SDG 8: PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL:

ORIGINAL: *ICT skills have already become a prerequisite for almost all forms of employment, and ICT capacity-building must therefore be prioritized in national youth employment and entrepreneurship strategies in all countries. It is not simply that most jobs and businesses now require ICT skills, but also that ICTs themselves are transforming the way that business is being done everywhere and creating new employment opportunities.*

A SOUTH AFRICAN-SPECIFIC PERSPECTIVE[1]:

HOW CAN INFORMATION AND COMMUNICATION TECHNOLOGIES HELP TO RESOLVE SOUTH AFRICA'S DEEP CURRENT AND FUTURE UNEMPLOYMENT CHALLENGES, AND DRIVE NATIONAL ECONOMIC GROWTH BY DOING SO?

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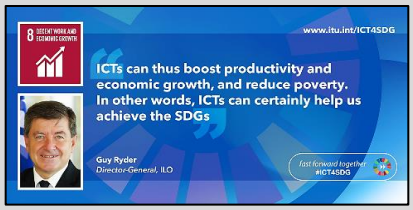
[1] First draft compiled by Walter Brown, Johannesburg 22 December 2021. Comments and suggestions welcome, email to: walter@sakan.org.za

Introduction:

Introductory Statements on ICT4SDG8 by the International Telecommunication Union (ITU: accessed April 2020):

"Decent work is at the heart of the search for dignity for the individual, stability for the family and peace in the community": Juan Somavia, former Director-General of the International Labour Organization (ILO)

The WTO Director-General's remarks restate the well-known relationship between ICT (and all its predecessors) and the economy. The question that arises is: *how can these significant efficiency and productivity gains be positioned to improve the lives of all **GLOBAL CITIZENS**, and not just the Global Economy which is heavily skewed in favour of those who already have much?*



ILO Director-General Guy Ryder correctly identifies ICTs as tools that can help us to reduce poverty and achieve all other SDGs. But, we must first position ICTs to do that, using ICT4SDG8 to "restore our humanity". Can we use ICT and all related technologies to redefine the human relationship with labour and work, and thereby drive the "Homo economicus[2]" concept into final extinction?

Digitalization is already a reality. Virtually all technologies serving the global Information Society, including those yet to emerge from the 4IR, are digitally enabled. The question should not be how "digitalization" will deliver new products, services, business models, entrepreneur opportunities, consumer benefits, it does that already. It should be "***how can people benefit directly from digitalization?"***

The statement by former ILO Director-General Juan Somavia directly links the three concepts of "human dignity", "family stability", and "peace in the community", to the concept of "decent work". The statement suggests strongly that Homo sapiens have evolved to become totally dependent on today's economic definitions of work and labour, from which they derive dignity, family stability, peace. This opinion is shared by Juan Somavia's colleagues from the helms of the World Trade Organization (WTO), the International Labour Organization (ILO), the United Nations Conference on Trade and Development (UNCTAD), and the International Telecommunication Union (ITU). All these highly respected global leaders and their organizations introduce more *econocentric*[3] and *technocentric* terms like economic costs and transaction speeds, productivity gains through business models and processes, consumer benefits, all supported by "digitalization", 5G and beyond, artificial intelligence, automation, software defined networks and gizmos, and virtualization of everything, and all the technological developments yet to come.

This discussion document will attempt to build on the insights and opinions of the above-mentioned highly respected global leaders, acknowledging and discussing very briefly the deep sociocultural transformations that shaped humanity's transition to today's "civilizations", and its near-total dependence on the prevailing concepts of labour and work. Arguments will be presented that the current socio-cultural-economic-geopolitical norms are relatively recent social constructs aged about 12,000 years, just 3% of humankind's ≥400,000-year evolutionary history. Also discussed will be the seemingly still prevalent concepts of labour and work derived from the thinking of 19th-century philosophers Friedrich Engels (1820 to 1895) and Karl Marx (1818 to 1883), who believed that human evolution was driven not by genetic evolution, but by the transition to "*social labour*" which enabled "*certain pongid populations*" (primates, gorillas, orangutans, etc.) to

[2] Homo Economicus: Humans described as rational and self-interested beings capable of making judgments towards subjectively defined ends (such as accumulation of wealth and resources). A critical review of Professor Peter Fleming's "The Death of Homo Economicus" is provided by Steven Poole of the Guardian at: https://www.theguardian.com/books/2017/sep/28/death-homo-economicus-peter-fleming-review.

[3] Econocentrism (urban dictionary, Economic Centrism: https://www.urbandictionary.com/define.php?term=econocentrism): A centrist economic world view which leads directly to extreme inequalities and neo-liberal and free-market economic dominance.

"*reproduce themselves as human beings*"[4]. This discussion will use the current scientific knowledge to argue for a kinder, people-friendly method of organizing humanity's activities to sustain itself, as an alternative to the approximately 12,000-year-old history of labour and work in which the generalized statement that humans work to live so that they can live to work" holds true.

The author of this document recognises the deeply entrenched social constructs that define the current era in terms of: (a) labour and the world of work; (b) wealth creation and materialism; (c) the resulting deep multidimensional inequalities; (d) rigidly entrenched social hierarchies; and (e) that any attempt to change this status quo will most likely be met with extreme hostility, be extremely difficult, and will demand several generations of informed knowledge accumulation and sharing before it can change. It is for this latter reason that the discussion strategy will avoid any perceptions or suggestions of prescription and proscription in the search for solutions for the multidimensional existential threats that face South Africa and similar developing economies worldwide.

The following paragraph provides a brief outline of the structure of the document, and how it relates to the full range of actual, perceived, implied and nuanced Sustainable Development Challenges that face humanity as a whole, and the immediate SDG8 related threats that face South Africa and its Southern African neighbours specifically.

Structure of the Discussion Document:
The format of the document is informal – a draft document intended to trigger further discussions and research. Given the complexity and very broad range of key issues discussed, numerous references are used, presented in the form of hyperlinks within the discussion document itself, and in footnotes. As a draft working document, it is recommended that electronic copies of the document be used to enable easy access to all the references via the hyperlinks provided.

Section 1.0: A statistical summary of the main components and impacts of the SDG8 challenges in South Africa is presented, with the specific intention of setting the scene for ensuing discussions that lead to practical solutions. The data presented must be seen as problem statements, the harbingers of extreme socioeconomic difficulties that lie ahead irrespective of the immediate actions taken by the Government of South Africa and all its stakeholders. The deeply entrenched SDG8 challenges faced by the country have a strong causal relationship with the country's historically derived societal divisions, which in turn shape the country's triple threats of inequality, poverty and unemployment. The deeply entrenched societal divisions cannot be overcome through any short- or medium-term interventions – they demand extremely long and complex corrective strategies and programmes, and for that reason, they must begin with the nation's children, especially those with socioeconomically marginalized family backgrounds. The discussion document presents several examples of nations that have overcome similar challenges in recent human history, from which South Africa can draw valuable insights.

Section 1.1: Statistics: A word of caution: "*Lies, damned lies, and statistics*". This popular expression has been mistakenly attributed to Mark Twain (he popularized it) and to Benjamin Disraeli; the reality is that its originator is not known, but the truism remains as valid today as it as was more than two hundred years ago during the times of Disraeli and Twain. Statistics, a discipline wholly dependent on numeracy and mathematics, has an unfortunate origin in politics[5]. Statistics can, and have, provided invaluable advance warnings of impending socio-political-natural disasters and erroneous growth strategies; they have also been grossly abused by ill-intentioned or simply ill-informed academics, criminals, scientists, politicians, and even well-meaning and well-intentioned civil society leaders and individuals, to deliberately and/or inadvertently mislead, often with deadly consequences.

[4] Yearbook of Physical Anthropology Vol 20, 1976: Labour, People, Culture: A Labour Theory of Human Origins: https://web.csulb.edu/~eruyle/published/ruyle_labor_29_.pdf
[5] Britannica: Probability and statistics: a useful introduction at https://www.britannica.com/science/probability

This is just a tiny fraction of what we know about statistics, and how they are or can be used and abused[6]:

1. "*Without learning to think statistically, we'll never know when people are bending the truth*" – opinion by Professor Paul Goodwin concerning the Coronavirus, and the political fallout that results from it;
2. "*Competent, honest statistics can illuminate essential truths. They can reveal social inequalities, indicate where resources or legislation should be directed, highlight dangers or help us to appraise a government's performance" But sham numbers detract from those that inform. Shocking figures capture our attention, while colourful anecdotes eclipse the informative but mundane*". Direct extract from the above opinion piece by Paul Goodwin;
3. The low mathematical literacy in South Africa has been acknowledged and reported by the nation's educational and developmental authorities, e.g., statistic provided by the Minister of Basic Education in Table 3 on page 8 of NSC EXAMINATION REPORT 2019, which indicate that just 54.6% of the nation's children exceeded the nation's 30% performance level in mathematics. Other discussions on statistics and math are included in this discussion document, and in the related document downloadable at: https://www.sakan.org.za/Docs/ICT4SDG4.pdf. This latter document includes a World Economic Forum (WEF) survey of South Africa's comparative performance in mathematics, countered by Kate Wilkinson at Africa Check.org. The national poverty in mathematical literacy exposed by South Africa's government, suggested perhaps imprecisely by the WEF, and "corrected" by Africa Check, demonstrate clearly the arguments about the use, abuse and misuse of statistics as discussed in this section.
4. In a related opinion piece, the theoretical physicist Professor Carlo Rovelli introduces the subject matter directly in the title of his publication: "*Statistical illiteracy isn't a niche problem. During a pandemic, it can be fatal*"**.** In the context of this discussion document, the triple threats that face South Africa, Inequality, Poverty and Unemployment, are probably as lethal as the Coronavirus that Carlo Rovelli discusses.
5. Professor Rovelli's paper raises the following questions directly related to the Coronavirus pandemic in South Africa, and the role of statistics in its control or mitigation: *Of the 16,866 deaths from the Coronavirus up to 1 October 2020, as reported in https://www.worldometers.info/coronavirus/country/south-africa/, how many South Africans would have survived the virus if the national inequality, poverty and unemployment levels were half what they are today and in immediately preceding years? What are the socioeconomic costs to the country of these deaths from the Coronavirus that could have been prevented if the country had half the current triple threat levels? Is it possible to calculate the cost/benefit ratios between investing in halving the triple threats through resolution of the key interrelated SDGs, and the total costs of prevention, treatment, and death from the Coronavirus pandemic?*

   These clearly relevant questions are extremely difficult and prohibitively costly to quantify, but they do illustrate the value of decision-making and policy formulation based on quantifiable statistical data wherever and whenever possible. They also raise the possibility and potential of erroneous "guestimates" and fake news supported by distorted statistics that could cause even greater harm to the nation than the preventable deaths themselves.

   There are numerous examples in South Africa of fake news supported by fake statistics that caused immense national harm – the various outbreaks of xenophobia, or Afrophobia as some prefer to call it, often targeting tiny populations of "foreigners", e.g. Nigerians who numbered just 0.05% of the population according to the most recent (2011) national population survey, updated in 2017 with the help of the United Nations that gave similar results, contradicting the "fake statistics" in media articles of 800,000 Nigerians in South Africa. Stats SA surveys suggest that the actual number is approximately 30-times lower. These fake statistics triggered severe xenophobic attacks on Nigerians by South Africans, an international incident necessitating a formal apology to the Government of Nigeria by South Africa's State President.
6. In his highly informative article, Professor Carlo Rovelli comments that "*Our extensive statistical illiteracy is today particularly dangerous*", and that "*Society would gain significant advantages if children were taught the fundamental ideas of probability theory and statistics in simple form in primary school, and in greater depth in secondary school. Reasoning of a probabilistic or statistical kind is a potent tool of evaluation and analysis. Not to have it at our disposal leaves us defenceless."*

This document uses statistical data available from the most easily accessible sources liberally, deriving all the charts presented from this data. Deep verification is conducted as much as possible, a key requirement for the

[6] There is a wealth of excellent academic publications on the mathematical basis, and the historical, mainly political origins of statistics, and nearly as many critical appraisals of how statistics have been used and abused by many, especially politicians. One authority and prolific writer on the subject is Professor Paul Goodwin, whose latest (February 2020) bestselling book "*Something Doesn't Add Up: Surviving Statistics in a Post-Truth World*": https://www.goodreads.com/book/show/51736604-something-doesn-t-add-up has an excellent review by Jinoy Jose Palathingal of the Hindu BusinessLine.com: "Statistics flatter only to deceive". Peter Goodwin discusses the critical importance of statistics, and how to understand them in this mis-information-rich globally devastating Covid-19 pandemic era, in an excellent article published by the Guardian at: https://www.theguardian.com/commentisfree/2020/oct/31/think-statistically-truth-falsehood.

use of statistical data – if in doubt, dig deeper into the data sources and interpretations, using own experience, logic, and rational thinking where necessary.

The data and charts that follow are presented mainly to acknowledge that South Africa does indeed face several threats, defined loosely by the SDGs. A much deeper consideration and analyses of all the data and derived charts is strongly recommended as part of the national SDG implementation programmes and their successors (SDG concludes in 2030, about nine years from now). The data and charts are merely the start of an intensive national problem-solving process, recommended strongly although using different language, by the nation's National Development Plan (NDP), which is plagued by widely acknowledged poor implementation.

Section 2.0: This section presents brief reviews of the very close interrelationships and interdependencies between all SDGs. These interrelationships and interdependencies demand a holistic implementation, but, such a holistic implementation is extremely difficult, as experienced by South Africa during the implementation of the SDG predecessors, the Millennium Development Goals (MDG) which ended in 2015. Significant components of this difficulty can be found in the very same human behavioural factors that this SDG8 programme seeks to address – the "divisions of labour", including the numerous academic disciplines and specializations, many of which tend to impede effective collaboration across all interrelated multidimensional SDGs. The ICT industry will be presented as an important economic sector in its own right, within SDG9, but of far greater importance is its role as a vital tool in support of all other SDGs. ICT is a critical enabler of the "Four C's" of **C**ollaboration, **C**ommunication, **C**ooperation, and **C**oordination within SDG17. The primary purpose of ICTs and all their predecessor technologies and formats throughout human history, has always been to empower and extend the uniquely human capacity for information sharing, an extension of the human linguistic endowment, long before the commercial value of ICTs began to drive the growth of these vital human development tools.

Section 3.0: ICT4SDG: Positioning ICT for delivery against all SDGs

This relatively lengthy discussion of over thirty pages is central to this ICT4SDG discussion. It begins with a summary of the 160-year-old history of ICT in South Africa, meanders through relevant statistics, benchmarking both qualitative and quantitative data against selected developed and developing peer countries from which South Africa can derive valuable insights and lessons. The section delves into a short summary of the types, technologies, successes, and failures of the most popular forms of public access, with detailed background information on each format relevant to South Africa and its selected peers.

The critical questions raised are: (a) What has been tried? (b) what has not been tried? (c) when, where and under what conditions did these trials take place? (d) Why were these trials selected, which worked and which did not? (e) What lessons can South Africa derive from its own attempts, and from those in the selected peer group countries?

A fairly detailed summary of the attempts and progress made in each of South Africa's BRICS partners, Brazil, Russia, India, and China, with as much historical background of each country's past, present and prospective futures and their relationships with ICT4SDG, is presented to support the statistics and benchmarks.

Section 3.0 concludes with a short list of key references which verify the facts presented and the assumptions made, for South Africa and its peer BRIC partners.

Section 4.0: A pathway towards socioeconomic inclusion via ICT4SDG:

This section expands previous reviews of the most critical criteria impacting ICT4SDG: the historical, cultural, economic, social and philosophical issues impacting the success or failure of ICT4SDG. The discussion reiterates the challenges the country must face, and how ICT4SDG might overcome the challenges for the folks who live at the base of the nation's development pyramid. The discussions are supported by numerous relevant benchmarks and reference documents presented as hyperlinks throughout the discussion document. These references include critical analyses and reviews of arguably the most influential global development reports available today, the World Bank Development Reports (WDR) spanning 2015 to 2021.

The question is asked yet again: What can South Africa learn from these benchmarks and referenced reports? What elements of the reports must South Africa retain, expand and implement? What elements of the reports must South Africa discard or ignore as inapplicable or inappropriate for the country's unique circumstances?

The single-minded objective for South Africa must be to make ICT4SDG work for its estimated 76% population who are too poor to access and use traditional ICT products and services to escape their collective poverty traps.

Section 5.0: An overview of the proposed pro-poor ICT4SDG strategy for South Africa:

Section 5.0 begins the concluding discussions, presenting the proposed overview of the proposed pro-poor ICT4SDG strategy for South Africa. This section proposes that ICT4SDG in South Africa must be more of a platform that grows over time, in a well-controlled virtuous circle control and management format, to suit all eventualities that face South Africa's growth with human dignity. It must be more than its underlying technologies and services, it must have a firm human face, of all who live in South Africa, rich and poor. The section poses the questions: (a) What is this platform? (b) What should it look like and how should it function? (c) Who should own and operate it? (d) What must it not be?

These are critical questions that inform the final recommendations that follow.

Section 6.0: The proposed pro-poor ICT4SDG strategy for South Africa.

The proposed ICT4SDG strategy for South Africa follows the traditional models of ICT development introduced during the ongoing World Summit on the Information Society (WSIS), with refinements currently underway, and with changes to meet South Africa's unique needs. The proposed strategy follows the WSIS-derived ICT Development Index, refining it as the ITU is doing, but with a specific focus on South Africa's unique needs.

Section 7.0: Concluding comments, observations and recommendations.

The conclusions and observations include additional final thoughts to emphasise the key issues covered in all preceding discussions.

A single recommendation is offered, build a national ICT4SDG platform, one which is based on the successes of similar platforms in South Africa's developed and developing country partners and peers.

The discussion document ends with an introduction of two annexes presented to emphasise selected critical components of the SDG challenges South Africa faces: (a) the twin challenges/tragedies of water and sanitation which impact the poor (SDG6) mostly; and (b) the skewed priorities of "Smart City" projects in SDG11, which effectively shut their collective eyes to the plight of 76% of the nation's population. This author argues that it is people who need "smartening", the cities, smart or otherwise, should be tools for that "*people-smartening*", not the reverse.

The cities, the technologies they use, their economies, and all the services they promise, are all within the broad spectrum of the SDGs, they all should be built and positioned to serve ALL of humanity, not just the few at the top of the global food chain, with the rest of humanity serving the tools themselves, e.g., the "*Sustained Economic Growth*" tool which seems to have become the *raison d'être* of all work done by humans. This tool now leads the objective of SDG8: "*Promote Sustained Inclusive Sustainable Economic Growth*". The tools used to meet that objective are "*Full Productive Employment and Decent Work for All*".

Was it always that way? If it was not at any time in the known 400,000-year history of our species, we should pose the questions: when did humanity become the servant of the economy? Why? Can we "recover" the seemingly lost humanity of Homo sapiens, so that the economy, and its supporting world of work, is returned to serve humanity, and not vice versa?

Section 1.0: A statistical summary of the main components of SDG8

1.1. Background information for the statistical summary:

1.1.1. Critical factors that define and shape ICT in terms of ICT4SDG:

Definitions and Meanings of critical ICT terminology: For as long as the genus Homo has been evolving towards us, Homo sapiens, over a period longer than 4 million years, the species desired, and "invented" the ability to share information and knowledge about the technologies and tools they invented, and the social and behavioural systems and processes which would enhance their evolutionary journey to today. The names given to these technologies, tools, and societal formations which enabled this sharing of ideas, information, and knowledge over progressively longer distances and evolutionary timeframes, are unknown. Many modern genetic and behavioural scientists e.g. Sarah A. Tishkoff et al in 2007, and Joaquim Pérez-Losada & Joaquim Fort, 2018, infer that these ancestral "tribes" must have used Africa's click languages to share their knowledge and technologies, the suspected evolutionary roots of all modern human languages used by humans today.

Whatever the origins or evolutionary trajectories that these technologies, tools, and social structures that drove human evolution to what it is today may have been, these trajectories were much faster than the social formations and structures that shaped modern humankind. These technological evolutions and their applications were so fast that they spawned a vast swathe of linguistic acronyms, jargon, phrases, hype, and even misleading and meaningless fashionable nomenclature (Instagram and Tik Tok?) which generate massive profits for their creators, e.g., Facebook's rebranding to Meta in the face of mounting global allegations of anti-social behaviour, as reported by the Independent of Friday 29 October 2021, and many others.

There is a need to demystify the ICT industry so that ordinary folk who reside at the bases of the global development pyramids can understand and use the vast opportunities the industry unleashes, and defend themselves and their children from the dangers hidden within that industry. The brief history of the Internet and its numerous offshoots provides a starting point for the demystification that is needed:

(a) The role of **Joseph Carl Robnett "Lick" Licklider** **(March 11, 1915 – June 26, 1990):**
An American psychologist and computer scientist who headed the Advanced Research Projects Agency Network (ARPANET), an institutional instrument of the U. S. Department of Defence, is credited with leading the invention and development of the Internet. The early Internet developed by ARPANET was a response by the U.S. government to the Soviet Union's launch of Sputnik in 1957, and the fear that the Soviet Union could easily destroy the U.S.'s national and military communications infrastructure by targeting key centralized PSTN switching centres. A distributed self-healing network was required. Lick "demilitarised" the idea by recognising and promoting the concept that the nascent Internet was far more valuable to humanity as a "*communication medium between people, one that dwarfs into relative insignificance the historical beginnings of the computer as an arithmetic engine*".

- "Licklider's vision of an 'intergalactic network' connecting people represented an important conceptual shift in computer science", specifically stated as "*It is not proper to think of networks as connecting computers. Rather, they connect people using computers to mediate. The great success of the Internet is not technical, but in human impact*" (author's emphasis).
- The ARPANET *Completion Report Draft* qualified the above vision with the following statements: "*The computer industry, in the main, still thinks of the computer as an arithmetic engine. Their heritage is reflected even in current designs of 'their communication systems'. They have an economic and psychological commitment to the arithmetic engine model, and it can die only slowly*" …… "*furthermore, it is a view that is still reinforced by most of the nation's computer science programs. Even universities, or at least parts of them, are held in the grasp of the arithmetic engine concept*".
- An excellent history of the background, thinking, and resulting structure and functionality of the Internet, written by Michael and Ronda Hauben was published online in 1998 by the University of Illinois in Chicago. Regrettably, Licklider's vision did not survive his departure from APARNET – his vision of an 'intergalactic network' connecting people changed soon after the global Computer Sector took ownership and control of the Internet, to an 'Intergalactic network connecting computers", a

"network of networks" which defines one of the most powerful evolutionary steps in the human capacity to process and "telecommunicate" information and knowledge across all geographic and cultural barriers.

(b) **Selected "Internet Age Definitions"**: As suggested in the introductory paragraphs of this section, the race for market dominance, fame and profits in the new ICT world, spawned numerous, sometimes meaningless nomenclature to describe this vital industry**:**

- **Digital**, as in the "*Digital World*", "*Digital Transformation*", etc. The use of digital engineering techniques in telecommunications (ICT, Internets) had a much humbler beginning than the "digital revolution" and "digital everything" that the industry has become. It was merely an applied engineering search to simplify the engineering challenges of the analogue electronic circuits that came before it. Analogue circuits were excellent in their days, but they could not scale easily, and were costly to design and manufacture. Replacing the infinite range of signal levels, frequencies, and orientations by the simpler two-level on or off states of electronic switches, using the binary numbering system in place of the traditional decimal numbering system, coded and decoded appropriately to represent the vast range of analogue signals, was a significant leap forward in engineering for the telecommunications sector.

  This transition from analogue to digital engineering techniques led to very large-scale circuit integration, which in turn enabled more powerful computer-controlled telecommunications, whatever their successors were named. The only changes in telecommunications that resulted from this "digitalization" was that the range of mostly analogue event inputs (voices, images, multimedia, numeric data, etc.), and the resulting outputs improved dramatically in range, scope, quality and quantity, and location.

  As per Licklider's vision for the Internet at its design phase, the role of the computer, besides its traditional use as an "arithmetic" computational device, was to facilitate telecommunications, and not to replace it or dominate it.

- **Digital Divides:** What exactly has been, or is being divided? Digits? This very popular overhyped phrase defies literal translation – what have digits, divided or not, got to do with inequality, poverty and unemployment as far as the victims are concerned? The term was coined by Lloyd Morrisett of the Markle Foundation in 1995 (see description and history by Hoffman and Novak here), and promoted vigorously by the National Telecommunications and Information Agency (NTIA) of the USA. The original concept simply referred to the access gaps between computer haves and computer have-nots. This was quickly extended to all information technology access gaps, especially those that reflect the generic divides between "the economic haves and the economic have-nots"[7] (wealthy versus poor).

  Is there a "Digital Divide" in South Africa? If there is, what are its attributes and dimensions, and how can we use these to bridge it? The statistical data available (ICASA 2019[8]) suggests that South Africa has already bridged its "Digital Divide" as currently defined. 3G national coverage has exceeded 99.5%; 4G/LTE coverage exceeded 87.5%; Smartphone penetration was more than 81.7% (2018). All these technologies are based on digital encoding and decoding of mainly analogue signals at the human/machine interfaces, therefore as far as a people-centric focus is concerned, South Africa's ICT infrastructures are already very close to 100% "digitized". Even one of the key ubiquitous public ICT sectors, broadcasting, consists of "encoding" analogue audio and video content into digital signal formats for processing and transmission, and "decoding" these digital signals back to their original analogue formats for human consumption. All telephones, fixed, mobile, smart or traditional, convert analogue inputs into digital signals, then back to analogue at the receiving end for human consumption and enjoyment.

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[7]. Excellent discussion of the *Information Haves* and *Information Have-nots* by Govindan Parayil (2005): "The Digital Divide and Increasing Returns: Contradictions of Informational Capitalism": https://www.tandfonline.com/doi/abs/10.1080/01972240590895900?journalCode=utis20

[8] National Digital Coverage: ICASA Report: "The state of the ICT sector report in South Africa 2019": https://www.icasa.org.za/uploads/files/state-of-ict-sector-report-2019.pdf.

- **Computer:** (Merriam Webster: a programmable usually electronic device that can store, retrieve, and process data: Etymology: 1640's - 'one who calculates'; from 1897 – 'calculating machine'.
- **Cloud**: (Merriam Webster: (i) a visible mass of particles of condensed vapor (such as water or ice) suspended in the atmosphere of a planet (such as the earth) or moon; (ii) something resembling or suggesting a cloud – light, filmy, puffy, billowy; (iii) something that has a dark, lowering, or threatening aspect - *// clouds of war - // a cloud of suspicion*; (iv) something that obscures or blemishes *// a cloud of ambiguity*); (v) An excellent location for conferences in these Covid-19 "Challenging Times"? – e.g., "*The best 2021 online cloud event*" at https://cloudconference.co.za/.
- **Cloud Computing:** Microsoft Definition: "*Simply put, cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale. You typically pay only for cloud services you use, helping you lower your operating costs, run your infrastructure more efficiently, and scale as your business needs change*".

The architects of the Internet clearly did not mean to build a "Digital World" in "*light, filmy, puffy, billowy*" environments that had "*dark, lowering, or threatening aspects*" which "*obscured and blemished*" one of the most effective tools for knowledge sharing amongst humans. Did these architects intend or plan for their "invention" to be: (a) so "cloudy", "obscure", and "blemished" that it became easy to "hi-jack" it for nefarious purposes? (b) which spread disinformation and misinformation, outright lies, fake news and conspiracy theories? (c) antisocial radicalization that breeds global nationalism and international terrorism? (d) cybercrimes that feed the gluttonous tendencies of Adam Smith's "*masters of mankind and their vile maxims*" (Adam Smith's Wealth of Nations — Bk 3 Chpt 04)? They did not, nor did they invent the growing "clouds" of meaningless and misleading jargon-filled acronyms and descriptions associated with the Internet today.

To conclude this sector in our search for responses to South Africa's immense ICT4SDG challenges, the opinions of a few more Internet "Founding Fathers" may help:

Tim Berners-Lee, inventor of the World Wide Web: "*The web can be weaponised – and we can't count on big tech to stop it: The Guardian 2018*"

"*The divide between people who have internet access and those who do not is deepening existing inequalities, inequalities that pose a serious global threat. Unsurprisingly, you're more likely to be offline if you are female, poor, live in a rural area or a low-income country, or some combination of the above. To be offline today is to be excluded from opportunities to learn and earn, to access valuable services, and to participate in democratic debate. If we do not invest seriously in closing this gap, the last billion will not be connected until 2042. That's an entire generation left behind*"

And:

"*In 2016, the UN declared internet access a human right, on par with clean water, electricity, shelter and food. But until we make internet access affordable for all, billions will continue to be denied this basic right. The target has been set – the UN recently adopted the Alliance for Affordable Internet's threshold for affordability: 1GB of mobile data for less than 2% of average monthly income. The reality, however, is that we're still a long way off from reaching this target – in some countries, the cost of 1GB of mobile broadband remains more than 20% of average monthly income*"

Vinton G. Cerf, co-creator of TCP/IP: "*Internet Access Is Not a Human Right: Vint Cerf 2012*"

Vinton "Vint" Cerf, one of the "founding fathers of the Internet", a co-creator of the TCP/IP protocols and other key components of the Internet, now vice president and chief Internet evangelist for Google, advises that the Internet is an important tool in support of human rights – it is not itself a human right. Vint derives his opinion from his deep experience in and of the Internet, from the original United Nations Human Rights Council's Special Report to the UN General Assembly of May 2011 (https://undocs.org/en/A/HRC/17/27), and from the numerous Internet use cases that were shaping the world during the first and second decades of this

twenty-first century. Vint refers specifically to the Arab Spring that unleashed the ongoing Middle East and related global crises:

> **The Arab Spring, start 2010, still unfolding in horrendous ways:**
> "*FROM the streets of Tunis to Tahrir Square and beyond, protests around the world last year were built on the Internet and the many devices that interact with it. Though the demonstrations thrived because thousands of people turned out to participate, they could never have happened as they did without the ability that the Internet offers to communicate, organize and publicize everywhere, instantaneously*"

In his opinion piece, Vint refers to countries, e.g., Estonia in year 2000, and France in 2009, that officially declared the internet a human right – there are many more today. He went on to argue that:

"*…technology is an enabler of rights, not a right itself. There is a high bar for something to be considered a human right. Loosely put, it must be among the things we as humans need in order to lead healthy, meaningful lives, like freedom from torture or freedom of conscience. It is a mistake to place any particular technology in this exalted category, since over time we will end up valuing the wrong things*"

More from Vint Cerf: July 1, 2020: COVID-19 highlights how we need better internet access everywhere:

In a wide-ranging discussion hosted by Vala Afshar of Salesforce and Ray Wang of Constellation Research, with special guests Vinton G. Cerf, president and chief internet evangelist for Google; Dr. Melissa Flagg of the Centre for Security and Emerging Technology (CSET) at Georgetown University; and Dr. David Bray of the GeoTech Center and GeoTech Commission at the Atlantic Council, generated thirteen key takeaways, four of which are selected herein for brevity:

- **The COVID-19 pandemic has identified the need for expanded internet access. "***Should connectivity be a public utility? Today, only 50% of the worldwide population has internet access -- a milestone that was celebrated by the UN in late 2019. According to Cerf, the pandemic has highlighted that we need better internet access everywhere. In some places around the world, school buses are being used to provide wireless internet access to student populations. Libraries are also providing hot spots for broadband access. The recognition that we need to provide remote internet access has been highlighted by the pandemic*."
- "*Duplicating of in-person classroom experience to a purely digital format may not be the optimal approach. Investments in online environments should focus on more individualized learning, according to Cerf. In order to do a good job of personalized learning, you need to develop a curriculum that you are supposed to learn, you also need to know what is not understood and to test for comprehension and learning. I believe that the distributed digital educational model will lead to a higher-education framework and operating system that is open (Android-like) versus closed (iOS-like), meaning students will have the option to take courses from multiple institutions of learning and receive accreditation based on a mutually agreed upon multi-university ecosystem framework*."
- Alone Together: Why We Expect More from Technology and Less from Each Other: "*Children using mobile and texting have learned a different social behaviour pattern. The children learned that it is OK not to respond to a text. If you do not know what to say, do not say anything at all. This means the children cannot cope with responding to the immediacy of having to respond -- this means they do not use the phone or meet in person. Today, the system we are using can turn the microphone off. There is control over who can be seen or heard. Cerf spoke about the need for socialists and psychologists to research and better understand how technology influences and effects the social environment that we experience*."
- **We must begin to tolerate differences and improve our critical thinking.** "*Cerf talked about the 'fear of the other' and the harm that it caused to society. Tolerance for disagreements and differences is key to having a healthy relationship. Critical thinking, not cynicism, is key to better understanding and protecting yourself against misinformation. Cerf reminded us that the best-packaged misinformation usually contains some level of truth that you recognize, leading you to believe the misinformation part of the package because you recognize that little bit of truth that is included*."

All thirteen "takeaways" are critical inputs in the proposed South African ICT4SDG design strategy, and must be built into the process.

1.1.2: Other critical inputs include the following:

Avoiding "Pilotitis" and Silo-itis[9]: ***Pilotitis*** (also Pilot-itis): the act of continuously pursuing small pilot projects to prove or improve generally well-known tried-and-tested facts, knowledge and applied practice about multidimensional development. Pilotitis wastes valuable and vital human energies and financial resources, obstructing and obfuscating vital large-scale applications of technology to address known human societal shortcomings, and thereby potentially fuelling further the inequalities that these projects are designed to reduce.

South Africa's fragmented ICT Industry is prone to Pilotitis and Siloitis epidemics:

- From the democratic dispensation in 1994 to concerns over 4IR Job losses in 2020, the national ICT sector located at the core of the 4IR has had nine changes in institutional oversight name and structure, and fifteen leadership (ministers) changes over the 26-year period, a sure sign of Siloitis in action. Restructuring, the establishment of new institutional silos, is often used as a palliative for institutional deficiencies;
- Examples of Pilotitis and Siloitis in action include the numerous failures of the national drive for Universal ICT Services, and the institutional and project (pilot) strategies set up for their delivery, e.g., USAASA, the USALs, Telecentre, and related rural broadband connectivity programmes. The stalled Digital TV migration process with its costly delays in reallocation of the Digital Dividend spectrum, falls within this category.

The clear lack of coordination between key government ministries and departments with mandates for contribution to the national ICT sector, e.g. DOC; DCDT; DST; DHET; the DTIC; etc., and between and within the specialised institutions setup for ICT4D, e.g. BBI; ICASA; SENTECH; SITA; USAASA, etc., is one of the major root causes of the nation's failure to provide affordable ICT services to all who reside in South Africa.

Silo-itis (also Siloitis): a corporate, institutional, organizational, or sectorial culture that is reluctant to share information and knowledge, or to cooperate with other organizational units that require such sharing and cooperation for their success and for the success of the whole sector and ecosystem. Siloitis leads to significant obstruction and disruption of the vital 4Cs of development – collaboration, communication, cooperation and coordination, across interdependent internal and external departments and divisions, and across all organizational units and institutional sectors of the interlinked ecosystem.

Siloitis is generally driven by corporate or institutional leadership egos, lack of confidence generally derived from the lack of specific and/or relevant knowledge, and competition for authority and power within and between organizations and institutions. The "not invented here" syndrome is a classic example of Siloitis that prevents or discourages the adoption and use of known solutions to ameliorate the many challenges enshrined in the SDGs. The South African ICT industry is especially prone to both Pilotitis and Siloitis. Numerous organizational silos within and between government departments and ministries, specialized institutions, and divisions within both private and public companies, fail to communicate, collaborate, coordinate, and cooperate effectively, classic symptoms of Pilotitis and Siloitis. The resulting stresses and tensions within these developmental ecosystems generally lead to missed opportunities and disputes that often require costly litigious resolution[10]. SDG17 and its integrated 4Cs must be strengthened to reduce Pilotitis and Siloitis.

The realities of Pilotitis and Siloitis are solidly entrenched in human behaviour and its effect on institutional performance. There are no quick fixes or medium-term remedies for these institutional malaises, the best that can be done is to acknowledge their existence and potential impacts during programme design and implementation, and minimise their impacts through focussed institutional, operational and business process

[9] Pilotitis and Siloitis: Well-known human and institutional behavioural phenomena, references include: (a) Pilotitis: (i) GSMA: https://www.gsma.com/mobilefordevelopment/programme/mhealth/pilot-itis-whats-the-cure/: (ii) Digital Impact Alliance: https://digitalimpactalliance.org/fending-off-pilotitis-in-global-tech/: (b) Siloitis: (i) The Guardian opinion: https://www.theguardian.com/books/2015/oct/17/the-silo-effect-why-putting-everything-in-its-place-isnt-such-a-bright-idea-gillian-tett-review: (ii) How The 'Silo Effect' Is Hurting Cross Team Collaboration: https://blog.trello.com/tips-to-improve-cross-team-collaboration

[10] Legal wrangles in the South African ICT sector examples of Siloitis: (a) 2016: "*Why Minister Siyabonga Cwele is suing Icasa*": https://mybroadband.co.za/news/government/175549-why-minister-siyabonga-cwele-is-suing-icasa.html; and http://www.saflii.org/za/cases/ZAGPPHC/2016/883.html: (b) "*DOC pays ICASA its dues after legal threat*": https://www.itweb.co.za/content/Gb3Bw7WoERy72k6V: (c) "*ICT Industry members sue ICASA and its leaders*": http://www.saflii.org/za/cases/ZAGPPHC/2016/93.html

design. Focused education for their prevention or reduction of these and other similar challenges is a vital component of education in this 4IR world. The learning and design processes required must be built into the design of the ICT4SDG programmes of action, especially through integration with Sustainable Development Goal 17: "*Strengthen the means of implementation and revitalize the global partnership for sustainable development*".

The Pilotitis and Siloitis phenomena have been particularly devastating for the health sector, especially notable in this Covid-19 global pandemic era, which has the potential to change the whole global developmental and economic ecosystems. Numerous reference documents of the Pilotitis-driven failure of mHealth are available, e.g., "mHealth for Maternal Health: mHealth Pilotitis – Time for Recovery or Relapse? March 31, 2014"

1.1.3. A Focus on Children and Youth:

A common theme that will be stressed throughout this discussion document is a very strong recommendation for a direct focus on very long-term alleviation and corrective programmes that focus on South Africa's children. About sixty five percent (65%) of the nation's children are deemed poor, and therefore deprived of virtually all opportunities for multidimensional sustainable development. Targeting the nation's adult population and its socio-economic-political leadership is absolutely necessary and vital, but such focus must be tempered by acknowledging and responding to the extremely difficult challenges of reversing deeply entrenched psychosocial behavioural realities and lifestyles amongst the adult population. The best response for South Africa is to develop the capabilities and capacities of the nation's most underprivileged children from the earliest possible age, so that they can develop the ten critical 4IR skillsets discussed in section 3 on page 8 of https://www.sakan.org.za/Docs/ICT4SDG4.pdf, and in time, use this knowledge to find solutions for the full range of socioeconomic challenges that they must face. There are immense possibilities for Early Childhood Development (ECD) across all 4IR disciplines and technologies, many of which must be developed for local languages, cultures and societal conditions, by this and related SDG action programmes.

Early Childhood Development (ECD) services are restricted. ECD programmes are offered at day-care centres, crèches, playgroups, nursery schools and in pre-primary schools. At the time of the survey, 38,4% of the 0–4-year-olds attended these kinds of facilities, and access to these facilities was highest in Gauteng (49,8%) and Western Cape (43,7%). Although 49,2% of children aged 0-4 years stayed at home with parents or guardians, the survey suggests that stimulation might be lacking. Almost one-half (46,8%) of parent or guardians never read books with children while 43,1% never drew or coloured with the children: Statement by Statistics South Africa on page 10/203 in the General Household Survey 2018: http://www.statssa.gov.za/publications/P0318/P03182018.pdf.

South Africa, like every other nation on earth, has a national education system that strives to prepare children for a highly uncertain future, but, are the current processes enough? ECD in South Africa, already deficient in scope and scale, is being devastated by the COVID-19 Pandemic[11]. The opinions, messages and studies listed in Footnote 11 must be examined and extended to encompass the whole SDG8 integrated challenge, for both the immediate and the very long-term evolution of society and its dependent world of work.

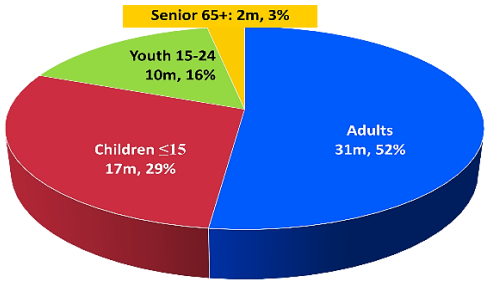
Cognitive Wastelands: A further key background remark that needs close scrutiny is the observation by Dr Nic Spaull, one of South Africa's leading educational professionals and a prolific activist for improved national education: "*Education both reflects and entrenches the inequalities in South African society. The top 200 high schools in the country produce more distinction marks in maths and science exams than the other 6,476 high schools put together. Meanwhile in 47% of high schools, not a single pupil meets a commonly accepted international standard for maths. The equivalent figure in Botswana is just 2%. These schools could be called "cognitive wastelands"*, says Nic Spaull of Stellenbosch University. https://www.economist.com/special-report/2019/04/25/south-africas-youngsters-are-let-down-by-a-lousy-education-system

[11] (a) ***Plight of ECD Workforce***: https://ilifalabantwana.co.za/wp-content/uploads/2020/04/Final-report-The-plight-of-the-ECD-workforce.pdf; (b) Daily Maverick 20 March 2020: **Children at risk as ECD crashes under COVID-19:** https://www.dailymaverick.co.za/article/2020-03-20-covid-19-children-at-risk-as-early-childhood-development-centres-close/#gsc.tab=0

The following statistical charts, tables, documented opinions and reports provide useful starting points for the lengthy SDG8 transformation processes required.

