. The institutional arrangements created for BBI were, and remain, such that the SOE is obliged to bear the same or similar operational and overhead costs as the main licensed ICT operators, but may not generate the profits and revenues from direct sales of ICT services to the general public that pay for such overheads. This arrangement is considered by many, including the authors of this concept paper, to be one of the main causes of BBI's perceived failures and lack of sustainability. The current efforts to move BBI oversight control to the DTPS is unlikely to reverse this very fundamental institutional design flaw.

3.5.2.3. **SENTECH:** Sentech is the national SOE tasked with building and managing the national signal distribution networks for the broadcasting sector. In 2002, Sentech was issued with "carrier of carriers" and multimedia licences, with spectrum assignments in the 2.6GHz and 3.5GHz bands. The spectrum assignments came with a mandate to roll out wireless broadband services with a primary focus on rural connectivity. Following the well documented costly failure of Sentech's MyWireless[35] venture into the public wireless broadband services market, and a series of plans, proposals and strategies to renew attempts the were never implemented, Sentech returned its spectrum assignments to the regulator in 2013.

3.5.2.4. **The State Information Technology Agency (SITA)**: SITA introduces itself in its website (http://www.sita.co.za/) through its mission statement: "*To render an efficient and value added ICT service to the public sector in a secure, cost-effective and integrated manner, contributing to citizen convenience*". With vast capacities available in meeting its mandate to provide ICT services to the public sector, there has been little consideration of how this capacity can be extended to ameliorate the nation's triple threats directly. There are clearly numerous possibilities, as illustrated by the early South Korean strategy which included massive over-capacitated rollout of the SITA equivalent network, followed by allowing competitive use of this over capacity by both public and private sector ICT companies. This strategy enabled the country to raise its low internet user penetration of just 7% in 1998 to an incredible 93% of households with access to the Internet by 2005, just seven years later.[36] The South Korean government avoided the common causes of SOE failures, the attempt to instil a "public service corporate culture" into a competitive commercial enterprise, or vice versa, to oblige a public service entity to compete in competitive corporate culture environment.

3.5.2.5. **Telkom.** As the former state ICT monopoly, Telkom has extensive national scale infrastructure, capacity, and competence in virtually every segment of the ICT ecosystem. The company, and its state shareholder, have experienced extreme difficulties in the transition from a protected state-owned monopoly to a competitive modern ICT company. The full complexity of Telkom's modernization efforts is beyond the scope of this paper; however, the most relevant feature of the company is its ownership of vast fixed ICT infrastructure assets: nearly 100% of the copper cable infrastructure which the SOE failed to leverage as an early entry into the broadband world (through ADSL); and its 80%[37] plus ownership of the national long distance optical fibre reticulation.

The complexity of retaining this vast ICT infrastructure as a competitive advantage in this modern competitive era, or releasing much of it for the social information services needed to mitigate the nation's triple threats, has defeated both the company and its state shareholder. Fibre optical networks run through many rural communities, but access to them by rural dwellers is not allowed. Remote relatively densely populated villages like Msinga in the KwaZulu-Natal province have Telkom fibre running through the village, however, efforts by

[35] *TechCentral 2010: http://techcentral.co.za/sentech-revives-broadband-network-plans/17834/*

[36] *The South Korean "miracle": http://www.thenational.ae/business/industry-insights/technology/south-koreas-path-to-internet-mastery*

[37] *Telkom's optical fibre network: https://mybroadband.co.za/news/telecoms/80239-telkoms-unrivalled-fixed-line-network.html*

USAASA, using the USAF, were obliged to extend 2G and 3G mobile services to the area for broadband connectivity, ignoring the vast connectivity that could be provided via the Telkom fibre cables.