1.2.1. Demographic summary: Race, Age and Unemployment:

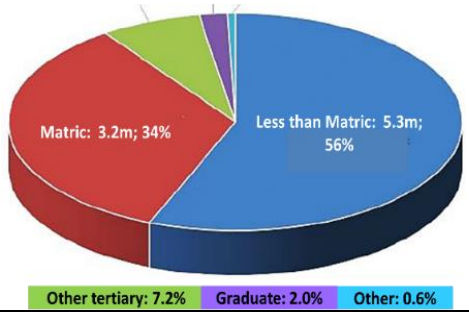
Chart 1.1a: Population by Age Group



Mid-term 2019 Population: 59 million

http://www.statssa.gov.za/publications/P0302/P03022019.pdf

Chart 1.1b: Unemployed by education level 2019



http://www.statssa.gov.za/publications/P0211/P02113rdQuarter2019.pdf

Table 1.1: Distribution by Age and Race

Age Group	Black	Coloured	Indian/Asian	White	Total
Adults	24,938,302	2,936,802	1,023,546	3,647,158	32,545,808
Children/Youth	22,504,957 (47%)	2,239,948 (43%)	479,461 (32%)	1,004,848 (22%)	26,229,214 (45%)
Total (2019)	47,443,259	5,176,750	1,503,007	4,652,006	58,775,022

1.2. Demographic and other SDG-related indicators:

"Children" are defined by Statistics South Africa as persons aged 0 to 17 years; Youth are persons aged 18 to 24 years; Adults are persons aged 25 years and above. Table 1.1 provides the nation's demographic details, based on the official race classifications carried over from the apartheid era.

1.2.2. Inequality and Poverty:

Charts 1.2a and 1.2b benchmark South Africa's income inequalities against the country's global peers. Multidimensional inequality and its impact on national growth with social stability, has been largely misunderstood, underestimated, or subjected to mass denialism and scepticism by large segments of South African society. This is changing, more South African leaders of all political persuasions are now abandoning their historical denialism of the existence, extent and impact of multidimensional inequality and poverty, particularly as the national social and economic tragedies triggered by the COVID-19 pandemic unfold. Public discourse across the whole nation, of the reality and impact of multidimensional inequality is growing, a fact that bodes well for South Africa's prospects of recovery from the COVID-19 state of disaster and its socioeconomic impact.

Chart 1.2a: Inequality (GINI Coefficient)

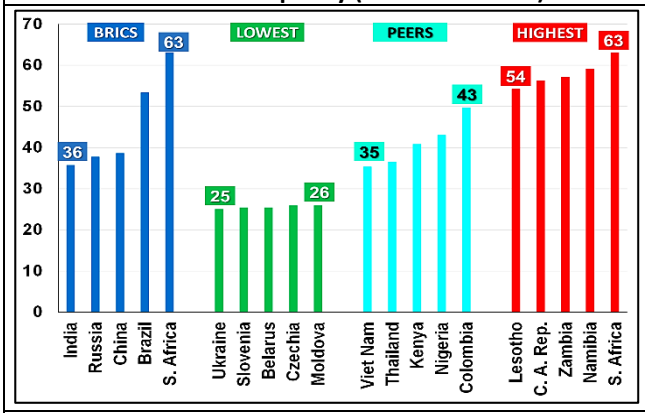
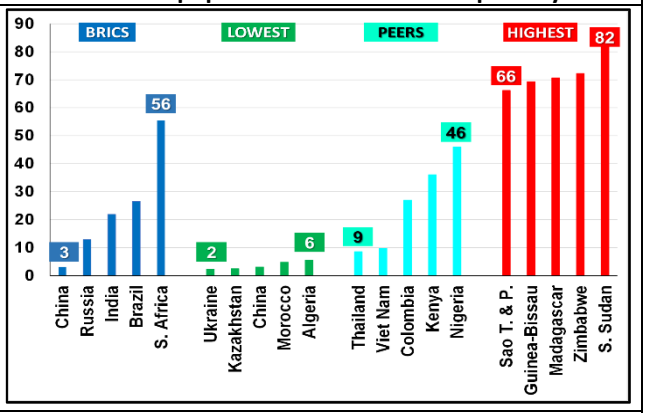


Chart 1.2b: % population below national poverty line



Data Sources: UNDP HDR2019: http://hdr.undp.org/en/data#

1.2.3. Poverty by age and race:

Chart 1.3a: Poverty measures by Population Group

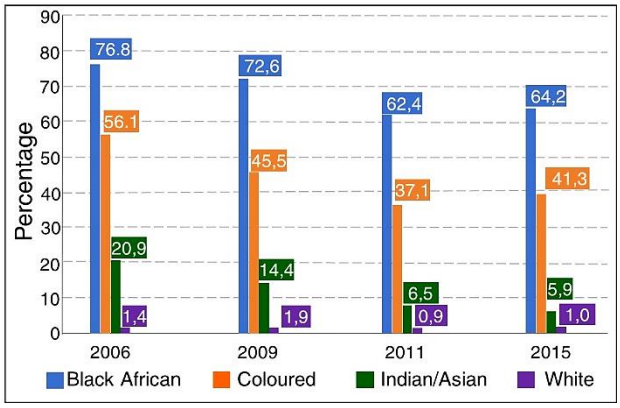
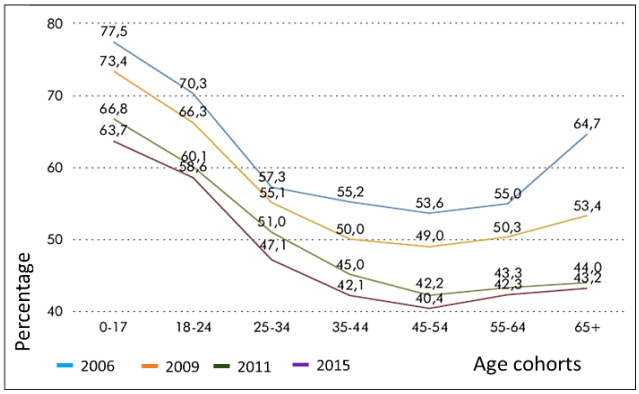


Chart 1.3b: Poverty measures by Age Group



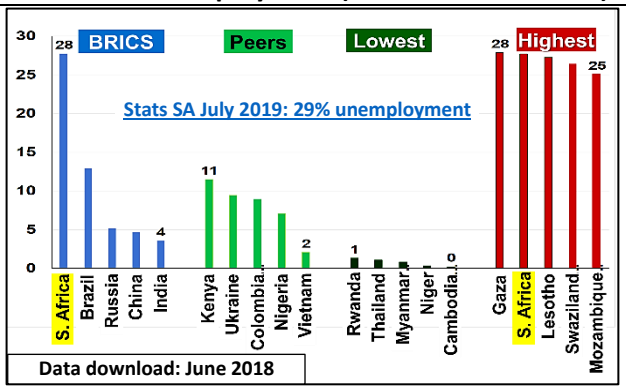
Charts derived from data on page 71/141 of http://www.statssa.gov.za/publications/Report-03-10-06/Report-03-10-062015.pdf
Indicators are percentages of the population cohort living below the inflation adjusted Upper Bound Poverty Line (UBPL), set at R1138 per person per month in 2017.

The relationships between multidimensional inequality, poverty and unemployment, and societal divisions and identities based on age, ethnicity, gender, language, geographical origins, race, and social hierarchy, are highly provocative triggers for social unrest and worse. South Africa has direct and recent history of such provocation through the extremely costly violent political struggles against its now defunct apartheid system of governance. This legacy of such provocation continues today, threatening the sustainable growth, development and stability of the whole nation. It will continue to do so for many generations to come, unless actions are taken today to equip future citizens with the wisdom to learn from the past in order to confront the challenges of their future.

Chart 1.3a illustrates the depth of the "race challenge" facing South Africa in this post-apartheid era, while Chart 1.3b portrays the extremely problematic poverty levels afflicting the nation's children: 63.7% of the nation's children aged 0 to 17 years lived below the national poverty line in 2015. As a result, South Africa's future is severely blighted – child poverty leads to developmental challenges and social ills defined by all seventeen SDGs, as discussed throughout this discussion document.

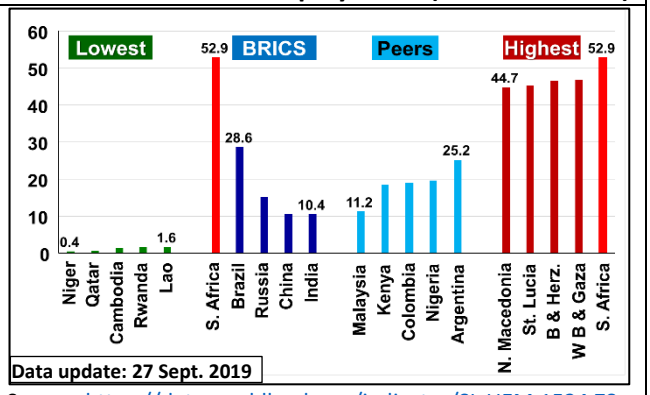
1.2.4. Unemployment and Unemployability:

Chart 1.4a: Unemployment (% Labour Force 2018)



Source: https://data.worldbank.org/indicator/SL.IND.EMPL.ZS

Chart 1.4b: Youth Unemployment: (% Labour Force)



Source: https://data.worldbank.org/indicator/SL.UEM.1524.ZS

On 23rd June 2020, Statistics South Africa announced that South Africa's unemployment rate had reached 30.1% (39.7% at the expanded definition), breaching the 30% rate for the first time since quarterly employment statistics were introduced in 2008. Al Jazeera quoted South Africa's Statistician-General as having said "*This is the first (time) ever that we have hit the 30 percent mark*". South Africa's National Treasury expects

unemployment to exceed 40% (official/narrow definition) under the influence of the Covid-19 pandemic (EWN 4th May 2020).

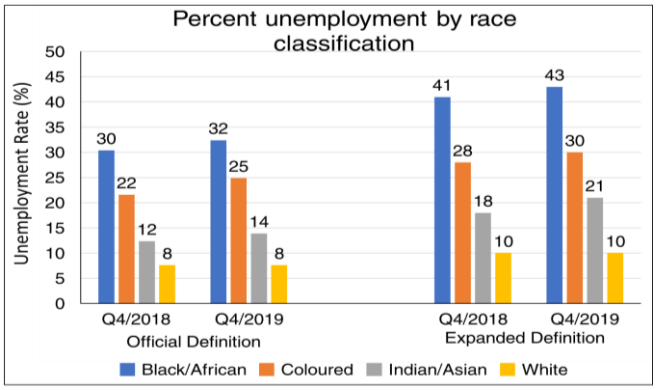
Besides South Africa's global leadership in nearly all measures of socioeconomic inequality, South Africa is also rapidly approaching global dominance in unemployment rates, at least for nations with functioning economies and statistical capacities. Clearly, South Africa's challenges of unemployment, and the challenge of finding "decent work" for those that are employed, are central to this SDG8 analysis and discussion. South Africa's "Unemployment Epidemic" suggested by the charts above is supplemented and strongly reinforced by external perceptions by some of South Africa's closest friends and their media outlets, e.g., the opinions expressed by the Economist in its April 2019 Special Report on South Africa's Unemployment levels:

The Economist Special report, Apr 25th 2019 edition: High unemployment is a symptom of South Africa's economic malaise:

"The struggle to get a job partly reflects how hard it is to search for one. Under apartheid non-whites were forcibly moved to areas far from city centres. The spatial inequality endures, making transport time-consuming and costly. On average black South Africans spend more than 100 minutes per day commuting, almost four times as much as the average American commuter. A study[12] published in 2016 found that young unemployed people spent 560 rand ($38) per month searching for work, an amount more than the average per-person income of their households. The barriers are not just financial. Since more than 40% of 15- to 24-year-olds grow up in houses without anyone in employment, they lack role models and contacts in the workplace."

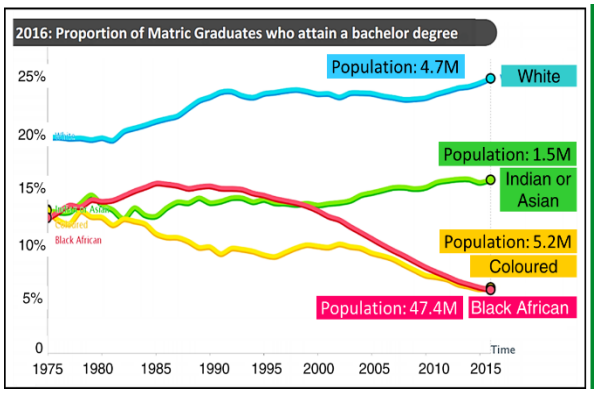
1.2.5. Racial Characteristics of Education and Unemployment:

Chart 1.5a: Unemployment by Definition and by Race



http://www.statssa.gov.za/publications/P0211/P02114thQuarter2019.pdf

Chart 1.5b: Graduation levels by Race: 2015



https://www.southafricanmi.com/education-statistics.html

The racial characteristic of unemployment and educational achievement depicted in charts 1.5a and 1.5b must be of deep concern to all South Africans. The "de-racialization" of education in South Africa that began with the final demise of apartheid in 1994 remains fragile[13]. Race, racism, and its ethnically divisive components remains a major national and global social provocation in this 21st century. Most credible scientists have over many years, provided conclusive evidence that racial differences amongst humans, and therefore racism, have

[12] Siyakha Youth Assets for Employability Study 2016: https://www.uj.ac.za/faculties/humanities/csda/Documents/Siyakha%20Report%20_%20Oct%202016%20Web.pdf

[13] "***De-racialization of Education***": See statement by Professor Nomalanga Mkhize, item 3 on page 3 of https://www.sakan.org.za/Docs/ICT4SDG4.pdf.

no scientific basis[14], but the social construct of racism continues to dominate, disrupt, and threaten the stability of modern societies the world over. Even the scientific community itself is a victim of regular resurgence of racism[15], a highly resilient pseudoscientific world view of racial superiority and inferiority that emerged directly from the Neolithic Revolution and its societal transformations[16].

Education is clearly a route out of this South African and global race-based malaise, but the interdependencies between the three core influences of education, ethnicity/race, and unemployment illustrated in the charts above, compounded by the influences of the remaining fourteen SDG challenges, renders the search for effective responses extremely complex and demanding. Nations that have developed appropriate and effective responses in this era, required timeframes of several decades, far beyond the 2030 target date of this round of SDGs.

To complicate the South African challenge further, there is a growing body of academics, philosophers, researchers and thinkers from all academic disciplines and ideological persuasions who believe that the world's education systems themselves have reached an advanced stage of obsolescence, and therefore demand radical transformation. But what is radical transformation in this context, and how can it be implemented? Virtually all developing countries, and numerous advanced economies, do not have answers to these critical questions, but those that embark on early virtuous cycle-controlled trial and error methods tend to realise early and sustainable successes irrespective of the nature or severity of the challenges.

The philosophical links between education, the triple threats of inequality, poverty and unemployment, and the emotionally sensitive ethnic, linguistic, racial, and social hierarchical divides amongst humans are critically important in this SDG8 proposed strategy, and will be discussed further against each SDG in the paragraphs that follow.

1.2.6. Education Outcomes and Unemployment:

Ancient Chinese Planning Philosophy**:** (Attributed to Guan Zhong, variants attributed to Confucius)

"The best investment for one year is to grow grains; the best investment for ten years is to grow trees; the best investment for a lifetime is to educate people. What you gain from one year's growth will be grains; what you gain from ten years' growth will be trees; what you gain from a hundred years' growth will be people."

A similar early Christian era quotation attributed to Aristotle and used mainly by Catholic religious sects in more recent times is: "*Give us a child until he's seven years old, and we'll have him for life*"[17]. The reality is that most of the irrational, senseless socio-cultural-politically harmful human behavioural practices, like racism, patriarchy, gender discrimination and abuse, are deeply entrenched in children's minds during their early formative years. Given the overlaps and similarities of education as espoused by Guan Zhong and taught by Confucius (circa 515 BCE) in the first quotation, and Aristotle and Christian leaders in the ensuing two millennia, the search for ways of ensuring that early childhood education, development and indoctrination leads to positive outcomes for humanity, must be anchored on the use of the SDGs and their successors after 2030, as preferred tools out of many choices.

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[14] (a) South Africa's late Professor Phillip Tobias' video discussion of "RACE" at https://vimeo.com/33672232 (contains nudity); (b) the 2000 White House Statement by the Human Genome Project that "Race" has no scientific basis, and (c) geneticist J. Craig Venter's educational video at https://www.youtube.com/watch?v=6vS7AO9XYj4.

[15] (a)WEF 20: discusses "***Black Lives Matter"*** etc.: https://www.weforum.org/agenda/2020/07/racism-black-lives-matter-civil-rights-change/; (b) Superior: The Return of Race Science by Angela Saini, reviewed by (i) Smithsonian 2019: "***The Disturbing Resilience of Scientific Racism"***: https://www.smithsonianmag.com/science-nature/disturbing-resilience-scientific-racism-180972243/; (ii) Nature 2019: "***Racism in science: the taint that lingers***": https://www.nature.com/articles/d41586-019-01968-z, and (c) The Guardian: "***Why race science is on the rise again***": https://www.theguardian.com/books/2019/may/18/race-science-on-the-rise-angela-saini.

[16] Impact of the Neolithic Revolution on society published by National Geographic at https://www.nationalgeographic.com/culture/2019/07/first-europeans-immigrants-genetic-testing-feature/ "*The first Europeans weren't who you might think".* **Update 2019:** *Humans in Europe 150,000 years earlier than thought – Natural History Museum*.

[17] A well-known popular phrase attributed to numerous originators that range from Aristotle (circa 350 BCE), through the Bible (Proverbs 22:6) about 3 centuries later, and popularised by St. Ignatius of Loyola about 2 millennia after Aristotle. The much-hackneyed phrase is central to today's Homo economicus' marketing models which targets pre-7-year-old child users via their doting parents with accessible disposable incomes for continuous toy replacements.

The dangers of negative early childhood indoctrination, which includes child abuse with its personality and behavioural shaping outcomes, can be deadly, as discussed in https://www.sakan.org.za/Docs/ICT4SDG5.pdf, and in the Skierlik murderous tragedy outlined in the text box below. The gender-based violence resulting from the current Covid-19 pandemic, the massive job losses, self-quarantine and self-isolation that resulted from it, have triggered numerous new outbreaks of gender-based violence in South Africa. The need for focussed early childhood development (ECD) that positively shapes South Africa's future society and its critical world of work is urgent - the integrated SDG tools must be aggressively applied if national man-made and natural disasters like the Covid-19 pandemic and socially disruptive challenges like mass unemployment and gender abuse in South Africa are to be averted.

Example of race-derived human tragedies in South Africa: On Monday 14 January 2008, a 17-year-old South African youth named Johan Nel murdered four fellow South Africans, including a 4-year-old toddler, simply because they were black, and poor. The gruesome nature of the Skierlik Murder spree attracted significant international interest, e.g., BBC at http://news.bbc.co.uk/2/hi/africa/7741301.stm, a significant blight on South Africa's image abroad. *The indoctrination of children at home, in their communities and places of worship, and through virtually all educational systems worldwide, continues, making it necessary for the whole world to seek corrective solutions through initiatives like the Sustainable Development Goals programme, and the Millennium Development Goals programme that preceded it.* Due to its recent history, just a few centuries in a very long evolutionary timeframe, South Africa is at the centre of the global racist dilemma, and must therefore be at the centre of the corrective actions needed for a safe, secure, politically stable non-racist future for the country and the world.

The South African Skierlik tragedy illustrates the negative side of early childhood indoctrination. Can such early childhood indoctrination be refocussed on the skills and attitudes required for 4IR-driven changes in labour and the world of work? It is most unlikely that the national educations system alone can deliver fully on any such objectives in the short and medium terms (30 years or less). The traditional systems of imparting and receiving education and knowledge are too deeply entrenched to enable the required changes in time to avert potential national disasters. As Confucius suggests in the opening paragraph of this section, one hundred years of educational reforms may be needed to "catch up" with the societal and technological advantages enjoyed by today's leading economies. It is useful to note that such long timeframes are not unusual – it took Finland, a world leader in the quality of education and social coherence, nearly half a century to reform its educational and social systems for the country to rise to global dominance in these critical areas. As discussed in the chapter on education in this SDG discussion series - https://www.sakan.org.za/Docs/ICT4SDG4.pdf, a growing number of developing and developed nations, particularly the high growth emerging economies, have embarked on extensive reforms of their education systems in readiness for the massive changes in the world of work demanded by the 4IR.

South Africa faces significant challenges at today's vital nexus of education, employment, labour, work, (SDG4 and SDG8), all compounded by the extreme influences of all other SDG challenges, particularly SDG1 (Poverty); SDG2 (Hunger); SDG3 (Health); SDG5 (Gender); SDG10 (Inequality); and SDG17 (Coordinating them all). South Africa hosts the largest number of universities per capita in Africa (South Africa: 2.3 per million inhabitants; Ethiopia 1.2 per million; Nigeria 0.74 per million). Four of the nation's universities top the African university rankings[18], but the nation features poorly in international educational outcome measures, as illustrated Chart 1.6b below. The nation's global leadership in the debilitating measures of socioeconomic inequalities are the real outcomes of the nation's poor educational achievements, in spite of being a continental leader in both investments in education (as a percentage of GDP) and the number and qualities of universities and research institutions.

South Africa has made numerous attempts aimed at finding solutions to these seemingly intractable and divergent challenges. The nation also has the advanced skillsets needed to understand and address the challenges, but finds it difficult to empower and use those South Africans endowed with these skillsets effectively. Numerous excellent world-standard research papers and publications by South African academics and thinkers are available, a microcosm of which are included as references in this discussion paper. A typical

[18] "*10 African Countries with the Most Number of Universities*": https://www.afterschoolafrica.com/47837/10-african-countries-with-the-most-number-of-universities/

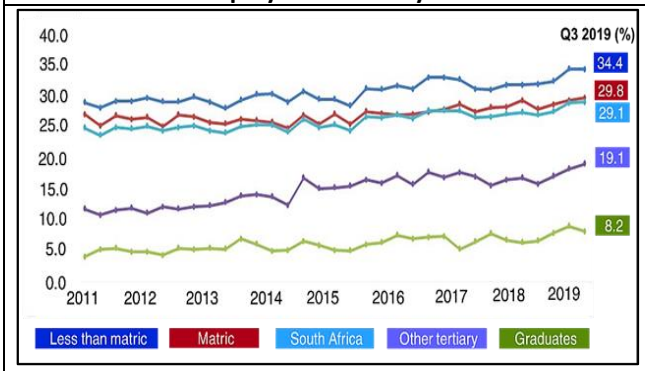
example of this record of research-based high level corrective efforts is the fairly recent (2018) research publication "What Drives Youth Unemployment and What Interventions Help?"[19] This vital research output, one of many, paints a picture of intensive engagement with the national challenges since the early 1990s, while at the same time recording numerous disappointing outcomes, which are verified by the statistical analyses that follow. A few illustrative extracts from this report include:

- *"The plethora of agencies across national and provincial governments that are not well-coordinated, that have struggled to implement programmes efficiently, and that are not accountable in the strong sense. This includes the youth-specific 'desks' at various levels of governance, but also the national departments of basic and higher education, for instance"*; (Author comment: ICT4SDG17 is relevant)
- "*Poor educational outcomes, particularly in basic numeracy and literacy, which are critical basic skills for employers";*
- *"A poorly coordinated further education system, which allows many young people to drop out and become vulnerable";*
- *"Lack of sustained economic growth that can drive labour absorption, in particular for young entrants*"; (Author comment: A "chicken and egg" conundrum – economic growth needs a well-educated workforce, but good education is best provided by strong economies, which in turn can/must/should lead to technological innovations and automation-driven job losses).

The statistical data that follows illustrates the starting point for consideration and action. A first look at the depth and extent of the challenges provides a prelude to the search for effective sustainable solutions based on a holistic approach to meeting all interrelated SDG challenges as far as possible.

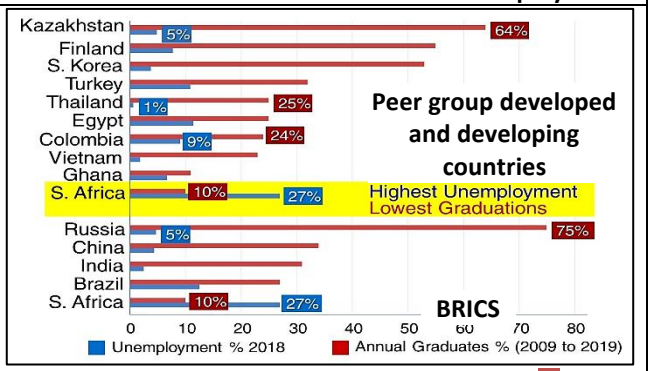
In Chart 1.6b, "graduate" is defined in accordance with UNESCO statistical classifications: First degree programmes at this level typically have a duration of three to four years of full-time study at the tertiary level. For systems in which degrees are awarded by credit accumulation, a comparable amount of time and intensity would be required. ISCED level 6 is Bachelor's degree or equivalent level, ISCED level 7 – Master's degree or equivalent level. Chart 1.6a draws attention to the alarming national educational outcomes which show that in 2019, 64.2% of South Africa's school entrants were not able to progress beyond the matric level, unable for various reasons to undertake tertiary education. Post-school participation in further education remained disappointingly low at just 8% in 2015 (page 22 [24 of 92] in Ref [19]) This educational outcome is discussed further in the document https://www.sakan.org.za/Docs/ICT4SDG4.pdf forming part of this series of SDG discussion documents.

Chart 1.6a: Unemployment Rate by Education Status



Source: Stats SA:
www.statssa.gov.za/publications/P0211/P02113rdQuarter2019.pdf

Chart 1.6b: Annual Graduations versus Unemployment



Sources: (1) World Bank DataBank: Education Statistics:
(2) World Bank Unemployment Database 2019:

Chart 1.6b presents a global benchmark of the number of graduates against the level of unemployment in each country depicted. The selection of peer group countries for the benchmark was based on availability of data, selection of developing nations with similarities with South Africa, South Africa's partners in the BRICS

[19] "***What Drives Youth Unemployment and What Interventions Help?***" A multistakeholder research initiative with academic participation by UCT and UJ from their educational and work-related faculties:
https://www.uj.ac.za/faculties/humanities/csda/Documents/Youth%20Unemployment%20report%20FINAL%20interactive.pdf

cluster, one fully developed nation with excellent educational and labour deployment (Finland), and one newly industrialised country, South Korea, which was less developed than South Africa just 40-years ago, and now features a GDP per Capita five times higher than South Africa's.

In Chart 1.6b, South Africa is the only nation in the benchmark with an unemployment level expressed as a percentage of the labour force, that is much higher than the level of university graduates, expressed as a percentage of the national population. Colombia has numerous demographic and economic similarities with South Africa, but outperforms South Africa in both educational achievement (24% versus 10%) and unemployment rates (9% versus 27%). A key component of the proposed ICT4SDG8 response must be to examine why this is so, what Colombia did that South Africa did not, and what lessons can be drawn, and applied to South Africa, from that close analysis.

1.2.7. Skills shortages and surpluses for the 4IR and beyond:

This section examines the specific skillsets needed for South Africa's participation in the Fourth Industrial Revolution (4IR), reviewed against the nation's capacity to meet the expected demands. The data draws from relevant (and available) international analysis, particularly from the OECD, adding to the numerous relevant local analyses, including the discussion document at https://www.sakan.org.za/Docs/ICT4SDG4.pdf. The charts provided suggest an urgent need for additional intensive local analyses, from which appropriate intervention programmes that directly target the full range of the nation's skills requirements for the full range of SDG challenges can be developed.

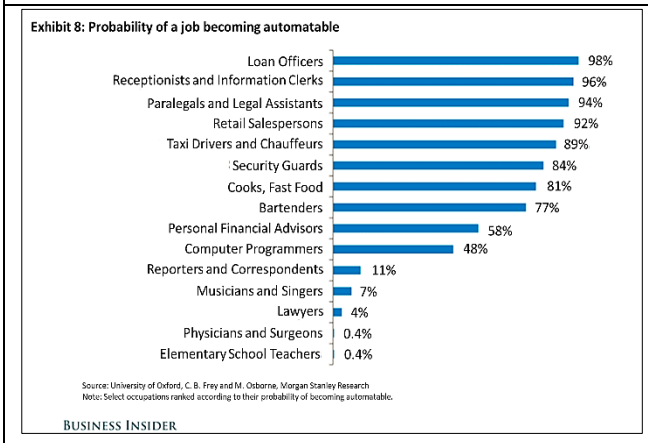
Basic background data for the benchmark: Argentina, Peru and South Africa

Table 1.7	Population (Millions)	GNP/Capita $PPP 2018	GNP/Capita CAGR (% pa, 2009-2018)	Fixed broadband penetration (2018)	Fixed broadband price $/Mb/month
S. Africa	58	12530	1%	1.9%	1.6
Argentina	45	22470	4%	19%	0.2
Peru	32	12450	4%	7.3%	0.07
OECD	1300	46200	3%	31%	0.3

Broadband price data from ITU: Measuring digital development: ICT Price Trends2019 | All other data from World Bank Databases.

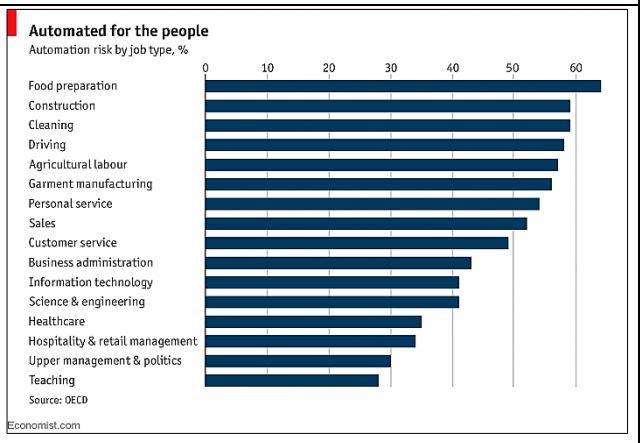
Charts 1.7a and 1.7b present the occupations with the lowest probabilities and risks of automation, which must therefore be the focus for national skills development. The charts also illustrate the occupations most suitable for automation, from which appropriate skills development and alternative job creation strategies must be developed.

Chart 1.7a: Jobs that are automatable



https://www.weforum.org/agenda/2018/01/the-fourth-industrial-revolution-a-survival-guide/

Chart 1.7b: Economist view on Automation Risk

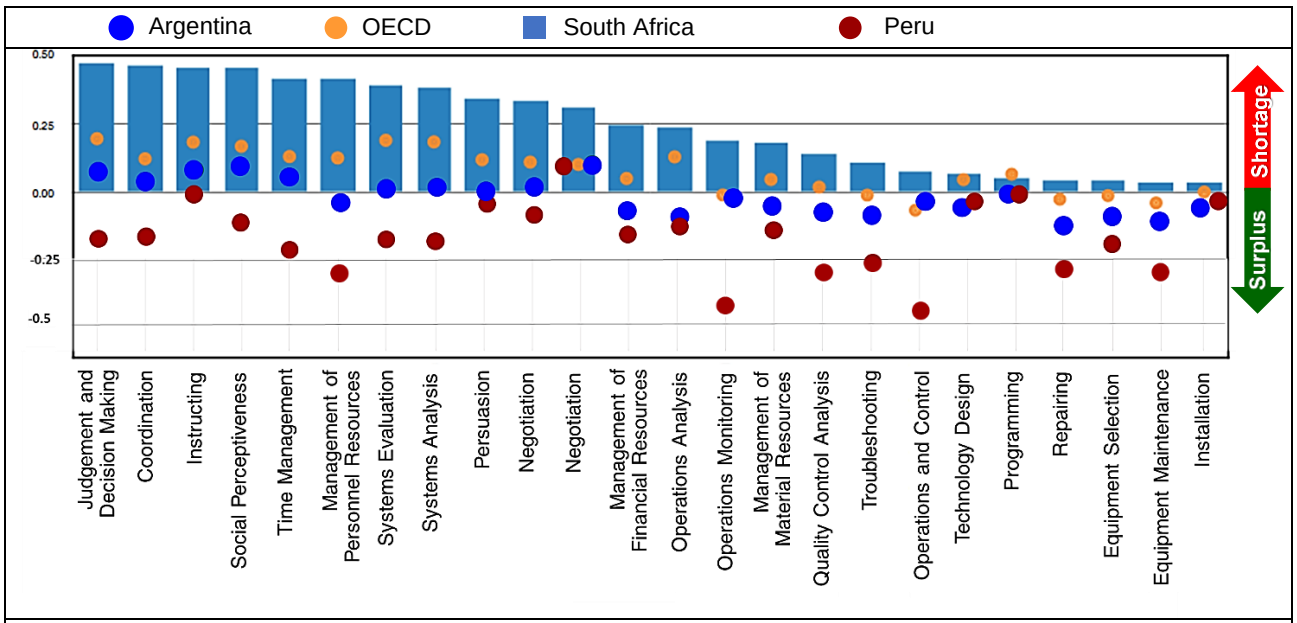


https://www.economist.com/graphic-detail/2018/04/24/a-study-finds-nearly-half-of-jobs-are-vulnerable-to-automation

Table 1.7 sets the stage for the OECD analyses presented in Charts 1.7c and 1.7d: comparative skills deficits and surpluses required for 4IR readiness. Table 1.7 also suggests significant differences in economic and ICT (fixed broadband penetration indicator) development between Argentina, Peru and South Africa. The former countries' economies grew four times faster than South Africa's, while Peru's fixed broadband penetration

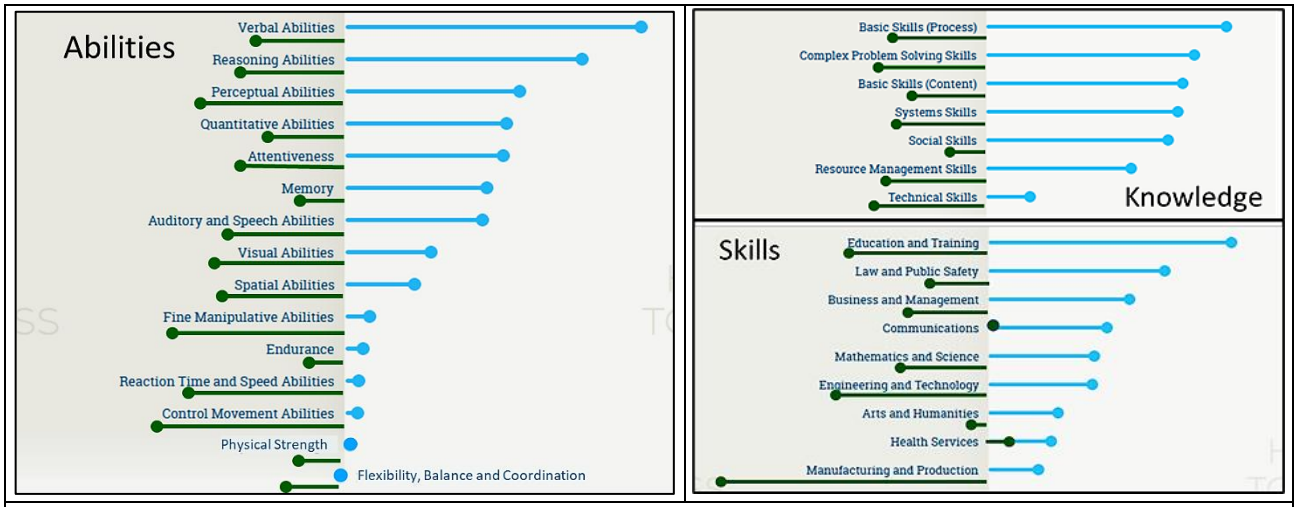
grew to nearly four times that of South Africa's, even with fixed broadband user prices 200 times lower than those in South Africa. In the search for ICT4SDG8 solutions for South Africa, the reasons why South Africa lags Argentina's and Peru's rates of development must be closely examined, and such examination expanded to include any other comparable developing nation for which suitable benchmarking data is available. The insights and lessons derived from such benchmarking could be of great value to South Africa's search for productive development strategies and programmes.

Chart 1.7c: Skills shortages and surpluses: OECD, Argentina, Peru, South Arica



Key: +1 = 100% skill shortage: -1 = 100% skill surplus.
Source: (1) https://www.oecdskillsforjobsdatabase.org/data/country_notes/South%20Africa%20country%20note.pdf
(2) https://www.oecdskillsforjobsdatabase.org/data/country_notes/Argentina%20country%20note.pdf
(3) https://www.oecdskillsforjobsdatabase.org/data/country_notes/Peru%20country%20note.pdf

Chart 1.7d: Ability, Knowledge, Skills: South Africa and Peru



Keys: Skill Surplus Skill Deficit: Peru: South Africa:
Source: OECD Skills for Jobs: https://www.oecdskillsforjobsdatabase.org/#ZAF/_

The professions and work occupations selected for the OECD analyses in Charts 1.7c and 1.7d are extensions of the ten critical 4IR skillsets published by WEF16[20], which are contextualized for South Africa in section 3. on page 8 of the complimentary document https://www.sakan.org.za/Docs/ICT4SDG4.pdf. The inclusion of Argentina, Peru and South Africa in the OECD analyses presents an invaluable opportunity for South Africa to conduct more rigorous analyses of the consequences of the nation's education systems' outcomes on the key indicators of ability, knowledge and skills, and how they impact and are impacted by the 4IR. The most important outcome of such analyses must be the development of national strategies that respond to the significant populations of South African citizens and residents that must/will lose their jobs to automation, thus exacerbating the already unacceptably high levels of unemployment. Chart 1.7c paints a disturbing picture of the 4IR skills deficits in South Africa compared to OECD averages, Argentina and Peru, with Peru portraying the highest levels of 4IR skills readiness in all selected indicators.

The challenge for South Africa is to address the nation's massive and still expanding unemployment levels while preparing children and youth for a vastly different future world of work. This balancing act of maintaining an obsolescent yet deeply entrenched global work philosophy, and preparing future populations for uncertain post-work yet productive lifestyles, will be extremely difficult, and yet failure must not be an option. There are vital lessons from South Africa's own evolutionary history to help overcome the socio-culturally sensitive social transformation necessary. Today's visionaries must begin to prepare future generations for such transformation. The SDG8 challenges, linked to all other related SDG challenges, provide the tools for such transformation.

1.3. Section summary:

Section 1.0 provides entry level quantitative data for intensive analyses of the status, impact, and possible corrective strategies for all SDG challenges that South Africa faces. These statistics are designated entry level only for the following reasons:

- Quantitative data alone is not enough to define, describe, or help to reduce the extreme dehumanizing challenges that poor people in South Africa face. Much more than quantitative data are needed. Inclusive coordinated analyses in all scientific disciplines, especially those within the academic classifications of "Humanities", e.g., ethnographic and related behavioural psychosocial multidisciplinary research for development, must be undertaken to complement the simpler quantitative data provided in this section of the discussion document.
- The quantitative data presented is invaluable as an early warning system of potential disaster at worst, and developmental stagnation at best. The first activity related to the quantitative data presented should be its verification and acknowledgement, followed by quantitative and qualitative expansion of the knowledge base so that the impacts of all multidimensional interdependent SDGs are built into the corrective strategies to be developed.
- It is vital to recognise and understand all previous attempts to resolve the specific SDG challenges, to draw on both successes and failures of all local historical attempts, and to study closely the successes and failures of South Africa's global peer countries, followed by the development of clear multidisciplinary and multistakeholder intervention strategies with equally clear data-driven virtuous circle programme control, monitoring and evaluation processes.

The key elements of the above summaries, supported by the quantitative analyses of the data presented, are central to the discussions that follow.

[20] WEF 2016: "***The 10 skills you need to thrive in the Fourth Industrial Revolution***": https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/

Section 2.0: Links between SDG8 and all other SDGs, and ICT:

The role of ICT in the achievement of all seventeen SDGs is examined further in this section, through an examination of the relationships between SDG8 and ICT, and all other sixteen SDGs. All SDGs were designed to address the numerous multidimensional threats to human development, in South Africa and in every country on earth, developing and economically developed. As noted in the MDGs that preceded this SDG initiative, ICTs were recognised as potent enablers for the achievement of all MDGs then, extended to all SDGs now since their launch in 2016. For the purpose of this discussion document, the intricate linkages between ICT and all SDGs, especially SDG8, are anchored on the following founding principles, assumptions, facts, and presumptions, the validity, relevance, and gravity of which must be an integral part of the SDG research and implementation programmes:

- The human desire, capability and capacity for interpersonal communications has been and continues to be a key driver of human evolution. How far back in the human evolutionary chain this desire for intra-species communications extends remains the subject of much research and speculation. The speculation is at last giving way to a growing level of scientific research-based opinion and certainty[21], that interpersonal communications were vital tools in the evolutionary armoury of our most ancient ancestors. How else can we explain how our ancestors migrated from Africa, their continent of birth, to every other landmass on earth, while at the same time nurturing our genus to our current global dominance of most things on earth?
- The relentless search for improved interpersonal communications amongst the genus Homo led to the development of language, a major evolutionary "leap forward" that catapulted our species to the top of nature's food chain. Invaluable as the knowledge of the importance of language in human evolution may be, the study of this invaluable human asset was, for much of our modern history, marred by a form of hubris that for many years denied the possibility of language originating in Africa, the continent of origin of all users of the language tool. Is there any logic in thinking of the emergence of a species in one locality, followed by the development of one of its most valuable assets several million years later in a totally different locality? Two important commentaries from highly respected very recent scientific researches illustrate this aspect of the study of languages well:

  ***FOXP2* variation in great ape populations offers insight into the evolution of communication skills (Dec. 2017):**

  Language is a defining feature of human uniqueness. Therefore, the cognitive, motor, and neural foundations that distinguish human speech and language from other animal communication systems have been a central focus of research in the social and biological sciences for more than 200 years. To address the puzzle of human language origins, it is essential to examine the cognitive processes, neurobiology, and genetics underlying this unique form of communication in an evolutionary context, particularly in comparison to our species' closest living relatives, the great apes (chimpanzees, bonobos, gorillas and orangutans):
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5715162/pdf/41598_2017_Article_16844.pdf

  And:

  Study Challenges Role of Speech Gene in Evolution of Human Language (August 2018):

  "We're interested in figuring out, on a genetic level, what makes us human," Henn said. "This paper shows how important it is to use a diverse set of humans in studying the evolution of all of us as a species. There's a severe Eurocentric bias in a lot of medical and other scientific studies, but we've found a scientific impetus for emphasizing diversity and inclusivity in data collection because it clearly yields more accurate results.": https://lettersandscience.ucdavis.edu/news/evolution-genetics-humans-language

- The likelihood of South Africa being one of the geographic locations of the birth of the genus Homo, and therefore of all languages, and the technological developments they inspired, is very high. One of the oldest fossils of our hominin ancestors, Australopithecus (translation: the "*southern ape*"), was discovered at South Africa's Makapansgat, an important world heritage paleoanthropological excavation site. Logic suggests that the genus must have developed language and passed it on to its descendants Homo erectus, who must have used the power of language to "emigrate" with reproductive size family members to the

[21] Example: (1) *How Language Began: The Story of Humanity's Greatest Invention*: Daniel Everett: https://profilebooks.com/how-language-began.html | (2) Excellent review at "*Homo erectus may have been a sailor – and able to speak*" The Guardian: https://www.theguardian.com/science/2018/feb/20/homo-erectus-may-have-been-a-sailor-and-able-to-speak

far reaches of Eurasia - China, Georgia, Flores, Indonesia, the Philippines. Homo erectus' wondering ways were emulated by their descendants, Homo heidelbergensis (originating in Zambia as the "Broken Hill Man"?), whose claim to fame was the colonization of Europe, and giving rise to their successor Homo species, the Neanderthals and the Denisovans. Neanderthals and Denisovans are now known to have interbred with modern humans whenever and wherever they encountered each other. Denisovans and Neanderthals continue their post-extinction existence within the genetic makeup of all modern humans[22], through deep ancestry (Homo heidelbergensis), and through more recent interbreeding 40,000 to 100,000 years ago.

In spite of this very rich evolutionary history, modern South Africa struggles with language proficiency, a core requirement for the vital "Decent Work" needed for survival in this post-Neolithic age. The land of the human "mother tongue"[23] struggles with up to 80% of its grade four learners unable to read for meaning, even in their home languages (this removes ethnic or regional biases). This learning deficiency has devastating impacts on the job prospects of future generations of South Africans in this 4IR age, a key reason for including the ancient historical detail of language origins in this ICT4SDG8 discussion document. The introductory statistics presented in Section 1.0 above are merely additional indicators of looming social problems which demand urgent redress, whatever the time span required for such redress may be.

- The Information and Communications Technologies (ICT) emerged in their ancestral and modern formats as a direct consequence of Homo sapiens' desire for geographically extended interpersonal communications. Any technology that facilitated this extension of interpersonal communication was considered, invented, adopted, adapted, and used by our species since it acquired cognition very early in its evolutionary path. The ICTs are simply technological tools that extend humanity's capacities and desires to communicate beyond distance, cultural and linguistic barriers. This human desire for unfettered communications beyond any conceivable distance or other limitations led modern humans to recognise the commercial and political value of the technologies they had invented. We suggest this modern human development led to new evolutionary specializations, towards Homo economicus and Homo technologicus, a prelude towards a Human 2.0 (cyborgs and AI-augmented humans) evolution?

Godlike 'Homo Deus' Could Replace Humans as Tech Evolves: Historian, prolific author, globally respected intellectual Yuval Noah Harari explores these questions in his runaway bestseller, "Homo Deus: A Brief History of Tomorrow": "*What happens when the twin worlds of biotechnology and artificial intelligence merge, allowing us to re-design our species to meet our whims and desires?*" Yuval Noah calls this new species "Homo Deus", others have called it Human 2.0 (Forbes), Homo sapiens 2.0 (Psychologytoday.za), or any of the growing extensions of Homo xxx, but who/what exactly is this new species? Black humans? Brown humans? Red humans? Yellow humans? White humans? Wealthy humans? Impoverished humans? North, East, West, or South dwelling humans? Those who can afford the ride to Mars? Who will get first choice of artificial human capability enhancements? Those at the front of evolution to Human 2.0? What will be the consequences on the second, third and last humans in the queue - will they remain Homo sapiens, or perhaps evolve to Homo stupidus? Will they emulate the fate of all of humanity's common ancestors, the Neanderthals and Denisovans, and the more modern Khoisan and related hunter-gatherers – extinction? Whatever the answers to these critical questions may be, speculative or otherwise, there is a growing urgency for the "need to know". There has always been safety in numbers, the best most efficient way of spreading knowledge today is through ICT and ICT enabled humans – mass information and knowledge access for the security and sustainability of Homo sapiens as the species continues to evolve into Homo xxx.

Today's insatiable demand for ICTs and their technological off-shoots and variants are driven more by commercial interests than by the altruism their early inventors intended, at least in South Africa and much

[22] Recent discoveries of Neanderthal DNA in both African and European populations confirm evidence of extensive interbreeding within and between our known ancestral species: https://www.nationalgeographic.com/science/2020/01/more-neanderthal-dna-than-you-think/

[23] African origins of Language, Reviews: (1) Africa the birthplace of human language, analysis suggests, (April 15, 2011): Science Daily: https://www.sciencedaily.com/releases/2011/04/110415165500.htm: (2) The Cradle of Language (2009): Oxford University: https://global.oup.com/academic/product/the-cradle-of-language-9780199545858?cc=us&lang=en&#: (3) "No country can make progress on the basis of a borrowed language": Professor Kwesi Kwaa Prah discusses African languages and their correlation with culture – African languages can and must be reduced in number, most are mere dialects of a smaller number of language roots: https://ela-newsportal.com/no-country-can-make-progress-on-the-basis-of-a-borrowed-language/ (4) Africa is home to 2144 languages – use them all: Professor H. Ekkehard Wolff February 8, 2018: https://qz.com/africa/1201975/african-universities-should-use-african-languages-not-just-english-french-and-portuguese/

of the developing world. They are also used, abused, or withheld, for insidious, dehumanizing, nefarious geopolitical antisocial practices and purposes. But, the value of ICT as tools for social cohesion, cooperation and development continues to trump its nefarious usage - to transcend all dehumanizing applications and practices defined under the growing range of cybercrimes that now extend to extremely dangerous global geopolitics.

2.1 ICT and SDG8: Job creation in the ICT and generic technology sectors

There has been a long-standing myth that the ICT sector, and the whole related technological sectors, do and must create jobs, now and continuously into the future. All technologies, especially those within the ICT classifications, have indeed created jobs (sometimes, but not always decent or rewarding), jobs needed for the post invention/innovation introduction, construction, and operations of these same ICTs. But they were all temporary – until the next ICT "disruptive" innovation arrives to render the jobs and processes obsolescent. The *raison d'être* of all technological advances, from their very humble beginnings as stone tools early in human evolutionary history (much of it in South Africa), has been to reduce the labour burden of human survival. In the case of ICTs of all genres specifically, the new technological varieties, were and still are used to spread knowledge and peace to all humanity, as so eloquently stated by USA's President James Buchanan in his ICT (telegraph) communications with the Queen of England [Text of messages here, also Table 3.0.2 (b)]. Technology (tools) are designed and introduced to improve productivity in any and all human endeavours. The ancient hunter-gatherer human ancestors improved their hunting and gathering productivity through stone tools that evolved to today's leading edge 4IR technologies (and destructive weaponry) – all designed to reduce the burden and cost of human labour, to weaken and/or eliminate humanity's near total dependence on jobs, restoring the species' humanity (John Hagel: Robots Can Restore Our Humanity, 2016).

The Internet and all its technological enablers, central to this ICT4SDG discussion, has always been recognised as a productivity enhancer, even with the reduction of ICT jobs resulting from its own technological advances:

Extracts from McKinsey Global Institute: Internet matters: The Net's sweeping impact on growth, jobs, and prosperity: https://www.nwoinnovation.ca/upload/documents/mgi-Internet-matters-report.pdf: May 2011:

- Internet accounts for 3.4% of GDP in 13 countries examined
- 21% GDP growth in last five years in mature countries
- 2.6 jobs created for one job lost
- 75% of Internet impact arises from traditional industries
- 10% increase in productivity for small and medium businesses from Internet usage
- Small and medium businesses heavily using Web technologies grow and export 2x as much as others
- Up to €20 per Internet user per month of consumer surplus

All the above is true and verifiable, BUT, while ICT (the Internet) usage creates jobs in all other ICT-user industries and sectors, these sectors want still more productivity gains, and will in time be inspired to automate their operations as much as possible using the latest ICT innovations. This is a never-ending cycle – more technology for more productivity gains leads to more economic and world of work changes which in turn require less human labour through technologically-driven automation.

Human beings are, in this economic era, the most expensive tool in the arsenal of economic progress – the costs of finding and shaping them from birth to retirement, the control, maintenance, management, and operationalization demanded by this "Human Capital", greatly exceeds all other corporate or institutional assets and resources. The etymology of the term "Human Capital" draws from its Latin origin *capitālis*, meaning "capital", or "head", interpreted by its Roman originators to reflect the common measure of wealth in that era - "*capitālis* – head of cattle". The term, even with massive stubborn support from economists (see support from WEF 2019 and World Bank 2021), and of course "Human Resource" experts and leaders, retains its uncomfortable association with slavery, intimate links historically verified by Harvard Researcher Caitlin C. Rosenthal (*The Messy Link Between Slave Owners and Modern Management*). The French translated the concept to "*chattel slavery*", while the globally respected intellectual Noam Chomsky expanded this into today's "wage slavery", a rather unpleasant denial of "decency in work" - "*wage slavery stands today as one of the greatest barriers to the progress of civilization*" – especially as humanity faces the post-Covid restructuring challenges.

What then is the appropriate interpretation of the concept of "decent work" so brilliantly, appropriately, and eloquently espoused by Juan Somavia in the opening paragraphs of this discussion document? How can we rethink the concept *"Decent work is at the heart of the search for dignity for the individual, stability for the family and peace in the community"* to emphasise the human dignity, stability and peace instead of its traditional mostly economic agenda? If we accept that the *raison d'être* of technological advances is, and has always been, to improve productivity by reducing the burden and cost of labour, then we must accept that the epitome of success must be the demise of work as we know it today – total productivity maximization through automation and mechanization. "*Decent work*" must be redefined as the human activity that gives pleasure to the "worker" through the provision of the goods and services that the worker's community appreciates and needs, and which also satisfy the worker's own material and psychological needs. The monetary rewards that define work as we know it today may need to become incidental to the process of human creativeness and innovation. This will not be new at all to the lifestyle of Homo sapiens – our common hunter-gatherer ancestors lived it for hundreds of millennia before we put a price on it.

For about 95% of Homo sapiens' existence, "work" consisted of (a) food and water acquisition, mostly through hunting and gathering; (b) tool-making (engineering) to enable that food and water acquisition, or to provide certain physical comforts for the whole community (see "200,000-Year-Old Bedding Found in South Africa May Be World's Oldest" – Smithsonian); (c) play usually combined with all other productive activities, which produce the outcomes of "work" as we know it today; (d) entertainment (firelight dancing, music-making, singing, story-telling, cave painting); (e) innovations to advance technoscientific knowledge; and of course (f) child nurturing by both genders to ensure species sustainability.

> Hunter-Gatherers' Work Is Playful Because It Is Done in a Social Context, With Friends. Peter Gray PhD

According to current conceptual definitions, such activities would be defined as "unpaid work" – in the modern context, mostly essential domestic work undertaken mostly by women who spend 55 hours or more per week doing it for no financial rewards.

The author of this document found it difficult to find an official definition of "work" for hunter-gatherers who cooperated and collaborated in all activities necessary for sustainable survival, with no concepts of individual, or even community rewards – what was needed to be done was just done, often with great pleasure - successful achievement and enjoyment by the community the greatest and only reward.

The rich human history of how Homo sapiens lived and related to "work" is still unfolding with numerous new discoveries across all continents, and a gradual reduction in dissenting opinions and views within the scientific community. This rich history cannot be easily précised within the limitations of this document. The reference links that follow are therefore provided to point towards the vast body of knowledge available on and off-line concerning this vital aspect of ICT4SDG8, and the vital need, and urgency, to access this knowledge, understand it, and use it for South Africa's development:

The Human Face of Work and Labour – Reference links to the Knowledge that can be Unleashed by ICT:

1. **Debunking old beliefs about humankind**: The historical belief systems about human nature, shaped by Thomas Hobbes amongst others (1651, humans are naturally "solitary, poor, nasty, brutish, and short"), were countered by Jean-Jacques Rousseau bout 100 years later, who believed that humans were inherently "good", but were "corrupted by civilization". But even these ideas have not escaped the criticism of some academics. These contrasting views shaped, and continue to shape, today's politics and the social hierarchies that define politics, society, and the world of work. They need to be understood so that modern societies can draw from, and accept, reject or refine, the wisdom of their ancestors, even in this technologically and socially complex world. Rousseau believed, nearly 300 years ago, that "everything started to go wrong once humans perfected the arts of agriculture and industry" – in which inequality emerged and flourished. This is the clarion call to action by numerous researchers today.
2. **The emergence of Homo economicus**: Definitions (a) Oxford Reference: Economic man, or the rational agent depicted in economic models. Such an agent has consistent and stable preferences; he is entirely forward-looking, and pursues only his own self-interest. When given options he chooses the alternative with the highest expected utility for himself. It is controversial whether this figure is realistic, and if not, how much that matters to economic theory. (b) Investopedia 2021: Homo economicus is a theoretical abstraction that some economists use to describe

a rational human being. In certain neoclassical economic theories, people are portrayed this way: as ideal decision-makers with complete rationality, perfect access to information, and consistent, self-interested goals. Although many behavioural economists dispute the assumption that humans are largely rational, and therefore the Homo economicus model, the question remains: how much has, or does, the Homo economicus model shape the world of work today, especially in South Africa with its deep socioeconomic divides? Can the irrational side of modern human behaviour, which diminishes the model, be overcome with the help of 4IR and AI so that the "rational self-interest" of Homo economicus is diminished? What could be the consequences (Vital discussions here1 and here2)? See also "*Technology advances — augmenting homo economicus*" in "The journey to machina economicus". Both the enlightened and the dark side of modern economics cannot/must not escape the scrutiny made possible by ICT4SDG.

3. **Richard B. Lee**, Canadian anthropologist born in 1937, was one of the earliest modern researchers to study surviving hunter-gatherer lifestyles, specifically the Ju/'hoansi and San peoples of Southern Africa. His seminal work was launched in 1966, at an opinion-shaping seminar titled "Man the Hunter", which led to a book of the same name, and many similar studies and scientific reports that followed. Sadly, following the Homo economicus model, the book, even in paperback, remains unaffordable for most of the research subjects, and the region's poor children and youth who need to know but cannot afford to know. It costs US$ 50.95 on Amazon – more than the average monthly expenditure limit of more than 30 million South Africans. All "free" copies demand access to the internet and the software tools to use them, which more than 30 million South Africans do not have in adequate quantities and qualities.

   An excellent albeit aged review of the book states: "*For the archaeologist, the importance of Man the Hunter is left in little doubt: "Cultural man has been on earth for about 2,000,000 years; For over 99% of this period he has lived as a hunter-gatherer. Of the 80,000,000,000 men who have ever lived out a lifespan on earth, over 90% have lived as hunter-gatherers (Lee and DeVore, p.3)".* The book, and others by the same authors, triggered a near-deluge of hunter-gatherer studies, some of which are briefly described below. There have been some criticisms, mostly of a superficial nature: "*The theory Is Debunked – hunter-gatherer ancestors were not hunters but prey for many predators*"; "*Why 'Man' the hunter, where were the women?*". Richard Lee's and his colleague's work present very useful insights into how we can shape the future through the wisdom of the ancients and the technological prowess of today and the future. (PDF at https://faculty.washington.edu/stevehar/lee.pdf.)

4. **Anthropologist Marshall Sahlins**, 1966: The Original Affluent Society: http://www.uvm.edu/~jdericks/EE/Sahlins-Original_Affluent_Society.pdf. In a related 2019 research paper, PNAS discusses the issues raised by Marshall Sahlins as follows: "*In 1966, the anthropologist Marshall Sahlins proclaimed hunter-gatherers to be the "original affluent society." He argued that hunter-gatherers enjoyed abundant leisure because they were unburdened by the presence of commercial markets, which induce people to spend more time working in the pursuit of material goods. This striking narrative contradicted older canonical views that people in less socioeconomically complex societies toiled endlessly just to survive. However, Sahlins' argument was grounded in only a small amount of empirical data, and quickly came under fire for various methodological reasons, including the difficulty of measuring work and play across societies. The question of how much time people spend working has thus remained the topic of great interest and ongoing debate*". The ongoing debate must be replicated in South Africa, extending much further into Sahlin's insights than just the "*Work time and market integration in the original affluent society*" that forms the basis of this PNAS research paper.

5. **John Gowdy, 2019: Our hunter-gatherer future**: Climate change, agriculture and uncivilization: https://www.sciencedirect.com/science/article/pii/S0016328719303507:

   John Gowdy, Professor of Economics Emeritus, Rensselaer Polytechnic Institute, Troy, NY, USA, suggests that the human journey to today has taken the wrong path – can we find our way back, especially with the help of our technological knowhow and prowess, before even that makes a wrong turn and destroys humanity as we know it today? Professor Gowdy thinks we can "return to our hunter-gatherer future" even in this era of great technological change, if we do the following:

   (a) **Change the way we produce food and our consumptive habits**: "*Maintaining agriculture will be unlikely after the climatic transition and the end of fossil fuels*": Human ancestors survived for more than one million years without agriculture, and still fed well……

   (b) **The environment will recover as the human domination of the Earth ceases**: Resolving ALL interrelated SDGs, with special attention to SDG 13: Climate Change.

   (c) **Rewilding**: SDG14 and SDG 15: Life under water and on land: In section 2.6.1.1. of this document, we state the troubling global statistic that 70% of the world's fresh water fish have disappeared as a direct result of water resource mismanagement. South Africa spends a fortune each year protecting its big game from extinction (Elephants, Rhinos, Leopards), the small game species have contracted and changed their habitats for survival,

some like the elegant cheetah are heading for extinction – conflict with Homo economicus industrial-scale farming communities. There are numerous examples of biodiversity recovery through very simple, logical, rational human interventions in many developed countries, e.g., https://www.rewildingbritain.org.uk/.

(d) **Rapidly reduce the human population**: The global population explosion is known to have been triggered by the agricultural revolution – more (cheap) food, more babies, more societal hierarchical fragmentation and large human settlements, more food wastage, demanding even more cheap food. Can this cycle be halted and controlled? The author quotes: Paul Ehrlich, "*Solving the population problem is not going to solve the problems of racism, of sexism, of religious intolerance, of war, of gross economic inequality. But if you don't solve the population problem, you're not going to solve any of those problems*"

(e) **Protect the world's remaining traditional cultures**: "*Human societies still exist that have little contact with the outside world. These groups may be the only humans having the necessary skills to survive a climate/social/technological apocalypse.*" South Africa had many of these human societies, there are a few survivors of these human societies spread throughout Africa and other parts of the developing world, including the harsh frozen wastes of the polar regions. They are all bordering on extinction, except in those in countries that care for humanity – mostly the Scandinavian socialist countries who protect their "indigenous" e.g., the Sámi people and their lifestyles. South Africa's cultural diversity is an immense but highly undervalued and underutilized advantage. This can change, if the country digs deep into its human past, if only to understand and learn from it. Besides the rich ancient fossil evidence that speaks through its DNA, the country has very recent memory of its disappearing hunter-gatherer ancestry – this memory must be refreshed and utilised.

6. **Dr James Suzman**: South African, great nephew of Hellen Suzman, a South African anti-apartheid and human rights veteran activist. James is an authority and prolific author of the lifestyles and plights of the Ju/'hoansi, one of the last remnants of Southern Africa's rapidly declining hunter-gatherer human ancestral populations. A small selection of James' publications from which South Africa can draw invaluable insights in how to prepare for the future are:

(a) **How Hunter-Gatherers May Hold the Key to our Economic Future,** February 2018**:** https://evonomics.com/hunter-gatherers-may-hold-key-economic-future/:

"*We (*humans*) are more than capable of leading contented lives that are not defined by our economic contributions, that automation provides exactly the opportunity we need to rethink our relationships with the workplace, and in doing so wean us of our dangerous obsession with growth*". And "*This is of course easier said than done as the Ju/'hoansi residents of Canaan know all too well. And if you were to ask those among them that still remember their lives as hunter-gatherers, they would remind you that "their primitive affluence" depended on far more than just a willingness to make do with having few needs easily met. It also demanded a society in which people cared little for accumulating wealth and in which everyone played an active role in jealously enforcing their fierce egalitarianism*".

(b) **How Neolithic farming sowed the seeds of modern inequality 10,000 years ago**: Published by The Guardian, December 2017: "*Most people regard hierarchy in human societies as inevitable, a natural part of who we are. Yet this belief contradicts much of the 200,000-year history of Homo sapiens. In fact, our ancestors have for the most part been "fiercely egalitarian", intolerant of any form of inequality. While hunter-gatherers accepted that people had different skills, abilities and attributes, they aggressively rejected efforts to institutionalise them into any form of hierarchy. So, what happened to cause such a profound shift in the human psyche away from egalitarianism? The balance of archaeological, anthropological and genomic data suggests the answer lies in the agricultural revolution, which began roughly 10,000 years ago*"

So, it is worth recognising that our current social, political and economic models are not an inevitable consequence of human nature, but a product of our (recent) history, and the choices we made. That knowledge could free us to be more imaginative in changing the way we relate to our environments, and one another. Having spent 95% of *Homo sapiens'* history hunting and gathering, there is surely a little of the hunter-gatherer psyche left in all of us. How can we use the creative thinking of our ancient hunting instincts to survive today?

(c) **Affluence Without Abundance**: November 2017: Review: "*An insightful and well-written book, describing the hard transition of foraging communities in Namibia from relative affluence during the Stone Age to contemporary poverty and misery. Avoiding both modern conceits and romantic fantasies, Suzman chronicles how economics and politics have finally conquered some of the last outposts of hunter-gatherers, and how much humankind can still learn from the disappearing way of life of the most marginalized communities on earth*." –Yuval Noah Harari.

If the success of a civilization is measured by its endurance over time, then the Bushmen of the Kalahari are by far the most successful in human history. A hunting and gathering people who made a good living by working only as much as needed to exist in harmony with their hostile desert environment, the Bushmen have lived in southern Africa since the evolution of our species nearly two hundred thousand years ago.

(d) *Work: A Deep History, From the Stone Age to the Age of Robots*: "*Work defines who we are. It determines our status, and dictates how, where, and with whom we spend most of our time. It mediates our self-worth and moulds our values. But are we hard-wired to work as hard as we do? Did our Stone Age ancestors also live to work and work to live? And what might a world where work plays a far less important role look like?" "'work' has its roots in the agricultural revolution ten thousand years ago. Our sense of what it is to be human was transformed by the transition from foraging to food production, and, later, our migration to cities. Since then, our relationships with one another and with our environments, and even our sense of the passage of time, have not been the same. Arguing that we are in the midst of a similarly transformative point in history, Suzman shows how automation might revolutionize our relationship with work and in doing so usher in a more sustainable and equitable future for our world and ourselves*".

South Africa, as discussed throughout this document, is plagued by virtually all the challenges resulting from the prevailing global socio-behavioural-cultural-economic norms, the challenges relate to all seventeen SDGs. And yet, the country is the home of a more peaceful sustained human development experience extending over a period of more than one million years. The technological knowhow needed to address these challenges in this modern age are available in the country, albeit in inadequate quantities, but, South Africa has not used this knowledge capacity and capability well.

This ICT4SDG discussion document is about how South Africa can use its ICT expertise and the resulting networks and services to spread the knowledge of human survival, from the deep past, through the turbulence of today, towards a calmer, safer, smarter future for all South Africans. There is an urgency for South Africa to address the 'Fierce Urgency of Now' so eloquently expressed by the Rev. Dr Martin Luther King Junior in a very different time and place:

"'*We are now faced with the fact that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history, there is such a thing as being too late. This is no time for apathy or complacency. This is a time for vigorous and positive action*.'"

South Africa must seek to maximise the recognition and use of all its small pockets of technological and intellectual excellence, and begin to rescue the nation from a very hard future, the "*fierce urgency of now*". The secret is through extensive consultation, coordination, collaboration and communications across the whole nation and across all knowledge disciplines, as provided for in SDG17.

2.2. SDG1 and SDG8: Poverty, Decent Work and Economic Development

The role of ICT in the alleviation of poverty is discussed in https://www.sakan.org.za/Docs/ICT4SDG1.pdf. This discussion centres on the interdependencies between SDG8 and SDG1, and how ICT can assist in the mitigation of both developmental challenges.

In South Africa, the loss of a job is a direct determinant of deepening poverty: the triple threats of inequality, poverty and unemployment are already endemic in the country as illustrated in the charts of Section 1.0. If South Africa's unemployment rises any further, the already high rate of poverty depicted in Chart 1.2b, paired with its racial characteristic of Chart 1.3a, could reach socially, economically, and politically destabilizing proportions. The ongoing global Coronavirus pandemic is expected to push South Africa's unemployment level from the global record of 30% towards an official unemployment rate beyond 40%, and up to 60% at the expanded definition of unemployment (includes unemployed persons who have abandoned the search for jobs). These troubling statistics will be extremely damaging to South Africa's prospects for economic growth with social stability.

There is a wealth of information and knowledge about the interdependencies of SDG1 (Poverty) and SDG8 (Jobs). The challenge is not a dearth of knowledge, it is the global lack of commercial and political, and even intellectual will to apply this wealth of information and knowledge to address both challenges and their critical interdependent SDG challenges, especially SDG10 – Inequality. The lack of commercial and political will is suggested strongly by Homo sapiens' tendencies towards the Homo economicus agenda and principles; a focus on commercial interests more than or at the expense of the wellbeing of the species as a whole. Sections 2 and 3 starting on page 5 of https://www.sakan.org.za/Docs/ICT4SDG1.pdf discusses this factor through a

brief historical review of South Africa's policy attempts to build pro-poor ICT networks and services since the dawn of the nation's democracy in 1994.

The dearth of political will, which should in theory favour human wellbeing over commercial interests, is stark. The national failure to enact pro-poor national socioeconomic growth agendas, as per the goals of SDG1 and SDG8, have to date proved far too onerous for South Africa, and for too many of its developing countries peers. In South Africa, good policies are frustrated by poor implementation, as indicated by the historical outline of ICT growth in South Africa before, during, and after apartheid. This actual or perceived national failure to build ICT4SDGs instead of the seemingly single-minded focus on the ICT needs of the rich, triggered the Data Services Market Inquiry[24], which was based on the assumption of market failure being the leading cause of this skewed ICT development focus. The final report of this market inquiry published by the Competition Commission South Africa in December 2019 is most informative.

In concluding this subsection, it is useful to rethink the underlying definitions and implications of the interrelationships and interdependencies of SDG1 and SDG8. An excellent entry to such reconsideration is captured by the opening statement of a very recent (released 2 July 2020) highly relevant and timely report to the United Nations Human Rights Council (UN-HRC)[25], the **Report of the Special Rapporteur on extreme poverty and human rights** (a.k.a. the Alston Poverty Report)**:**

The parlous state of poverty eradication UN-HCR July 2020

The world is at an existential crossroads involving a pandemic, a deep economic recession, devastating climate change, extreme inequality, and an uprising against racist policies. Running through all of these challenges is the longstanding neglect of extreme poverty by many governments, economists, and human rights advocates.

This discussion document shares the very strong opinions expressed in the "Alston Poverty Report", for example, that the traditional measure of international poverty offered by the World Bank is flawed:

"*…. the international community mistakenly gauges progress in eliminating poverty by reference to a standard of miserable subsistence rather than an even minimally adequate standard of living*".

This statement infers that the developmental strategies used to achieve all SDGs, especially SDG1 and its interdependencies with SDG8, may themselves be flawed: they may be based on inappropriate indicators, and they lack a human face. The seemingly single-minded economic focus of virtually all SDGs, especially SDG1 and SDG8, are captured fully by the nearly 30-year-old cliché, "It's the Economy, Stupid" – the economy has become the sole driver and measure of humanity's success, "trumping" the sentiments of e.g. the USA's 32nd President Franklin D. Roosevelt, who believed that the "*test of our progress is not whether we add more to the abundance of those who have much; it is whether we provide enough for those who have too little*."

South Africa's review of the intricate relationships between SDG1 and SDG8 should lead to a concerted national effort to "restore our humanity" by redefining the world of work, the role of technology, and refocussing the stated SDG1 objective to "End poverty in all its forms everywhere" on human wellbeing more than the economic models that favour economic growth over the wellbeing of people.

South Africa and its neighbours have the deep historical background to understand and deal with this still unfolding human tragedy of inequality and poverty. Some of the nation's finest academics[26] are busy trying to enlighten South Africans and the world in general. South Africans of all political and ideological persuasions should listen carefully and act - the most important tools for such listening, learning and action are the ICTs, hence this ICT4SDG8 discussion document.

[24] The Competition Commission South Africa: Data Market Inquiry: (a) All final submissions at http://www.compcom.co.za/submissions-to-the-data-inquiry-provisional-findings-and-recommendations/ | Final Report at http://www.compcom.co.za/wp-content/uploads/2019/12/DSMI-Non-Confidential-Report-002.pdf; (b) 160-year history of South African ICT on page 7 of http://www.compcom.co.za/wp-content/uploads/2019/08/Walter-Brown.pdf

[25] Countries 'off-track' to end rising global poverty, UN report warns: **The parlous state of poverty eradication:** https://chrgj.org/wp-content/uploads/2020/07/Alston-Poverty-Report-FINAL.pdf

[26] Example: Dr James Suzman, Anthropologist: Short read: "***How Hunter-Gatherers May Hold the Key to our Economic Future***" https://evonomics.com/hunter-gatherers-may-hold-key-economic-future/: Author of "Affluence Without Abundance"; and "Work - A History of How We Spend Our Time**"** (March 2020)

- "*The Sustainable Development Goals are failing in relation to key goals such as poverty eradication, economic equality, gender equality, and climate change. They need to be recalibrated in response to COVID-19, the ensuing recession, and accelerating global warming*".
- "*Poverty is a political choice and its elimination requires: (i) reconceiving the relationship between growth and poverty elimination; (ii) tackling inequality and embracing redistribution; (iii) promoting tax justice; (iv) implementing universal social protection; (v) centering the role of government; (vi) embracing participatory governance; and (vii) adapting international poverty measurement*" (Alston poverty report).

These, and all the insights gleaned from the extensive reference links provided in this discussion document, must form the basis of the proposed ICT4SDG8 interventions.

In conclusion of this short summary of the key linkages between SDG1 and SDG8, it is useful to note once more the depressing observation of the near-absolute entrenchment of the Homo economicus model in most human societies today. This seemingly unwavering focus on the economy and its "world of work" foundation is illustrated unintentionally by the popular Cambridge Dictionary, which provides just one example of the use of the term "raison d'être" – "*Her job is her raison d'être*" – her job is the reason for her existence! The medieval god Mammon demands absolute allegiance, commitment, and obedience from birth to death.

Until humanity takes action to "Restore our Humanity" through the redefinition of work and its linkages to all other SDGs, the mantra "It's the economy stupid" will continue to prevail at the expense of sustainable global peace and shared prosperity. ICT4SDG8 is just one of many tools that humanity has at its disposal to restore humanity as discussed by a growing number of competent thinkers. A useful conclusion of this section is the recollection of a conversation between the author of this document and an academic from the Netherlands whose name has sadly faded with the mist of time:

Anecdotal Case Study: The Netherlands' distaste for Inequality and Poverty

On 9th June 2009, the author of this document presented a paper at the European Conference on Information Systems (ECIS) 2009 held in Verona, Italy. The paper focussed on the triple threats of inequality, poverty and unemployment in South Africa[27], and proposed a research framework to counter these threats. During the discussions that followed, a delegate from the University of Amsterdam commented that the Netherlands did not have a poverty challenge – ***the country's leaders had "eliminated poverty by simply criminalizing it".*** When pressed for an explanation, the response was:

- The Netherlands economic-political-social system is a "Democratic Socialist Capitalist Monarchy" – a capitalist "free market" economy with a strong socialist flavour that rigorously combats extreme inequality and poverty, focussing instead on the wellbeing of all its citizens;
- Any resident of the Netherlands who lives in poverty must have broken relevant laws, by failure to access and use the poverty-defeating resources provided by the state;
- The distaste for inequality is said to stem from the nation's deep history of flooding – the massive natural disasters were "great levellers"[28] – royalty and peasants, Catholics and Protestants, rich and poor, were equally vulnerable to death by flooding – a major incentive for full cooperation via socialist-leaning policies within a capitalist economic framework.

A highly informative SDG progress report (https://sustainabledevelopment.un.org/content/documents/16109Netherlands.pdf), prepared by the Kingdom of the Netherlands in 2017, has numerous invaluable lessons that South Africa can draw from and use in the nation's ongoing SDG agenda.

2.3 SDG2+SDG8: Extreme Hunger, Decent Work and Economic Growth

The relationship between SDG2 and SDG8 (*End hunger, and provide decent work and economic growth)* is simple, well-known, and well-understood:

- Hunger threatens children's mental development, limiting or damaging their potential and subsequent educational achievement, and therefore their employment prospects from early childhood through youth and into adulthood;
- Poverty leads to hunger, which in turn leads to diminished job opportunities, and this leads to increased socioeconomic inequalities with their socially disruptive tendencies;

[27] ECIS 2009 Verona, Italy: (a) "Towards a Research Framework for a Human Development-based 'Bottom of the Pyramid' ICT Development Strategy in South Africa": *http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.632.2945&rep=rep1&type=pdf*: (b) The Presentation: *https://www.sakan.org.za/Docs/ECIS%202009%20ICT4HDev.pptx*.

[28] The Great Leveler | Walter Scheidel,| Princeton University Press 2018 | Excellent review at https://www.theguardian.com/books/2017/mar/29/the-great-leveller-walter-scheidel-review-paul-mason

- Job loss leads to poverty which leads to hunger.
- Hunger results from poverty, which gives rise to poor education, which in turn leads to indecent work, unemployment and 4IR-driven unemployability. This vicious circle can be devastating – the root cause of many state failures throughout the history of humankind since the emergence of statehood some 12,000 years ago.

How can the intricate linkages between employment and unemployment (SDG8), poverty (SDG1), and the consequential hunger (SDG2) stemming from both, be managed for balanced growth in human wellbeing? The challenge for South Africa and many similar developing nations, is the implementation of known, tried and tested solutions that can reduce hunger, inequality, and poverty, irrespective of the availability or absence of traditional wage labour, decent or otherwise. The advent of today's Coronavirus pandemic adds an immediate sense of urgency to applying these tried and tested solutions, as observed by Oxfam in a vital report for South Africa:

OXFAM BRIEFING: The Hunger Virus: How COVID-19 is fuelling hunger in a hungry world.
Even before the pandemic hit, 13.7 million people living in South Africa did not have access to enough food as a result of high levels of unemployment, lack of access to assets such as land or fishing permits, and the high and rising price of food and other essentials. Inequality and discrimination mean that some groups such as women – who earn 27% less, on average, than their male counterparts – are more likely to experience hunger: https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621023/mb-the-hunger-virus-090720-en.pdf

ICTs are potent tools for hunger alleviation, but their use for this SDG2 and SDG8 challenge, and all other SDGs, has been limited in most developing countries, including South Africa, by the following:

2.3.1 A top-down supply side economic model defines ICT4SDG in SDG2:

The primary focus of this sub-section as stated, is on the agriculture and food production sectors, and less on the wellbeing of especially children. This is illustrated well by the International Telecommunication Union's (ITU) coverage of the relationship between ICT and SDG2:

(i) "*To feed a growing population, agriculture is increasingly knowledge-intensive. ICTs help farmers improve crop yields and business productivity through better access to market information, weather forecasts, training programmes, and other online content tailored to their needs*"

(ii) Two case studies: (a) The Krishi Call Centre (Agriculture Call Centre), a public-private initiative in Bangladesh that enables access to real time agricultural information and extension services using mobile cellular telephone services; and (b) Innovating with Fatoumata: How m-farming can feed the next 2.4 billion people. Run by a graduate aerospace engineer, the project aims to build capacity for improved water management for rural farmers, using Wi-Fi connected IoT to monitor all ecological processes required for intensive agriculture in rural "smart farms", including automated water management systems.

(iii) Statements of support by (a) the U.N. Secretary-General: *"In a world of plenty, no one, not a single person, should go hungry"*: (b) UNDP Administrator & Former Prime Minister of New Zealand: *"There is a marked global trend towards sustainable agriculture, building on traditional methods which use fewer chemical inputs, carefully manage soil and water resources, and work hand-in-hand with nature.":* (c) the President of IFAD: "*The better ICTs respond to the demands of people, groups, and communities, and the better their design (according to local circumstances and conditions), the bigger the contribution of ICTs to the achievement of the SDGs"*; (d) the Director-General of FAO: "*The use of ICTs can support many activities of rural development, food security and climate change. FAO hopes to make terabytes of global data and information accessible, useful and understandable to farmers, fishers, collectors and pastoralists."*

These initiatives are clearly necessary, invaluable, and urgent, but they are difficult to scale up for impact on the poorest of the poor in both rural and urban centres. Unemployment, and therefore, hunger, poverty, and exclusion from nearly all developmental opportunities, are daily challenges for more than half of the population, whose life-experiences are captured in the following summaries:

2.3.2 How the very poor families relate to ICT4SDG2 and ICT4SDG8

South Africa's poverty levels in 2015 amounted to 55.5% of the population, the average household monthly expenditure was approximately R768[29] (≈US$44, 4% of national GNI/Capita PPP). Unemployment levels often exceed 70% in much of rural South Africa[30]. Most of the nation's poor are not farmers, they generally lack the knowledge, skillsets, and financial resources required even for subsistence farming. Their rural homelands are often arid with poor soils unsuitable for sustainable technology-driven agriculture, very poor access to communications, energy and other critical support services. Water shortages are such that many rural (and poor urban) children are unable to wash their hands even in this Covid-19 pandemic era. Most of the nation's fertile land has been allocated to large-scale commercial farmers with access to nearly all the sophisticated 4IR agricultural technologies available for modern food production. South Africa enjoys nearly 100% food security with enough for export, yet 13.4 million South Africans, 25.2% of the population in 2015, lived below the nation's food poverty line, barely able to feed themselves and their families. This alarming situation is highlighted by Statistics South Africa in:

Page 24 (33 of 36): 4.2 Conclusion:
"Whilst South Africa is food secure at national level, the country is still food insecure at household level. Food inadequacy and hunger are still a challenge. About 13,4 million households had inadequate or severe inadequate access to food and about 1,6 million households experienced hunger in 2017. Households headed by females and those headed by black Africans are more likely to experience hunger and inadequate or severe inadequate access to food. Households with a higher number of young children and those that are bigger in size are more likely to experience hunger and inadequate or severe inadequate access to food".
Source: STATS SA 2019: http://www.statssa.gov.za/publications/03-00-14/03-00-142017.pdf

The best utilization of ICTs within South Africa's poorest communities is to call for help and support from extended families with resource capacities to help. A few known references for such ICT utilization are presented below:

Many poor rural dwellers in South Africa are obliged to devote a significant proportion of their already meagre incomes from e.g., social grants and family support, to buy mobile phone airtime as they seek help from their extended families with salaried jobs in the cities. Examples include:

(a) Managing Distance: The Social Dynamics of Rural Telecommunications Access and Use in the Eastern Cape, South Africa: Skuse and Cousins 2005. Mobile telephony has become an essential survival tool for the poor, but it's cost of use drives already poor people deeper into chronic poverty.
https://assets.publishing.service.gov.uk/media/57a08c88ed915d622c0013eb/R8232-ISRGWP1.pdf

(b) The support document in this series, https://www.sakan.org.za/Docs/ICT4SDG2.pdf, provides a link to a video presentation by David Fincham, an aquaculture expert, who argues that poor people in rural South Africa depend on mobile telephones to "put food on the table". The example David provides describes a rural mother who is obliged to spend 20% of the food support funds provided by her city-based son, to purchase mobile telephone airtime, so that she can alert him again when the extended family needs more food. Video available at:
https://www.youtube.com/watch?v=sr3yhNXWPI0;

(c) A Kenya study conducted by the World Bank concluded that 20% of Kenya's poorest citizens were obliged to forego an expenditure (e.g., one meal per day) in order to pay for mobile phone service, which they consider vital for their survival:
https://www.infodev.org/sites/default/files/final_kenya_bop_study_web_jan_02_2013_0.pdf

(d) A study conducted by the International Development Research Centre (IDRC) in Mozambique, "*African Women and ICTS*" reports: "*Another Manhiça woman, who divides her time between the field and domestic work at home and has a family of ten, told us that when there is no food in the house, they use the mobile phone to contact relatives in South Africa to ask them to send food*" (page 37 of 233 in
https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/37700/IDL-37700.pdf?sequence=1&isAllowed=y)

[29] Average household expenditure level for South Africa's poor derived from poverty headcounts published by Statistics South Africa in https://www.statssa.gov.za/publications/Report-03-10-06/Report-03-10-062015.pdf

[30] Example of rural unemployment - See page 12 (17 of 60): The COFISA supported Ungana-Afrika reports 78% unemployment in the "Dwesa Village Connection Business Modelling Feasibility Analysis": http://www.sakan.org.za/Docs/Dwesa%20Village%20Connection.pdf.

The discussions above indicate a clear and direct link between SDG2 (Hunger), SDG8 (Jobs), and SDG9 (Technology innovation and infrastructure). They suggest much wider dependencies within and between all SDGs, especially SDG17 (Partnerships for the Goals) which must focus directly on national public and private sector policies and multistakeholder partnerships to ensure effective communication, coordination, collaboration and cooperation for an effective holistic response to all SDG challenges.

Clearly, there are no quick fixes for the mammoth SDG2 and SDG8 challenges faced by South Africa. The most practical approach must therefore be very long-term in nature; the strategy must equip the youngest South African children, especially those from the poorest communities, with the intellectual and mental capacities to craft future practical solutions based on acquired global and local knowledge. The scale and depth of the SDG challenges renders it nearly impossible to craft effective short-term interventions of scope and scale for immediate impact. Most short-term developmental energies may have to be devoted to maintaining peace and social stability in the face of rising levels of public anger and impatience.