3.5.3. **Summary of this short outline of the SOEs:** In the opinion of the authors of this document, it is easy to identify and discuss the shortcomings of SOEs as vehicles for the reduction of South Africa's triple threats; it is much more difficult to find solutions within the existing socio-economic-political environment to enable them to do so. The human factors governing the decisions are much more complex than the business and technological solutions available. The SA-LAN concept offers a way out of these dilemmas: massively shared access to broadband infrastructure by citizens who would not otherwise afford such access individually, while at the same time enabling the network owners to realize reasonable returns on their investments through such sharing. The SOE ICT capacities, if used judicially through appropriate institutional arrangements and business modelling, can go a long way to mitigating the nation's triple threats. National ICT policy and regulatory provisions should allow SOEs to refocus their service portfolios directly at the 30 million South African citizens residing at the base of the national development pyramid, and their children who account for 63% of the national child population.

3.6. The proposed SA-LAN implementation process: The most important factors that limit the capability of South Africa as a whole to provide developmental level services to the nation's poor, is poverty itself: "you can't monetize poverty, or easily profit directly from it". This feature of the challenge leads to the following prescripts for a successful SA-LAN implementation:

3.6.1. The SA-LAN implementation plan must not be positioned as a "project". If it is to be used at all to mitigate the nation's triple threats, it must be positioned and managed as a development process, not a project. The technologies and business models to be used are simple, tried and tested, and only need to be rendered for high level scalability and relevance to the 30 million economically marginalized South African citizens and their children;

3.6.2. As an ongoing development process, full ownership of the rollout process, but not the SA-LANs themselves, must rest fully with the local authorities responsible for development of the target communities. Strong partnerships with relevant line ministries and departments, local communities, civil society, academia and research and development institutions, and willing international partners who have experienced the process in one way or another, are vital to its success. In the latter case, the BRICS community, especially Brazil, hold much promise.

3.6.3. Given the above criteria, the normal project implementation processes of outsourcing implementation through external consultants and service providers, and the use of the tender process to manage such outsourcing, is a sure recipe for failure and must be avoided at all costs. Similarly, operations after SA-LAN implementations must be kept extremely simple; no management contracts of any sort. Once established, direct commercial arrangements between the SA-LAN owners and their service providers (e.g. broadband connectivity), must follow normal commercial practice without intermediaries. The reality remains that poverty cannot be monetized, and any attempt to do so will defeat the primary objective of alleviating the nation's triple threats.

3.6.4. Process management should ideally be the responsibility of local authorities, using the significant budgets assigned to poverty alleviation (e.g. Johannesburg's Mayor allocates 60% of the municipal budget on pro-poor programmes: EWN May 2017). Where local authorities genuinely lack this capacity, partnerships with academia and relevant research institutions, commercial banks and willing businesses through their CSR budgets, can fill the intellectual capacity gaps. Costs, especially capital investments and operational overheads, must be cut down drastically without reducing motivation and quality. These seemingly conflicting requirements can be met as follows:

3.6.4.1. The SA-LAN concept should be aggressively supported, marketed and promoted by concerned agencies such as the Department of Telecommunications and Postal Services, DSBD/SEDA, ICT industry forums, and civil society organizations, and local authorities. The marketing and promotional activities should target local authorities and all political parties irrespective of political allegiances, so that local authorities,

especially their mayors and similar level decision makers, understand and adopt the concept as a component of their poverty alleviation, job creation, and e-readiness strategies.

The South African Local Government Association (SALGA)[38] must be canvassed to support the concept and promote it aggressively to its members, and play a central role in process implementation;

3.6.4.2. Reduce design and implementation overheads drastically without prejudicing quality and enthusiasm. This can be done by emulating the 1970's aerospace research innovation comprising "Skunkworks"[39]: very small multidisciplinary teams, preferably drawn from existing municipal divisions such as IT and business development, working autonomously within the municipal bureaucracy, but with maximum high-level support and tight monitoring to deliver high quality results at the lowest possible cost. The Skunkworks method can be extended to the institutional and business supporters of the concept to add the knowledge capacities needed for the process. These Skunkworks teams will be tasked with setting up the SA-LAN strategies for each local authority, and/or participating as team members of collaborative partnerships with e.g. academia and related research organizations. All essential planning and implementation functions, including the design and implementation of the essential distribution systems required to collect, warehouse and refurbish donated second-hand ICT hardware, must be undertaken by these teams.