ICTs are vital tools for the achievement of all development plans, including the SDGs. Today, wireless controlled drone aircraft and soil/water quality IoT sensors aid the growth of grains and trees. Lifelong learning is possible through the use of ICT access to high quality information and knowledge, in schools, at home, and anywhere, even during leisure time. Instant medical diagnosis and remote surgical procedures are possible with the help of advanced artificial intelligence (AI) ICT interconnected machines. ICTs help to ensure food abundance and security for most nations, and yet in South Africa today, more than half the population live below the nation's poverty lines. More than 25% of South Africa's population eke out a living below the food poverty line, unable to feed their families adequately for productive socioeconomic participation. And yet, nearly 100% of South Africa's population is covered by 3G and 4G/LTE mobile broadband services, with leading edge 5G services scheduled to expand rapidly with the imminent (as of October 2020) spectrum auction summarised in the text box below.

Given the spectrum price expectations detailed in the planned spectrum auction, it is most unlikely that any successful bidders will be willing to invest portions of this spectrum to meet the specific needs of South Africa's 30 million plus citizens who live in poverty. They will continue to use a significant proportion of their already meagre incomes, estimated at R 768 per month, on airtime to seek help in acquiring food for their families, instead of purchasing food with that outlay. And their wealthier compatriots, about 24% of the population, will continue to benefit directly from the 5G and beyond ICTs promised by the spectrum auction. The radiofrequency spectrum, a natural resource, is being "sold" to fuel Homo economicus alone.

SPECTRUM AUCTION: ITA OCTOBER 2020 FOR HIGH DEMAND SPECTRUM

In launching the spectrum auction, the Chairperson of ICASA stated: "The licensing of spectrum remains key on our regulatory agenda because we understand the benefits thereof. The spectrum auction proceeds will have broader economic benefits for the country as they will also incentivise broadband infrastructure investment and thus stimulate economic growth. More importantly, the release of spectrum is critical to ensure continued provision of good quality broadband services and the lowering of the cost to communicate (particularly data costs) in South Africa."

The Chairperson proceeded with the pronouncement which included the following application and reserve prices:

1. Non-refundable application fee: R1.5 million (USD91,000);
2. Lowest reserved price: 1X2 MHz in 3.5 GHz band: R527 million (USD595 thousand);
3. Middle reserved price: 2X5 MHz in 700 MHz band: R527 million (USD32 million);
4. Highest reserved price: 2X10 MHz in 800 MHz band: R1.16 billion (USD70 million).

NOTES: (1) The lowest reserved price, 3.5GHz band, is best used for 4G/LTE and 5G small cell services in dense urban environments, generally unsuitable for pro-poor applications: (2) The 700 MHz and 800 MHz spectrum bands are eminently suitable for low density rural areas and wide coverage in poor dense urban areas, but indicated price reservations unlikely to encourage such usage. The pro-poor price target of ≈ R38 per month for the full suite of pro-poor transformational ICT services (5% of average income/expenditure) cannot be met through this spectrum auction.

ITA Source: ICASA: https://www.icasa.org.za/uploads/files/ita-for-the-radio-frequency-spectrum-licences-for-imt-spectrum-bands.pdf

Cost to Communicate over the same period as the planned Spectrum Auction:

Pre-paid data bundle internet search on 13 October 2020 (US$ 1.00 = R 16.52)

1. Lowest: Cell C 500 MB Anytime, valid for 30 days: R 35.00
2. MTN Monthly 500 MB: R 75.00
3. Vodacom 500 MB per month recurring: R 79.00
4. Telkom 500 MB "Once Off" bundle valid for 2 months: R 69.00

These prices are clearly beyond the affordability of South Africa's poor (R 38 or 5% of average monthly expenditure). The question that must be asked is what level of socio-economic transformation and upliftment can be realized from the 500MB per month that they may afford? What is the minimum broadband speed and usage limit that will enable transformation and upliftment of the poor, including their user skills acquisition needs? Will 500 MB per month, which is just within their affordability limit, be enough?

South Africa needs to position ICTs so that all who reside in the country can do more with the services than to beg extended family members to assist in putting food on their tables. There are many possibilities to position ICTs to help the poor exit their poverty traps: all that is needed is national will – by politicians and the business sector alike.

2.4 SDG3 and SDG8: Health, Decent Work, and Economic Development

The United Nations defines SDG8 as: "*Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all*". The order in which the three sub-goals are stated in this SDG implies that the end objective of labour and work is economic progress – for those that own the means of production, with a hope and a prayer that some of this wealth will "*trickle down*" to those who's physical *labour* creates it. Work, decent or otherwise, is therefore a prerequisite for productive employment, which in turn is a prerequisite for perpetual economic growth.

Seven grim-faced African health workers dressed in identical uncomplimentary uniforms, "relaxing" in what appears to be a run-down unkempt segment of the health facility where they work, suggests a demeaning work environment far from the criteria of "Decent Work for All". The numerous photographs of health workers in Western countries, even under this Coronavirus pandemic, stand in stark contrasts with the implied work conditions and facial expressions (just two muted smiles) of these African health workers. Source: Health workers: just what the doctor ordered for economic growth and health security": Photo: WHO/S. Aranda

The World Health Organization (WHO), a specialized agency of the United Nations dealing with health issues, defines the relevant SDG as "*SDG 3: Ensure healthy lives and promote wellbeing for all at all ages*". WHO also

discusses the link between SDG 3 and SDG 8 in its March 2016 website "*Health workers: just what the doctor ordered for economic growth and health security*".

The choice of words in this WHO article, which includes "*just what the doctor ordered for economic growth*" in the heading, reasserted in the sub-heading of the second paragraph "*Health workers improve productivity*", and the general tone of the WHO article as a whole, leads to the logical interpretation that the primary purpose of the health sector and its workforce is to ensure an adequate supply of "*Human Resources*" (a.k.a. Human Capital – "capital" derived from its Latin origins, meaning "cattle") which remain healthy enough to drive continuous economic growth, continuously expanding the wealth of e.g. South Africa's richest 1% population who's wealth equates to the total cumulative wealth of the remaining 32.4 million people of the nation's adult population (see BUSINESSTECH article here).

The World Health Organization, like all its sister agencies in the United Nations family, and most of humanity that believes the economy is the *raison d'être* of human existence, favours the concept of humans as economic resources, as expressed in its October 2016 publication "*Global Strategy on Human Resources for Health: Workforce 2030*" (Note: original document was removed from the WHO website). A closely related paper published in February 2017 at https://www.healthaffairs.org/, introduces the subject as:

The Work/Health Relationship

"Work affects health, and health affects work. Efforts to improve the health of the population must take into account the myriad ways employment and work conditions can improve or harm physical and mental health. Efforts to improve worker productivity must consider the growing burden of chronic diseases, the prevalence of unmet mental health needs, and the caregiving demands many workers face when they return home from their jobs. A collection of papers in this month's Health Affairs expands our understanding of the complex work/health relationship"

This view of workers, in the health or any other sector, differs from the views of a growing number of "people-oriented" thinkers, or perhaps re-thinkers, who pose the question: "*Do we work to live so that we can live to work?*" Even after transposing the words "work" and "live", the meaning remains unchanged, modern humans seem to have no choice but to work so that they can live, and must therefore live so that they can work. Depriving the folks who live and work at the base of the human development pyramid from work, i.e., rendering them unemployed, is akin to a death sentence for many. The article "Work/Health Relationships", and the related opinions of WHO and its sister UN agencies, favours the notion that "Human Resources for Health" are needed to keep workers healthy so that their commercial productivity can be secured and expanded, all in the interests of economic growth.

The WHO document Global Strategy on Human Resources for Health: Workforce 2030 focusses, as per the title, on "Human Resources for Health (HRH)", defined by WHO as "*all people engaged in actions whose primary intent is to enhance health*", qualified further on page 35, perhaps as an extension of ICT4SDG3, as a "policy option" to "*Strengthen HRH information systems and build the human capital required to operate them*". Yes, Human Resources are needed deliver health services, and these "resources" must be strengthened by the "human capital" who operate the information systems that control the HRH.

Was the genus Homo always regarded as a Capital Asset? Was there a commercial value assigned to the HRH that delivered health services over the last 400,000 years of our existence, and the 2 million years or so before it? The unfolding scientific discoveries suggest that there was not. The evidence is that they cared for their sick and infirm of all ages, with no expectation of returns on the labour invested in such caring. The evidence includes: (a) September 2001: France, about 200,000 years ago, a very old, toothless pre-Neanderthal was fed and cared for until his death many years later; (b) October 2010: About 500,000 years ago, a member of *Homo heidelbergensis*, badly crippled through injuries in his youth, was "nursed" to his death aged 45 years; (c) Dec. 17, 2012, Vietnam, 4,000 years ago: a young man crippled by disease, paralyzed from the waist down, was nursed for more than ten years after the onset of his ailment; (d) More evidence here.

Is "*decent work for all*" workers who deliver health services, and all workers who receive these health services, possible if such workers have negotiable price tags on them? Are changing economic values of these "human capital" and "human resources" which obey supply and demand economics, worthy of the term "*decent*"?

2.4.1 Impact of Covid-19 on Health; Labour; Work:

This discussion document is about the nexus between SDG3 (Health) and SDG8 (Jobs). The extremely disturbing levels of deaths, ailments, job losses, medium/small business failures, and global economic depressions and recessions resulting from the Coronavirus pandemic provide ample justification for inclusion of the pandemic in this discussion. Clearly, a detailed analysis of the Coronavirus pandemic is beyond the scope of this document, but the following very brief extracts from current reports[31] suggest that this and future pandemics must be key components of all SDG programmes yet to be designed and implemented, especially this SDG3/SDG8 nexus:

(a) **A lost generation?** While millions of people worldwide continue to lose their lives, their jobs and wages, their homes, their ability to afford food and health services for themselves and their families, Swiss bank UBS estimates that the 2,825 billionaires in the world in 2019 increased their cumulative wealth to US$10.2 trillion, an increase of 27.5% on their already immense wealth, as a direct result of the Coronavirus (Reuters Oct. 2020: Billionaire wealth reaches new high during COVID-19 pandemic – UBS);

(b) **Inequality Escalates:** Oxfam, drawing on analyses and data from numerous credible sources, reports that:

- The wealth of the world's richest 1% is more than double the cumulative wealth of 6.9 billion people;
- "*Almost half of humanity is living on less than $5.50 a day*": More than 30 million (>50%) South Africans live below this international poverty line for upper middle-income economies like South Africa;

(c) **Deaths due to unaffordable health services** amounted to more than 10,000 per day globally, from all ailments before the Coronavirus pandemic. In early October 2020, the Coronavirus alone accounted for 370,596 new infections and up to 9,000 deaths per day worldwide, most of them working age adults.

Covid-19 is strictly an SDG3 health sector challenge, but its impact on labour and the world of work in SDG8 changes the discourse – it is a pandemic of jobs and economic devastation for most, the health pandemic is both cause and effect of these related pandemics.

Any attempt to separate the health and social "pandemics" will exacerbate each challenge. The Siloitis and Pilotitis effects discussed in section 1.1.1. sub-paragraph d) will diminish the effectiveness of any corrective action. Additional but limited official and media coverage of the impact of Covid-19 on SDG8 are:

- ILO estimates job losses due to Covid-19 reached 400 million in Q2/2020; As jobs crisis deepens, ILO warns of uncertain and incomplete labour market recovery. If only the ILO could work closely with the WHO "people recovery" in this Covid-19 crisis period, perhaps the desired "labour market recovery" would follow.
- **OECD** 27 July 2020: COVID-19 is causing activity to collapse and unemployment to soar
- **Christian Science Monitor**, May 2020: No jobs, so what future? Half the world's workforce on the edge.
- **South Africa**, July 2020: EWN: 3 mn jobs lost in SA since lockdown, black women hit hardest – survey:
  - "In February, women accounted for just under half of all employment or 47%, but they accounted for a staggering two thirds of the net job loss that occurred between February and April."
  - At least 1.5 million people managed to hang onto their jobs, but received no pay.
  - Many of those who lost employment are in grant recipient households, but almost 30% of those retrenched between February and April live in households with no access to social grants.
  - Around 47% of households ran out of money to buy food in April.

(d) **Impact of Covid-19 on learning, and therefore the future of work.** What is online learning for South African children from poor backgrounds, if they don't have access to computers and adequate affordable internet connections at home (and in many rural or poor urban schools)? The paucity of research data in South Africa for this specific concern leads us to seek understanding and lessons that could be turned into

[31] (a) Read short review of the UBS report at https://www.theguardian.com/business/2020/oct/07/covid-19-crisis-boosts-the-fortunes-of-worlds-billionaires | (b) Oxfam "5 Shocking Facts" report of January 2020, prior to Coronavirus data availability: https://www.oxfam.org/en/5-shocking-facts-about-extreme-global-inequality-and-how-even-it | (c) Worldometer Coronavirus Worldwide Graphs for October 14 2020: https://www.worldometers.info/coronavirus/worldwide-graphs/

action programmes from other jurisdictions. A few highly informative analyses produced in the short time span of the Coronavirus are listed with minimum comment in the footnote below[32].

What we do know is that the so-called "Digital Divide" discussed in section 1.1.1 a), which continues to devastate most South African children's learning potential as a direct result of Covid-19, reminds us of the biblical roots of the term – the divide between those who have much and those who have too little: "*Matthew 13:12 NIV: 'Whoever has will be given more, and they will have an abundance. Whoever does not have, even what they have will be taken from them.*" The children of wealthy parents in South Africa and the world over "have much" – fast broadband connected desktops (wide screens are best for learning), laptops, smartphones and tablets, and the ability to use them all at will: "*they will be given more*" knowledge by highly competent South African and foreign educators at will. The >65% of the nation's children from poor backgrounds who "do not have", will have what little learning opportunities they have at already poor schools taken away from them – they cannot connect to online learning through connected terminal equipment they don't have, nor can they receive guidance from their similarly technologically illiterate parents and/or guardians, and even the many educators who lack full techno-literacy. The Coronavirus has pushed the already precarious future of this cohort of South Africa's children deeper into the quagmire of ignorance in this world of exponentially increasing technologically-driven knowledge.

The virus itself does not discriminate in any way, but our societies do; they reward the very wealthy most generously even during the pandemic, while the poor get poorer, desperately seeking the most basic means of survival for themselves and their families. No nation, irrespective of its wealth, economic prowess, or military might, is immune. This stark reality is documented by the disturbing research evidence produced by the likes of Professor Walter Scheidel of Stanford University:

Walter Scheidel: The Great Leveler[33]:

1. Since the stone age era, extreme inequality has been reduced by (a) Global Pandemics, e.g. the 1300s Black Death - 75 to 200 million casualties; the Coronavirus is expected to kill 4 million people; (b) War: WW1 and WW2 - up to 200 million casualties; (c) Social upheaval and mass mobilization (Slave trade - up to 150 million deaths; Communist Revolutions – up to 100 million) (d) State and Societal Collapse – DRC conflict >5 million, no end in sight yet; Syria? South Sudan?
2. 30 April 2020: Guardian Interview with Walter Scheidel: "*If the affliction of coronavirus has shamed us into anything, it is a vivid appreciation of just how cruelly topsy-turvy our world is. Low-paid healthcare workers, bin collectors, bus drivers and supermarket shelf stackers, not hedge fund managers or venture capitalists, have kept us from falling apart*".
3. Will the Covid-19 pandemic turn out to be a "great leveller"? Walter Scheidel responds that it depends on the severity and longevity of the pandemic, and how compelling the socioeconomic disasters will be to encourage governments and societies to take action: "*Governments have had to intervene to prop up businesses and jobs in ways that only months ago would have seemed unimaginable.* ***The viability of a universal basic income — a dream for egalitarians worldwide — is once again part of the mainstream debate in many countries***" (author's emphasis).

2.4.2 Selected Summaries of Scientific Linkages between Health; Labour; Work:

All branches of science are integral to the health and wellbeing sector, and have been throughout the four-million-year evolutionary history of the genus Homo. We may not know the specific details of the scientific and medical knowledge that early hominins acquired, however, their survival to become the dominant life form today suggests that they did indeed acquire significant scientific knowledge for a successful evolution to

[32] Media coverage of Covid-19, Educational Challenges, and impact on the world of work: (a) Los Angeles Times Aug. 13, 2020: "*A generation left behind? Online learning cheats poor students*", Times survey finds: (b) Brookings Institution June 22, 2020: "*Unequally disconnected: Access to online learning in the US*": (c) The Guardian, October 2020: "*People, not carbon emissions, should be at the heart of the west's climate action*" (d) UNESCO derived, April 2020: At least 1.5 billion students and 63 million primary and secondary teachers are affected by Covid-19 are not learning or teaching – more than half do not have access to connected learning tools at home.

[33] Walter Scheidel: The Great Leveler: Princeton Press: https://press.princeton.edu/books/paperback/9780691183251/the-great-leveler: Review by Cato Journal at https://www.cato.org/sites/cato.org/files/serials/files/cato-journal/2017/9/cato-journal-v37n3-15-updated.pdf (a) AND an excellent interview with Professor Scheidel by the Guardian at https://www.theguardian.com/world/commentisfree/2020/apr/30/walter-scheidel-a-shock-to-the-established-order-can-deliver-change .

today's modern humans. What we do know is that our evolutionary ancestors shared the knowledge they had acquired widely throughout the species, and much of this scientific evidence originates in South Africa itself: "*Humans evolved by sharing technology and culture*"[34] – evidence unearthed at the Blombos Caves, South Africa, dated circa 100,000 years ago. The culture of sharing knowledge freely amongst all humans changed dramatically with the dawn of the "*Neolithic Revolution*[35]" about 12,000 years ago. Knowledge became a commodity, owned, sold and traded by its creators, withheld from many identified as "the other" – those outside groups based on superficial differences such as nationality, race, religion, culture. Human "ownership" followed soon after, humans were "commoditized" as "Human Capital" and "Human Resources", they were bought and sold as slaves, slavery was integrated into all the religions that humans followed. The age of egalitarianism and free knowledge sharing diminished as the Neolithic Revolution became the norm in virtually all the world's countries and nations.

The health services industry (SDG3) and the labour/work industry (SDG8) both required increasing scientific, technological, engineering, and the underlying mathematical knowledge and skills (STEM subjects) very early in their evolutionary history in order to create the knowledge that drives today's global societies. The evidence unearthed in South Africa's Blombos Caves, and other abundant palaeoarchaeology national heritage sites indicate that this knowledge may have begun in South Africa, but history has been unkind to the country in terms of contemporary educational progress in these vital subjects. The extreme socioeconomic inequalities in the country ensure that a few economically advantaged children excel in these subjects, but the majority of the nation's children struggle to keep up with any of their wealthier local and international peers. Further analyses and discussions are provided in https://www.sakan.org.za/Docs/ICT4SDG4.pdf, and will be discussed further in the section pertaining to SDG4 and SDG8, but for the purpose of this section, it is necessary to emphasise that SDG3 and SDG8 depend entirely on each other, and on SDG4, which lays the foundation for them both.

2.5 SDG4 and SDG8: The Nexus of Education, Decent Work and Economic Growth

The link between education, labour and the world of work is well-known and understood by many – academics, presidents, political leaders and their supporting bureaucrats, educators, business and commercial leaders, civil society, most parents rich and poor, and children. And yet, South Africa's education system is unable to close the gap between modern society's knowledge and skills needs and the skills available in the country as a whole. The inequality gap in the country extends well into the educational arena, – a few excellent schools and institutions of higher learning providing world class graduates in an environment of massive national educational shortcomings. Educational inequalities are the root cause of the nation's deep multidimensional inequalities and consequential poverty levels illustrated by all the charts of Section 1.0.

South Africa ranks amongst the world's leading countries in terms of the share of GDP spent on education, but the average national educational outcomes rank amongst the lowest in the world. As a result, the home of the "cradle of humankind" faces severe existentialist challenges in this global knowledge-driven age of plenty. The limited statistical charts presented in Section 1.0 of this document are merely a hint of the depths of this challenge. The current Coronavirus pandemic is providing a stark reminder of the consequences of inaction.

How can South Africa begin to bridge the glaring gaps between its educational outcomes and the rapidly evolving 4IR skills needs? The discussions that follow, and those that precede this section, are just a very small sample of the ongoing local and global search for solutions for the numerous stated and unstated dilemmas. One area of search preferred by the author of this document is to seek lessons from South Africa's rich ancient history in order to understand the changes that led to the current challenges, and from such understanding, develop a series of interventions that will alleviate short-term societal disruptions and steer the nation

[34] (a) "*Humans evolved by sharing technology and culture*": Professor Christopher Henshilwood and Doctor Karen van Niekerk; February 2016: https://www.uib.no/en/news/95420/humans-evolved-sharing-technology-and-culture; (b) Smithsonian 2008: "*The Great Human Migration: Why humans left their African homeland 80,000 years ago to colonize the world*": https://www.smithsonianmag.com/history/the-great-human-migration-13561/; (c) Smithsonian 2020: "200,000-Year-Old Bedding Found in South Africa": https://www.smithsonianmag.com/smart-news/archaeologists-find-200,000-year-old-bedding-south-african-cave-180975592/; (d) NCBI 2009: "Catalysts for Stone Age innovations": https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2686379/

[35] Opinion by a South African academic and researcher, Dr. James Suzman: "How Neolithic farming sowed the seeds of modern inequality 10,000 years ago": https://www.theguardian.com/inequality/2017/dec/05/how-neolithic-farming-sowed-the-seeds-of-modern-inequality-10,000-years-ago

towards a more stable productive distant future. South Africa, alongside its African neighbours, especially those situated in the East African Rift Valley region, and the more recent identification of the more than 300,000-year-old Jebel Irhoud fossil from Morocco[36], suggest that modern humans still have much to learn from their ancient ancestors. The 8 to 9 million-year evolutionary journeys of our ancient ancestors still hold numerous mysteries that can inform our journey into the future, especially with the wise application of our current technological prowess. If we abuse our technological capability, we will destroy or render the future unliveable for many. For those members of our species lucky enough to have access to, understand, and benefit from the immense information and knowledge of ourselves and our environment, they will understand the clear risks of the impending sixth mass extinction, our role in the process, and how best to protect our species from the expected extinction to which humankind may have contributed.

And yet, there are many more immediate threats to decent sustainable human existence than the distant threat of the sixth mass extinction – the fully integrated threats expressed by all seventeen SDGs present immediate challenges which have, could and will continue to drive whole nations and regions into chaos and disarray – failed statehood is a preferred description of this condition. Education – the acquisition of the knowledge about these threats, and how to respond to them, is virtually the only tool available to the species to address the immediate and medium-term challenges, and in time, minimize the challenges to be faced in the very distant future. Even the advanced technologies available to the species today are wholly dependent on education for their construction and use. This very simple statement raises the age-old question about the purpose and target of education: "Education for whom and for what?"

The above question lies at the very core of humanity, and therefore given the destructive nature of Homo economicus, the survival of all other lifeforms. The ability to survive and reproduce itself is vital for all species or lifeforms, and this ability demands all forms of innate, explicit and implicit knowledge, and its wise application. The question is therefore directly relevant, and can be extended to "when did education actually begin within the human species, and why?"

The still expanding evidence from virtually all scientific disciplines: archaeology and palaeoarchaeology, anthropology and palaeoanthropology, biology and its genetics specialisations, palaeopsychology and related behavioural and social sciences, all agree from the evidence "unearthed" by recent research that our species, Homo sapiens, began life between 50 and 60 million years ago alongside our ape-like hominin ancestral relatives. Did all these ancestral relatives "teach" their offspring over some 60 million years for the successful application of knowledge to become us – Homo sapiens? The clear answer is that they did not "teach" as we now understand the term in our schools and most of our institutions of learning. They enabled learning, fostering and nurturing the learning of future generations to survive and continue the successful journey to today. New knowledge was acquired and passed from one generation of the same species to its immediate future generations – the children and youth. Learning happened, and continues to happen, with and/or without teaching and education, in isolated remnant human hunter-gatherer societies. The logical trigger that led to the schools, colleges and universities that we now take for granted, must have been the Neolithic Revolution of 12,000 years ago. The 60-million or so hominid evolutionary journey to today seemed to have progressed quite well through learning by observation, emulation and experimentation, and massive free sharing of newly acquired knowledge and skill sets.

It would be absolutely wrong and misleading to suggest that schools, colleges and universities are unnecessary in this knowledge-driven age with its near-total dependence on STEM subject knowledge, but it is absolutely correct and timely to question how to transform these facilities into institutions of high-quality learning that are more responsive to today's growing existential threats. The question "Education for whom and for what" is central to that quest for educational transformation – a very slow very lengthy process that can only be

[36] The Jebel Irhood fossil, excavated in 1991 in Morocco, has been identified as an early member of our species, living about 300,000 years ago. The fossil is described fully by one of the world's leading institutions on genetics, the Max Planck Institute at https://www.mpg.de/11322481/oldest-homo-sapiens-fossils-at-jebel-irhoud-morocco. An extensive discussion of how this elder member of our species survived, and how his generation probably interbred with many other related but now extinct ancestors of modern humans, is presented in a detailed lecture by the highly respected anthropologist Professor Christopher Stringer of the Natural History Museum London, available in a 50-minue video at available https://www.youtube.com/watch?v=9NydQFhPVDc . The formal descriptive document by Chris Stringer and colleagues is available online at https://onlinelibrary.wiley.com/doi/epdf/10.1002/jqs.3137

successful if we begin with the very young from all social hierarchies, especially those that are disproportionately disempowered from the base of today's human development pyramid.

2.5.1 "Education for whom and for what?"

The above question has far-reaching implications and potential impacts on the future of learning, and therefore of work, in this 4IR age. It is therefore useful to examine the question closer, beginning with its origins. The best information on its origins we have found so far is a reference to the question exactly as stated nearly 80 years ago in the United Kingdom, published on JULY 3, 1943, in Vol. 152 of Nature, available from https://www.nature.com/articles/152004a0. Key points raised in this 1943 document are:

EDUCATION: FOR WHOM AND FOR WHAT?

- In 1943, a document which became known as the Board of Education's "Green Book", was issued "*in order that ideas on the future shape of Great Britain's educational system might be discussed and clarified*"
- Attempts were made to restrict access to the document, but inevitably, it was leaked and widely circulated.
- The first complaint was about the pompous, pretentious and jargon-rich language that ordinary working parents could not understand. This failure was rectified by the National Union of Teachers which published a pamphlet in plain understandable English. The core message of the pamphlet was that in the parent's strive for a democratic way of life, one of the major victories of the war must be a good education for their children (author's emphasis).
- The question of what a "good education" was, loomed large: too many parents felt a strong sense of their own limitations, were frustrated by missed opportunities, and felt only half educated. They wanted much more for their children but were frustrated by their inability to articulate this need.
- The National Union of Teachers assisted, pointing out that a "good education" must be a balance between physical and mental growth, however, mental growth was extremely difficult to define and quantify – numerous failures by children who should never have failed we too often recorded and socially visible.
- The inequality of opportunity was recognised by all and vigorously discussed - "*Some children are taught in splendid buildings, others in disgraceful buildings; some in large classes, others in small; some stay at school until 18, others must leave at 14; some have the chance of going to the university or technical college, others must work at uninteresting jobs and feel defrauded all the rest of their lives*" (author's emphasis).
- The conclusion of the process was that it was no use for parents blaming others for the deficiencies of their children's education – the parents themselves must take ownership of the struggle, it was the parent's responsibility to ensure that their children of both genders get education to support their parents' struggle for their democratic ideals.

Seventy-seven years after the Board of Education's Green Book, the conversation of equality of educational opportunity in the United Kingdom continues. The question "Education for whom and for what?" has yet to be answered.

In a Google search for the origins of the phrase "Education for whom and for what?", dozens of articles were listed, very few of which related directly to the question, with the exception of Noam Chomsky's 2012 lecture at Arizona University. The following brief extracts from a few relevant publications provide an impression of the focus and thinking of the majority of authors on the subject:

a) **"From 'Humanist' to 'Godly'?'**: The Changing Social Function of Education in Early Modern English Grammar Schools": Emily Lynn Hansen, PhD, University of York, History Faculty: April 2015: https://etheses.whiterose.ac.uk/10120/1/emily%20hansen%20thesis%20106032672.pdf

   Dr Hansen's 352-word thesis explores the "*social function of England's grammar schools between approximately 1480 and 1640, and how this changed due to the influences of both humanism and religious reform.*"

"*Grammar schools were put to use, officially, in upholding loyalty to the established church, and encouraging the spread of religious knowledge, yet the means to this end was primarily via the teaching of classical, secular, material*". The closest definition of "humanism", a central theme of the thesis, appears on page 12 as "*the approach to learning based around the study of classical Greco-Roman texts and languages, which developed in Italy and spread north across Europe*".

Historically interesting as this may be, Dr Hansen's thesis does not help us answer the provocative question of "Education for whom and for what?", but she does include a chapter on the subject, with no reference to Noam Chomsky who is credited with promoting the question in modern times. The role of grammar schools in the United Kingdom is still under debate and scrutiny, still searching for an answer to the above provocative question.

b) "*What's Christianity Ever Done for EDUCATION?*". The still strong influence of religion in nearly all nations, and even in secular education systems like South Africa's, is discussed at length by Reverend Doctor Ian Robinson, a lead lecturer at Australia's Charles Sturt University's School of Theology. Dr Robinson's book "*What's Christianity Ever Done for EDUCATION?*" is important – the role of religion in education remains very strong especially in developing countries, in schools and in homes, and must therefore be accommodated and adjusted if a practical, implementable answer to the critical question is to be found.

The stated goal of Dr Robinson's study booklet is most appropriate: "*To spark a change in the quality of discourse about the changes in institutions and society that we are undergoing, under the crushing weight of the business paradigm*". Dr Robinson supports very strongly the role of specifically Christianity in education, and provides a useful historical reference for this role. His promotion of theology in education is demonstrated by statements such as:

- "*This study shows why you can thank Jesus who inspired millions of followers to support widespread universities, literacy, libraries, the importance of the child and universal education*." (Page 3).
- (a) "*Christians have a track record of strong contributions in practise, in person and in principle*"; (b) "*Christians 'tend to' have strong positive influence when Jesus is role-model"; (c) "Christians have done some terrible things within their powerful place in education for which an apology or two is required"; (d) Christians may still be good for education today"* (Page 4); (e) Dr Robinson makes reference to Noam Chomsky's Arizona lecture "*Education for whom and for what?"* on page 27 of his 35-page booklet with no specific comment or relationship with his religious perspective.

While Dr Robinson promotes Christianity as a pathway to education in the future, the historical references and opinions provided are critical in understanding some of the complexities that stand in the way of fundamental transformation of the global education system, as suggested by the question "*Education for whom and for what?*". While South Africa is officially a secular state, religious beliefs and influences are deeply entrenched, and some of the leading schools in terms of educational outcomes are religious owned and operated.

It is critical therefore to understand fully the role of religions in the search for the nexus of SDG4 and SDG8, and to develop the required responses.

c) **Education today for the world of tomorrow**, by Charles Hummel, published by UNESCO in 1977.
This 210-page document provides excellent historical data and discussions published in 1977. Chapter 3, "The Democratization of education" covers the sensitive challenge of inequality in education, and the resulting inequality in the opportunities for, and the dignity of, paid employment. These topics are as relevant today as they were 23 years ago when the document was written. The enrolment charts for each level of education on page 95, covering Africa, North America, and Latin America, raise the question of the magnitude and impact of the statistical changes between 1960, the start of the data presentations, to today's 2020 performance in South Africa at the upper level of education. The document is well worth reviewing as part of the SDG4/SDG8 programme that will be recommended. The document is available at: https://unesdoc.unesco.org/ark:/48223/pf0000023705.

d) **"Education for Whom and for What?"**: the Noam Chomsky lecture: University of Arizona on 8 Feb 2012[37]. Noam Chomsky, born 7 December 1928, emeritus professor of linguistics at MIT, currently Laureate Professor of Linguistics at Arizona University, recognised global authority in anthropology, philosophy and cognitive psychology, and controversial political dissident, has been included in the top ten most cited sources alongside Marx, Lenin, Shakespeare, Aristotle, the Bible, Plato, Freud, Hegel and Cicero, by various authorities including MIT, (1992).

Noam Chomsky's views on "*Education for whom and for what?*" add valuable context to this discussion on the nexus between SDG4 and SDG8. However, in the interest of brevity of this discussion document, full justice cannot be given to the immense quantity of historical and current insights covered in the two-hour long 18,000-word transcript of his lecture. This discussion document assumes that the ideas raised by Professor Chomsky have been, and will continue to be, studied and considered seriously by South Africans active in finding sustainable solutions for the national challenges enshrined in SDG4 and SDG8, and all other SDGs through the strong interdependencies of one SDG on all others.

The key points of Chomsky's 2-hour long lecture are:

d1. Going back in history to some of the earliest credible sources of the role of education in society, e.g., the writings of ancient Greek philosophers like Aristotle (368 BPE–348 BPE), all philosophies were based on the assumption that "*higher education is basically for the elites, for the privileged. The rest of the population should be dumbed down, maybe allowed entry into vocational schools, to learn trades*": Opening remarks by Noam Chomsky starting at **09.43** minutes into the video of the lecture.

d2. To support his historical summary, Chomsky quotes, amongst others: (i) James Madison, 4th US President: (1751 to 1836): "*we have to make sure that the public is marginalized, because otherwise there'll be trouble*"; and: "*If there was true democracy, the majority of the population would use their voting rights to take away the property of the rich – to carry out land reform – obviously, that would be unjust*…." (author's summary and emphasis); (ii) Ralph Waldo Emerson 1805 to 1882, questioned the motivation of political interest in public education, quoting USA public servants: "*this country is filling up with thousands and millions of voters, and you must educate them to keep them from our throats, by "frightening them into obedience through indoctrination via mass education targeting the labour and skills needs of the elites";* (iii) Chomsky compares the conclusions and views of James Madison et al with those of Greece's Aristotle about 2,000 years earlier: "*Madison and Aristotle faced the same problem, - education with true democracy would lead to civil strife for equal share of resources and opportunities - but they drew opposite conclusions. Aristotle's conclusion was we should eliminate inequality-- make everyone middle class, more or less* (author's emphasis). *And he proposed actual measures for this--what we would call today welfare state measures--and that would overcome the problem*."

d3. Professor Noam Chomsky concludes the session on "education for whom?" by reviewing his own background and education. A member of a working class mainly unemployed immigrant family, Chomsky's immediate relatives who were unable to complete even basic education, attended workers' education courses, and acquired "high culture" appreciation through public free-of-charge Shakespearean and similar performances in public parks, etc.

At approximately 23.5 minutes into the video, Chomsky steers the lecture towards "education for what?" by reviewing two contrasting images of the purpose of education:

- "*Education is like pouring water into an empty vessel and, in fact, it's a pretty leaky vessel as you all know from your experience. So, you pour water into a vessel, and, of course, all of us have been through this, and you remember nothing*";
- "*The other alternative is that teaching should be like laying out a string along which the student can explore and progress in his own way. That image comes from Wilhelm von Humboldt (*paragraph 1.5: Public Education and Politics*), who was the founder of the modern university system, also one of the founders of classical liberalism*";
- Chomsky then proceeds to discuss the educational theories of John Dewey (chapter 5: Philosophy of Education), who wrote that it is "*illiberal and immoral - to train children to work - not freely and intelligently, but for the sake*

[37] "*Education for Whom and for What?":* Noam Chomsky video lecture at the University of Arizona on Feb. 8, 2012, available to view or download at https://www.youtube.com/watch?v=e_EgdShO1K8&feature=emb_logo .

of the work earned, in which case their activity 'is not free because not freely participated in'". John Dewey also pointed out that it will be like a leaky vessel – inappropriately timed and uninteresting facts in – misunderstood or rota-learned facts out - very little actual knowledge learned.

d4. At 26:13 minutes into the video, Chomsky summarises the two concepts of education and learning as they relate to science education, quoting the guidance of American biochemist Bruce Alberts: "*So one approach he discusses is, in fact, the Enlightenment view-- that teaching is laying out a string along which the student progresses in their own way through discovery and exploration. And his version of it is that "our goal is to make it much easier for teachers everywhere to provide their students with laboratory experiences that mirror the open-ended explorations of scientists, instead of the traditional 'cookbook' labs where students follow instructions to a predetermined result.*" Chomsky concludes: "***Tragically, we have managed to simultaneously trivialize and complicate science education. As a result, for far too many, science seems a game of the recalling of boring, incomprehensible facts-- so much so that it may make little difference whether the factoids about science come from the periodic table or-- a movie script***" (author's emphasis).

d5. At this point in the analyses of Chomsky's views on education, it is useful to note that the concept of "laying out a string along which the student progresses" is not new – it has served modern humans throughout its evolutionary history – some pockets remain today amongst the last surviving hunter-gatherer societies in Africa. This ancient "African way" of learning has been summarised by two leading South African researchers on the subject:

- **Professor Christopher Henshilwood** discusses the origins of scientific knowledge from his Centre for Early Sapiens Behaviour researches located at Blombos Caves, South Africa. He summarises his findings in an easily understood video - "Time Machine – the Origins of Innovation". Can the "time machine" be equated to the "string of learning" introduced by Professor Chomsky? The video is available to view and download at: *https://www.youtube.com/watch?v=G5_JctzoxXA&feature=emb_logo*. In painting the "string of knowledge", Professor Henshilwood is supported by the world-renowned Astrophysicist Neil deGrasse Tyson, the current Director of the Hayden Planetarium and the Department of Astrophysics at the American Museum of Natural History. Neil introduces Professor Henshilwood's research through his own video aptly sub-titled "*Ladder to the Stars | Cosmos: Possible Worlds*"
- Dr James Suzman, South African anthropologist and author of "Affluence Without Abundance" asks: "Did our Stone Age ancestors also live to work and work to live? How did we learn to survive the 9-million years of successful evolution before we went to school in preparation for a 'decent job'? Will the 'ROBOTS' we are now inventing free us again from this life of servitude? https://www.penguinrandomhouse.com/books/599857/work-by-james-suzman/

d6. At 31.03 minutes into the lecture, Professor Chomsky mockingly raises the popular cliché "*No Child Left Behind*" – no child must be left behind in the cycle of deficient "education", in which "empty leaky vessels" are filled with "knowledge" deemed necessary by others with near-zero participation or understanding by the child, the child's parents or guardians, and even the community who were most likely subjected to the same poor quality of learning, unable to articulate their concerns and needs as suggested in the 1943 English discussion of "Education for Whom and for What?" (Section 2.4.1 above):

> *"The 'Factory Girls' (*as they were called then*), and the 'Town Artisans', resented the transition from 'an agricultural society of free, independent people to an industrial society, in which it was necessary to turn free farmers into disciplined factory workers.' The industrial system, they said, was 'crushing their culture, their dignity, their freedom.' It was turning them into something like slaves. In fact, a century and a half ago, a very common belief-- so common that it was a slogan of the Republican Party supported by Abraham Lincoln-- was that wage slavery is different from chattel slavery only in that it's temporary, but other than that it's the same*. (author's emphasis). *You're being forced-- you're working on command, not under your own initiative."*

d7. For much of the next 20 minutes or so, Chomsky discusses the frustration of "the workers" during the early stages of the "First Industrial Revolution":

Chomsky infers that the new "factory workers" referred to this transformation as "the new spirit of the age to gain wealth, forgetting all but self". He equates this to the views of Adam Smith, the so-called "father" of capitalism, who called it "the vile maxim of the masters of mankind". The picture that emerges is a form of capitalist economy – a neoliberal free market economy that was resented by the workforce of some 200 years ago, but nevertheless won the battle of socioeconomic ideologies that went on to shape today's world.

South Africa needs to avoid Adam Smith's "*vile maxim of the masters of mankind*", by enabling the most effective learning for the nation's future generations, especially those imprisoned within the nation's inequality, poverty, and unemployment traps. The lessons from South Africa's ancient ancestors, who are also all of humanity's ancient ancestors, must be relearned and reapplied within this challenging technological age that demands fundamental changes to the complex national education, learning and employment ecosystems. The wisdom of Noam Chomsky illustrated in this and related video documentaries[38] have numerous lessons for South Africa, but the nation must develop its own implementation capacity urgently – the requisite national knowledge and skills are available but in inadequate quantities – they are just not used for maximum effect as the nation grapples with the need for affirmative action of various kinds to redress historical failures.

Other directly related references to the South African situation, and to Professor Chomsky's discussion of "Education for Whom and for What?" are:

- ***Peter Gray, Ph.D***., a prolific researcher and author, well-read in South Africa through his publications in Psychology Today (ZA), traces the history of LEARNING in publications like "*Children are designed by nature to educate themselves*"; all we need to do is to provide "the string" to enable sustainable learning;
- **Gul Deniz Salali:** *"Modern hunter-gatherer children could tell us how human culture evolved and inspire new ways of teaching".* The research was funded by, amongst others, South Africa's National Research Foundation (NRF) and eight South African universities: Gul Deniz Salali provides as an example, a video and discussion of a 13-month-old baby girl living in the dense forests of the Congo, who learns about survival freely and with great pleasure, through emulation of what her adults and peers do on a daily basis: https://theconversation.com/modern-hunter-gatherer-children-could-tell-us-how-human-culture-evolved-and-inspire-new-ways-of-teaching-122241
- Reviewing the above lessons from our ancient past must remind us of today's disturbing national situation, e.g. STATS SA's observation that 49.2% of South Africa's 0 to 4-year-old children have never had a story or book read to them, nor had they received any drawing or painting guidance from parents or guardians - virtually zero intellectual stimulus for discovery and self-learning (page 10/203 in the General Household Survey 2018). The lack of stimulus is defined by the children's living conditions - dangerous and stressful shack dwellings like the home of Cape Town's **11-year-old Kelina,** who tells the story of her daily strive for education and survival in the video documentary "*Miseducation | WHY POVERTY?",* which links South Africa's poverty crisis directly to the educational challenges facing the children of the nation's poor.

2.5.2 Section Conclusions: Where to next for South Africa's ICT4SDG4 and ICT4SDG8 Nexus?

To conclude this section, it is necessary to note that virtually all South Africa's world record socioeconomic inequalities are born, nurtured, and sustained in the country's homes and classrooms where more than 60% of the nation's children live and learn, and in the structures of governance where policies are crafted but implementation is weak. The nurturing activities in homes and schools leave much to be desired; they are directly responsible for the expansion of South Africa's multidimensional inequalities and poor employment prospects for many, as discussed in the highly informative yet disturbing 2015 video documentary about South

[38] Examples of other key works by Noam Chomsky: (a) A panel discussion at Harvard 2013 with *Bruno della Chiesa* and Harvard's psychologist *Howard Gardner* discussing Paolo Freire's 1970's classic "*Pedagogy of the Oppressed*", a standard textbook for nearly all African revolutionary movements five decades ago, available at https://www.youtube.com/watch?v=2Ll6M0cXV54. (b) Noam Chomsky's 2012 London lecture on "The Purpose of Education", summary with full video recording at https://www.faena.com/aleph/articles/noam-chomsky-education-vs-indoctrination/#; (c) Noam Chomsky - Work, Pay, and Raising Children: An interview that covers the critical areas of work and raising children, with special emphasis on gender-based disparities and division of labour: https://www.youtube.com/watch?v=KBSUkDXekMM.

Africa's school systems available to the nation's economically marginalized children - "Some children are more equal than others".

There are numerous high-quality research documents and media publications, and several concerned civil society movements, that verify the contents of this disturbing video documentary; they all paint a dismal picture of the education systems that impact the majority of South Africa's children who are mainly poor. The video documentary provides exceptionally strong evidence of where South Africa's triple threats of inequality, poverty and unemployment begin – in the homes of economically disadvantaged South African parents who cannot find "good schools" for their children, and do not have the educational knowledge themselves to bridge the learning gaps. The contribution by Professor Naledi Nomalanga Mkhize two-minutes into the video documentary, reinforces the existence of excellent schools in wealthy, mainly white dominated neighbourhoods, and very poor "black schools" everywhere else:

> "*De-racializing the South African school system did not solve the problem. De-racialization is not transformative; what is transformative is changing the structural problem of the way the school system was set up in the first place. And that was the problem of black schools, which are the majority, being schools of poverty and impoverishment, both intellectually as well as financially and economically. So, what should have happened was that we should have gone to the black schools first, and turned them into beacons of hope."*

How can we "transform" South Africa's "black schools" into "beacons of hope" as advised by Professor Mkhize? One way is to examine how other countries achieved, or are achieving this noble objective. All countries on earth have gone through major challenges in developing equitable societies, building secure futures through their schooling systems - education for all - "leaving no child behind" in the sense that avoids Noam Chomsky's very narrow dangerous interpretation of this over-used and abused cliché. We must seek the restoration of ALL South Africa's humanity, black, white, rich poor, old and young, through education and the transformation of the world of work to serve humanity as a whole, not just our Homo economicus minority who adhere to the "*vile maxim of the masters of mankind*". Other nations have achieved this onerous task, as discussed in the following section.

2.5.2.1 Lessons from South Africa's Peers: Where to next for South Africa's ICT4SDG4 and ICT4SDG8?

The following very brief summary suggests avenues for focussed research leading to the desired transformation of South Africa's education systems, and the ensuing transformation of the nation's world of work. South Africa's educational achievements are benchmarked against seven peer countries selected for their globally recognized educational excellence, impressive social cohesion (Sweden), or similarities with South Africa.

Table 2.4: Educational benchmarks for identification of actual and potential problem areas.

Country	Population Millions	GNP/Capita (US$ PPP)		GNP/Capita	Achievements: % above or below average		
		1999	2018	20-yr CAGR (%)	Math	Reading	Science
China[2]	1300	2410	15320	9.70%	8%	0%	5%
Estonia[3]	1.3	9070	35340	8%	6%	5%	8%
Finland	5.5	24520	49720	4%	4%	7%	8%
S. Korea	52	16200	39630	5%	7%	5%	5%
Sweden	10.3	27250	54640	4%	1%	2%	0%
Singapore	5.7	40490	92150	4.50%	15%	9%	13%
Vietnam	96	2120	7230	7.40%	1%	-1%	6%
S. Africa[1]	**58.5**	**7170**	**12530**	**3%**	**-26%**	**-36%**	**-28%**

Notes: (1) Achievement: all PISA 2015 except South Africa which used TIMSS 2015 and PIRLS 2016
(2) China Pisa Results for Beijing, Shanghai, Jiangsu and Guangdong Provinces;
(3) Estonia; GDP/Capita years 2000 to 2018;

Sources: (a) Economic data: World Bank Development Indicators; (b) PISA: https://nces.ed.gov/surveys/pisa/pisa2015/index.asp
(c) PIRLS 2016 /TIMSS 2015: http://timssandpirls.bc.edu/timss2015/index.html

The first benchmark presented, Table 2.4, is not intended to be judgemental, nor to imply competitive advantage in any way – it is merely a tool to recognise the depth and range of attention needed for South Africa to chart a path towards a highly educated and prosperous future with maximum dignity of work. Clearly,

South Africa cannot, and must not attempt to blindly emulate the processes followed by any of these countries, but every effort must be directed towards deriving vital lessons from them all, so that they can be aligned to South Africa's unique cultural sensitivities and social constructs:

Table 2.4 illustrates clearly the educational dominance of the government and people of Singapore in the top ranks of global educational achievement. Even with this clearly admirable achievement, the very brief review of Singapore's education that follows will paint a picture of restlessness – policy changes focussed on lifelong non-stop self-driven learning, driven by the notion that "*learning is not competition*" – it should be more of cooperation and collaboration than competition. And it is continuous – never-ending – rational responses to any and all changes.

As stated in preceding paragraphs, the primary purpose of this specific discussion document is to examine the overall problem statement regarding the nexus between education and work, in the quest for effective alleviative ICT-based solutions to South Africa's interrelated SDG challenges. The selected solutions must emphasise the human side of the high technology ICT sector, as observed by Douglas McGregor of MIT's Sloan School of Management in 1960, long before the advent of the 4IR and its impact on motivation and the world of work:

> **The Human Side of Enterprise** - 1960: "*It has become trite to say that the most significant developments of the next quarter century will take place not in the physical but in the social sciences, that industry—the economic organ of society—has the fundamental know-how to utilize physical science and technology for the material benefit of man-kind, and that we must now learn how to utilize the social sciences to make our human organizations truly effective.*"

Making our "*human organizations truly effective*" in South Africa must begin with the nation's children, and the full knowledge that the key elements of the current Homo economicus model have become so deeply, and dangerously entrenched, that efforts aimed at short- and medium-term changes will not work. The responses that will be proposed in this discussion document will merely set an environment for South Africa's leading educational and labour professionals to begin to shape the nation's future society, through education of the children - over the one-hundred plus years that may be necessary, as suggested by China's Guan Zhong some 3,000 years ago:

> ***"If your plan is for one year, plant rice. If your plan is for ten years, plant tree. If your plan is for one hundred years, educate children."*** (Popularly attributed to Confucius). This ancient Chinese philosophy leads to the discussion of educational reforms in China.

2.5.2.2 China:

China, the most populous nation on earth with the second largest, and still growing economy, has numerous lessons for South Africa and the rest of the world, on how to, and how not to, transform national educational systems. A few key known facts about the development of the nation, its education and work ecosystems, all of which suggest more intensive but open-minded scrutiny in South Africa's quest for education and work transformation are:

- China's ancient evolutionary history provides deep insights from the past, from which we can attempt to understand the societal complexity of the present, and try to chart pathways into a stable sustainable future. The first African migrants, in the form of humankind's common Homo erectus ancestor, arrived in the landmass we now call China some 2.1 million years ago[39], and thereafter launched the very long learning curve that shaped one of the most significant nations on earth today. China's ancient learning processes followed the informal learning pathways of China's African hunter-gatherer ancestors, and positioned China, together with the more publicised "Fertile Crescent", at the forefront of the Neolithic

[39] Nature 2018: "*Hominin occupation of the Chinese Loess Plateau since about 2.1 million years ago*", summarized elegantly in The Atlantic at https://www.theatlantic.com/science/archive/2018/07/early-humans-left-africa-250,000-years-earlier-than-thought/564896/. Read also latest discoveries of Homo erectus in South Africa in "The Conversation" at https://theconversation.com/fossil-find-suggests-homo-erectus-emerged-200,000-years-earlier-than-thought-135068.

Revolution[40] - the invention of farming and fixed human settlements - triggering immense socio-cultural changes that define modern humans today.

- The world's oldest known formalized education system began in China more than 2,000 BCE[41], about 1,500 years before Greece's formalization of education, the preferred western reference point. For more than 2,000 years, China's education systems lurched from excellence to mediocrity or worse, and back again to excellence, providing vital lessons of successes and failures for developing nations like South Africa. China's current high-tech 4IR leadership position is driven by an ageing population and the need for technologically-driven automation of work to replace human labour.
- China's deep human history, intimately tied to Africa's history through very deep and ancient genetic links, and the country's mammoth strive for continuous societal improvement via education, has many useful lessons for South Africa. Key lessons on how to deal with impressive successes mingled with significant failures and reversals in the national education systems, can be drawn from the long history of education in one of the world's leading 4IR nations. The most recent educational policy transformations in China are beyond the scope of detailed discussion in this document, however, some introductory references are provided in the footnote[42] below. The lessons to be learned from China must be part of the ICT4SDG4/8 development, and must focus on South Africa's children who reside at the base of the nation's development pyramid. Top-down initiatives are plentiful, but to date, success has been limited.
- There are numerous bilateral partnerships between China, continental Africa, and South Africa that can anchor the ICT4SDG initiatives proposed in this discussion document. The following very small selection provides some useful references:
  - Africa and China Higher Education Cooperation: Establishing Knowledge Sharing Partnership between Students: https://files.eric.ed.gov/fulltext/EJ1139625.pdf
  - South-South Cooperation in the Internationalisation of African Higher Education: The Case of China: Kenneth King, University of KZN, 2013
  - 2016: China donates a planetarium to the Sci-Bono Discovery Centre located in Johannesburg's Newtown Precinct, an organ of the Department of Basic Education (DBE): https://www.brandsouthafrica.com/governance/education/sci-bono-planetarium-160316
  - The close partnership between China and South Africa was reinforced by President Xi Jinping during his address at the 10th BRICS summit in Johannesburg, South Africa, July 26, 2018. The full speech is available via the hyperlink provided, and suggests close cooperation between China and South Africa through extensive exchanges in cultural, educational, health, sports, tourism and other areas.

2.5.2.3 Estonia:

After nearly 1,000 years of tumultuous history of multiple colonization's, with similarly tumultuous changes in the nation's educational systems and their outcomes, Estonia's education system has finally settled at the apex of Europe's educational assessments. In the 2018 PISA global tests, Estonia ranked first in Europe, and fifth after China (Beijing, Shanghai, Jiangsu and Zhejiang); Singapore; Macao; and Hong Kong. Some of the key factors behind Estonia's new-found excellence in education are:

- Estonia's humility and modesty: the nation's leaders do not seek superiority or praise for any progress or indicator of excellence – they celebrate self-criticism. Nothing that the nation's leaders do or can do is considered good enough, the quest for improvement is what drives the nation to continuous success;

[40] China's contribution to the Agricultural Revolution is discussed by the USA's National Academy of Sciences in https://www.pnas.org/content/104/3/1087 and other related research reports.

[41] History of Chinese education available at https://education.stateuniversity.com/pages/269/China-HISTORY-BACKGROUND.html, with current policy formulation challenges and opportunities discussed by CNN at https://edition.cnn.com/2019/07/16/asia/china-education-reform-intl-hnk/index.html.

[42] Chinese education: (a) *A comprehensive history*: https://education.stateuniversity.com/pages/269/China-HISTORY-BACKGROUND.html; (b*) Beijing education reforms aim to help China's over-worked, over-tested students*: https://edition.cnn.com/2019/07/16/asia/china-education-reform-intl-hnk/index.html; (c) *OECD 2016: Education in China - a snapshot*: https://www.oecd.org/china/Education-in-China-a-snapshot.pdf; (d) *UNESCO 2017: Using ICTs and blended learning in transforming technical and vocational education and training*: https://unesdoc.unesco.org/ark:/48223/pf0000247495

- Absolute equality in all aspects of education is a central theme: the principle of "no child left behind" is adhered to honestly and strictly, unlike the deliberately misleading interpretations discussed by Noam Chomsky in section 2.4.1 of this document. All children get the same quality of learning irrespective of their economic background, home language, or even intellectual capacities: the nation strives to remove all forms of grading within the school system. In the 2012 PISA international maths assessment, **more than a third of the nation's top performers were from the poorest family backgrounds;**
- Early childhood education (ECD) is compulsory and free, and includes free meals for all children and educators. Education as a whole is mostly free. Private schools and colleges are welcome, but are generally trumped by the high standards maintained by the public school system;
- Additional details of Estonia's history of educational transformation, policy evolution, and current outcomes are available through the following links:
  - 2016: https://hechingerreport.org/estonia-new-finland/
  - 2019: BBC News: Pisa rankings: Why Estonian pupils shine in global tests;
  - June 2020: Organisation of the Education System and of its Structure.

The history of Estonia's educational transformations contains numerous possibilities for trial in South Africa, from the nation's base of the development pyramid, where Estonia's stunning success started.

2.5.2.4 Finland:

Finland is recognised as a world leader in education, even with the slight recent decline in international test results like PISA and PIRLS. Finland's education system is not based on performance testing; the country has little interest or incentives for competitive testing for these international educational assessments – the nation's primary focus is on equipping children for a potentially tumultuous future, especially given Finland's climate change vulnerabilities. The high quality of learning in Finland is acknowledged and much admired by virtually all countries.

A very brief desktop review of the history of Finland's educational development suggests that the key reforms that led to the county's global dominance in educational performance were triggered first by a deadly famine from 1862 to 1868, followed soon after by the devastation of World War I (1914 to 1918). Both national catastrophes were exacerbated by extremely high levels of socioeconomic inequalities, the nation's Gini coefficient rose to extremes of up to 0.88, in 1868. For comparison, South Africa's current pre-Coronavirus Gini coefficient was estimated by STATS SA and its global partners, at 0.68; a modern world record (Chart 1.2a in paragraph 1.2.2 of this document).

Finland's survival through these disasters triggered a national race to reduce socioeconomic inequalities, and thereby drive rapid socioeconomic development through education and maximum population participation in multidimensional national development. This "trigger" towards excellence tends to verify the findings of historian Walter Scheidel (The Great Leveler) who concluded that it is disasters like famines, wars and pandemics that trigger reductions in inequalities. Was Finland's development in modern times triggered by the disasters referred to above?

Finland's education "miracle" is very well documented, and is summarized by the author of this discussion document in the supporting ICT4SDG4 document at https://www.sakan.org.za/Docs/ICT4SDG4.pdf. Two recent media articles that suggest the key attributes of Finland's educational systems today are: (a) The Guardian Teacher Network (2017): "*The big lesson from the world's best school system? Trust your teachers*"; and (b) The World Economic Forum (2018) publication "*10 reasons why Finland's education system is the best*", which lists the following "reasons":

1. **No standardized testing:** Children follow the "string" of self-driven but guided learning described by Noam Chomsky in his lecture "*Education for Whom and for What?*", summarized in sub-paragraph d3 above;
2. **Accountability for teachers:** The qualifications, status, and motivation of Finland's educators is so high that the concept of teacher accountability does not apply – an incompetent or ineffective teacher in the system is highly unlikely, and would not last long enough in hers/his job to do any damage;

3. **Cooperation not competition:** A Finnish educator commented on this that "*Real winners do not compete*" – they prefer cooperation within the profession, with society, and with learners of all ages;
4. **Make the basics a priority:** "*Many school systems are so concerned with increasing test scores and comprehension in math and science, they tend to forget what constitutes a happy, harmonious and healthy student and learning environment*" (direct quotation from the reference document);
5. **Starting school at an older age:** Compulsory basic education starts at age seven. Until then, children are "unchained" from compulsory education, except for a compulsory one-year long "pre-primary education" if judged needed by professionals, that smooths the transition to formal compulsory school. Early childhood education and care (ECEC) is a legislated entitlement for all children in Finland, available at parent's discretion from birth to school entry age.
6. **Providing professional options past a traditional college degree:** After completing compulsory basic education schooling at age sixteen, Finland's children have numerous options to obtain various levels of post-compulsory education qualifications: vocational education and training for various trades; professional level qualifications at academic and applied science universities; numerous opportunities via short and medium-term bridging courses to transfer from one post-school educational stream to any other;
7. **Finns wake up later for less strenuous schooldays:** Finnish learners enjoy stress-free education: school starts between 09:00 and 09:45, ending between 14:00 and 14:45, with one-hour lunch break and 15-minutes relaxation between each class;
8. **Consistent instruction from the same teachers**: Finland's learners often have the same educator for up to six years of their compulsory schooling, thus building strong bonds of mutual trust between educators and learners, with the former often fulfilling the roles of mentor and guide to all children in their relatively small classes;
9. **A more relaxed atmosphere:** Relaxed stress-free schooling for educators and learners alike is top priority in Finnish schools. Numerous stress-relieving breaks are dotted throughout the school day, with flexible times for meals etc. The emphasis on relaxation even applies to classroom layouts and furnishings – in several age groups, even desks are not mandatory – any seating, reclining, or lying arrangements on cushions, carpets or mats, which suit children's individual preferences for improved relaxed learning, are welcome;
10. **Less homework and outside work required:** Finnish learners get all the knowledge they need in classrooms under the guidance of their teachers – homework and regular external assignments are minimal. Finnish children are said to have far less homework than any other country with formal school systems, and yet they outperform most other learners in their age groups.

Numerous South African educators are fully familiar with Finland's educational systems, many have studied these systems in Finland, and through Finnish development partnerships with South Africa, exemplified by the 2020 detailed report "*South Africa and Finland Education Collaboration and Market Opportunities*" prepared through Finland's multi-partnership with several leading South African universities. The question that arises is: *how can the strong partnerships between Finland and South Africa be extended to deal directly with South Africa's educational and work-related challenges discussed in this document*? Clearly, finding solutions for South Africa based on the Finnish model of development is a very long and fiendishly complex process. Finland learned from its own socioeconomic disasters of 1860 and 1914, to reach the level of excellence portrayed by the nation's current education and work environments – a journey of 160 years - with more refinements still to come.

In our search for learning opportunities from the experience of Finland, one of many answers to the question raised above, it is useful to review available real-life scenarios in each country; for example, the four-generational story of the Vesala family in Finland, and the hugely contrasting story told in the video documentary "*Some children are more equal than others*" in South Africa:

Finland's broadband household penetration that feeds Taito's comment in the text box that follows was about 25 times that of South Africa in 2019. What can we learn from this very human Finnish story to improve the future of the Eastern Cape children shown in the South African documentary video referred to above?

100 years of Finnish education success stories: *https://finland.fi/life-society/100-years-finnish-education-success-stories/*

One hundred years of the Finnish journey towards excellence is told through the highly informative story of 96-year-old Taito Vesala (in 2016), who attended four years of formal schooling in the six years between 1926 and 1932, and was obliged to find a job after completion of compulsory school at 12-years of age. Taito's son Jarmo Vesala, aged 66 at the time of compiling the story, gained from an additional two-years of compulsory education, and enjoyed a career as a service station entrepreneur. Taito's grandson Jari Vesala, who benefitted from the extended compulsory nine-year-long basic school system and tertiary education, qualified for a career as an earth-moving contractor, states his appreciation of the school system that made his career possible, and especially the junior school meals, which he continues to enjoy in his adult life, for a small affordable fee of course. Taito's great-grandson Tatu Vesala, will complete his nine-year compulsory schooling in 2022, and will have a choice of free tertiary education in any subject or profession of his choice. He has all the online learning support necessary at home and in school to overcome the current devastating Coronavirus epidemic – his country is well-equipped to face most 21st-century challenges, much more than it was 160 years ago when devastating natural threats shaped his great grandfather Taito Vesala's life. Taito concludes his family story with the observation that "Young people today are quite something - they receive so much information that I can't help but admire their skills!".

2.5.2.5 The Republic of Korea:

The Republic of Korea (alternative South Korea) enjoys a few nicknames that laud the nation's economic growth prowess – "*Miracle on the Han River*"; "*Korean Miracle*"; "*Asian Tiger*" (the latter alongside Hong Kong, Singapore and Taiwan, all high growth economies). The country is one of the most studied, and therefore documented countries in modern times, in honour of its rapid growth from an economically and natural resource deprived country in the 1960's, to rank amongst the world's most industrialized wealthy countries by the 21st century. In 1960, South Africa was richer than South Korea by a factor of three (GNI/Capita ratio 443:158). The nation's GNI per Capita rose from US$130 in 1964 to US$33,790 in 2019, compared to South Africa's rise from US$520 to US$6,040 over the same period.

Given that this discussion document is about how ICTs enable economic and social growth, the comparison of ICT growth between South Africa and South Korea is equally stark. In 1960, South Korea's telephone density was too small to measure with any significant meaning, while that of South Africa was just over 4 per 100 people. By 2017, South Africa ranked 92 out of 176 nations in the International Telecommunication Union's (ITU) ICT Development Index (IDI – see revisions via the link), while South Korea led the world for most of the years that ITU calculated this value.

As indicated in the preceding paragraph, numerous very high-quality reference documents about the "South Korean Miracle" are easily available online. For the purpose of this discussion document therefore, only a small number with key relevant information will be referenced. South Korea must be central to South Africa's ICT4SDG research and development – the nation cannot afford to ignore vital lessons from the South Korean "miracle". The two countries have had several technical cooperation partnerships over the last two decades, including a still still-born "Digital Television Migration" programme (link information from Wits University 2010 study), in which the first target completion date of 2008, selected in readiness to meet the international 2015 deadline, was stretched to 2021 (ITWeb Sep. 2020), and then again to 2023 (Tech Central 8 Dec. 2020). South Korea's attempt to establish set top box manufacturing facilities in South Africa, which led to Sentech's Vivid satellite TV decoders and the company's Freevision TV service seems to have been similarly short-lived – Google searches of "Freevision" are generally limited to the launch of the service in 2013. To date, the phenomenal successes of South Korea's could not be replicated in South Africa, for reasons that need to be understood by all South Africans.

South Korea's transition to a global leader in ICT, and a major player in the world economy, was not easy. The turbulent at times extremely violent history of the country, and its educational systems, is told by Professor Noriyo Isozaki, a graduate of Tokyo University and South Korean specialist researcher in her highly informative publication "Education, Development, and Politics in South Korea", available for download at: https://link.springer.com/chapter/10.1007/978-981-13-2859-6_10.

Professor Noriyo Isozaki outlines the central role of education in the "*formation of human capital*" necessary for the "*supply of workers*" with the required skills to fuel the nation's high economic growth rates from poverty to the country's present classification as a high-income country. Noriyo Isozaki also paints a gloomy picture of "excessive" competition for good grades in the nation's "test-based" education system, the high stress levels on learners and their parents, and government's recognition of the "problem", noting that even with this recognition, the goal of "*human resource development turned out to be more important*".

Professor Noriyo Isozaki's choice of the terms "human capital" and "human resources", when considered against the origins of these terms as discussed in section 2.3 of this document, may be an indicator of the nation's favour of "human resources development" over "human capability development" as espoused by Nobel laureate and multiple award winner Amartya Sen in the context of human development (see e.g. "*Sen's Capability Approach"* at https://iep.utm.edu/sen-cap/).

Much of the successes, and criticisms, of South Korea's education system are verified by Korean academic Se-Woong Koo, a graduate of Stanford University who explains that his mother moved him from a high school in SEOUL, South Korea, to another in VANCOUVER, Canada, to remove him from the destructive stresses of education in South Korea, which had severe health effects on his elder brother. Dr Se-Woong Koo's opinion piece "*An Assault Upon Our Children*", published by the New York Times in 2014, comments as follows:

An Assault Upon Our Children: By Se-Woong Koo: **"***I was fortunate that my mother recognized the problem and had the means to take me abroad. Most South Korean children's parents are the main source of the unrelenting pressure put on students. Thirteen years later, in 2008, I taught advanced English grammar to 11-year-olds at an expensive cram school in the wealthy Seoul neighbourhood of Gangnam. The students were serious about studying but their eyes appeared dead. When I asked a class if they were happy in this environment, one girl hesitantly raised her hand to tell me that she would only be happy if her mother was gone because all her mother knew was how to nag about her academic performance".*

South Africa can derive numerous lessons from the "Korean Miracle" – how to educate for high economic growth, and how to avoid some of the pitfalls of high economic growth under the Homo economicus model. South Korea, like its partners amongst the Asian Tigers, is also searching for ways of restoring the nation's humanity – education is central, but needs careful design and nurturing.

Table 2.4.2. Fixed Broadband Penetration and Unemployment Levels

Fixed broadband penetration 2019			**Unemployment levels**						
Country	**Penetration Per 100 people**	**10-year CAGR %**	**Household penetration %**	**Total unemployment: % of workforce**			**Youth unemployment: % of youth workforce**		
				2010	**2015**	**2020**	**2010**	**2015**	**2020**
China	31	15.2	85.4	4.5	4.6	4.4	9.9	10.8	10.5
Estonia	34	3.7	90	16.7	6.2	5.4	32.9	13.1	12.0
Finland	32	1.0	94	8.4	9.4	6.7	21.3	22.3	16.4
Korea, Rep.	43	2.6	100	3.7	3.6	4.6	9.7	10.3	11.9
Singapore	26	0.4	98	4.1	3.8	4.4	9.8	9.3	9.7
Sweden	40	2.3	98	8.6	7.4	6.7	24.7	20.2	18.0
Vietnam[1]	15	15.3	40	1.1	2.1	2.0	3.4	6.7	7.2
S. Africa	2	8.4	10.4	24.7	25.2	28.5	50.5	50.3	55.7

Notes: 1. Fixed broadband household penetration in Vietnam derived from national plan 2016
2. Unemployment data predates impact of Covid-19 pandemic, value reported depends on reporting date.

Data sources: Broadband: World Bank: https://data.worldbank.org/indicator/IT.NET.BBND.P2
Unemployment: World Bank: https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS
Youth unemployment: World Bank: https://data.worldbank.org/indicator/SL.UEM.1524.ZS
Household broadband data obtained from online publications for individual countries, and from OECD database.

Table 2.4.2. reviews some of these challenges. South Korea is a clear leader in broadband "people-centred" penetration, which has most certainly fuelled high economic growth. This ICT growth will continue to be channelled towards continued economic growth, but it will be tempered by a strong balance with inclusive

highly creative youth development beyond mere economic growth. In this table, South Africa clearly has mammoth challenges related to ICT development and its impact on youth development and employment. The high-tech dependant future will be less reliant on employment alone, it will favour creativity, critical thinking, and innovation for personal growth first, and national economic growth to follow.

2.5.2.6 Singapore:

Singapore is the acknowledged world leader in international educational tests, highest test scores for math and science in TIMSS 2015 and 2019, and highest scores for math, science and reading literacy in PISA 2016 international tests. This enviable position was earned through hard work and dedication, trial, error and correction, since Singapore acquired its independence from British colonial rule in 1963, before becoming an independent sovereign "city state" in 1965.

Throughout the colonial and early post-colonial periods, Singapore struggled with inherited educational policies and systems that ranged from Chinese influenced "Confucius" models, through various mixtures of early British and other western models. The primary objectives of the western educational models were strictly economic – the goal of the British colonial schools established by the most significant colonial leader of Singapore, Sir Stamford Raffles, was "*to train clerks for the commercial houses of Singapore*", so that these commercial houses would *"eventually destroy the spell of Dutch monopoly; and what Malta is in the West, that may Singapore be in the East."* (Singapore: History & Background with a focus on education: https://education.stateuniversity.com/pages/1343/Singapore-HISTORY-BACKGROUND.html). As soon as Singapore regained its full independence in 1965, the economic focus of the nation's education system was retained, and improved, alongside a policy focus of even greater value – full equitable inclusion of all population groups within the rich multi-cultural composition of the country, without diminishing in any way individual ethnic cultural practices or preferences.

Singapore's continuous educational improvements and reforms have served the country very well, as illustrated by its leadership in international achievement testing, while at the same time ensuring social stability through multi-cultural inclusivity, and catapulting the country's economy to third highest globally in terms of purchasing power parity GNI per Capita by 2017 (World Bank database 1990 to 2019: https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD.)

Even with the admirable and hugely impressive world-leading system of education, the government and people of Singapore remain concerned: the competitive pressures and stresses for high educational achievement, on children, parents, educators, and society as a whole, leads to numerous unexpected outcomes, like rising levels of youth suicides and other unwelcome individual personality disorders. An excellent study of these concerns has been prepared by Singaporean educator Rum Tan in an excellent balanced article "*Is the Singapore Education System Too Stressful and Flawed?*", available online at: https://smiletutor.sg/is-the-singapore-education-system-too-stressful-and-flawed/.

Besides documenting the strengths and weaknesses of Singapore's education system, Rum Tan concludes his analysis with an excellent summary of how Singapore's Ministry of Education (MOE) is dealing with the challenges:

- **Scrapping exams** for Primary 1 and 2, doing away with mid-year examinations for Primary 3 and 5 and Secondary 1 and 3, and rolling in **limits to weighted class tests** per term.
- Deemphasising academic grades and leaving more room to nurture the joy of learning.
- Tackling the nation's growing levels of inequalities head on, through recognition that *a competitive skills-based education system actually fuels inequality*, instead of reducing it as general education should do. Some of the strategies adopted include additional spending and educational attention on low-income families, especially the expansion of early childhood development (ECD) opportunities for children from this population cohort, and many more similar pro-poor initiatives.
- The Coronavirus pandemic effectively reinforced Singapore's already strong educational focus on 4IR readiness, expanding the nation's "blended learning" mix of online home-based learning with in-person classroom tuition. Singapore was well-prepared for the unwelcome pandemic, after having increased its

national ICT connectivity - in 2018 Singapore reported 98% of households with 24/7 broadband connections with average download speeds of 185.25 Mb/s. South Africa's 2018 internet household penetration was 10.4%, as reported by the STATS SA, with a national average speed of 14.1 Mbps in September 2020.

The critical question arising from the above very brief summary of the world's leading country in education for the changing world of work, is "what can South Africa learn from the dynamic highly progressive educational systems developed by Singapore?" The countries differ greatly in terms of population, culture, and economic progress, but they share a common humanity that demands educational attention in this challenging age of Homo economicus confusion.

2.5.2.7 Sweden:

Sweden is classified as a successful welfare capitalist state: a strongly capitalist-leaning economy with a strong (welfare) abhorrence of inequality and poverty. The country is technologically advanced, 98% broadband household penetration, and the home of some of the world's leading electronic brands, including Ericsson that is so deeply entrenched in the history of ICT. The nation's educational outcomes are average for Europe, but their excellence is demonstrated in the technological innovation arena, although even in this regard, some of the Asian tigers and larger eastern neighbours have learned well from the experience of Sweden, and are increasingly competitive.

What can South Africa learn from Sweden's experience in the education and labour sectors, the primary focus of this discussion document? Clearly, the countries differ greatly in terms of mainly environmentally-driven attributes that include cultural preferences, but the fundamental objectives of both SDG4 (education) and SDG8 (labour, work), and where they intersect, are culturally insensitive and shared by both countries, irrespective of their respective levels of development.

The well-documented evolution of Sweden from one of the poorest nations in Europe up to the end of the 19th century, to one of the wealthiest egalitarian nations in Europe and the world, mainly through the vehicles of education and labour transformation, comprised a largely inclusive dedicated effort lasting more than a century, as described in numerous highly informative reports, including:

- **The rise, fall and revival of a capitalist welfare state**: what are the policy lessons from Sweden? Andreas Bergh, May 2012, available online at http://www.ifn.se/wfiles/wp/wp873.pdf. In his paper Andreas Bergh poses four questions of great relevance to South Africa:
  - **How did Sweden become rich?** *For South Africa, how can all South Africans become rich (at least in terms of wellbeing)?*
  - **What explains Sweden's high level of income equality?** *What explains South Africa's global record income inequalities in this post-democratic age? Sweden's Gini Coefficient was 28.8 in 2017, S. Africa's was 63 in 2015.*
  - **What were the causes of Sweden's problems from 1970 to 1995**? *South Africa should ask: What are the causes of the nation's slow pace of development since the advent of democracy in 1994?*
  - **How is it possible that Sweden, since the crisis of the early 1990s, is growing faster than most EU countries despite its high taxes and generous welfare state?** *What can South Africa learn from the Swedish experience of how to become a high-growth market-driven welfare capitalist economy?*

  The author explains Sweden's "economic miracle" through the following summarized headings:
  - Growth-promoting major institutional reforms;
  - The author identifies several root causes for Sweden's rise and fall of income inequalities, which include: land reforms; trade unions and centralized wage bargaining; primary school reforms; the introduction of social insurance schemes; and increased female labour participation.
  - Errors in macroeconomic management that included ill-conceived tax and labour relations reforms (the latter reduced productivity and raised costs), and politicization of institutions, were recognised as part of the long list of policy failures that led to the national performance declines of 1970 to 1995;

- **Popular Adult and Labour Education Movement in Sweden—History, Content, Pedagogy**: In this highly informative 2016 paper by Stockholm University's Petros Gougoulakis, the author paints a picture of close highly inclusive coordination between fundamental transformation of the national basic and higher education systems, and an all-embracing adult education programme, both of which transformed the nation from poverty to global wealth leadership in just over one century from the late 18th century to the early/mid-20th century. This inclusive educational effort aimed directly at establishing a high-growth capitalist-leaning economy alongside an effective welfare system that ensured cooperative partnerships between government, the labour movement, and society in general. The full document is available online at Cambridge University Press via this link.

The "*Swedish Model"* discussed in these and numerous other documents, which seeks national prosperity, equity, gender equality, autonomy and independence for the nation, and the time it took to realise these noble objectives, must remind us of China's Guan Zhong's ancient philosophy that "*the best investment for a lifetime is to educate people"*. This Swedish Model must be included as an important component of any South African implementation of ICT4SDG4/8.

2.5.2.8 Vietnam:

Vietnam has been included in this discussion document to represent a low/middle income developing country, which rose from abject poverty just a few decades ago, to a vibrant high-growth middle-income country in this 21st century. Vietnam's performance in this competitive modern world is particularly impressive after considering the nation's brutal colonial history stretching back to 111 BCE, and culminating in final self-governance as recently as 1975 when the brutal war with the United States of America came to an end (https://education.stateuniversity.com/pages/1672/Vietnam-HISTORY-BACKGROUND.html).

Concerning unemployment, the central theme of this discussion document, Vietnam's 2020 unemployment rate was reported at just 2% overall and 7.2% for its youth, compared to South Africa's 28.1% (updated to over 30% by Stats SA) and a threatening rate of over 50% for the nation's youth. Similarly, as illustrated in Table 2.4.2 above, Vietnam, with far fewer financial resources than South Africa as measured by GDP, managed to increase the nation's household broadband penetration to approximately 40% compared to South Africa's 10.4% as reported by STATS SA. This latter broadband at home statistic is vital for learning during this disastrous Covid-19 pandemic era.

What is this "*Vietnamese Miracle*", and can South Africa use any information derived from it to renew the country's progress out of a dangerously high world record level of socioeconomic inequality through education and work (Gini coefficient 35 Vietnam, 63 South Africa)? Can the South African nation draw inspiration from Vietnam's economic resilience even during the global Covid-19 pandemic, with records of an economic contraction of just under 7% after a 20-year CAGR of +7.4% per annum (World Bank Vietnam), compared to South Africa's 17.1% economic contraction (World Bank Oct. 2020) from an already dismal economic growth rate of just 0.7% in 2019 (African Development Bank Group)? Is there anything that Vietnam does to match global educational achievement test scores that can help South Africa rise out of the dismal international test scores of TIMSS 16 (math 26%, science 28% below global average – Table 2.4 of this document), or the recently published 2019 TIMSS achievement results announced by the Minister of Basic Education, which showed South Africa scoring 22% and 26% below world averages for Grade 9 math and science respectively, where Singapore once again led the world with equivalent scores of 23% and 19% above average for math and science for its **grade 8 learners**? See TIMSS & PIRLS website at https://timss2019.org/reports/download-center/ for all 39 participating countries, Vietnam did not take part in this round.

In conclusion of this short summary of the Vietnamese nexus of SDG4 and SDG8, this discussion document strongly recommends a deeper study of the actions taken by Vietnam to improve its multidimensional human development, as part of the action-oriented R&D that will be recommended. For the purpose of this document, the following reference links are recommended as an introduction to the "*Vietnamese Miracle*":

- Vietnam: History & Background: https://education.stateuniversity.com/pages/1672/Vietnam-HISTORY-BACKGROUND.html

- The story of Viet Nam's economic miracle: https://www.weforum.org/agenda/2018/09/how-vietnam-became-an-economic-miracle/
- History of Education in Vietnam: https://sites.miis.edu/educationinvietnam/historyofvietnam/history-of-education/

2.5.2.9 Section Conclusion:

The brief discussion of eight economies (includes South Africa via this discussion) with mixed levels of economic and social development under very wide variations and evolutions of political ideologies available to mankind, demonstrates several fundamentals, two of which are:

- The primary objective of a better life for all is shared by virtually all of humanity, even though its concept is so ill defined as to render it meaningless in many societies. The economy in this era of human evolution is clearly central to this quest for a better life. The economy has become the de facto means of finding that better life, whether we like this or not, and even with our general science-based knowledge that this was not always the case, that Homo sapiens survived for more than ninety percent of its existence without the help of economics as we know it today.

  With that truism in mind, education and the world of work have become servants of the economy, as the South African anthropologist James Suzman observed from his researches, "*we work to live so that we can live to work*", and we learn so that we can maintain economic growth for which we live and work. This model of Homo economicus derived from the works of economist and political philosopher John Stuart Mill, is still alive and well, but it is beginning to show signs of obsolescence – raw capitalism is progressively being questioned, a process that is central to education and work. The concept of Homo economicus can force Homo sapiens to go the way of modern human's ancestral cousins, Homo neanderthalensis and the Denisovans. To counter this potential extinction of future generations of Homo sapiens, it is necessary to impart ALL available and relevant knowledge and information, about our past, present, and possible future, to the future adult members of our species, especially those that try to eke out a better life from the base of the global development pyramids. Learning is central to human survival, and education is just one tool for such learning which clearly needs adjustment and refining.

- High quality learning via high quality education for all is the second shared objective of modern humans in their quest for a better life. But how to deliver such high-quality learning for all is the central question for which the short summaries of various attempts in eight disparate nations are outlined. The history of the evolution of education in every country on earth as suggested by the summaries provided is extremely complex, very long, and fraught with frequent missteps, red herrings, and disastrous errors of judgement, natural human frailties that afflict all nations, irrespective of development, geographic origins, or ethnic identities. World leading economies like China, Finland and Sweden, and the new educational "tigers" on the block, to which we must add Estonia and Vietnam, all needed a century or more to get to where they are today – global leaders must prepare for the future for the still unfolding technological world of the 4IR and beyond.

  The statistical evidence provided in this section suggests that South Africa as a whole is on a sensitive path of re-discovery of human learning. South Africa is a key ancestral evolutionary home of Homo sapiens, who knew how to share information with everyone of all ages in readiness for the long journey to today. New experiences and environments that changed much of our superficial appearances and our multicultural multi-ethnic self-identities encountered during that long journey encouraged human forgetfulness of how best to learn and to share that learning equitably. The long journey to today also had other vital components of learning – Homo sapiens' ancient ancestors obviously knew how to unlearn – errors of judgement were recalled through stories, belief systems, cultural norms, so that future generations would not repeat them again. These are lessons seemingly lacking in our modern haste to accumulate more. South Africa's evolutionary contribution to humankind suggests that there is much historical unlearning and relearning that the country must undergo.

The Covid-19 global pandemic has escalated the urgency for the transformation of learning and work, as recognized strongly by one of the principal architects of the world of work – the International Labour Organization (ILO) which writes:

> "*The pandemic is making us rethink and re-organize education. Workers with higher educational attainment may expect to be able to find a job (and a quality job, for that matter) as soon as they become available. But is that so?*": https://ilostat.ilo.org/education-pays-off-but-you-have-to-be-patient/

A useful final statement to conclude this ICT4SDG4 and ICT4SDG8 discussion.

2.6 SDG5 and SDG8: The Nexus of Gender Inequality, Decent Work and Economic Growth

Table 2.5.1: UNDP Human Development Report (HDR 2020): Gender Inequality Data

HDI rank	Country	Gender Inequality Index (GII 2019)		2017 Maternal mortality /100000	Youth birth rate /1000: 15-19 yrs. 2015-19	% Female seats in parliament 2019	% Population with ≥ secondary education ≥ 25 yrs.: 2015-19		Labour force participation %: ≥ 15 yrs. 2019	
		Value	Rank				Female	Male	Female	Male
2	Switzerland	0.02	1	5	2.8	38.6	95.6	96.8	62.9	73.8
7	Sweden	0.04	3	4	5.1	47.3	89.3	89.5	61.4	67.8
11	Finland	0.05	7	3	5.8	47.0	100.0	100.0	55.5	62.8
23	S. Korea	0.06	11	11	1.4	16.7	80.4	95.5	52.9	73.1
11	Singapore	0.07	12	8	3.5	23.0	78.1	85.1	62.0	78.3
29	Estonia	0.09	21	9	7.7	29.7	100.0	100.0	57.1	71.0
85	China	0.17	39	29	7.6	24.9	76.0	83.3	60.5	75.3
117	Viet Nam	0.3	65	43	30.9	26.7	66.4	78.2	72.7	82.4
114	S. Africa	0.4	***93***	119	***67.9***	***45.3***	75.0	78.2	***49.6***	***62.7***
179	Yemen	0.8	162	164	60.4	1.0	19.9	36.9	5.8	70.2

Source: UNDP-HDR 2020: Gender Inequality Index: http://hdr.undp.org/en/composite/GII

Notes: (1) Switzerland and conflict-devastated Yemen added to illustrate the highest and lowest GII Ranks; (2) South Africa ranks very high in gender equality at the highest social levels of e.g., female seats in parliament, but unacceptably low in the maternal mortality, youth birth rate, and labour force participation indicators, and therefore in the overall GII ranking of 93, which is inconsistent with the country's level of economic development; (3) GII ranks are out of 162 countries, selected on the basis of data availability for benchmarking.

Table 2.5.1 above provides a summary of the United Nations Development Report on gender inequality for the same benchmark nations introduced in the preceding section, with the addition of Switzerland representing the most egalitarian country at the time of reporting, and Yemen as the least egalitarian of those countries for which data are available (total 162 countries). The relatively high level of female participation in parliament verifies South Africa's progress towards gender equality, but all that this welcome statistic does is to highlight the remaining socio-hierarchically skewed inequalities – gender equality is progressing well only at the upper end of the nation's development pyramid, the lower levels remain unequal as shown by the data. Violence against children, girls and women (GBV) in modern South Africa remains the nation's greatest challenge in this SDG.