3.6.4.3. As in the Brazilian model, municipalities should as far as possible release underutilized buildings, or repurpose buildings for use as computer warehousing and refurbishment facilities, in the manner of the Brazilian CRCs described in section 2.2.6 of this concept paper. Small CRCs located within the target communities should be preferred, thus reducing accommodation and travel costs for the trainee SA-LAN owners who will operate the businesses, and the overhead costs for participating municipalities. Regarding housing the actual SA-LANS, the choice should be the homes of the new owners, with minimal extensions, assisted by the municipality through loans if necessary. Other possibilities include the use of underutilized public spaces, with basic modifications for the security of people and equipment. Luxurious SA-LANs should not be the immediate target, the entrepreneurs should be challenged to grow from any entry level and quality, with the more enterprising owners gradually improving their businesses to attract more users and therefore higher profits.

The range of entry and end points for Brazil's LAN House phenomenon

From "Spaza-shop butcheries" with internet access, through LAN House shacks, to sophisticated versions with comfort and elegance, all welcome as entry and end points to a decent quality of life and opportunities for growth for economically disadvantaged citizens. In many cases, e.g. prior to and during the Brazilian Soccer World Cup of 2014 and the Brazilian Olympics of 2016, new LAN Houses located in favela shacks followed the introduction of law and order police units to minimise crime during these international extravaganzas. The value of LAN Houses for law and order maintenance is fully recognised.

[38] *The South African Local Government Association: http://www.salga.org.za/*

[39] *Skunkworks: (Collins Dictionary): (1) a group of engineers, scientists, etc. engaged in research and development, usually secretly or in isolation (2) the division within a company or the facilities of such a group:* http://www.collinsdictionary.com/dictionary/english/skunk-works

Any alcove anywhere: *Almost as essential as rice and beans, the internet is increasingly being accessed in the Brazilian favelas. According to the Data Favela Institute, 52% of slum dwellers have access to the internet. Through the network, communities demystify the poverty associated with community impotence*.
http://plus.google.com/100029495329387361499

With creativity, Brazilian favelas dribble digital exclusion

3.6.4.4. Once the distribution systems for collecting and warehousing donated second hand equipment is established, the training of young candidates from the target communities should commence. This must begin with the identification of such candidates, followed by the impartation of very basic skills to refurbish the computers and services, and to set them up and operate them as SA-LANs. This training must include the basic business skills needed to run the SA-LANs as private SMME businesses. Such training should draw on the expertise of all willing academic and research institutions as part of their own training programmes, willing private sector partners, and civil society organizations with the requisite skills. The technical staff of the municipal Skunkworks must lead these short but focussed training programmes, with partners where necessary.

The initial SA-LAN setups and operating procedures should be based on standard models developed by the municipal SA-LAN Skunkworks, with as much help and participation by students from the nearest academic or vocational training institutions, and from suitable ICT innovation hubs where they exist. Expansions and service improvements should be left to the creativity of the SA-LAN owners as a means of self-development. Multi-services should be encouraged as business growth and sustainability models. The end results of how these SA-LANs will be used must not be limited in any way, extending if necessary to the Japanese models that provide overnight accommodation with internet connectivity to homeless migrant workers[40]. Even in very wealthy Japan, LAN-Houses provide opportunities for the poor and homeless to survive and to improve their life conditions.
Once established, a "hands off" relationship between the local government and the SA-LAN owners that build independence and true entrepreneurship spirits, is vital. Failures should be allowed, successes celebrated, and takeover and mergers encouraged to fill gaps as they arise. All credit facilities where necessary should be handled by banks and/or similar competent authorities, facilitated by the Skunkworks teams as part of their initial support strategies.

4. Budgets, funding, and sources of funds. A typical small (6 computer) Internet Café in a good location in South Africa costs roughly R120,000 to set up, generates revenues of about R800,000 per annum on operating costs of about R700,000 per annum, falling to R580,000 after set up costs are settled during the first year of operations. Sales of functioning Internet Cafes range from R50,000 to R400,000. These set up costs are clearly beyond the capacities of the target SA-LAN owners, hence the strategy proposed for the SA-LAN concept.