The full range of interdependent and interrelated SDG challenges that form the basis of this document all contribute towards GBV in ways that have yet to be identified, analysed, and used to develop effective holistic national responses. They all have a direct destructive and disruptive relationship with SDG8 – the world of labour and work. This discussion does not provide answers to these complex SDG relationship challenges at this stage, all that the discussion can do is to draw on South Africa's known ancient history and current knowledge in the search to understand how we arrived at today, and how this understanding can help us to shape the future. Some of the vast body of research evidence of relevance to this discussion, which must be expanded over time as part of the applied research agenda proposed, include the following summaries:

2.6.1 References consulted and to be consulted further to fully understand the nexus of Gender Inequality (SDG5), and Decent Work and Economic Growth (SDG8) in South Africa:

2.6.1.1 Desmond Morris: The Human Zoo.

In his excellent 1969 book "The Human Zoo" (book, PDF 12Mb; video, MP4 195MB), Dr Desmond Morris, a globally celebrated socio-biologist born in 1928, focusses his analytical attention on the residents of the so-called "Concrete Jungle", cities and towns into which they migrated in their quest for survival. Desmond Morris equates these cities to cages, and their occupants to abused, angry animals physically confined to these cages. In such living environments, animals, including the Homo sapiens variety, generally develop extreme anti-social mental defects and responses, the fundamental causes of gender and child abuse in South Africa and elsewhere according to many credible researchers. Dr Morris objects to the use of the term "jungle" to describe the modern living environment, arguing that animals living freely in the "jungle" do not, under their normal habitat conditions, murder and rape the females, children and youth of their species or social groups.

The horrendous practice of child rape, and the abhorrent "corrective rape"[43] that plagues the residents of South Africa's poorer "concrete jungles", or more accurately "tin shack and cardboard jungles" (Cape Town: When it rains, sewage from the public latrines floods my living room – click to read more), is unique to modern humans. Egalitarianism is a more representative relationship form amongst most animal species, and was the norm in pre-Neolithic humans, even with minor hierarchical variations for protection and security where sexual size dimorphism[44] is a required species attribute. The relationship between sexual size dimorphism, illustrated in Darwinian-type gene selection for environmental adaptation and speciation, and the changing path of Homo evolutionary trajectories, continues to be debated and researched in modern scientific circles, but does not seem to play a major role in modern human patriarchal social structures. In the known pre-agricultural revolutionary past, this egalitarianism was especially extended to children and youth, with minor adjustments for immaturity and growing levels of knowledge, thereby safeguarding all future generations.

Is Dr Desmond Morris, and the growing body of academics, philosophers, multidisciplinary scientists and researchers who think along the same lines, correct in their suggestion that gender and child abuse is an unnatural destructive social construct, an aberration in the orderly chain of Homo evolution? Did these social aberrations begin with the dawn of the Neolithic Revolution, a direct result of the consequential population increases and the formation of progressively over-crowded human settlements (villages, towns, cities, states), and the disruptive socioeconomic hierarchical divisions that arose from such crowded settlements? Recent studies of living hunter-gatherer communities suggest far greater egalitarianism with fully recognised and respected divisions of labour based on capabilities and capacities, including biological, e.g., child-bearing and nurturing. The few remaining hunter-gatherer communities striving for survival in all continents tend to support Desmond Morris' and his fellow scientific communities' opinions well. The Ju/'hoansi communities spread throughout Southern Africa, and the Hadzabe communities living in Tanzania, are just a few examples well within reach of South African researchers. Professor Christopher Henshilwood continues to unearth more compelling evidence from the Blombos Cave and other stone age human settlements dotted throughout Southern Africa. This modern research into very ancient human origins, and the behavioural inferences drawn from these discoveries/researches, is augmented and further authenticated by many other modern scientists, including Dr James Suzman[45], an authority on the anthropologies of surviving hunter-gatherers in Southern Africa. James Suzman describes the egalitarian lifestyles and social orders of the Ju/'hoansi, and the

[43] Corrective Rape in South Africa: An oversight in South Africa's Constitutional Formation? See SAFLII definition and discussion at http://www.saflii.org/za/journals/AHRLJ/2015/3.pdf

[44] Further scientific evidence and opinion on sexual dimorphism in the modern human population available at (1) USA National Academy of Sciences: https://www.pnas.org/content/100/16/9103 (2003); and (2) U.K.'s The Royal Society "*Humans as a model species for sexual selection research*" at https://royalsocietypublishing.org/doi/10.1098/rspb.2017.1320 (2017).

[45] Dr James Suzman, South African Anthropologist, author of influential books like "*Affluence Without Abundance: The Disappearing World of the Bushmen*" and "**Work** - A History of How We Spend Our Time" (https://www.bloomsbury.com/uk/work-9781526604996/), writes in The Atlantic about how a 200,000-Year-Old Culture Encountered the Modern Economy, and was very quickly "consumed" to a life of misery defined by the "Homo economicus" culture of the modern era. The cultural transformation of a 200,000-year-old highly stable self-sufficient "affluent" human society into a new Ju/'hoansi tribe surviving at the lowest edge of the modern Homo economicus world order, complete with its GBV consequences, is an evolutionary tragedy that began unfolding about 12,000 years ago with the dawn of the Neolithic Revolution.

relationship of these lifestyles with the work required for survival, which the Ju/'hoansi sustained for more than 200,000 years. They must have been doing something right.

2.6.1.2 Professor Pieter Coetzer, University of the Free State, 2005.

In a **2005 academic paper** published in the Journal for Contemporary History Volume 30, Issue 3, January 2005, Pieter Coetzer wrote in "Rape in contemporary South Africa – more vexing and vicious than ever", as follows:

INTRODUCTION: "*Shortly after the ANC had taken over the reigns in 1994 a major study on crime was conducted by the Human Source (*Sciences – author correction*) Research Council (HSRC). According to them crime was regarded as South Africa's worst problem and they warned that if the government did not get in check within the last three years of the century the RSA would sink as a country. In this report they covered the* ***increase in violent crimes from 1980 to 1995****. Since 1980 to 1989 there was a steady increase in violent crimes which included assault, murder and rape. Rape was one of the crimes which increased every year. No wonder the incidence of crime, particularly rape, in South Africa is well above the world average. Crime, at that stage, took over from political violence as the country's biggest nightmare.*"

About sixteen years prior to the publication of this discussion document, Professor Coetzer wrote that "*No other country in the world has women who are as outspoken about rape or abuse as in South Africa and one should applaud their refusal to remain silent. South Africans have no choice. In Meadowlands, Soweto, the SA Police said that 90% of rape cases in 2003 was against children aged 12 or younger. The police arrested around two-thirds of perpetrators, but there were only convictions in 20% of the cases (recent research alleges that this figure is nearer to 1%). The reason for this is that many parents were happy to accept as little as R50 to drop charges. That is one of the most common reasons for unsuccessful prosecutions*".

The plight of South Africa's women, and especially their children, demands directly focussed attention from the whole nation, using all technologies available, including and especially the ICTs, which can help to ameliorate these challenges, and which can exacerbate them just as easily if the technology is used blindly without the user skills and social support systems needed.

The impact of gender discrimination and violence against women and children is obviously devastating on the future of work prospects of the nation, and therefore on its economic growth, a critical component of SDG8.

2.6.1.3 Nyasha Karimakwenda, University of Cape Town (UCT), gender related research academic:

- Today It Would Be Called Rape 2013: A Historical and Contextual Examination of Forced Marriage and Violence in the Eastern Cape. "*The practice of ukuthwala has received considerable attention from the media, government, and civil society over the past few years. Reports assert that there has been a marked resurgence in the practice, in a distorted and destructive form, where older men target and violate vulnerable young girls, forcing them into marriage*".
- The cultural roots that condone rape 2014: A study of the stubborn prevalence of "Ukuthwala" (carry off, abduction), and its complicated intersection between culture and violence. Nyasha traces the history of this generally unenforced sexual crime against teen and pre-teen girls back to the 1800s in South Africa;
- Safe to Violate: The Role of Gender in the Necklacing of Women During the South African People's War (1985–1990): 2019: "*By analysing why and how women were necklaced, and linking these acts to the broader context of rampant violence against women, this article reveals that the murders were the consequence of a particular expression of masculinity that sought to create specific subjects out of women*";
- The language of erasure: neutralization techniques in contemporary South African marital rape judgments 2020: "*Through a feminist sociolegal framing, I integrate multidisciplinary tools that counter simplistic conceptions of rape myths and highlight how myths are locally and culturally contingent. With this foundation, I apply neutralization theory to the judicial language of marital rape cases to explicate how patriarchal caricatures of sexual violence transition from the social sphere into the legal sphere.*"

The single criticism of Nyasha's highly impressive, informative and invaluable research output are the restrictions placed on its access – the Homo economicus phenomenon restricts access to these and other bodies of work to academics and "the haves" who can afford to pay to acquire or just read them – the people who need the awareness and knowledge most, adults and children at the base of the nation's development

pyramid, are excluded from the hard lessons that are needed to shape the future of South Africa through its children.

2.6.1.4 Recent media coverage of GBV:

- **December 2009, Vuk'uzenzele** (get up and do it for yourself), a national government communications portal, documents a report of an Eastern Cape teenager, abducted by a man ten years her senior, locked up, beaten and raped, and when she managed to escape, her parents sent her back to the man's house. She again escaped, only to be abducted again – she contacted her dance instructor who reported the abduction, setting the wheels of justice in motion. A police spokesperson said the prevalence of child marriages (through "ukuthwala", to abduct and "carry away" young girls, purportedly for "marriage") is still alarmingly high; "In one week, we along with the Hawks – rescued three young girls". All were victims of ukuthwala. In the 21st century? (https://www.vukuzenzele.gov.za/teenager-escapes-ukuthwala).
- **March 2020: Daily Maverick: 'There is no greater crime' — court increases child rapist's sentence to life imprisonment:**
  "*For a child to be violated in the sanctity of the only place she can call home is a most egregious breach of trust. Can she ever feel safe again? Unsurprisingly, the psychologist's report diagnosed the child with post-traumatic stress. Apart from the fears, the nightmares, the diminished social and scholastic functioning exhibited at the time the report was compiled, there will be long-term psychological consequences. It is stated that these will have a negative impact on her psychological growth and psycho-sexual development into adulthood – no amount of counselling can counteract this. In short, this young girl's life has been irreversibly damaged".*
- **September 2020:** "*Objective and subjective experiences of child maltreatment and their relationships with psychopathology*" (https://www.gwern.net/docs/psychology/2020-danese.pdf); "Too many of the child rape victims in South Africa are murdered" – Associated Press December 2020, reports that "*In South Africa, child homicide show 'violence entrenched'"* – a horrific statistics that may be undercounted.
- **16 December 2020, SABC News:** North West ANC calls for rape accused Lekwa-Teemane mayor to step aside: https://www.sabcnews.com/sabcnews/north-west-anc-calls-for-rape-accused-lekwa-teemane-mayor-to-step-aside/ "*The African National Congress (ANC) Interim Provincial Committee (IPC) in the North West has requested the mayor of Lekwa-Teemane Local Municipality in (*name of accused withheld in this document*) to step aside. This after (name and age withheld) was charged on two counts of sexual assault, rape and abduction. He allegedly sexually assaulted and raped two girls*".

2.6.1.5 Related international research documents, opinions, and philosophical constructs:

(a) **New Scientist**: Anil Ananthaswamy and Kate Douglas: 18 April 2018:
The origins of sexism: How men came to rule 12,000 years ago: "*Human societies weren't always male-dominated. The switch came when we became farmers – and that suggests ways to roll back towards a more equal system*"

(b) **MDPI:** Jean Bérard 2016: **"***Can a Patriarchal World Be Corrected by a Criminal Law? Feminist Struggles, Penal Justice and Legal Reform in France (1970–1980)".* A useful record of struggles by women against gender abuse and the legal systems which refused to criminalize rape in France, a feature that extended to numerous other countries, and is still relevant even in states in which rape has been criminalized: https://www.mdpi.com/2075-471X/5/1/12.

(c) **Anthropology:** Oxford Research Encyclopedias: "*Hunter-Gatherer Women*": Marlize Lombard and Katharine Kyriacou, September 2020: https://doi.org/10.1093/acrefore/9780190854584.013.105. This highly relevant report examines the respective roles of women and men in hunter gatherer societies, verifying the results of numerous other studies of the egalitarian lifestyles and labour divisions in which all activities and functions are shared as far as practical by both genders, including the vital child upbringing and education function. Such egalitarian relationships seem to fade after the advent of farming, both agricultural and pastoral, although patriarchy is far more enhanced in agricultural than in purely pastoral societies.

(d) **Professor Darcia Narvaez**, University of Notre Dame[46]: Professor of Psychology, prolific researcher and author, and globally respected authority on gender issues related to this discussion document. Darcia Narvaez' insights in parenting and children's psychosocial development, and gender related human behavioural psychology in general, provides vital knowledge for understanding South Africa's alarming gender relationships. Virtually all of Darcia Navaez' research findings and opinions have great value for South Africa's quest for a better future for its female inhabitants, how to prepare all the nation's children to create and maintain this desired future.

In the introduction to her article sub-titled "*Growing Up to Become 'A Good and Useful Human Being'*", Darcia Navaez quotes cultural anthropologist Marshall *Sahlins'* statement that "*In comparison to our pre-agriculture foraging cousins we are far from virtuous and might even be considered to have lost our minds, if not our humanity*", qualifying this statement with "*In fact, we are quite immoral, wicked, and stupid if we use anthropological reports of those who live like our presumed nomadic foraging, gatherer-hunter ancestors as a baseline*". She then proceeds to discuss the false Hobbesian preconceptions of hunter-gatherers as being ""solitary, poor, nasty, brutish, and short", arguing instead that their egalitarian gender cultures promoted extensive in-group and inter-group cooperation that sustained the lifestyles for hundreds thousands of years, from which vital lessons for today and the future can be derived.

In a related article "*Getting Back on Track to Being Human*", Professor Narvaez suggests that the Cooperation and compassion portrayed by most hunter-gatherer communities in all corners of our world are signs of intelligence, whereas the modern-day lack of these human attributes is an indication of the toxic stress levels that define our current lifestyles, the Homo economic strive for more of everything.

(e) **Professor Sarah Blaffer Hrdy,** University of California, Davis: "*Mothers and Others*", and other vital research publications. Sarah Blaffer Hrdy's award winning book provides numerous very useful insights for understanding the changes in human behaviour following the transition from hunter-gatherer lifestyles to sedentary city-dwelling Homo economicus-driven social formations. Her discussions of modern human's cooperative breeding practices, in which alloparenting, a term used to describe community-wide shared parental care for all children within the group beyond the nuclear family, are highly informative. With the advent of crowded urban dwelling as described by Desmond Morris in previous paragraphs, and the demise of community wide cooperation that enables cooperative breeding or alloparenting, Professor Blaffer Hrdy's research may provide answers for South Africa's demise of community-wide cooperation that may have led to the GBV and child abuse challenges that impede the nation's socioeconomic development in this twenty-first century.

2.6.1.6 25 Nov 2020: Statement by the State President of South Africa:

To conclude this subsection of the document, a statement on the national crisis by the highest political authority in the country reflects the national consternation:

President Cyril Ramaphosa: Dialogue on Gender-Based Violence and Femicide:
https://www.gov.za/speeches/dialogue-mark-16-days-activism-26-nov-2020-0000: *"As I address you this evening, somewhere in this country a woman or a child is being abused, beaten, assaulted or terrorised. They face this violence on the streets, at school, on campuses, at work and places of worship and, worst of all, in their own homes. In a country with the most progressive of constitutions, which promises equality and dignity for all, the women and children of South Africa live in fear of violence every day. As we launch this year's campaign we ask: for how long must this go on? For how much longer must we say 'enough is enough', only for it to continue? It simply cannot go on"*

The South African State President's entreaty is shared by most South Africans – "*it simply cannot go on*". The whole nation shares President Ramaphosa's anguish, passion, and hopes, which must drive the whole nation, and all international supportive partners, to double and redouble their efforts to find solutions to a

[46] Darcia Narvaez: (1) An excellent video lecture "The Science and Pseudoscience Podcast - Episode 2 Darcia Narvaez" at https://www.youtube.com/watch?v=7BlvSasaj8M, and (2) Professor Sarah Blaffer Hrdy, "*Mothers and Others*", an informative video lecture introducing her book and theories is available at https://www.youtube.com/watch?v=XsuuPMUIMEE

horrendously complex social challenge, occurring right at the doorstep of "The Cradle of Humankind" – where egalitarian human existence began several million years ago.

This discussion document suggests that South Africa's current corrective efforts, dominated by "top-down" social interventions and well-intended and structured but poorly enforced justice and legal provisions, necessary as they may be, need an urgent "bottom-up" lift – one that directly targets the women and children of the poorest communities in the country. This intervention must begin at the earliest possible cognitive formative years of the most vulnerable children, those whose families and guardians are defined by the charts and data provided and discussed section 1.2 of this document; those with parents, caregivers or guardians that are ill equipped to protect or effectively nurture their young charges for effective contribution to, and survival of, this complex socially challenged technologically-driven world.

How can South Africa shape its young minds to acquire critical thinking skills so that they can develop all other skill sets demanded or deemed necessary by modern society and its evolving 4IR? How can we do this for the nation's children within the first seven years of their lives, when they are most susceptible to numerous forms of indoctrination that define the world that they must inherit? Virtually all religious sects, and some socio-political ideologies, recognise this early childhood susceptibility to indoctrination, and many leverage this vulnerability mostly with good intent, but sometimes with unexpected undesirable results. The damage to children's brain functions and cognitive development brought about by the parallel traumas of poverty, hunger, and physical abuse of both children and their parents or caregivers, is well-known and discussed briefly with references in the support SDG discussion documents: (a) SDG1, Poverty (page 5 of 19) in https://www.sakan.org.za/Docs/ICT4SDG1.pdf; (b) SDG3, Health and Wellbeing (page 2 of 6) in https://www.sakan.org.za/Docs/ICT4SDG3.pdf; (c) SDG4, Education, (page 3 of 29, and throughout the document) in https://www.sakan.org.za/Docs/ICT4SDG4.pdf; (d) SDG5, Gender Equality, with specific reference to possible mental health disorders emanating from childhood abuse in "*Baby Rape in South Africa – Brutality breeding Brutality?*" – research by South Africa's Dr Amelia Kleijn on the possible causes of infant rape, on page 7 of 35 in https://www.sakan.org.za/Docs/ICT4SDG5.pdf.

2.6.2 Section Conclusions:

The short conclusion of the above extremely difficult, emotive, and sometimes controversial social phenomena in South Africa, is that we have no answers or effective responses at present. The vast intellectual capacity available in the nation has the capability, and capacity, to understand the phenomena fully, and to begin crafting corrective responses. But, in the opinion of the author of this document, this vital capacity is neither coordinated effectively nor focussed appropriately. This perceived national shortcoming simply means that the nation must refocus its whole SDG strategy on SDG17 – "Strengthen the means of implementation and revitalize the global partnership for sustainable development". Some of the most critical components of this important SDG are the "4Cs" – in alphabetical order, **C**ollaboration, **C**ommunication, **C**ooperation, **C**oordination. These four critical components of SDG17 are significantly constrained by the prevalence of Pilotitis and Silo-itis as discussed in section 1.1.1 sub-paragraph d) of this document. Pilotitis and Silo-itis must therefore be positioned as critical developmental barriers that must be dismantled in the interest of achieving and sustaining all SDGs.

Directly related to SGD17 is the primary focus of this discussion document – the ICT sector, which also lies at the core of all 4IR technologies, including the massively complex AI-driven equipment that enabled e.g., the record time development of COVID-19 vaccines to address the major immediate threat facing humanity today. Without the **I**nformation that must be **C**ommunicated between geographically and socio-culturally dispersed humans and their interconnected **T**echnologies, the 4IR and all its past, present, and future iterations would have no value. Because of this cross-cutting multisectoral and multidisciplinary nature of the inputs and outputs of ICT, the constituent technologies, and their supporting infrastructures, should not be confined to one or two SDGs – all SDGs require ICT services for their achievement and sustainability, and therefore integration of the services themselves, and the multidisciplinary partnerships required to build, operate, and most importantly, productively use the ICT, all within the framework of SDG17.

The very brief mentions of ICTs in most of the SDGs, for example in the infrastructure and industry segment of SDG9, underestimates and undermines the full value of information and knowledge in the resolution of all SDG challenges. Can the ICTs be returned to their original evolutionary purpose of sharing information and knowledge for human survival and growth, the restoration of Homo sapiens' "humanity", instead of the blind search for "more" in the current preoccupation with ICTs positioned as tools to promote the relatively new Homo economicus aspirations? This should be the primary purpose of ICT4SDG – especially its 4C's role in SDG17.

The "how" to refocus the ICT sector more towards SDG17 in support of all other SDGs than it currently is, will be suggested in the final conclusions and proposed strategies for implementation of a holistic ICT4SDG approach in South Africa.

2.7 SDG6; SDG7; SDG13; SDG14; SDG15; and SDG8:

Water, Sanitation and Energy (SDG6+SDSG7); Climate Action and Change (SDG13); Aquatic and Terrestrial Life and their Habitats (SDG14 and SDG15); How they all relate to the World of Work (SDG8).

In this discussion document, the five selected SDGs and their complex relationships with SDG8 (Decent Work and Economic Growth), are examined as holistically as possible within the limited scope of this document. Their close interdependencies and interrelationships, especially the causal relationships between them all, and especially with SDG8, position them as critical inputs for such a holistic approach. The discussions and references provided are, for practical necessities, limited to very short summaries of the very broad spectrum of evidence and knowledge available about each SDG, its relationship with all the others, and to the people and multicultural communities of South Africa. The discussions and reference lists are intended to provoke further discussions, refinement of existing strategies and action-programmes, and to encourage further research and development with a strong focus on the base of South Africa's development pyramid, specifically the triple threats of inequality, poverty and unemployment.

2.7.1: SDG6: Water and Sanitation: *Ensure availability and sustainable management of water and sanitation for all* (https://sdgs.un.org/goals/goal6).

Quotations from key references concerning this SDG introduces the related South African challenges well:

a. **The National Development Plan 2030 (NDP)**: Our Future – Make It Work: https://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf.

South Africa's National Development Plan, launched on 15th August 2012, reinforces the centrality of water and sanitation in national development, the relationship between water and sanitation and all other critical life-sustaining challenges and threats, embodied in all seventeen SDGs. This centrality features prominently throughout the NDP in every section, with a specific focus provided in the section "Water and Services" starting on page 177 (181 of 489).

The architects of the NDP, the National Planning Commission of South Africa, understood and noted the numerous complexities and shortcomings in the nation's water and sanitation sectors, and included several criticisms with recommended solutions:

Accountability and Responsibility: Page 60 (63 of 489)

"A recurring theme in the plan is that the accountability chain needs to be tightened. The public needs a clearer sense of who is accountable for what. There need to be systems to hold all leaders in society accountable for their conduct.

Weak, poorly performing systems make it hard to attribute responsibility, with the frequent result that no one is accountable. The plan cites the example of what happens when the water in a town is found to be undrinkable. The media blame the Minister of Water Affairs. The community blames the mayor. The mayor blames the head of the water utility. The head of the water utility blames the technical engineer. The engineer says that the maintenance budget has been cut for the past three years and now the water is undrinkable. The head of finance in the municipality says that the budget was cut because personnel costs have crowded out maintenance expenditure. The mayor argues that the salary structure is negotiated at a national level by the South African Local Government Association. The association says that municipalities can opt out of these agreements if they are unaffordable. And so on"

Some of the solutions included the establishment and/or reinforcing of the Department of Performance Monitoring and Evaluation (DPME), and called for "*shareholder compacts with state-owned enterprises and performance agreements with Cabinet ministers to be made public*":

The "challenges" outlined in the above extract from the 2012 NDP suggests factors far beyond the environmental, technical, and even resource scarcity of the actual national challenges – they are strictly human in nature, and thus demand human-focussed interventions for resolution, mainly through life-long learning within SDG4 – Quality Education. The impact of climate change and the current drought period which began to intensify in 2018, exposed dramatically the nation's water and sanitation challenges, and the numerous human failures that were recognised by the NDP architects at the formulation stages of the plan. The graphic illustrations and references provided in Annex 2.6.1, and additional very recent media reports of continuing sewage pollution in built-up low-income residential areas in South Africa, are evidences of the seriousness of South Africa's SDG6 challenges.

b. **The *National Water and Sanitation Master Plan Volume 1: Call to Action v 10.1 | 31 October 2018:*** The "Call to Action" by South Africa's Master Plan for SDG6 draws directly from the nation's Constitution:

The Constitution of South Africa concerning SDG6 Goal and Targets:

Firstly, the values of the Constitution include those of human dignity, the achievement of equality and the advancement of human rights and freedoms.

Secondly, the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that

i. *prevent pollution and ecological degradation*
ii. *promote conservation; and*
iii. *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*

Thirdly, the Constitution states that everyone has the right to have access to sufficient food and water.

Fourthly, the Constitution states that the property clause may not impede the state from taking measures to achieve land, water and related reform, to redress the results of past racial discrimination.

These constitutional imperatives, combined with the national water and sanitation policy papers, the National Water Act and the Water Services Act, give the mandate to the water sector to:

- *Provide universal and equitable access to reliable water supply and sanitation services*
- *Protect, manage and develop the nation's water resources in a manner that supports justifiable and ecologically sustainable economic and social development*
- *Transform access to water to redress the racial imbalances created by apartheid.*

The full Master Plan proceeds to introduce the nation's "water crisis", as it relates to the nation's NDP and related SDG processes, as follows:

The *National Water and Sanitation Master Plan Volume 1: Addressing the crisis*

"South Africa is facing a water crisis caused by insufficient water infrastructure maintenance and investment, recurrent droughts driven by climatic variation, inequities in access to water and sanitation, deteriorating water quality, and a lack of skilled water engineers. This crisis is already having significant impacts on economic growth and on the well-being of everyone in South Africa". (Addressing the Crisis: Page 2 (9 of 403: Online copy available *Here*)	1. Over 3 million people still do not have access to a basic water supply service and 14.1 million people do not have access to safe sanitation; 2. Only 64 % of households have access to a reliable water supply service; 3. 56% of waste water treatment works and 44% of water treatment works are in a poor or critical condition. 11% of all are dysfunctional; 4. More than 50% of South Africa's wetlands have been lost, and of those that remain, 33% are in poor ecological condition; 5. Only 5% of agricultural water used is by black farmers; 6. 41% of municipal water does not generate revenue. 35% is lost through leakage; 7. Municipalities are losing about 1660 million m^3 per year through nonrevenue water. At a unit cost of R6/m^3 this amounts to R9.9 billion each year; R33 billion more is needed each year or the next 10 years to achieve water security.

c. **The World Bank: Water: An Overview:** https://www.worldbank.org/en/topic/water/overview

> **Water touches every aspect of development** and it links with nearly every Sustainable Development Goal (SDG). It drives economic growth, supports healthy ecosystems, and is essential and fundamental for life itself.
>
> Some 2.2 billion people around the world do not have safely managed drinking water services, 4.2 billion people do not have safely managed sanitation services, and 3 billion lack basic handwashing facilities. Gaps in access to water supply and sanitation, growing populations, more water-intensive patterns of growth, increasing rainfall variability, and pollution are combining in many places to make water one of the greatest risks to economic progress, poverty eradication and sustainable development.
>
> The consequences of such stress are local, national, transboundary, regional, and global in today's interconnected and rapidly changing world. Consequences will be disproportionately felt by the poorest and most vulnerable.

Nearly all the developing world's major man-made water reservoirs were designed and developed with financial and technical assistance from the World bank, for both the provision of safe, clean water for human consumption, food production, industrial use, and to secure global environmental functionality and sustainability. Water storage and management facilities also enable the generation of environmentally-friendly electrical energy through hydroelectric dams. As will be discussed further in the following paragraphs, there have been numerous successes of these generally very large water and energy generation projects, and regrettably, a significant number of unexpected and undesirable results in both water and energy sectors.

d. **The International Telecommunication Union (ITU):** https://www.itu.int/en/sustainable-world/Pages/goal6.aspx:

> More than 800,000 deaths are caused each year by unsafe water and poor sanitation. ICTs are particularly important for smart water management, facilitating the measurement and monitoring of water supplies as well as necessary interventions, and enabling practitioners at the local level to ensure the equitable and sustainable extension of water, sanitation and hygiene (WASH) services. As the costs of ICTs continues to fall, governments will be able to better integrate ICTs into monitoring and evaluation frameworks to optimize operations and improve the quality of service.
>
> *Diseases from **unsafe water and lack of basic sanitation kill more people every year than all forms of violence, including war**. Children under five years old account for 90% of the 30,000 deaths that occur every week from unsafe water and unhygienic living conditions. (Source: https://www.charitywater.org/)*

Eight hundred thousand annual deaths from unsafe water and poor sanitation worldwide are significant, tragic, and wholly unnecessary. While data for mortality rates that can be attributed to unsafe/unclean water consumption and inadequate sanitation are sketchy, the World Health Organization in its 2016 assessment (WASH) ranks South Africa 133 out of 183 countries world-wide, and 11 out of 54 continental African countries with valid reports. South Africa has the 7th highest GDP per Capita in Africa (World Bank Data 2019), suggesting once more that the country's investments in its citizen's development is either inadequate or less than optimal. This is reflected in the world-record high income inequalities discussed in Section 1.2.2 of this document.

The current COVID-19 pandemic, with its increased demands for water-borne sanitation (e.g., frequent hand-washing with soap), is just one reminder of humanity's total dependence on clean water and hygienic sanitation for survival. The images, media reports, and references provided in Annex 2.6.1**:** SDG 6 Sanitation: Impact on South African Citizens', illustrates the scale of South Africa's SDG6 challenges.

e. **The United Nations Department of Economic and Social Affairs Sustainable Development**: An Overview of Water: https://sdgs.un.org/goals/goal6

This highly informative high-level overview of SDG6 correctly focusses on the current threats of COVID-19, highlighting the following troubling statistics:

- Before COVID-19: (a) "*Despite progress, billions still lack water and sanitation services*"; (b) "*2.2 billion people lack safely managed drinking water*"; (c) "*4.2 billion people lack safely managed sanitation services*";

- COVID-19 Implications: (a) "*3 billion people worldwide lack basic handwashing facilities at home*"; (b) "*Two-in-five healthcare facilities worldwide have no soap and water or alcohol-based hand rub*"; (c) "*Water scarcity could displace 700 million people by 2030*" (NDP and SDG target completion date).

While this SDG global thinktank must focus on global issues, each country is obliged to use these issues to take a closer look at its own SDG challenges and develop effective responses. South Africa has good starting statistics compiled by the infrequent STATS SA surveys, but these need to be authenticated, verified, and updated, continuously in a virtuous cycle as so strongly recommended by the nation's NDP. Could this be a secondary activity of the ICT solutions to South Africa's SDG challenges that will follow this discussion document?

As pointed out strongly by the nation's National Water and Sanitation Master Plan, South Africa faces a multidimensional water and sanitation crisis. The nation's base of the pyramid population is powerless to reverse this crisis – the poor and socially marginalised are the central victims of it. A holistic approach to all the interrelated SDGs, especially the critical SDG6 in its entirety, needs to be addressed most urgently.

2.7.1.1: The Convergence of Energy, Water and Sanitation: SDG6 + SDG7: Big Dams for Water Consumption, Agriculture, Food provision, Sanitation, Electrical Energy Generation, and Recreation (SDG6 + SDG7), and their relationship with SDG8:

Given the very close interdependencies and relationships between SDG6 and SDG7, the two are discussed together, with general commentary on their impacts and additional interdependencies on all other SDGs, especially SDG8 which is a key component of South Africa's triple threats on multidimensional growth with social stability. The discussion begins with a very short list of two key national reference documents:

From South Africa's SDG Country Report 2019

4.4.3 SDG 6: Ensure availability and sustainable management of water and sanitation for all. SDG 6 seeks to ensure availability and sustainable management of water and sanitation for all. Access to safe water and sanitation and sound management of freshwater ecosystems are essential to human health and to environmental sustainability and economic prosperity (UN, 2019).

From South Africa's National Water and Sanitation Master Plan 2019

Volume 1: A Call to Action: Ready for the Future and Ahead of the Curve: https://www.gov.za/sites/default/files/gcis_document/201911/national-water-and-sanitation-master-plandf.pdf

Volume 2: Plan to Action: Ready for the Future and Ahead of the Curve: October 2018: https://cer.org.za/wp-content/uploads/2019/02/Volume-2-Plan-to-Action.pdf

Volume 3: Schedule of Action: Ready for the Future and Ahead of the Curve: https://cer.org.za/wp-content/uploads/2019/02/Volume-3-Schedule-of-Action.pdf

South Africa's Master Plan has been very well conceived and presented – the challenge lies in the action and implementation. Annex 2.6.1: *SDG 6 Sanitation: Impact on South African Citizens,* verifies the Master Plan's recognition of SDGs as a "crisis". This discussion document simply restates the urgency for action.

SDG6 – Clean Water and Sanitation, and its SDG7 by-product:

Brief overview of the state of SDG6 and SDG7 in South Africa

Table 2.6.1.1: South Africa's Water, Sanitation, and Energy Summary – 2020 estimates or closest available data

Resource Type	Estimated Capacity	Annual Consumption	Reference Links
SDG6 - Clean water	• 212 dams, 37 km^3 maximum capacity: 77% contribution; • Ground water: 9% contribution; • Recycled water: 14% contribution; • Annual river runoff: 49 km^3	• Availability: 1100 m^3 per capita per annum; • 98% utilization of predicted availability • Total national annual consumption: ≈5km^3 • 1.5 km^3 annual wastage through poor O&M of water infrastructure	(1) List of dams in South Africa (2) 2nd South Africa Environment Outlook: Chapter 8 – Inland water (3) National Water and Sanitation Master Plan (4) Africa Check: South African Water Consumption (5) MIT 2017: Water Access in South Africa

Key reference: The Lesotho Highlands Water Project (LHWP)

Project, conceived circa 1950, planned completion 2016, revised completion 2026, estimated total costs vary between R 32 billion and R 120 billion depending on source and dates of estimate and exchange rate used. Lesotho technical parameters: water capacity: >2 km^3; Electrical energy ≈ 1GW; water delivery capacity ≈ 150 m^3 per second, of which Lesotho consumption is just 2 m^3 per second: Objectives: (a) Affordable hydroelectric energy and access to clean water for national survival and to fuel Lesotho's economic growth; (b) to alleviate Lesotho's massive social challenges which include poverty levels approaching 50% of the population; (c) Derive revenues from sharing water resources with neighbour South Africa – up to 2,000 km^3 per annum water exports to South Africa planned: Cost/benefit analysis of LHWP for Lesotho and South Africa discussed in "*EXPLAINER: HOW MUCH MONEY LESOTHO EARNS FROM SALE OF WATER TO SA*".

The well-intentioned LHWP continues to be plagued by unexpected and undesirable outcomes, including well-documented failures to meet the primary objective of poverty alleviation, and verified levels of financial mismanagement and corruption. Critical analyses of these criticisms include:

- "*Lesotho water project failed to cut poverty, critics say*"
- "*The LHWP II is delayed, expensive and wastes water*"
- *"No new dawn over Lesotho water supply to Gauteng"*
- The World Bank, a major funding agency and coordinator of several multilateral investment organizations, added to the criticism in two 2010 reports: "Lesotho Highlands Water Project: *Communication Practices for Governance and Sustainability Improvement*" (PDF at https://openknowledge.worldbank.org/handle/10986/5945); and a Project Assessment Report dated May 4, 2010. The World Bank identifies communication challenges within and between all stakeholder levels as one of the critical factors contributing to poor project implementation and outcomes.

The communications challenges, especially those related to the access to knowledge by and for all stakeholders - top-down design, management and monitoring, bottom-up understanding and inclusive engagement – are the raison d'être of this discussion document.

SDG6 - Sanitation

South Africa's scientific and technological knowledge and competence of all challenges related to safe waterborne public sanitation systems for all is very well developed, as are the national skillsets required to build, operate and maintain such systems. But all is not well as the prolific well-publicised evidence shows. The major national failing is that the national sanitation networks and systems are not shared equitably amongst all South Africans, far too many South Africans are deprived of the most basic modern sanitation services. Mismanagement and inadequate selection of competent South Africans to lead the sector are also contributory factors.

The divisions between the safe sanitation "haves" and "have-nots" in South Africa follows the extreme levels of inequality and poverty depicted in the statistical data and charts presented in section 1.2 of this document. The underlying causes for these deficiencies are strictly human – not technical. The most recent illustrations of these deficiencies are provided in Annex 2.6.1.

South Africa ranks amongst the 30 driest countries in the world. Poor rainfall levels, about half the world's average annual rainfall, leads to relatively low river flows that severely limit the nation's potential for: (a) the provision of enough clean water for direct consumption by South Africa's human population and other lifeforms; (b) economic growth through commerce and industry, including agriculture and food production; (c) waterborne sanitation and therefore disease and pandemic control and prevention, and therefore the full range of health and wellbeing challenges related to SDG3; and (d) provide affordable, clean, reliable, sustainable, modern energy for all, and in so doing, support the water needs of human development through growth of the commercial, industrial, and agricultural sectors. These are the principal raison d'être for the construction of virtually all major dams.

Further references on the impact of water and sanitation deficiencies on South Africa's poorest population include, but are not limited to:

a) **Big Hydroelectric dams are not the answer:** A growing body of multidisciplinary economic, scientific and social evidence suggests that most big dams in the world tend towards threats to development rather than the intended economic panacea:
   - The USA has removed more than 1700 dams since 2012, escalating to 90 dam removals per year by 2019. The USA's National Inventory of Dams (NID) lists 91,468 dams ranging from very small (approximately the size of South Africa's smallest listed dam – the Grey Dam in Makhanda), to relatively large ones, e.g., the Elwha Dam with its reservoir capacity about 1,000 times South Africa's largest Gariep Dam and Reservoir, but about 4,000 times smaller than Southern Africa's Kariba reservoir and hydroelectric dam. This dam removal is being followed by the even larger Klamath River Renewal project, the removal of four relatively large dams on the Klamath river system, all to restore the local (indigenous) population's humanity, recover the ecologically damaged land, flora and fauna ecosystems, and bring back the 76% of fish stocks destroyed by misconceptions of "economic progress" (National Geographic July 2020: 76% decline in fresh water fish species in less than 50 years);

- While Africa continues to fuel its misconstrued belief that economic, and especially social benefits, will "trickle down" from large hydroelectric and water storage dams, Europe is engaged in a massive dam removal programme. More than 5,000 big and small dams and weirs have already been removed, with tiny socioeconomically progressive Estonia contributing to about ten removals to the programme in the current decade;
- In general, big dams have been severely criticised by numerous researchers, but too many especially developing nations find it extremely difficult to wean their national growth policies and personal ambitions from the attractiveness of big dams. A small sample of such research criticisms include:
  - World Bank criticism of big dam projects: Hydropower Dams and Social Impacts: *Sociological Perspective* January 1997 - a special focus on failures of national policies, implementation and enforcement related to population displacement and involuntary resettlement. Nearly seven million persons displaced by year 2000 from 153 dams with more than 4,000-person displacements each. More than 300,000 people were displaced by the Cahora Bassa and Kariba dams on the Zambezi River;
  - IUCN and World Bank: Proceedings of the April 11/12 1997 Workshop: Large Dams – Learning from the Past – Looking at the Future. The workshop was convened as a result of numerous well-intentioned very large hydroelectric dam constructions failing to meet expectations, especially expectations concerning the plight of the poor who were obliged to relocate from the planned flood plains – their sustainable quality of lives mostly worsened – they did not share in the benefits of the massive investments in human costs, land and money;
- The commitment by the World Bank to "*learn from the past*" in order to build a better future for all has been cast in doubt:
  - The Guardian, July 2013: *The World Bank is bringing back big, bad dams*: (a) "*A renewed focus on mega-dams will make matters worse in Africa and benefit companies, not people*"; (b) "*The Inga 1 and 2 dams on the Congo River are a case in point. After donors have spent billions of dollars on them, 85% of the electricity in the Democratic Republic of Congo is used by high-voltage consumers but less than 10% of the population has access to electricity. The communities displaced by the Inga and Kariba dams continue to fight for their compensation and economic rehabilitation after 50 years*". *And South Africa is thinking about investing in the Grand Inga III, and to build a massive high voltage transmission link between DRC and South Africa!* Hydro Review March 2020: Does South Africa need the Grand Inga project?;
  - Water Power Commentary on Big Dams: Revisiting the debate on large dams, 3 April 2020: This report discusses the work of the World Commission on Dams (WCD), launched at the IUCN/World Bank Conference in 1997. The report suggests that with all the global knowledge accumulated about the impact of big dams on the global poor, the "lessons learned" have been quickly forgotten – the mistakes of the past are repeated continuously, with devastating results on Africa's and the world's poorest populations;
  - China: Will China's immense Three Gorges Dam engineering feat become a pyrrhic victory – a mammoth human disaster? Many think it may: (a) Asia Times, July 2020: "*Three Gorges Dam deformed but safe, say operators*"; (b) The Japan Times, September 2020: "*The big China disaster that you're missing*"; (c) The World Bank was and remains a major investor in the Three Gorges Dam (new funding proposal 2017), but, some of the World Bank's own analyses have observed that "*Initial analyses Indicate that resettlement of people displaced by the reservoir is the single largest problem created by the dam*" (World Bank Technical Paper No. 110, 1989: Dams and the Environment).
- To conclude this short summary on large hydroelectric generation dams, it is useful to review the major Southern African regional big dam disasters, the construction of which was supported by South Africa in the country's search for energy that it cannot produce through traditional methods:
  - The Zambezi River: Cahora Bassa and Kariba. These two dams, built with significant financial support from the World Bank prior to and after the political liberation of Mozambique, Zambia and Zimbabwe, resulted in vast population involuntary resettlements, often forced through

official violence, to vacate the resulting huge flood plains and downstream river ecosystem changes. Many of these "resettled" populations are still struggling to acquire decent lifestyles and work. All three countries continue to face major economic growth challenges, even after the promised economic utopias. Key references include (a) "*Damming of the Zambezi River - Reassessing hydropower reliance in Southern Africa*"; (b) MDPI 2016: *A Survey near Tambara along the Lower Zambezi River";* (c) California Institute of Technology (Caltech) 2015: The Kariba Case Study: "*The involuntary resettlement of 57,000 people within the reservoir basin and immediately downstream from the dam was responsible for serious environmental degradation which was one of a number of factors that left a majority of the resettled impoverished*". And now, Zimbabwe plans to build yet another large hydroelectric dam downstream from *Mosi-oa-Tunya*, the magnificent Victoria Falls - the US$4 billion Batoka Gorge Dam. Mozambique, at the same time, is well advanced in its planned construction of the Mphanda Nkuwa Hydropower Project, both projects raising once more the spectre of mass population impoverishment that resulted from the Cahora Bassa and Kariba experiences.