As discussed in section three above, the critical success criteria for the SA-LAN concept is the drastic reduction of rollout and operating costs, achieved by classifying the concept as a process, not a project. Initial support of the process must be integrated into local government budgets for poverty alleviation. Elements of the process has started, through the extensive municipal broadband and Wi-Fi access networks gaining increasing popularity in South Africa, and the whole world of developing and developed nations. These municipal initiatives, necessary as they are, focus mainly on the connectivity needs of poor communities. The SA-LAN concept extends this focus to direct user capacity development and job creation. On a national scale, funding should be secured from national policy instruments such as USAASA and its successor, the Digital Development

[40] *"YOUin Japan.net" article at: http://youinjapan.net/sleeping/internet_cafe.php: Video with English subtitles at: https://www.youtube.com/watch?v=MtdupS0qRt0&spfreload=5*

Fund. As per the Brazilian LAN House experience, SA-LAN owners will be expected to pay back the initiation costs on terms to be arranged with each participating local authority. The Brazilian model of obliging LAN House owners to pay back the direct costs of setting up their business in instalments over five years, should be considered. The Brazilian experience demonstrates that once established, the process becomes self-perpetuating and sustainable – new entrants from the favelas seize the opportunity without the support of the local authorities.

There is however, a need for seed funding for the promotion and marketing activities for the process itself, through sponsorships by state, commercial and other entities that already invest in alleviation of the nation's triple threats. The initial canvassing and promotion activities will comprise the following:

4.1. Sponsorships by South African Banks: Most commercial banks in South Africa have expressed deep concern over the economic trajectory of the nation, specifically the intractably high inequality, poverty and unemployment levels that threaten the environment in which they conduct their businesses. The evolving South African political climate, which has led to severe downgrading of South Africa's economy, is of great concern to all the nation's commercial banks. Furthermore, all South African banks are fully familiar with the disruptive effects of the ICT industry, and have extended their portfolios to include various ICT products for their customers. Some banks have recently extended their support services directly to poverty alleviation through sponsorships of learners in response to the #FeesMustFall mass protest movement[41]. Some of the major commercial banks are seeking to finance credible programmes for poverty alleviation via ICTs. There are risks that some of these good intentions could be subverted by the dependence on obsolete models of interventions, such as variants of the failed Telecentre concept; direct partnerships with local authorities using the SA-LAN concept can reduce these risks. South Africa's commercial banking sector could provide invaluable support for the initiative through effective use of their significant CSR budgets, in full partnerships with local authorities and the teams set up to introduce the SA-LAN concept.

4.2. Captains of the South African Industry. Nearly all large industries and commercial companies have deep vested interests in the sustainable growth of South Africa's economy, and many have significant Corporate Social Responsibility (CSR) budgets and divisions to foster such growth. The major mining conglomerates, with their massive often restless employees, continually seek ways of improving the living conditions of their employees and their families. BHP Billiton[42] for example has proactively intervened in South Africa's skills development challenges, and may be willing to extend such interventions to support the SA-LAN initiative.

Within this sector is a promising initiative at an early stage of development: the mining giant Anglo Gold Ashanti (AGA) is working closely with the University of Cape Town (UCT) to develop a strategic framework to operationalise the Sustainable Development Goals in South Africa, through academia/industry partnerships. This development aligns very closely with the SA-LAN concept, the operationalisation of the SDGs from the base of the development pyramid. The critical aligning feature of the SA-LAN concept is its citizen-centric approach to development, instead of the techno-centric approaches that dominate the pro-poor interventions in the ICT industry.

4.3. The National ICT Industry: All major players in the ICT industry are deeply concerned over the socio-economic-political stability of the nation, which ultimately determines their long-term business sustainability. As discussed in section 3.4 of this document, they all face the dilemma of providing affordable ICTs to the masses of poor South Africans, while at the same time protecting their shareholders' interests. The industry is under continuous criticism over the national cost to communicate conundrum. Most would welcome an initiative such as the SA-LAN process, but this must be rendered credible through high level government support, and funding through their own significant contributions to the government controlled Universal Service and Accesses Fund, and its imminent successor the Digital Development Fund soon to be introduced by the DTPS.

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[41] Standard Bank introduces the FEENIX crowd funding programme for #FeesMustFall: https://www.feenix.org/

[42] BHP Billiton Skills Summit presentation by the author of this paper: http://www.skillssummit.co.za/presentations/2013/SACF_presentation.pdf

4.4. Public sector institutions: The support of the DTPS, the Parliamentary Portfolio Committee on Communications, and the state ICT regulator ICASA, are essential to the success of the SA-LAN concept; they control the policy and regulatory environment within which the concept will thrive or fail. Other key public-sector institutions that need to be canvassed for support of the concept are:

4.4.1. **The Department of Trade and Industry (DTI) and its specialized agencies:** The DTI, through its global trade links, specifically the BRICS community, was instrumental in introducing the SA-LAN concept in South Africa, as discussed in section 2.2.6. Furthermore, the DTIs equally close links with local public-sector institutions active in the economic space, positions the DTI as a mandatory support partner for the initiative. Can this DTI global influence be extended to initiate a research partnership with Brazil and other BRICS nations for the process, with seed funding from the BRICS Bank? All BRICS nations can add significant value to South Africa's SA-LAN concept: (a) Brazil, with its visible success in the LAN House phenomenon (more than 100,000 in urban and rural areas); (b) Russia with its very popular Cyber Café gaming houses with 100Mbps backhaul connections; (c) India with multitudes of Internet Cafés that are currently on the decline due to heavy-handed regulation driven by security concerns; (d) The rise and fall and rise again of China's 146,000 "official" Internet Cafés or "Game dens" which attracted 20 million users per day[43] in 2016 (note the role of Tencent which drives the process in China, is partially owned by South Africa's Nasper's with a 33% shareholding). Valuable lessons can be learned from these global partners as South Africa strives to mitigate its triple threats through the ICT tools at its disposal.

4.4.2. **The Department of Small Business Development and SEDA.** These two closely related institutions are crucial partners, their mandates are focussed entirely on the SMME community, which lies at the core of the SA-LAN concept. At present, the ICT related activities by these two institutions is minimal compared to the other socioeconomic sectors, but this can change.

4.4.3. **The Industrial Development Corporation (IDC):** "*The IDC has committed itself to funding youth-empowered and youth-owned enterprises to the value of R4.5 billion over 5 years*". This funding arrangement is restricted to loans of R1 million per business, exceeding by far the investment levels envisioned by the SA-LAN concept. There are, however, numerous possibilities that could benefit the concept, for example, funding the SMME businesses that provide the backhaul connectivity to the micro SA-LANs, as suggested in section 1.4.5 of this paper, or bulk funding of groups of SA-LANS to comply with the institution's funding policies.

4.4.4. **Academia and research institutions.** All South African universities and vocational training centres can play a critical role in the success of the SA-LAN concept, by assigning their graduate students to acquire hands on practical experience assisting the SA-LAN owners to set up their businesses, and to develop or select the software tools that will attract youth and local adults to use these facilities. Universities with significant IT and/or engineering, small business, and social development faculties should be encouraged to "adopt" SA-LANs within their areas of influence, and extend their partnerships towards high level technological and ethnographic research to address the impact and response to the 4IR. Several leading South African universities have acquired useful experience in this regard, and know intimately the weak spots of similar well-intentioned interventions. For example, the research project[44] conducted by the Universities of Fort Hare and Rhodes, within the COFISA (Cooperation Framework on Innovation Systems between Finland and South Africa), has invaluable lessons for the mitigation of the numerous institutional and regulatory barriers that inhibit the success of pro-poor initiatives in South Africa.

4.4.5. **South Africa's Council for Scientific and Industrial Research (CSIR):** The CSIR and its specialized research division the Meraka Institute has immense capabilities and capacities to contribute to the SA-LAN concept. They also have invaluable experience in launching nearly identical development programmes which have not yet fully succeeded in driving ICT usage amongst the poor. Projects such as the very well-funded

[43] *China's internet cafes are coming back, thanks in large part to Tencent:* https://www.techinasia.com/china-internet-cafes-back

[44] *The Fort Hare, Rhodes and COFISA research project in the Eastern Cape, 2010: http://www.foresightfordevelopment.org/sobipro/download-file/46-236/54*

Wireless Mesh Network Project[45], and the Digital Doorway[46] initiative were unable to scale nationally for a number of reasons, including the lack of an enabling environment for their success, and their perceived techno-centricity. The SA-LAN concept can be viewed as an extension of the two concepts, mitigating the reasons for their lack of scalability and sustainability, by addressing the needs of the youth directly and in a way that they will embrace and welcome.