- **South Africa specific water challenges**: South Africa's water-stressed environment prevents the nation from developing large hydroelectric power generating projects, hence most of the nation's hydro-generated electricity must be imported from its neighbours and sub-regional partners. There are hidden costs in this strategy though, most of them directly linked to environmental changes: (a) drought depletions of generating capacities in major installations like Kariba (see WEF 16 report) have become a reality; (b) climate change-driven weather conditions like flooding and storms that impact the hydro-generation and transmission of electricity, and which threaten mainly poor rural dwellers in the dam's flood plains; (c) sociological setbacks that can, will, and often have led to socio-political instability.

  There are also local conditions that impact South Africa directly:

  - Poor management and natural phenomenon that impact South Africa's available water resources directly:
  - Climate change, e.g., rising incidences of drought that impact surface and ground water capacities and qualities, e.g., eastern and western Cape provinces;
  - Critical highly publicised reports of rural and urban water shortages, like the Makhanda water crisis, which is exacerbated by extreme socioeconomic inequalities. Water shortages have devastating impact on the poor, mainly black South African population. The "economic have's" receive minimum media coverage, they have capabilities and capacities to obtain and store water from the intermittent public supply, or the ownership of wells and onsite water storage facilities. See article "*Makhanda residence drawing water from sewer manholes*";
  - Water management deficiencies have resulted in extensive pollution of vital water resources, e.g., the Vaal River system as illustrated in Annex 2.6.1.1. Even more tragic is the nearly irreversible pollution of a significant water reservoir which can, but does not, provide water to the water-stressed commercial centre of the nation – Gauteng. *The tragedy of Hartbeespoort Dam***,** in which 186,400 million litres of water has been rendered unusable for human consumption or for farming, by uncontrolled pollution by sewage (Cyanobacteria Toxins, and "more shockingly", nuclear waste);
  - Acid mine groundwater pollution. The remnants of historical mining continue to demand costly treatment in Gauteng and other former mine precincts (Wits University 2018: The heat of acid mine drainage"). Such pollution has reduced the quality of water in numerous local rivers and streams, rendering these water resources unsuitable for human consumption. It has also contributed to dwindling qualities and quantities of freshwater fish, rendering the few that survive pollution unsuitable for human consumption. The water is generally unsuitable for agriculture.

This short summary of South Africa's clean water challenges suggests that there are no "quick fixes". Only long-term remedies are practical, and these must begin with the wide dissemination of information and knowledge for and to the current economic, political, and intellectual "top-down" leaders of the nation, and for and to the main victims of the water crises, the poor, especially the children of the poor. The ICT4SDG6

initiative that targets all South African stakeholders and their external development partners, is the best platform for such knowledge dissemination and acquisition, the primary purpose of this discussion document.

SDG7 – Affordable Clean Energy for All:

Table 2.6.1.1 Continuation: South Africa's Energy Summary – 2020 estimates or closest available data			
Resource Type	**Estimated Capacity**	**Annual Consumption**	**Reference Links**
Total Electrical Energy Generation – SDG7	58 GW	207 TWh.	(1) IEA 2019 Analyses (2) USAID 2020 "Fact Sheet" (3) CSIR 2017-2050 Forecasts
Related references: (1) 1,000 MW imported from Cahora Bassa, Mozambique; consideration of a further 900 MW; Transmission lines remain vulnerable to inclement weather and climate change related natural disasters, e.g. extensive transmission line failures during massive floods in years 2,000 (extreme rainfall); 2007 (Cahora Bassa overflow and Cyclone Favio); 2010 (La Niña event); Exceptionally heavy rain in 2015, the South East Africa Monsoon Changes; Cyclone Idai (2019); Cyclone Eloise (2020-21); with more major climate events in future resulting from climate change. (2) High level consideration of investment in the (controversial) new Inga 3 dam project in DRC, expectation of 2.6 GW import: Transmission costs and reliability of great concern: Critical comment: The Conversation, July 2020: Local wind and solar generation offer better prospects, and the Hydro Review analysis of March 2020: Does South Africa need the Grand Inga project? The transmission lines (and substations) for such a venture will need to traverse several southern African countries depending on the chosen route, thus vulnerable to economic/political/environmental factors in each transit country. (3) The best prospects for reliable, sustainable clean energy for South Africa remain renewable solar and wind derived electricity generation, with nuclear as a costly alternative waiting for technological advances in fusion reactors.			

The greatest challenge for South Africa's energy sector is not only the nation's lack of capacity or capability to produce all or any forms of energy needed by the nation, immense as these challenges may be. The major challenge is the equitable distribution of the energy available to the nation. It is the failure of the nation to empower all of its people, ensuring they all have enough transformative quantities and qualities of clean energy to support such transformation. It is the affordability of energy for individual, family, and community use that impacts the nation's human and economic development the most. A first approximation of electrical energy affordability in South Africa is:

- The 2020 national Upper Bound Poverty Line (UBL) provided by STATS-SA: R 1,268 per month
- Low/mid income electricity price in 2020 (Moolman & Capes 2021): R 1,178 per month
- S. A. residents living in multidimensional poverty (55.5% - UN HDR 2020): 33 million

33 million, or 55.5% of the nation in 2020, are obliged to spend 93% of their monthly expenditure capability just to match the average electricity consumption by their high- and middle-income compatriots, in their own country. Greater rigour is obviously required in this analysis before firm conclusions can be made, or responsive programmes developed. Such analyses must be undertaken as part of the implementation research that will be recommended. The available statistics are invaluable as an early warning call to action.

The South African energy sector has clearly been problematic for a very long time, from even before the onset of national democracy in 1994. The current series of judgement errors began during the economic and institutional structural reforms that followed the final end of apartheid in 1994. These errors of judgement are illustrated by former President Thabo Mbeki's apology for the nation's electrical energy problems (Engineering News 2007). And now, in 2021, twenty-seven years after democracy, the following verifies the ongoing energy crises:

Key Extracts from the State of the Nation Address by President Cyril Ramaphosa, 11 February 2021:

1. "Restoring Eskom to operational and financial health and accelerating its restructuring process is central to this objective"
2. "We are working closely with Eskom on proposals to improve its financial position, manage its debt and reduce its dependence on the fiscus"
3. "Despite this work, Eskom estimates that, without additional capacity, there will be an electricity supply shortfall of between 4,000 and 6,000 megawatts over the next 5 years, as old coal-fired power stations reach their end of life"
4. As part of the measures to address this shortfall, we will in the coming weeks issue a request for proposals for 2,600 megawatts from wind and solar energy as part of Bid Window 5
5. "Eskom, our largest greenhouse gas emitter, has committed in principle to net zero emission by 2050 and to increase its renewable capacity"

South Africa's poor, more than half the nation's population who reside in both rural and urban areas, will continue to face extreme deprivation of developmental quality energy, water, and sanitation resources and services, unless and until the national policy and its implementation prioritizes their needs and develops creative innovative action programmes to alleviate those deprivations. The National Development Plan 2030 (NDP), approved in 2012, recognised the needs and urgency for effective action, but the 2030 target set for completion of the NDP will not be met. Similarly, the desired sustainable development goals and their targets discussed in this document will not be fully realized by the target 2030 end date. A successor to the SDGs will be needed, in much the same way that the SDGs were the successor of the largely unmet Millennium Development Goals and their targets. But, the conflicts between South Africa's preferred macroeconomic growth models, and the socialist-leaning policies and action programmes needed to reduce inequality and poverty, will continue unabated. The best response must therefore be the very long-term solutions that begin with education of the poorest children and youth in the land – the more than 60% of the nation's children who live in poverty, so that they may acquire the knowledge and wisdom to develop creative solutions in future, thereby contributing to economic growth, instead of being a drain on the economy as they are at present.

This discussion document is about SDG8 – Decent Work and Economic Growth. Neither decent work nor economic growth can be provided or created while more than half the nation's population struggles to access clean water, hygienic sanitation, clean energy, and the knowledge and skill sets demanded to produce, protect, and use them all. Failure to demonstrate visible, measurable progress in overcoming the challenges espoused in both the NDP and the SDGs will most likely result in socio-economic-political turmoil, as human history has proven so many times in the past. Numerous historians, scientists and philosophers have addressed the inequality conundrum, and the political turmoil that results from it.

2.7.1.2: The ICT Tool as enabler of Knowledge Acquisition for SDG6, SDG7, and therefore SDG8:

Inequality and poverty lie at the core of the SDG challenges under discussion in this section. These modern very human challenges are not new: all religious and life philosophies have attempted to address these twin challenges for as long as today's historians can remember. Early Buddhist, Hindu and Taoist scriptures wrote about and warned of the dangers of inequality as far back as the 15th century BCE. Ancient Greek philosophers like Aristoteles and Plato proposed the creation of a welfare state to overcome inequality and poverty nearly three millennia ago. More recently socialist-leaning philosophers like Marx and Engels joined their earlier capitalist proponents like Adam Smith, the so called "father of capitalism", who wrote in The Wealth of Nations - "*All for ourselves and nothing for other people, seems, in every age of the world, to have been the vile maxim of the masters of mankind*". In this 21st century, historians like Walter Scheidel and his dismal historical account of the factors that reduce inequality in his book "The Great Leveler", and in his May 2020 video discussion of "*How to Fix Democracy*", is joined by the popular Jewish historian Yuval Noah Harari ("*Technology risks dividing the world into wealthy elites and exploited 'data colonies,'*"), who asks "*Could advances in technology, genetics and artificial intelligence lead to a world in which economic inequality turns into biological inequality?"* They all recognise that inequality lies at the heart of all socio-economic-political ills that impact all nations, and that technological advances will most likely fuel inequality further, unless inequalities in access to and use of technology are reduced or eliminated.

Access to, and the ability to use, appreciate, respect and protect all the technologies associated with SDG6 and SDG7 can and will reduce inequality, even at the base of the development pyramid. Deficiencies in any of these aspects will exacerbate the economic and social harm perpetrated by the failure of SDG8 – work. Pro-poor ICT4SDG can/must help.

South Africa's inequalities in access to, and ability to utilize, humanity's most ancient and potent tool for information and knowledge sharing, the ICTs, is described in numerous research documents, including those written by the author of this discussion paper, for example, in the content and list of references in http://www.compcom.co.za/wp-content/uploads/2019/08/Walter-Brown.pdf. There are numerous ways of providing clean water, safe sanitation, and electrical energy using the most appropriate and cost-effective technologies available, in both rural and economically stressed urban areas of South Africa, but without the knowledge and skills needed, communicated to all via the ICTs, none of these technologies can be maximised or scaled up to resolve the nation's challenges. The knowledge of these technological solutions and their

human impacts, which sustained Homo evolution throughout its millions of years into today, is fading in favour of new technological solutions seeking new problems, often forgetting old problems and the lessons derived from them. The focus of new technological innovations too often favours new profit generation and maximization through the sales of the latest, often short-lived popular gizmos, with few applications for the resolution of the numerous inherited human challenges.

The ICTs can, perhaps must, be used to recover the fading memory of historically tried and tested human cohesion and values. There is an urgent need to "defragment" the confused mess of good, bad, and ugly information overloads in today's big data, which has become the driving force for many young, and "wannabe" ICT innovators today. But, access to suitable affordable ICTs must first breach the nation's mystical "digital divides" - the invaluable information and knowledge distributed by ICTs - the "blessings from heaven" referred to by US President Buchanan in his 1858 message to the Queen of England (Table 3.0.2 (b) in the next section), must descend from those lofty "computers in the clouds", back to mother earth to solve real earthly human challenges.

2.7.2: SDG13, SDG14, SDG15, and their relationships with SDG8:
(a) SDG13: *Take urgent action to combat climate change and its impacts*; (b) SDG14: *Conserve and sustainably use the oceans, seas and marine resources for sustainable development; (c)* SDG15*: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.*

In this section of the discussion document, a closer look at "*man's inhumanity to man*" (Cambridge Dictionary) through e.g., local and international genocide and racism, is provided, posing the question that if "mankind" cannot protect and support its own species, how then can it protect and support all other lifeforms and physical environments that enable their existence? The quotation by Henry Beston is an apt introduction to this aspect of the discussion:

"For the animal shall not be measured by man. In a world older and more complete than ours they move finished and complete, gifted with extensions of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendour and travail of the earth." — Henry Beston, The Outermost House: A Year of Life on the Great Beach of Cape Cod

Henry Beston (1888 to 1968), a much admired academic, author and naturist, reminds us that humans are but one component of nature, neither superior nor inferior to any other life forms or the life-sustaining physical environment in/on which they live. Evidence from a growing number of researchers suggests that the mutually dependent relationships between all lifeforms and the living environment has been the driving force of Homo evolution throughout its nearly 3 million years that led to us – Homo sapiens. Henry Beston's timely reminder of other animals' role on earth must serve as a warning of the destructive nature of modern humankind, the destruction of the world's biodiversity and its consequences on the expected mass extinctions summarised briefly in the text box on mass extinctions that follows.

Biodiversity destruction must be viewed as a crime against humanity, and a crime against the lived environment, the latter defined as "all aspects of the environment that humans, or other living organisms, have inhabited, experienced, shaped and/or been shaped by, in the past, present and/or the future"

Are modern humans the principal architects of climate change i.e., SDG13, and its resulting desertification, land degradation, and wide-scale pollution? Are these modern humans responsible for the destruction of the oceans, rivers, seas, wetlands, marine and all lifeforms that live in or depend on the life-giving ecosystems, i.e., everything related to SDG14? Can or must humans be blamed for the whole range of terrestrial ecosystems deterioration and destruction, including all life on or in the physical land environment, all earth's flora and fauna, and the earth upon and in which they survive (SDG15)?

Clearly, nature can on its own accord be a major destructive force which leads to climate change and environmental destruction – the factors that caused the past mass extinctions listed in the text box that follows. More recently, just 74,000 years ago, the Mount Toba event which nearly caused the extinction of modern humans is a good example of nature charting its own course. But, humankind's quest for more of everything adds to nature's wrath, by choosing to exacerbate climate change and all its consequences, in its seemingly blind pursuance of the end objectives of Homo economicus: "*All for ourselves and nothing for other people seems in every age of the world to have been the vile maxim of the masters of mankind"*. This frequently repeated quotation (in this document) is yet another reminder of Adam Smith's insight, the so-called "father of capitalism" in his warning against humankind's uninhibited neoliberal free market economics. The modern human focus on material and financial accumulation above all else is receiving criticism from a growing number of economists, scientists, historians, philosophers, and many leading thinkers, including Peter Fleming in his 2017 polemic "*The Death of Homo Economicus review – why does capitalism still exist?*". The mounting criticisms of capitalism, or Homo economicus which is "not dead yet" as inferred by many economists, have very little to do with political-economic ideologies (capitalism, communism, socialism, etc.), they have everything to do with life sustainability, for humans and for every other life form, and the environment within which they all live, irrespective of human ideological outlooks.

Mass Extinction:

Definition: The global annihilation and extinction of at least 75% of all species in existence across the entire Earth, over a "short" geological period of time, about 2.8 million years of the estimated 3.5 billion years that living organisms have thrived, multiplied and diversified to occupy every ecosystem on Earth.

Key References:

1. UN Report: Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating': UN 2019: "*Current global response insufficient; 'Transformative changes' needed to restore and protect nature; Opposition from vested interests can be overcome for public good; Most comprehensive assessment of its kind; 1,000,000 species threatened with extinction"*
2. Are We in the Middle of a Sixth Mass Extinction? Science 2011: "*Earth's creatures are on the brink of a sixth mass extinction, comparable to the one that wiped out the dinosaurs. That's the conclusion of a new study, which calculates that three-quarters of today's animal species could vanish within 300 years"*
3. Sixth mass extinction of wildlife accelerating, scientists warn: The Guardian, June 2020: "*Analysis shows 500 species on brink of extinction – as many as were lost over previous century*"
4. What is a 'mass extinction' and are we in one now? Article lists the previous 5 mass extinctions: (1) **The Ordovician Mass Extinction**, 440 million years ago, 85% species rendered extinct; (2) **The Devonian Mass Extinction**, 375 million years ago, 80% species eliminated; (3) **The Permian Mass Extinction**, 250 million years ago, 96% species destroyed; (4) **The Triassic-Jurassic Mass Extinction**, about 200 million years ago, more than half of all living species eliminated; (5) **The K-T Mass Extinction**, about 65 million years ago – asteroids and/or meteors killed the dinosaurs and many other species – 75% in all.
5. **The Sixth Mass Extinction** – Are we in it? Are we causing it? Numerous scientific articles and videos, including Arizona State University's (ASU) "The Great Debate on Extinctions", moderated by theoretical physicist Lawrence Krauss, with a panel of eminent scientists including poet and naturalist Diane Ackerman; paleoanthropologist Ian Tattersall; ASU President Michael Crow; planetary scientist Lindy Elkins-Tanton; Geneticist Svante Pääbo, sequencer of the Neanderthal genome; and Prof. Neil Gershenfeld, Director of MIT's Centre for Bits and Atoms, who works to "bring the university to the learner, anywhere on earth, through Fab Labs: The Great Debate can be viewed at: https://www.youtube.com/watch?v=BFcZG_QVsT8

Humankind's contribution to climate change and its consequences must remind us of one of many very dark periods of human history – the deliberate greed-fuelled near genocidal extinction of America's native population by newly arrived migrants from Europe. The new immigrants resettled throughout the American continent, stealing from, enslaving and killing Native Americans, largely for their land and natural resources (read the Smithsonian's article "*The Shocking Savagery of America's Early History*"). An apt proverb from these fellow humans, whose only fault was wandering too far from their ancestral homes in Africa, arriving in their new home (America) about 20,000 years ago (Smithsonian, 2020), is informative in the context of this discussion:

"When the last tree is cut down, the last fish eaten, and the last stream poisoned, you will realize that you cannot eat money": Native American Proverb

Sadly, the last tree in this proverb may not necessarily be cut down, it will most probably be burnt to make way for monetary profits from the agricultural land it grows in, and for the minerals it hides between its roots,

or for the energy hidden in its trunk (charcoal). Whole forests of trees are being cut down for their commercially valuable timber and other economic "resources" extracted from their trunks and foliage, and as fuel to burn even more trees and life-giving plant species for whatever lies under them. This last tree may be located in the still burning forests of Brazil (https://phys.org/news/2021-01-brazil-wildfires-surge.html); the flaming disasters of California and other American states (the fires arrived thirty years too early – Scientific American 2020). And from the conflagrations of Australia, worsened by the Australian Government's refusal to take guidance from the ancient knowledge of its Aborigine population (https://www.bbc.com/news/world-australia-51043828). The Aboriginal population of Australia nurtured those trees sustainably for about 60,000 years since their arrival from their African ancestral homes (PNAS 2018 article here), about 58,000 years before the "*the masters of mankind with their vile maxim of profit above all else*" followed those African footsteps to set the forests on fire. Similarly, the last fish will not necessarily be eaten, it will probably rot on the sun-baked floor of their sun-dried former watery habitats, die from poisoning in the dangerously polluted dams, rivers and streams like South Africa's Hartbeespoort and Vaal dams and river systems, or from the steady replacement of the fish's lifegiving diet by the plastic waste that pollutes much of the world's oceans and rivers, and of course, by humanity's insatiable hunger.

The merciless massacre of the "*subhuman Indian savages*" by the federal government, the U.S. Army, and many white settlers, which "*forced countless Native Americans off their lands, away from ancient hunting grounds, and onto reservations*" is told in numerous historical records, neatly summarized for the purpose of this discussion by The National Catholic Reporter in https://www.ncronline.org/blogs/making-difference/forgotten-plight-native-americans, Feb 2, 2015, by Tony Magliano.

The genocidal extermination of America's native population was not the first, nor will it be the last. Today's media is dominated by too many similarities, including the still unfolding Rohingya Genocide, and the human tragedies of Syria, the Yemen (FAO 2018: "*The world cannot stand by watching Yemen's human tragedy"* – but the world is standing by and watching the brutality unfold. Genocide must remind us of Africa's own Rwanda and (other) genocides. Rwanda's President Paul Kagami is said to have renamed the ICT ministry to "The Ministry of Youth and ICT" so that the youth would acquire the information and knowledge via ICT needed to ensure that the genocide "never happens again". The ICT ministry has since been renamed to "Ministry of ICT and Innovation", a trend followed by neighbouring Kenya which established the Ministry of ICT, Innovation and Youth Affairs". These two African countries are keenly aware of the need to safeguard the futures of their nations through knowledge accessed via ICTs.

This discussion document is about South Africa, a country which many scientists are converging on the possibility that it may have been a central geographic birthplace of all humans (Nature 2019). It may also have been the birthplace of most attributes that gives the species its unique identity, the capacity for creative innovation, and an innate desire to share such creativity and innovation with other members of the species. With such attributes, South Africa could then be the "evolutionary" home of the creators, perpetrators, and the victims of all SDG challenges – the birthplace of all the "good, the bad, and the ugly" that defines modern humans, irrespective of their nationality, language or pigmentation. Could South Africa and its neighbours in Southern Africa, based on this ancient evolutionary history of humanity, be the beacon of hope for humanity's future? A quick glance into the knowledge and thinking of our common human ancestors, reshaped by the knowledge of the present, and creative imagination and visions of the future, may be the wisdom that South Africa and the world needs to overcome the numerous SDG challenges facing the world today.

The key scientific disciplines of Anthropology, Archaeology and Palaeontology are just a few that provide measurable, evidence-based research outputs that tell the whole human story, from the emergence of life some 3.5 billion years ago, to today's planned escapes to Mars and beyond, which only the economically endowed Homo economicus members of our species will afford. Such evidence includes, but is not limited to:

*"Africa was the birth-place of Homo sapiens and has the earliest evidence for symbolic behaviour and complex technologies. The best-attested early flowering of these distinctive features was in a glacial refuge zone on the southern coast (*of Africa*) 100–70 ka, with fewer indications in eastern Africa until after 70 ka. Yet it was eastern Africa, not the south, that witnessed the first major demographic expansion, ~70–60 ka, which led to the peopling of the rest of the world".* Scientific Reports: Nature 2019: https://www.nature.com/articles/s41598-019-41176-3

It is useful therefore to consider the origins of these SDG challenges, by and in the original home of Homo sapiens – Africa. Southern Africa's 200,000-year-old cultures of the Ju/'hoansi and fellow hunter-gatherers, rapidly, and brutally, being driven into cultural and identity extinction, provide excellent avenues for such consideration. The brutality of this dark period of human history that still leads to such cultural and identity extermination is well documented, e.g., in the brief discussion on racism that follows:

- **Racism - A History (Part 1 of 3) – The Colour of Money:** https://www.youtube.com/watch?v=GcrcflTCu4Q: This video documentary produced and broadcast by BBC begins with a survey of the causes and effects of global racism, tracing its origins to the 15th century religious belief systems, which justified the single-minded quest for wealth under any circumstances, brutal or otherwise - the key ingredients of the Homo economicus model whichever way it is defined or interpreted;
- **Racism - A History (Part 2 of 3) – Fatal Impacts:** https://www.youtube.com/watch?v=8hNiuzX2u3E: This episode is particularly disturbing, warnings for sensitive viewers are necessary. It discusses the horrors of the genocidal activities of the German armed forces and settlers, who succeeded in "exterminating" up to 80% of Namibia's Herero nation, and up to 50% of the smaller Nama nation, in the short four years between 1904 and 1908. Extremely disturbing visuals of thousands of human skeletons lying unburied on Namibia's desert sands, and images of mounted heads of adults and children used for "research", and said to have been sold as souvenirs in Germany, paints a gruesome picture of the sheer brutality of the events. Namibia's strive for reparations continues more than one hundred years later: (a) BBC August 2018: Germany returns skulls of Namibian genocide victims; (b) DW March 2018: US judge dismisses Namibia's genocide claims; (c) The Guardian, August 2020: Germany offers Namibia €10 million in reparations, Namibia rejects the offer. Namibia's genocide story parallels the genocide of South Africa's *Khoikhoi* (pejoratively also named Hottentots) and other San groups, however, South African historians could not match the meticulous reporting and photographic evidence provided by the German soldiers and settlers in Namibia. This powerful, disturbing video is also available at: "*Namibia: Genocide and the Second Reich (BBC)*"
- **Racism - A History (Part 3 of 3) – A Savage Legacy:** https://www.youtube.com/watch?v=V4sYJdYEsHM**:** This episode examines the aftermath of the African genocides, and of slavery as practiced during those dark periods of human history. The documentary also traces the continuing post-slavery servitudes and deprivations in most countries, developed and developing, including the United States of America. Much of this "savage legacy" continues into the 21st century and beyond – the current "Black Lives Matter" movement which has globalized from its origins in America, suggests that humanity's work is not yet done – it is up to the present generations to shape the young minds of future generations of humans, beyond the socioeconomic confines of race, ethnicity, nationality, language, and wealth. Today's children must learn to learn from history, so that they can avoid the numerous historical mistakes, survive the present challenges, and shape a better future for themselves and their life-giving ecosystems.

The big question that arises from the above discussion, one that bears repeating, is: Why is this history important? If we don't understand fully humanity's past miss-steps, all that this, and future generations will do is repeat the past errors of judgement, exacerbated by humanity's modern technological prowess. Science teaches us that all human beings, including their most recently discovered Neanderthal and Denisovan ancestors, originated in Africa, irrespective of their current nationalities, languages, or levels of pigmentation. Humanity therefore has common challenges which can best be resolved by understanding humanity's common origins, common hopes, and value systems that included equitable sharing of the global opportunities and resources sustainably, through the productive, intelligent, and wise application of available and future technologies.

Southern Africa's Ju/'hoansi and their close Southern African ethnic and genetic relatives are the oldest known living representatives of our species. They are central to this discussion, and for the understanding of humanity's origins and evolutionary errors of judgement. This knowledge must be collated, communicated and shared through the power of the global and national ICT networks and services. The Ju/'hoansi story is summarised in the references provided in the text box that follows, representing vital knowledge sources for all South Africans and their fellow continental and global peers to understand fully, and "educate" future citizens to avoid the destructive errors of history.

First People, First Tribes: Some References

1. Nature Communications 2014: *"(the) Khoisan populations have maintained the greatest nuclear-genetic diversity among all human populations, and the most ancient Y-chromosome and mitochondrial DNA lineages, implying relatively larger effective population sizes for ancestral Khoisan populations."*
2. Proceedings of the National Academy of Sciences of the United States of America (PNAS) 2011: *"Hunter-gatherer genomic diversity suggests a southern African origin for modern humans"*
3. Stanford University/Physics.org 2011: *"Genetic analysis finds that modern humans evolved from southern Africa's Bushmen"*
4. The Conversation 2016: *"(The Khoisan) are variously described as the world's first or oldest people; Africa's first or oldest people, or the first people of South Africa……..Their first-people status is due to the fact that they commonly retain genetic elements of the most ancient Homo sapiens"*
5. James Suzman: Affluence Without Abundance 2017: Review by Yuval Noah Harari: *"An insightful and well-written book, describing the hard transition of foraging communities in Namibia from relative affluence during the Stone Age to contemporary poverty and misery. Avoiding both modern conceits and romantic fantasies, Suzman chronicles how economics and politics have finally conquered some of the last outposts of hunter-gatherers, and how much humankind can still learn from the disappearing way of life of the most marginalized communities on earth"*. – Yuval Noah Harari, author of SAPIENS: A BRIEF HISTORY OF HUMAN KIND and HOMO DEUS: A BRIEF HISTORY OF TOMORROW.

Given that the ancient protectors of biodiversity in all corners of the world, illustrated by the examples of America's native inhabitants and South Africa's living and extinct human ancestors, have been so thoroughly misunderstood and undermined, could it be that the attempted extermination and abuse of their cultures and identities, and their natural ecosystems, represents the worst crimes against humanity and its lived environment? Could we narrow down the SDG13, SDG14, and SDG15 challenges to these crimes, and seek solutions from the lessons we can learn from these 200,000-year plus histories? The dehumanising cycles that led to previous mass cultural extinctions cannot be reversed, but the significant contribution to those threats by today's Homo economicus-leaning humans can and must be understood and reversed before the final curtain of the sixth mass extinction obliterates the human species as we know it today.

This search for restoring our humanity and reversing the current biodiversity destruction must be central to finding solutions for all SDG challenges, not just SDG13, SDG14, and SDG15. It must include how best to use available and future ICT4SDG tools to speed up the process and prevent further reversals. Humanity must not close its eyes and ears to the voices of the past, or the creativity of present generations of inspired leaders and courageous young people like Greta Thunberg and Malala Yousafzai, and of course, the generations of global citizens yet to come. Today's youth are surrounded by technologies that their parents never imagined, and yet more than one billion children worldwide are "multidimensionally poor" - (UNICEF https://www.unicef.org/social-policy/child-poverty). The South African statistics are even more alarming – more than sixty percent of South Africa's children live in poverty (http://www.statssa.gov.za/?p=13438). And yet, the global tentacles of modern ICTs "cover" every living man, woman, and child on earth, through both terrestrial, submarine and satellite communication networks, but far too few enjoy the benefits of such coverage. Unlike our common Ju/'hoansi ancestors who enjoyed "Abundance Without Affluence" in the past, too many of today's global, and Southern African citizens, are greatly disempowered and disenfranchised by ICT "*abundance without access*" – they are too poor to afford the global abundance of ICTs. The SDGs, and their tools like the ICTs, must be used to change this dismal scenario, positioning the full might and wealth of the full range of 4IR and beyond technologies at the disposal of today's and tomorrow's youth so that they can become the defenders and guardians of the future.

To conclude this section of the discussion document, it is necessary to refocus on South Africa's poor, the 55% population and their children who are both perpetrators and victims of climate change and biodiversity destruction. Perpetrators because it is impossible to think about biodiversity preservation if your children and

extended families are starving, while the food and monetary resources they need to survive are those which need protection from the avarice of the global haves who want even more. It is extremely difficult to imagine the value of copper cables that power the nation's economy and its communications, in the eyes and mindsets of the very poor who must watch as their children and elders starve. A $1,000 electrical pylon is not worth much more than its scrap metal value in the eyes of the very poor and hungry. The value of the copper wires "fuelling" the Gautrain's ride from Sandton to OR Tambo International Airport has the same value as two loaves of bread in the eyes of those South Africans who have no business traveling to OR Tambo International for anything else but work. Poverty, and its fellow travellers of inequality and unemployment will undermine every effort made by South Africa to ameliorate and reverse the challenges enshrined in each and every SDG, including the vital SDGs under discussion in this section, unless and until there are very visible activities seen and understood by the poor as a promise of a better future.

One of the most respected scientists of our time, Albert Einstein, is reputed to have said: "*I do not know with what weapons World War III will be fought, but World War IV will be fought with sticks and stones*." It certainly could be the weaponry of WW3 that returns us back to the stone ages, but it could also be climate change and biodiversity destruction – key weapons of the sixth mass extinction. Either way, returning to the stone age lifestyles might be one way of sharing earth's resources equitably once again amongst all things that thrive on those resources, but only if humanity survives its mainly self-inflicted disasters.

2.8: SDG9, SDG10, SDG11, SDG12, and their relationships with SDG8:

(a) SDG9**:** *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;* (b) SDG10: *Reduce inequality within and among countries; (c) SDG11: Make cities and human settlements inclusive, safe, resilient and sustainable; (d) SDG12: Ensure sustainable consumption and production patterns.*

This grouping of SDG challenges has been chosen for convenience in the effort to summarise their interrelationships and interdependencies within the group and with all other SDG challenges. SDG10 (inequality) for example, pervades every other SDG challenge, and is discussed within the detail of each challenge. Similarly, SDG8 (work, labour, jobs), the subject of this discussion, is influenced by, and influences, every other SDG. The following brief summary of each interrelationship and interdependency adds to preceding and any further discussions that may follow in this document:

2.8.1: SDG9: Infrastructure:

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. Building resilient infrastructure to serve individuals, whole families, communities, nations and societies, has been the principal objective of Homo sapiens since their transition from highly mobile migrant hunter-gatherers to sedentary lifestyles in progressively larger villages, towns and cities. This process began with the Neolithic Revolution some 12,000 years ago. The innovation element may also have been an objective and activity of archaic humans and hunter-gatherer pre-agrarian societies that preceded modern economic man by up to 400,000 years. Human history is littered with rich evidence of ancient, often very impressive infrastructure developments. Examples include the Gobekli Tepe construction built in present-day Turkey about 12,000 years ago, the Egyptian pyramids and infrastructure networks aged about 5,000 years, the Maya city-states with their impressive engineered water and sanitation infrastructures dating back about 3,000 years. Less researched are the ancient African infrastructures that supported the successful human evolution and multiple modern human migrations which peopled the world starting about 120,000 years ago. Humans evolved to become the dominant global species in periods stretching back to 400,000 years, the evidence of this is mounting with each new scientific "discovery". A debate is heating up amongst scientists and other concerned global leaders and thinkers, of whether or not this process of "civilization" (urbanization and its technological drivers)" is/was beneficial to the species and its environment.

But, while building resilient infrastructure has been a continuous post-Neolithic human preoccupation, the beneficiaries of such infrastructure tended to follow the social hierarchical fragmentation that grew out of the agricultural revolution. The elite, including royalty and their bureaucratic, military and religious acolytes and

sycophants, enjoyed the benefits of such infrastructure development more than the "lower classes" or "working classes" of people, as non-elites are politely called in the politically correct lexicons of today. The extremely unequal infrastructure development in South Africa discussed in the preceding section 2.6.1 of this document, visually illustrated in Annex 2.6.1. which references sanitation, provides clear evidence of the inequitable access to all kinds of infrastructure. South Africa has all the knowledge the country needs for the construction and operation of nearly all modern infrastructure networks and services, vital knowledge which is wholly undermined by a classic inability to share such infrastructure fairly amongst its citizens and residents. This is a potentially fatal inability as history has demonstrated time and time again.

Regarding the need to promote inclusive and sustainable industrialization, is ANY industrialization both inclusive and/or sustainable? Nearly all economies that industrialized rapidly to drive even faster economic growth (as demanded in SDG8?) have contributed the most to global pollution and therefore the climate change that is said to fuel the advent of the sixth mass extinction. Table 2.7.1 demonstrates the contributions to global CO_2 emissions from 1751 to 2017 (Source: https://ourworldindata.org/contributed-most-global-co2):

Table 2.7.1: Global CO2 emissions from 1751 to 2017 by geographic regions and highest within regions.

Region/Country	Billions of tonnes of CO_2	Global percentage (%)
North America	457	29
USA	399	25
Canada	32	2
Asia	457	29
China	200	12.7
Japan	62	4
Europe	514	33
EU-28	353	22
Russia	101	6
Africa	43	3
South Africa	19.8	1.3
Egypt	5.5	0.35
South America	40	3
Brazil	14.2	0.9
Argentina	8	0.5

The countries that achieved very high economic growth are also the biggest polluters as measured by the long-term levels of Co2 emissions.

Breaking News: The Guardian, Mon 15 Mar 2021 04.51 GMT: Beijing skies turn orange as sandstorm and pollution send readings off the scale | *"Air quality indexes recorded a "hazardous" 999 rating on Monday as commuters travelled to work through the thick, dark air across China's capital and further west"*

China Power: February 2021: "*Air pollution contributes to millions of premature deaths around the world each year. In China, rapid industrialization has wrought intense levels of air pollution that present serious social, economic, and political problems. China's leaders have responded with measures designed to improve air quality, but they face significant challenges in balancing economic growth with environmental and social welfare*"

As China struggles to become a global economic leader (second after the USA today), the country must also grapple with the consequential extreme environmental damage, and the stubbornly high inequality that economic growth through industrialization brings. According to World Bank statistics, China's GINI Coefficient has fluctuated between a low of 32.2 in 1990, peaking at 43.7 in 2010, and falling to a still uncomfortable level of 38.6 in 2015.

South Africa has the highest GINI Coefficient in the world, entering its democratic dispensation in 1994 with a GINI Coefficient of 61 (1997 estimate), climbing to 65 in 2015, as reported by Statistics South Africa in http://www.statssa.gov.za/publications/Report-03-10-19/Report-03-10-192017.pdf.

Will South Africa's strive for higher economic growth through industrialization achieve this economic objective while at the same time dislodging the country from its African leadership position in CO_2 emissions, and global leadership in income inequality? Will any progress in industrialization be inclusive as required in this SDG, thereby reducing the nation's unacceptably high inequality levels, or will it perpetuate the racially skewed inequality and poverty discussed with graphic representations in Section 1.0 of this document?

South Africa is not alone in facing the above dilemmas, they represent immense challenges for the whole world. The post-agricultural and post-industrial global human societies are so deeply entrenched in the concept of industrialization as a tool for the desired never-ending economic growth that any desired change is nearly impossible to imagine. But, the global climate change crises, and the persistent human costs of such unmitigated economic growth, are gaining significant attention and concern by a growing number of global leaders, intellectuals, deep thinkers, and credible/respected media organizations. The global conversation is changing, supported by numerous world forums, non-government activist movements, and highly respected intellectuals like Joseph Stiglitz addressing the World Economic Forum 2020 (WEF20):

> Here's how companies can build a better economy, by Joseph Stiglitz
> This year's meeting highlighted disenchantment with the increasingly dominant American model of shareholder-first, profit-maximizing firms. More than 50 years ago, WEF founder and head Klaus Schwab argued for stakeholder capitalism: enterprises should be accountable for the interests of their customers, workers, communities, and the environment, as well as their shareholders. Some 45 years ago, with Sandy Grossman, I showed in a standard economic framework that maximizing shareholder value would not maximize societal welfare. In speech after speech this year, business leaders and academics explained how Milton Friedman's successful advocacy of shareholder capitalism led directly to the crises we face today – including, in the US, opioid addiction, childhood diabetes, declining life expectancy amid soaring "deaths of despair" – and the political divisions they have fuelled.
> "*If capitalism is to work – if it is to address these crises and serve society – it can't do so in its current form*": Joseph E. Stiglitz Professor, Columbia University 07 Feb 2020

As South Africa and the rest of the world seek economic growth for its continuously increasing populations through industrialization, there is an urgent need to pause, and attempt to measure the cost of any such industrialisation in terms of human and environmental costs. Technology can help, e.g., in the ICT industry and its application to ICT4SDGs, the human and economic values of expanding national ICT infrastructure is absolutely clear, and even measurable, but even this infrastructure rollout must pause to rethink the total architecture of the infrastructure networks, construction practices, and the technologies used to reduce energy consumption and waste disposal while providing the services needed for sustainable human development. Similar considerations and opportunities are available in all infrastructure sectors, but all of them, no matter how "smart" they may be, depend on "smart people" for their SDG-friendly designs, construction, operation, and use. The "people first" approach that runs throughout this discussion of all SDGs is vital, practical, and possible for "green" infrastructure projects. This must be the guiding principles underlying all industrialization and infrastructure development processes.

2.8.2. SDG 9 - Foster Innovation. *Innovation By whom? For whom? For what?* South Africans, like other humans the world over, are inherently innovative. They have a strong ancestral history that survived for more than 200,000 years with extreme fluctuating levels of natural climatic challenges, including severe draughts, food scarcity and desertification, e.g., drying of the Sahara. And still they found the energy for global-scale "walkabouts" that peopled the world. They are the ones for whom we now seek innovative skill sets? Perhaps humanity as a whole has been looking in the wrong places for these innovative skills. Perhaps we should be seeking ways of just releasing (freeing) people's natural creativity and innovative instincts, and letting them get on with the job of fixing the world and creating the future. Perhaps it is the global and local leaders that need the innovative skills to develop the social environments that foster innovation – the societal structures, environments and processes that restore the innovative spirits of humanity which led to today. Perhaps the search should be for the innovative spirits that are hidden deep within the human genome, the genes inherited from the deepest clades of modern humans[47] - the extended relatives of Southern Africa's Ju/'hoansi? The former hunter-gatherers who wondered far and wide, dealing with vast environmental and other challenges that ranged from intense dry heat from whence they came, through frozen wastelands over which they travelled, before settling on all the variants of the global environment. They had to be exceptionally innovative

[47] (a) Carina Maria Schlebusch, Wits University 2010: *Genetic variation in Khoisan-speaking populations from southern Africa*: http://wiredspace.wits.ac.za/bitstream/handle/10539/8992/CM_SCHLEBUSCH_THESIS.pdf | (b) Tatiana M. Karafet et al: *New binary polymorphisms reshape and increase resolution of the human Y chromosomal haplogroup tree*: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2336805/pdf/830.pdf | (c) Nature Communications 2014: *Khoisan hunter-gatherers have been the largest population throughout most of modern-human demographic history* | https://www.nature.com/articles/ncomms6692

to do this, hence the approach to this SDG must include the restoration or rebirth of that innovative gene, re-establishing once more the long-lost egalitarian societies of the past which had learned to live in harmony with nature.

Modern South Africans are innovative, with global luminaries like Mark Shuttleworth, Siyabulela Xusa, and of course Elon Musk, who plans to launch tens of thousands of Starlink LEO satellites to blanket earth with super-fast wireless broadband internet services. Starlink plans 100% global digital coverage, but is unlikely to bridge the digital affordability divides. The collateral damage to the near-space environment expected from Starlink may be immense, as will be the challenge of serving Elon Musk's poorest compatriots in the land of his birth. Will Elon Musk's broadband Wi-Fi pricing match the affordability needs of South Africa's majority citizens? With their still declining (severely impacted by Covid-19) average monthly expenditure limits of less than R 800 per month?