In addition to the above invaluable lessons learned, CSIR Meraka are considering the establishment of a new research initiative in partnership with ICASA, the 5G Research Alliance of South Africa (5GRASA). 5GRASA will focus on the impact of the fifth mobile generation of technologies and networks (5G) on tomorrow's technical standards and the required regulatory interventions. The research will also extend to the impact of 5G on society, especially the nation's triple threats of inequality, poverty and unemployment. This is a research direction that can have profound impact on the modernization and sustainability of the SA-LAN concept as it unfolds. The advent of 5G, and its expansive Internet of Things (IoT) component, are critical outcomes of the 4IR that can change the dynamics of the SA-LAN concept, and South Africa itself, in fundamental ways.

The above list is by no means exhaustive: South Africa demands intensive attention to the inclusion of the nation's poor majority in the national development process. National scale collaboration and coordination is vital.

5. Theoretical Foundations: Further research opportunities:

This concept paper is derived largely from extensive work undertaken by the authors in the African ICT industry over many years, and more recently, through research conducted at Monash University's South African Campus, which focussed primarily on the relationship between ICTs and Human Development[47]. The papers listed in footnote 47 provide quantitative evidence of the impact of South Africa's triple threats on the nation's progress in Human Development, and are consistent with the growth challenges and resulting objectives in the nation's National Development Plan. The papers were written and published well before the NDP was crafted.

The SA-LAN concept, once initiated, has the possibility of opening up immense new avenues for new research. For example, the ethnographic research conducted by Brazil could be extended to cover the unique South African socio-cultural-political environment, providing new insights into the appropriation of technology by South Africa's poor.

On a much broader research perspective, would it be possible to extend such ethnographic research into the realms of fundamental anthropological and archaeological science: the quest to understand human cognitive evolution under the influence of environmental and technological forces? South Africa lies at the heart of this human evolutionary cycle, as described in numerous research papers, including the 2015 research paper "*Examining the Causes and Consequences of Short-Term Behavioural Change during the Middle Stone Age at Sibudu, South Africa*"[48]. The short extract from this research paper suggests the immense possibilities available for scientific research. South Africa's children, studied through the laboratory of the SA-LAN, can contribute greatly to the global understanding of human technological appropriation, from the MSA more than 50,000 years ago, to today's 4IR world.

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[45] *CSIR Meraka Wireless Mesh Network Project: http://www.esastap.org.za/download/present_pov_04_2012.pdf*

[46] *CSIR Meraka Digital Doorway initiative: https://researchspace.csir.co.za/dspace/handle/10204/2676*

[47] *(1) Next Generation ICT Policy in South Africa: Towards a Human Development-based ICT Policy: https://link.springer.com/content/pdf/10.1007%2F978-0-387-84822-8_8.pdf*
(2) Towards a research framework in ECIS 2009: https://www.researchgate.net/publication/221408276_Towards_a_research_framework_for_a_human_development-based_Bottom_of_the_pyramid_ICT_development_strategy_in_South_Africa
(3) Innovations for digital inclusion: Leveraging next generation networks for human development from the bottom of the pyramid: http://ieeexplore.ieee.org/document/5338901/

[48] *Examining the Causes and Consequences of Short-Term Behavioural Change during the Middle Stone Age at Sibudu, South Africa: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130001*

Abstract: *Sibudu in KwaZulu-Natal (South Africa) with its rich and high-resolution archaeological sequence provides an ideal case study to examine the causes and consequences of short-term variation in the behaviour of modern humans during the Middle Stone Age (MSA). We present the results from a technological analysis of 11 stratified lithic assemblages which overlie the Howiesons Poort deposits and all date to ~58 ka. Based on technological and typological attributes, we conducted inter-assemblage comparisons to characterize the nature and tempo of cultural change in successive occupations*.

There are numerous other related scientific researches that verify South Africa's role in early human evolution, e.g. the invaluable very recent discoveries of Homo Naledi at Sterkfontein, with its unfortunate highly publicised non-scientific socio-political criticisms that followed the discoveries, to the Blombos Caves near Still Bay on the southern coast of South Africa which stretch our knowledge of our common human evolutionary history back 170,000 years ago and more. These are just a few examples of research possibilities:

The excavations at Blombos Cave have yielded important new information on the behavioural evolution of modern humans. The archaeological record from this cave site has been central in the ongoing debate on the cognitive and cultural origin of early humans and to the current understanding of when and where key behavioural innovations emerged among Homo sapiens in southern Africa during the Late Pleistocene. (https://en.wikipedia.org/wiki/Blombos_Cave)

The possibility of ethnographic and related scientific enquiry in 21st century South Africa, bridging the gap of knowledge about human evolution from more than 150,000 years ago, to today's young South Africans trying to engage and "evolve" with the emerging 4IR technologically-driven age, has intriguing potential.

6. Complementary projects and processes in South Africa:

Given South Africa's recognition and concern over the nation's triple threats, numerous projects and processes are in progress to mitigate them. The most directly related projects and processes to the SA-LAN process are:

6.1. Innovation Hubs and Incubators:

Interventions aimed at ameliorating the nation's triple threats include numerous incubation and innovation hubs, entrepreneurship development entities, state funding institutions, and private sector initiatives including subsidies by national banks. Typical innovation hubs focussed specifically on the ICT sector include The Innovation Hub[49] located in Tshwane, the state administrative capital; Incubation Hubs funded and operated by the Small Enterprise Development Agency (SEDA)[50]; Innovation hubs and incubation facilities operated by several universities, such as Wits University's Tshimologong Precinct[51], are just a few examples. Few focus directly on children and youth from the base of the nation's development pyramid. In addition, their scalability remains a challenge; their successes could become a pyrrhic victory if equal, preferably more, attention is not given to the masses that reside at the base of the nation's development pyramid, with far too few opportunities for technological and digital literacy appropriation.

An interesting variant of the university-based intervention is the Zenzeleni Networks' Village Telco[52] model conceived by the University of the Western Cape. This project seeks to empower villagers to build their own ICT infrastructures, with minimal external assistance. This too lacks immediate scalability with respect to mass access to marginalized children in both rural and urban areas.

6.2. ICT connectivity programmes:

The national government and virtually all provincial and local authorities, recognise the triple threats, but their wide-ranging interventions, including those of the SA Connect National Broadband Policy, tend to focus on ICT connectivity more than the triple threats themselves. ICT specific interventions by local public authorities include Cape Town's broadband and free Wi-Fi initiatives[53] and the City of Tshwane's Project Isizwe[54], with many more similar initiatives in the pipeline. Other initiatives, like the highly acclaimed Siyafunda CTC, focus

[49] *The Innovation Hub: http://www.theinnovationhub.com/#home*
[50] *SEDA Incubation Hubs: http://www.seda.org.za/MyBusiness/STP/Pages/Incubations.aspx*
[51] *The Tshimologong Precinct: The http://www.jcse.org.za/hub*
[52] *Zenzeleni Village Telco: https://villagetelco.org/deployments/mankosi-south-africa/*
[53] *Western Cape broadband initiatives: https://www.westerncape.gov.za/general-publication/switching-public-wi-fi-hotspots-across-western-cape*
[54] *Project Isizwe: http://www.projectisizwe.org/*

on the use of computer terminals and similar devices, are based on the assumption that user knowledge of the devices will "trickle down" towards mass digital literacy acquisition. Whilst absolutely necessary, most initiatives of this kind fail the test of scalability at the base of the pyramid. In a similar vein, the growing local government interest in free Wi-Fi access is welcome, but with limited resources assigned to infrastructure growth and expansion, such free connectivity tends to introduce new entry barriers for small businesses who wish to begin their entrepreneurship journeys using Wi-Fi as a low-cost entry technology. Competing with "free" services itself poses new unexpected entry barriers.

As suggested throughout this concept paper, the role of local government authorities is central to the success or failure of the SA-LAN concept, and therefore of alleviating the nation's triple threats. However, local government initiatives in rolling out broadband infrastructure have been mired in controversy, driven mainly by the lack of trust between the public and private sectors, and mixed agendas and objectives between profitable free market like entities, and strictly social interventions. One civil society entity that has reviewed these conflicts provides very useful background to this conundrum, the Right2Know study on "Alternatives to Privatized Telecommunications"[55]. Lessons should be drawn from this study.

6.3. Given the high value of all the above initiatives, it is important to position the SA-LAN concept as a complimentary process that does not compete with any of them. It's focus on children and youth must be very specific. The concept can, and must draw on all the above initiatives for skills and technical support, while at the same time preparing tomorrow's youth to become more proficient participants of the emerging information-driven society. The direct contribution to employment is an invaluable added benefit of the SA-LAN concept.

7. Conclusion: Most developed and developing nations have benefited greatly from the Cyber Café movement, the most affordable and convenient access to the internet for those without access, for travellers, and for social engagement. Some countries, like South Korea in its early race to global broadband leadership, used the concept deliberately as a growth strategy as the country faced the 1997 Asian Financial Crisis. Chinese Cyber Cafés entered the market in 1995, with the Government of China merely "allowing" the concept to grow to employment levels in excess of 1 million by 2005, with 20% of the population using them as their primary access to the internet. By 2016, the daily usage of Cyber Cafés was estimated at 20 million users per day. South Africa's entry into the Cyber Café world was strictly informal, entrepreneurs seeking a source of income, and succeeding. The South African Cyber Café business today continues to focus nearly exclusively on the medium to high income populations, with far too few catering for the poor in their own communities.

If the SA-LAN concept is to succeed in South Africa, the following are critical success criteria:

- The concept must be adopted as a process and not a project: it must not be subjected to the standard project implementation processes which include outsourcing and the associated legal tendering instruments;
- It must be supported by local authorities as part of their poverty alleviation strategies;
- All national institutions and private sector entities with the prerequisite will, knowledge capacities, and resources should be encouraged to participate actively;
- The primary target must be South Africa's children and their community elders, all residents at the base of South Africa's development pyramid;
- The challenges to be addressed are global in nature, with a unique impact on South Africa. The implementation strategies should thus develop a global focus, integrating fully with global initiatives such as the Sustainable Development Goals and similar initiatives, but localizing the interventions to suit South Africa's unique cultural and historical heritage and sensitivities;
- The opportunities for further fundamental research must be promoted as a direct contribution by South Africa to the global understanding of human behaviour and its triple threat challenges. South Africa, through both its ancient and modern history, presents an excellent laboratory for such scientific enquiry.

[55] *Right2Know study on "Alternatives to Privatized Telecommunications"* http://www.r2k.org.za/wp-content/uploads/R2K-alternatives-privatisation-telecoms.pdf

7.1. FUTURE CITIZENS: Today's children are the Next Generation of Citizen/Leaders who will be shaped by, and will in turn shape, the Next Generation of 4IR ICT ecosystems.

Brazil readies her Next Generation of Citizens with Next Generation of ICT Networks

From the mighty Amazon Jungle into Digital Favelas, a better future 4ALL

Girls seek knowledge to protect themselves from child/gender abuse

Preparing for a new highly disruptive 4IR world of work

Outsiders often see favela residents as "untamed" and digitally illiterate. But during eight months of ethnographic fieldwork in the slums of Brazil, I saw people challenging the notion of "resource poverty," appropriating ICTs and skill building in innovative ways. David Nemer

The SA-LAN concept is route towards South Africa's Next Generation of Citizens and Leaders, using Next Generation of ICT Networks and Services, and learning from the successes and failures of the nation's global peers. South Africa's triple threats of inequality, poverty and unemployment are best tackled by the victims themselves, from their residences at the base of the development pyramid, with some help from their more advanced peers and enlightened leaders.