The most important and urgent challenge for SDG9 is the innovation of technological solutions that will help South Africa's and the world's poorest populations mitigate the impacts of all multidimensional SDG challenges, including the SDGs related to the protection of the world in which the poor, and their wealthier compatriots, live.

2.8.3: SDG10: Reduce inequality within and among countries:

The concept of inequality tends to be misunderstood by many high-ranking national decisionmakers and leaders in both the public and private sectors of many developing countries, and by a number of influential international experts and decisionmakers. Many interlocutors encountered in developmental discussions tended to confuse the concept of inequality with wealth: "it is impossible for South Africa to have higher inequalities than say poverty-stricken Malawi, or much poorer Ethiopia for example, their economies are so much lower". The reality in this argument is as follows:

- **South Africa:** GNI/Capita 2019 - $6040; GINI Coefficient - 63; with an upper-middle income classification, the applicable poverty line is $5.50 PPP per day, or R12 per day.
- **Malawi:** GNI/Capita 2019 - $380 (6% of SA value); GINI Coefficient - 44.7 (30% better than South Africa); Applicable poverty line for low-income economies is $1.90 PPP per day, SA equivalent R4.30 per day.
- **Ethiopia**: GNI/Capita 2019 - $850; GINI Coefficient – 35, about half that of South Africa; Applicable low-income poverty line is $1.90 PPP per day.

Both Ethiopia and Malawi are much poorer economically than South Africa, but their economies are more evenly distributed than that of South Africa's. Their GINI Coefficients are lower than South Africa's, but still too high to forestall potential societal upheavals. The GINI Coefficient international alert line is set at 40, higher than the estimated value for Ethiopia. Ethiopia is known to be one of the oldest countries in the world, the original birthplace of much of Homo sapiens ancestors, e.g. Lucy, the ancient "Gogo" about 3.2 million-years-old in 2020. Her country was the stepping stone for the "out of Africa" human migration which "peopled" the world. The country has been plagued by numerous social disruptions extending back to pre-biblical periods.

The generally poor layman's understanding of inequality and its role in society has often demanded an explanation of the statistically complicated GINI Coefficient, hence the author's preference for the Palma Ratio, which is much easier to explain to lay persons. The concept of inequality amongst humans may be a mystery to most people, especially the victims of this inequality, yet it pervades all seventeen SDGs as both cause and effect, a relationship discussed briefly within each SDG in this discussion document.

For the purpose of this document, detailed discussions of the concept of inequality will be eschewed in favour of summarising the key elements of inequality, supported by a short list of references, as a guide to more detailed consideration and analyses as part of the ICT4SDG programme implementation:

a) **Economic inequalities**: There exists a very wide range of monetary indicators between and within countries, leading to numerous quantitative representations of inequality and economic growth. Indicators such as individual and household incomes, individual and household expenditures, wealth differentials between individuals, households and nations, Gross Domestic Product and Gross National Income (GDP and

GNI), proliferate the whole range of developmental discourse, but they are seldom translated into language that the poor who are targets of development, can understand. The impact of exchange rates, including those for purchasing power parity (PPP, another indicator demanding mass understanding), influence all indicators. But, the nexus between economic growth and inequality growth is so important that the actual or perceived lack of precision in the analyses pales into insignificance when compared to the economic, social and political damage that high levels of inequality can bring.

Virtually all economists and philosophers worthy of note have voiced opinions on the relationship between inequality and the economy: (a) Confucius about 500 BCE - "*When a country is well governed, poverty is something to be ashamed of. When a country is badly governed, wealth is something to be ashamed of*" - Forbes; (b) through Greece's Aristotle and Plato: "*There should exist among the citizens neither extreme poverty nor again excessive wealth, for both are productive of great evil"* OECD longstanding concern about inequality; (c) Mathew 25:29 in the Bible - "*For whoever has will be given more, and they will have an abundance. Whoever does not have, even what they have will be taken from them"* (A non-theological interpretation is needed); (d) John Maynard Keynes – "*the income of the poor should grow more quickly than that of the rich, not the other way around, as has been the case for decades*" (Carnegie Endowment June 2019); and (e) Nobel Laureate Joseph Stiglitz, 2012: "*The Price of Inequality: How Today's Divided Society Endangers Our Future*" and September 2020: "*Conquering the Great Divide: The pandemic has laid bare deep divisions, but it's not too late to change course*".

The cacophony of inequality debates began many centuries ago, fuelled by the commercialization and ownership of everything, including ideas and people. People, including women and children, were enslaved and traded like all other movable and immovable properties, "human resources"; valuable "human capital" (waged slaves? – See PBS article "*The North and the Wage Slavery*"). All this seems to have begun unfolding with the agricultural revolution 12,000 years ago.

South Africa, with a racially skewed world record level of income inequality and poverty (charts 1.2a and 1.3a in section 1.2), needs to urgently balance the policy imperatives related to inequality and poverty reduction, and economic growth. The nation's National Development Plan (NDP) has all the right arguments, and objectives, but the nation urgently needs insights into how to implement this plan so that economic growth is not achieved at the expense of inequality and poverty reduction. This is an extremely complex task, one that has dominated human imagination for millennia, but must nevertheless be faced if South Africa is to survive and prosper, before the calamities that normally follow deep and growing levels of inequality and poverty undermine all the nation's efforts. A very short list of the numerous relevant studies and reports include:

- The IMF: A vital rethink of economic development: (a) 2017: "A New Twist in the Link Between Inequality and Economic Development"; (b) 2020: "Reduce Inequality To Create Opportunity"
- World Economic Forum 2020: "Addressing inequality is necessary to promote economic growth"
- Joseph Stiglitz 2015: Inequality and Economic Growth:

Joseph Stiglitz 2015: Inequality and Economic Growth:

In the middle of the twentieth century, it came to be believed that 'a rising tide lifts all boats': economic growth would bring increasing wealth and higher living standards to all sections of society. At the time, there was some evidence behind that claim. In industrialized countries in the 1950s and 60s every group was advancing, and those with lower incomes were rising most rapidly.

In the ensuing economic and political debate, this "rising tide hypothesis" evolved into a much more specific idea, according to which regressive economic policies – policies that favour the richer classes – would end up benefiting everyone. Resources given to the rich would inevitably 'trickle down' to the rest. It is important to clarify that this version of old-fashioned 'trickle-down' economics did not follow from the post-war evidence. The "rising-tide hypothesis" was equally consistent with a 'trickle-up' theory – give more money to those at the bottom and everyone will benefit; or with a 'build-out from the middle' theory – help those at the centre, and both those above and below will benefit.

Joseph Stiglitz 2015: Inequality and Economic Growth (Continued):

Today the trend to greater equality of incomes, which characterised the post-war period, has been reversed. Inequality is now rising rapidly. Contrary to the rising-tide hypothesis, the rising tide has only lifted the large yachts, and many of the smaller boats have been left dashed on the rocks. This is partly because the extraordinary growth in top incomes has been going along with an economic slowdown.

The trickle-down notion – along with its theoretical justification, marginal productivity theory – needs urgent rethinking. That theory attempts both to explain inequality – why it occurs – and to justify it – why it would be beneficial for the economy as a whole. This chapter looks critically at both claims. It argues in favour of alternative explanations of inequality, with particular reference to the theory of rent-seeking and to the influence of institutional and political factors, which have shaped labour markets and patterns of remuneration. And it shows that, far from being either necessary or good for economic growth, excessive inequality tends to lead to weaker economic performance. In light of this, it argues for a range of policies that would increase both equity and economic wellbeing.

(b) Social Inequalities: Social inequalities are the broad spectrum of inequalities between people, and therefore between nations, that emerged after the transition from an egalitarian hunter-gathering lifestyle to a more sedentary, socially hierarchical Homo economicus type of human existence that valued material accumulation and ownership (economics) more than humanity itself. Egalitarian lifestyles changed to hierarchically segmented social systems of "*tribes and super-tribes, status and super status, sex and super-sex*" (Desmond Morris, the Human Zoo) that shapes nearly all social systems and structures used by humans today. This segmentation lies at the core of all inequalities within the modern human species. In the opinion of this author, based on desk studies of the opinions expressed by credible researchers, the order and relationships of social inequalities related to this discussion are:

i. **Inequalities in Education**: Inequalities in all aspects and outcomes of education (pedagogical philosophy and focus, content, style, etc.), lies at the root of all inequalities. And this inequality has a very dangerous racial bias (race and super-race?), as shown in the discussions and charts of Section 1.0. A very small selection of very recent relevant research publications that focus mainly on the evolutionary origins of inequality, for which mass education is needed, include:
   - Emeritus Professor, Tim Crowe, University of Cape Town, February 4, 2016: How the origin of the Khoi San tells us that 'race' has no place in human ancestry:
   - Nature 2019: "A dispersal of Homo sapiens from southern to eastern Africa immediately preceded the out-of-Africa migration" – modern humans were wandering around Africa interbreeding with all other archaic hominin relatives and the newly evolved Homo sapiens they encountered, before they left to do the same in the reset of the world. Many followed the footsteps of their ancestors to all corners of the Homo-inhabited world, e.g., our Homo erectus ancestors "wandered" over to China more than 2 million years ago (Nature: July 2018), followed by some of their descendants who included the family from Broken Hill (Kabwe), Zambia, who emigrated from Africa to populate Eurasia as Neanderthals and Denisovans (Chris Stringer, Natural History Museum U.K. 2020, and Smithsonian 2020).
   - While the United States of America struggles with a growing level of nationalism and the socio-economically-politically disruptive and destabilizing threats of "white supremacy (2016 Britannica definition)", their top scientists keep proving beyond reasonable doubt that racism is a social construct that cannot be justified in any branch of science, e.g., (a) Tim Crowe: Emeritus Professor, University of Cape Town, November 2015: "How science has been abused through the ages to promote racism"; (b) Harvard 2017: "How Science and Genetics are Reshaping the Race Debate of the 21st Century"; and (c) NIH May 2020: Ancient genome-wide DNA from France highlights the complexity of interactions between Mesolithic hunter-gatherers and Neolithic farmers, demonstrating once more that even modern post-Neolithic revolutionary and post-Industrial revolutionary humans cannot be separated from their African and hunter-gatherer past – they interbred their superficial multi-cultural-ethnic-social human differences into a vast global melting pot of multi-pigmented, multi-eye-coloured, multi-hair-textured, multi-ethnic-national mass of humanity.

ii. **Ethnic and Racial Inequalities:** This particular form of inequality has spawned the most barbaric excesses of brutality within the Homo sapiens species world-wide. It has been particularly brutal in Southern Africa - Namibia and South Africa as detailed in the discussions on race and racism in Section 2.7.2. of this document, with further details of the impact of ethnicity and racism on women and children in ICT4SDG5 - https://www.sakan.org.za/Docs/ICT4SDG5.pdf.

The truth about racism, one of the most abhorrent human behavioural practices known to humankind, one which often leads to violent revolutions, wars and genocide, has no scientific basis in any branch of the natural sciences. Racism in all its forms is strictly a social construct that has attracted numerous pseudoscientists who attempted to justify the global scourge using their professions in the broader social science disciplines. Doctor John Philippe Rushton (1934 to 2012, University of Western Ontario, psychology and political science) and his like-minded colleague Professor Arthur Robert Jensen (1923 to 2012, emeritus professor of psychology at University of California, Berkeley), studied IQ differences between "races" in South Africa in the late 1990s and early 2000s, concluding that genetic inheritance positioned blacks at the lowest IQ levels, followed by darker skinned coloureds and dark-skinned Indians, and above them light-skinned coloureds and east Indians with slightly lower IQs than white, with far east Asians, mainly people from Hong Kong and Japan, leading the IQ global rankings (https://www1.udel.edu/educ/gottfredson/30years/Rushton-Jensen30years.pdf).

Both men's researches were officially retracted or otherwise discredited as shown in the documents via the links on each name. But their racist theories continue to garner support from white racists and neo-Nazis who use their discredited theories to further their racist agendas even today. Perhaps it would have helped the two academics and their intellectual compatriots, if they had chosen disciplines within the natural sciences, like anthropology, biology, genetics, and palaeoanthropology. Equipped with this scientific knowledge, they would have "discovered" that their ancestors were (black) Africans who had joined the great trek "Out of Africa", probably out of South Africa, where the infamous pseudoscientists found so many low IQ ancestral relatives. The report in Nature 2019, https://www.nature.com/articles/s41598-019-41176-3 – explains how these not-so-low IQ ancestors of everyone left Southern Africa to settle in eastern Africa prior to embarking on their global "walkabouts" to become everyone, including misguided pseudoscientists.

Racism, and its ethnic- and religious-based variants, are deeply entrenched in recent human evolutionary history. Inequality between humans is thought to have started unfolding with the Neolithic revolution about 12,000 years ago. This major lifestyle change, from roaming hunter-gatherers to sedentary farmers, fuelled the onset of social hierarchies and property ownership, which included people, slaves and women. Racism has no genetic basis besides the superficial pigmentation differences that our "cultural sensitivities" observe and interpret. Even South Africa's "inconvenient truth", xenophobia, which some South Africans have renamed "Afrophobia", defined by UNISA's School of Humanities as "*xenophobia is fear of the other; Afrophobia is fear of a specific other—the black other from north of the Limpopo River",* can and must be likened to ethnic and race-based inequality.

The architects of apartheid, and of global slavery, drew their inspiration from narrowly selected and interpreted biblical verses as explained in "Kevin Giles | April 20, 2016 "*Justifying Injustice with the Bible: Apartheid*", and in "Time: February 2018: *How Christian Slaveholders Used the Bible to Justify Slavery*". This link to mass belief systems explains the deep entrenchment of racism in humanity as a whole. Racism is about inequality, unscientific concepts of superior and inferior "races", ethnicities, or just belief systems (the Rohingyas are just as much "Burmese" as their non-Muslim compatriots, but the killing continues). It will therefore be extremely difficult to dislodge racism in any society or nation, let alone South Africa, with its deep racist historical legacy. The national constitution, policy, and legal and justice systems are necessary and vital, but they are not palliatives. The "curative" process must begin with shaping the thinking of the very young through education, of all ethnicities, pigmentations, and social backgrounds, a very long-term process that demands technological support.

iii. **Some theoretical background and other references related to Inequality in South Africa**:

- **Nature 15 November 2017: "***A deep divide between rich and poor dates back millennia: The gulf between the haves and have-nots was smaller in the ancient Americas than in Eurasia. After the advent of farming, inequality rose more dramatically in Europe and Asia than in the Americas*": https://www.nature.com/articles/d41586-017-06050-0. (The South African parallel are the Khoi and San hunter-gatherer groups).
- **World Inequality Report 2018**: https://wir2018.wid.world/: (a) "*South Africa stands out as one of the most unequal countries in the world. In 2014, the top 10% received 2/3 of national income, while the top 1% received 20% of national income*". (b) Rising black per capita incomes over the past three decades have narrowed the interracial income gap, although increasing inequality within the black and Asian/Indian population seems to have prevented any decline in total inequality.
- **Joseph Stiglitz, November 2017:** "Inequality? The result of our choices and political and economic actions": "*In recent years, the growing focus on economic inequality among different sections of the population has been calling for innovation of the traditional economic and political systems with a view to interpreting, supporting and regulating change in a fair and sustainable manner. The general perception of what politicians can do about this inequality has become uncertain, also due to a strong employment crisis in many economic sectors*".
- **Horizontal inequality as an outcome: Oxford Development Studies 2018**:
  https://www.tandfonline.com/doi/pdf/10.1080/13600818.2018.1508565?needAccess=true:
  Carla Canelas and Rachel M. Gisselquist provide an excellent introduction to the difference between horizontal inequality (inequality between groups – "them" versus "us"), and vertical inequality (inequality within groups – "my cousin's family is richer than ours, but that's O.K. because they worked harder"). Horizontal inequality frequently leads to intergroup conflict, a central role in the apartheid system of the past, the "Afrophobia" and xenophobic outbreaks today, and other ethnic/race-based conflicts that South Africa experiences too frequently.
- **World Bank Policy Research Working Paper 8657**: Vertical and Horizontal Redistribution, November 2018: This World Bank Working Paper focusses primarily on Western and Eastern Europe, but the lessons drawn and recommendations offered are highly relevant to South Africa.
- **Amnesty International 11 February 2020**: "South Africa: Broken and unequal education perpetuating poverty and inequality**": "***The South African education system, characterised by crumbling infrastructure, overcrowded classrooms and relatively poor educational outcomes, is perpetuating inequality and as a result failing too many of its children, with the poor hardest hit according to a new report published by Amnesty International today".*

Section Summary and Conclusions: Inequality lies at the core of virtually all SDG challenges, including and especially SDG8 – Labour and Work, which is both cause and effect of inequality. If within this broad challenge, educational inequality is the foundation, then humanity as a whole, and South Africa, the focus of this discussion document, must find solutions for the educational challenges that took more than 12,000 years to solidify and become global. An interesting very popular modern commentary of the role of education and knowledge in global ethnic and racial inequality can be found in the writings of Marcus Garvey (1887 to 1940), which inspired the late global musical icon Bob Marley's (1945 to 1981) international hit "***Redemption Song*" -** "*Emancipate yourselves from mental slavery - none but ourselves can free our minds*". This composition was inspired by Marcus Garvey's thinking that "*A people without the knowledge of their past history, origin and culture is like a tree without roots*" – a key concept in this discussion document.

Modern human communicators can draw valuable lessons from all artists like Bob Marley, and long before him, from internationally loved and legendary visual artists like Vincent van Gogh or Pablo Picasso who drew much inspiration from Africa. Their artistic instincts are joined by numerous modern multi-genre musical forms like South Africa's popular genre "Kwaito", loved by most youth, but which this author neither understands nor likes. The list of modern inspirational artists must include Nobel Laureate Bob Dylan and his significant artistic contribution to America's Civil Rights movement, using songs like "Blowing in the Wind (1963 with

lyrics): "*how many times must the cannonballs fly - Before they're forever banned? (anti-war)*" and "*The Times They Are a Changin (1964)*" written in tribute to the American Civil Rights movement of the 1960s.

As humanity searches for its long-lost humanity, one area of this search must be the arts. Children are born with artistic instincts, all that is needed is the right nurturing to encourage development of these instincts. Children need not be the hapless victims of Homo economicus commercialization, most are born with significant creative capacities and instincts, most of which are irreparably damaged by poverty and poor nurturing. Artistic jobs are self-created; all genres of art are known to be key drivers of human evolution, e.g., the impressive 20,000-year-old cave paintings of Lascaux in France. The French hunter-gatherers of yesteryear did not need education to know how to tell their history through art – they inherited the requisite genes and instinct from their ancient African ancestors.

The complex challenges of education, and therefore inequality and jobs in South Africa are summarised in section 2.4 of this document - SDG4 and SDG8: The Nexus of Education, Decent Work and Economic Growth. The origins of these challenges are well captured by Noam Chomsky's reference to James Madison and Aristotle in "*Madison and Aristotle faced the same problem, - education with true democracy would lead to civil strife for equal share of resources and opportunities - but they drew opposite conclusions. Aristotle's conclusion was we should eliminate inequality-- make everyone middle class, more or less* (author's emphasis). *And he proposed actual measures for this--what we would call today welfare state measures--and that would overcome the problem*." South Africa still searches for the "magic wand" of a welfare state that addresses the needs of all its people.

2.8.4: SDG11: Human-centred settlements, cities, homes: Much more than "*Smart Cities*":

> *"The growth of large metropolitan areas around the world has been very recent and very rapid, particularly when measured against the duration of human beings' existence as a species. For the first 95% of our time on earth, we built no settlements at all. Cities of a million people arose during only the last 1% of homo sapiens' time on earth, and there are already 500 such cities in the world today. If we have spent most of our existence as small wandering bands, does that mean we are ill-equipped to manage urban settlements of this vast size? The key to success in our current urban transformation may in fact be the same as the key to mankind's earliest origins - our ability to cooperate"*
> https://blogs.worldbank.org/sustainablecities/have-humans-evolved-manage-megacities

Cities are post-Neolithic Revolution human innovations. Humans lived as small hunter-gatherer nomadic groups of one hundred individuals or less, surviving through close collaboration and coordination within the group and with neighbouring groups, for more than two million years, even before their evolution to Homo sapiens (references e.g., Hunter-Gatherer Culture). They shared their knowledge and technological innovations freely, uninhibited by notions of intellectual property ownership (IP). They did not need villages, towns or cities, until they chose a more sedentary agriculturally based lifestyle approximately 12,000 years ago, about 3% of their existence as Homo sapiens. This "evolutionary" transition is described well by Dr Desmond Morris in Section 2.6.1.1. of this discussion document. Desmond Morris' views are shared by a growing number of academics, institutional and other thought-leaders, including the World Bank, one of the most influential global institutions of today, as stated in the opening text box above.

The table below illustrates the level of the South Africa's urbanization. Could this be representative of the "end of the road" of a very proud history of human evolution from its place of birth to today's socially fragmented human condition? The paragraphs that follow present ideas of how South Africans can begin to think about the challenges of urbanization, and seek solutions about how to survive its inevitability by learning from humanity's ancient past, and reinforcing humanity's chosen response with today's technological prowess.

Urbanization: South Africa compared

Country/Region	Population			Urbanization (Percent)		
	1990	2019	CAGR	1990	2019	CAGR[3]
S. Africa[2]	36.8m	58.6m	1.6%	52%	67%	0.9%
World	5.3b	7.7b	1.3%	43%	56%	0.9%
Highest (China)	1.1b	1.4b	0.7%	26%	60%	2.9%
Lowest (Tuvalu)	8913	11646	0.9%	41%	63%	1.5%
Colombia[1]	33.1m	50.3m	1.5%	67%	81%	0.5%

Note[1]: Colombia included for comparison for its numerous demographic, economic, and geographic similarities with South Africa.
Note[2]: South Africa breached the 50% urbanization level in 1986, projected to rise to nearly 90% by 2050.
Note[3]: Post-apartheid urban growth (1995 to 2015) ranged from 29% in Port Elizabeth to 411% in Rustenburg: Fastest Grown Cities in South Africa, September 2015.

Can South Africa build the urban socioeconomic safety nets needed by a population engaged in socioeconomically complex transitions from hunter-gatherer to rural lifestyles to today's urban lifestyles? There are a small number of countries worldwide that have successfully managed these transitions, but there are many more that have not – the ashes of failure are piling up in far too many countries in Africa, the middle and far Eastern countries, in parts of Europe, and in the Americas north and south. For example, as the United States grapples with a rising tide of far-right nationalism and its deadly racial undertones, a leading US Armed Forces representative recalled, in January 2020, the prophetic words of Martin Luther King Junior in his 1967 sermon - a 'Fierce Urgency of Now'

> *"We are now faced with the fact that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history, there is such a thing as being too late. This is no time for apathy or complacency. This is a time for vigorous and positive action."* – as quoted by Deputy Defence Secretary David L. Norquist at the Pentagon Auditorium on January 16, 2020.

In terms of modernization through urbanization, an irreversible trend whether we like it or not, South Africa faces the same "fierce urgency of now" in this SDG11 and related challenges. It is not the cities, or the human settlements, that need to be inclusive, safe, resilient, and sustainable; it is the people who build and live in the cities. The concrete and steel, or even the broadband networks that are said to anchor "smart cities", do not care about inclusivity, safety, resilience, or sustainability, the people in the cities do. This kind of thinking will be discussed further in the following paragraphs.

Key background national reference documents:

- National Migration Dynamics: Stats S A, based on last national census of 2011, updated 2015, illustrates massive rural/urban migrations into Gauteng and Western Cape, population declines in all other provinces: https://www.statssa.gov.za/publications/Report-03-01-79/Report-03-01-792011.pdf
- Department of Human Settlements: All annual reports from 2009 to 2020 provide details of national visions and strategies for SDG11: http://www.dhs.gov.za/content/annual-reports

2.8.4.1: City/town development:

The Reconstruction and Development Programme (RDP): The key objectives of the RDP as crafted in 1994 were "to address the immense socioeconomic problems brought about by apartheid". These ambitious objectives comprised the following key development challenges (in priority order of attention): SDG11 (housing); SDG6 (water and sanitation); SDG7 (electricity, energy); Land Reform, comprising virtually all socioeconomically linked SDGs; SDG3 (Healthcare); and Public Works dealing with issues in virtually all socioeconomically linked SDGs with special emphasis on SDG8 (jobs) and SDG11 (cities and habitats).

The RDP has been plagued with numerous implementation challenges, ranging from mismanagement at institutional levels, misappropriation of budgets and funds, and frequent construction quality breaches that necessitated costly repairs. These shortcomings frequently led to violent service delivery protests. A few out of a significant number of well-publicised reports of these shortcomings include:

a. **Business Insider December 2020**: Government is ending free housing projects – here's what it will offer instead:

> The national department of housing and human settlements has ordered provincial governments to immediately downscale free housing projects. Serviced sites, where people can build their own homes, will be preferred. Housing projects will only be supported if they benefit the elderly, child-headed homes, people living with disabilities, and military veterans. Is this the end of the RDP? Human Settlements Minister Lindiwe Sisulu has previously said that the policy has had unintended consequences, with many of these houses ended up being sold or rented out by the new owners. She also said that the free houses created "a culture of entitlement" among South Africans.

b. **The Conversation, October 2019**: **Amira Osman**, Professor of Architecture, Tshwane University of Technology: "*South Africa urgently needs to rethink its approach to housing*" "Gauteng has a backlog of a million houses. The problem has been exacerbated by budget cuts. In addition, it is said that more than 100,000 people move to Johannesburg a year, making it impossible to address the scale of demand. Recent events seem to imply that the government may be resorting to short-term measures to pacify anger and protest. But a major overhaul of housing policy is what's actually needed.

c. **AllAfrica.com**: (a) October 2019: "*More failure: Another RDP Housing contract in a shambles*" "*In 2015 Gauteng-based company Vuikani Construction and Transport was awarded a R82-million tender to build 489 houses in villages in the Cofimvaba district. Four years later, only 95 houses have been completed and residents are fed-up";* (b) 22 May 2020 – *"South Africa: SA Housing Policy Fails to Support Delivery"* The article covers numerous aspects of the RDP's deficiencies, suggesting that back-yarding, home construction in the back yards of existing homes, is a better option, growing 200% over the last fifteen years. Without full integration into already stretched urban infrastructures, back-yarding has/will give rise to more unexpected outcomes; (c) November 2020: "*South Africa: 1,000 RDP Homes Substandard and Unfinished*" "*In 2014 a R200-million tender was issued to build 1,500 houses in Matatiele, Eastern Cape. 1,000 units were completed, but the department says they do not meet the required standard. The contractor denies this and says government owes it money. Over 1,000 RDP house beneficiaries in Jabavu village in Matatiele, Eastern Cape, have been left with unfinished houses after the contractor left three years ago, say residents*"

2.4.8.2: Smart Cities[48]: Is it Smart Cities, or Smart People who build Smart Cities, that South Africa needs to overcome its SDG11 social challenges?

The term "Smart City" was introduced by IBM and Cisco in the early 1990s, to indicate the use of ICT in spreading information and knowledge to address the growing socioeconomic challenges of urbanization and uncontrolled urban sprawl. The fundamental objective was to "think deeply out of the box" to resolve the growing social problems of rapid urbanization. As it was born in the ICT sector, the term became synonymous with ICT, and today Broadband in all its flavours, including the Internet of Things (IoT) and the whole spectrum of 4IR and future technologies. Along the way, people, and even cities to some degree, became secondary to the technological solutions.

Definitions of Smart Cities:

a) **United Nations Family**: In 2013, as part of the winding down process of the Millennium Development Goals programme (MDG, 2000 to 2015), and preparations for its successor the Sustainable Development Goals programme (SDG, 2016 to 2030), the International Telecommunication Union (ITU) was tasked with defining the concept of Smart Cities for inclusion in the unfolding SDG strategies. After extensive global consultation, the ITU recognised the need to focus on people first, and introduced the concept of sustainability into the definition (https://www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx):

"*A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects*".

[48] The birth of the Smart City concept: Science Direct 2016: https://core.ac.uk/download/pdf/82436357.pdf

The whole United Nations family adopted this ITU-developed definition. The United Nations Human Settlements Programme (UN-Habitat), which is central to SDG11, is one of the very few UN agencies that details the technological elements of the smart city concepts, but reinforced its "people-centredness" in the concluding paragraph: "*Ultimately, the deployment of frontier technologies and sustainable urban development needs to pay particular attention to underserved populations in order to address inequalities and bridge social and spatial divides*":
https://unhabitat.org/sites/default/files/documents/2019-09/strategic_plan_2020-2023.pdf .

b) Wikipedia: A **smart city** is an urban area that uses different types of electronic methods and sensors to collect data. Insights gained from that data are used to manage assets, resources and services efficiently; in return, that data is used to improve the operations across the city. This includes data collected from citizens, devices, buildings and assets that is then processed and analysed to monitor and manage traffic and transportation systems, power plants, utilities, water supply networks, waste, crime detection,[1] information systems, schools, libraries, hospitals, and other community services.

c) IoT Agenda: A smart city is a municipality that uses information and communication technologies (ICT) to increase operational efficiency, share information with the public and improve both the quality of government services and citizen welfare.

d) OECD 2020: The "smart city" concept initially referred to initiatives that use digital and ICT-based innovation to improve the efficiency of urban services and generate new economic opportunities in cities. With the proliferation of smart city initiatives around the world, greater attention needs to be paid to whether the benefits and costs of smart cities are spread across all segments of society, i.e., assessing the distributional effects of smart cities on people, planet and places. Based on the discussions that took place during the first session of the 1st OECD Roundtable on Smart Cities and Inclusive Growth, this section will: (i) review existing definitions of smart cities and propose a possible typology of smart cities; (ii) present a SWOT analysis of smart city initiatives in OECD countries; and (iii) discuss the role that national and sub-national governments play in smart cities and inclusive growth. Key Point: "*While digital innovation remains central to the smart city concept, a key question is whether investment in smart technologies and digital innovations ultimately contribute to improve the well-being of citizens. A human-centric approach is considered key to make a city smarter. This is why the **OECD** defines smart cities as "initiatives or approaches that effectively leverage digitalisation to boost citizen well-being and deliver more efficient, sustainable and inclusive urban services and environments as part of a collaborative, multi-stakeholder process" (OECD, 2018a)."*

Various observations and opinions on utility of Smart Cities:

e) World Economic Forum, 16 April 2019: "Smart cities must pay more attention to the people who live in them"

> Mostly, the stakeholders of smart city projects are politicians, consultants, academics and tech companies. However, the most important group of stakeholders is often missing: the ordinary citizens that will have to live in these transformed cities.
> In consequence, strategies and projects focus too much on technology and not enough on cities' inhabitants. This issue has been raised before in academia and has been answered with frameworks and standards such as the Boston Smart City Playbook or the BSI Smart City Standards. Yet research has shown that there are still shortcomings and contradictions regarding true inhabitant-centricity. In light of the fact that inhabitant-centricity and citizen engagement are deciding success factors for any smart city transformation, it becomes vital to put inhabitants first. Otherwise, cities might invest significantly into services that its people will neither use nor want. If decision-makers do not change the current trajectory, we will see more protests similar to the ones in Toronto this year..

f) The Conversation, April 21, 2019: Smart cities: The promises and failures of utopian technological planning. "*Utopian projects have faced much criticism, including not being able to scale up. Some pilot projects have been reported as inauthentic, as untrustworthy or flawed in design. True solutions need a community-engaged design process that promotes inclusion and avoids elitism or exacerbating existing problems*"

g) **Example of a Smart City gone wrong**: BRASILIA: Preservation of a Modernist City, 2013: In 1956, Brazil initiated planning and implementation of a brand new "smart" capital city: ultra-modern office complex designs for the governing bureaucracies, and equally modern residential, commercial, services,

educational and health facilities for up to half a million Brasilia City residents and civil servants, all within easy reach of the governance sector via modern transport infrastructure. The completed design was awarded UNESCO's World Heritage Site status for its excellent modern design and artistic elegance. Fifty years after Brasilia was inaugurated in 1960, the wheels began falling off. Implementation was excellent, but did not fully take into account the massive social challenges the whole country faced - high levels of poverty and inequality, a GINI Coefficient of 54.7 by year 2000, compared to South Africa's 63, and international alert line of 40. The population of Brasilia exploded to nearly three million Brazilians (six times plan), setting up informal and similar settlements plagued by most of the social challenges that effect poor nations and their (un-smart) cities: social segregation, poor transportation, deteriorating public spaces due to poverty and neglect, etc. Brazil needs to do much more to realize the dream of a "smart" capital city – the nation must account for all its citizens.

h) India, 2017: Criticism of India's Smart Cities Mission is mounting: "*Two years into the Modi administration's ambitious goal to create 100 smart Indian cities by 2020, the real problems facing people remain: poverty, lack of basic services, and an ever-present risk of being forced to leave one's home"* Criticism of India's smart city strategy include, but are not limited to:

- Cities compete for a share of the national "smart city budget", with little attention to resolving the numerous social challenges: "*More than smart cities, we need smart solutions in an inclusive policy framework. Equity should be at the heart of urban planning*"; Shivani Chaudhry, director, Housing and Land Rights Network.
- Urban experts observe that the initiative is not addressing the real problems facing too many people in India's teeming cities: crushing poverty, a lack of basic services, and an ever-present risk of being forced to leave one's home.
- India's Director of Housing and Land Rights Networks comments further: "*People, not technology, have to be at the centre of any state intervention. While technological developments are very important and hold the potential to bring about positive change, they should be based on an inclusive approach, not on a platform that is patently exclusive*"

Brazil and India are key BRICS partners with South Africa. Can South Africa collaborate with these two countries more intensively to avoid the very costly unexpected outcomes of the Smart City concepts?

i) **Smart Cities in South Africa**. Like many other developing countries, South Africa has toyed with the smart city concept, with strong recommendations and expressions of support by high-ranking local officials and experts. The following extracts from relevant studies and reports summarise the South African Smart City approaches:

The Proceedings of the Smart City Initiatives Seminar held on 3 September 2019 (note: online document removed in 2020, copy available on request): This multistakeholder consultation convened by the Academy of Science of South Africa (ASSAf) is an important portrayal of the concerns and understanding of the smart city concept in South Africa. A detailed analysis is beyond the scope of this document, hence the following summary of the key issues and comments raised in the proceedings of the consultation workshop:

- There is no universal definition of smart cities. ICT is a common factor and enabler, but ICT vendors are driving technology solutions which do not necessarily address the challenges that need to be addressed.
- "*Technology is a means to an end. The problem is that cities are being sold technology to provide solutions to problems that are not clearly identified. It will be easier for cities, provinces and the State to come up with a framework once a definition of smart cities is agreed upon*."
- Comment by DTI representative: "*Smart cities in South Africa should link to a global market base and cannot only focus on this country's needs and needs to have a long-term view."*
- The increased migration from rural to urban areas necessitates implementation of smart solutions.
- Smart Cities discussion is not only about technology. It is about ensuring that there are new operating models in municipalities, solutions are people-centric solutions and smarter business processes. Culture and context are key. At the centre is a systems approach to smart cities. They cannot be realised by just one organisation. This requires a number of stakeholders to collaborate using integrated data models. Municipalities cannot work in silos. There is a role of SALGA and the SACN in this.

- ASSAf representative, page 22 of 40: "*Where does urban resilience come in and what role does it play in contributing towards a smart city? This addresses the problems relating to safety, gender mainstreaming and collection data."*
- Question by UJ Representative, page 25 of 40: "*Are smart cities what people want, or are factors such as housing, water and jobs more important?"*
- Educational institutions are not producing people that can work with big data, IoT and artificial intelligence. People have to be sent to the USA or China to be retrained in order to manipulate technologies. Schools not producing graduates that are tech savvy.
- Children have been a missing piece in the discussion around smart cities. The current focus is on institutions of higher learning and training, but the discussion should start at primary school level in order to ensure that children are educated to prepare them for smart cities.
- Smart cities must take a people-first approach, be society-centric and address local challenges.

This author's response to the Smart Cities workshop and proceedings suggested that the target for smart cities, if the concept is to be used at all, must be a technologically neutral focus on the nation's deep triple threats of inequality, poverty and unemployment, avoiding any costly techno-centric solutions as far as possible. This author's submission is available for view and download through this link: "The Smart City Initiatives in South Africa"

j) **ESI Africa, 5 November 2020**. 3 Steps to make SA's cities smarter rather than building new ones. Key points selected by the author of this document (text in italics represents direct quotations):

- *There is an immense opportunity – that is both scalable and replicable – in making existing cities in South Africa smarter and more people-centric.*
- *COVID-19 has highlighted underlying vulnerabilities that undermine South African citizens' quality of life. These include growing inequality, limited and/or ageing infrastructure, and a shortage of public resources to address these challenges – but applying smart city principles to all cities, and not only flagship projects, can help address some of these vulnerabilities.*
- ***Exclusive by design: Smart cities in South Africa:*** *Smart cities put people and the environment at the heart of high-tech developments that use data and technology (digital transformation) to drive service delivery and quality-of-life improvements for residents. But to support these efficiencies, flagship smart cities often put the technology at the centre and want to implement all innovations at once, which comes with high upfront capital investments that are recovered through higher property values and rentals.*
- *So how can South African cities be made smarter? By following these three steps:*
  - **Step 1: Gather data:** "*accessing accurate, relevant, and real-time data is a challenge in South Africa"*
  - **Step 2: Experiment rapidly:** (Author's comments): While agreeing in general with all the statements on rapid experimentation, some warnings are offered: Who is conducting the experimentation? If it is not fully inclusive, with the infrastructures and outcomes owned and operated by local residents, and supported strongly by local authorities, the most likely outcome is failure to meet sustainability objectives. This is especially important if the "smart city" is based on "smartening" an existing poor urban enclave, say informal settlement. Non-citizen participation will sound the death knell of the initiative. Pilotitis and Siloitis are particular dangers as discussed in Section 1.1.2. of this document.
  - **Step 3: Partner broadly:** (Author's comments): This is perhaps the most important criteria, recognized in MDG8, and now SDG17, but it is also extremely difficult if the target community for "smart city" development are those who live at the base of the development pyramid. If all multistakeholders involved in development do not actively support the initiative in an inclusive "bottom-up" development and operational mode, one which embraces frequent failures of small and micro enterprises as the norm, not the exception, the best laid plans will fail. Africa is awash with such failures in virtually all disciplines, especially those that depend on technology for their success – read about the failure of well-designed mHealth projects, exacerbated by the Covid-19 pandemic. A hint of the numerous documented challenges is an excellent December 2019 opinion piece by Paul Trigonoplos: "Leaving 'pilotitis' behind" - what it takes to become a full-scale population health manager.

k) Smart cities in South Africa! A case of misplaced priorities? July 2017: Walter Musakwa (University of Johannesburg) and Baleseng Tlholohelo Mokoena (City of Ekurhuleni): "This discourse (smart cities) has permeated through to most South African metropolitan cities such as Johannesburg and Cape Town. Nevertheless, the question remains, do we really need smart cities in South African and other cities in Africa mired in poverty and inequality juxtaposed with wealth and un-paralleled information and communications infrastructure?

l) South African Cities Network August 2020: Smart City Paper Series: Smart Governance in South African Cities. An in-depth analysis of the opportunities presented by the smart cities concept, with summaries of smart city strategies in Cape Town and Johannesburg. Both cities have demonstrated a commitment to smart cities, but highlight the following associated challenges:

- The lack of intellectual depth among officials and leadership – city officials and residents need skills development and training.
- The disconnect to unemployment challenges – smart cities may be a fashionable concept, but South Africa needs low-skilled jobs.
- Systemic high levels of corruption that create a volatile and unstable working environment – officials or departments may be unable or disincentivised to undertake innovative projects or initiatives, which may be brought under further scrutiny or risk an unfavourable audit outcome.

The challenges identified above have led to extremely costly unexpected outcomes of the smart city concepts as outlined briefly in the following section.

m) **South African Smart Cities (aka "integrated broadband networks") gone wrong**:

The following summarises a few well-publicised unexpected outcomes of South Africa's Smart City initiatives:

Johannesburg: The "Joburg Broadband Network Project (JBNP)" began life in 2007 with the publication of a tender to build, operate, and transfer (BOT) modern broadband networks with the full suite of peripherals and services to support Johannesburg socioeconomic development. In March 2009, a "contract" was awarded to Ericsson SA, the local representative of L.M. Ericsson, a global Swedish ICT company established nearly 150 years ago. Ericsson SA set up Citiconnect Communications (CCC) for the joint venture partnership with the City of Johannesburg (CoJ), primarily to meet various ownership details including BBBEE considerations. The CoJ/Citiconnect partnership set up yet another operating company in January 2010, BWired, to build the network, scheduled for completion in 2013, to operate the network over a 12-year period after completion, and thereafter transfer the network to CoJ in circa 2025. The total cost of the BOT arrangement was estimated at R1.2 billion. In 2014, the CoJ declared a dispute with Citiconnect Communications, terminated the contract, and began proceedings to take over BWired and integrate its operations into the municipality's normal operations.

The controversy surrounding the Johannesburg Broadband Project continued over the next few years, with well-publicised accusations, counter-accusations, and allegations of high-level corruption in government, the ruling ANC party, and within the City of Johannesburg itself. A few selections of such publicity include: (a) City of Joburg 10 March 2017: Investigation into City's R1.3 billion acquisition of Broadband Network; (b) The Citizen 21 July 2017: Senior official in charge of Joburg broadband project suspended; (c) Times Live 13 December 2017: Minister implicated in dodgy R1.7bn Joburg broadband tender; (d) Times Live 20 January 2019: ANC bigwigs named in US fraud probe into botched broadband project.

> On 21 January 2019, ITWeb reported that the "*Future of Joburg's broadband network remains unclear: After more than a decade, there is still no clarity as to when the Johannesburg Broadband Network (JBN) project will go live and when residents will benefit from the 900km fibre broadband network infrastructure*." ITWeb went further to report that in 2015, CoJ had agreed to buy the broadband network from its joint venture for the sum of R1.3 billion, transferring all assets to a newly created CoJ owned entity, the Metro Trading Company (MTC), which was said to have no telecommunications experience of any sort, and was itself facing administrative and financial difficulties".

On 23 February 2021, TechFinancials.co.za reported that "*City of Jo'burg Identifies a Potential Buyer for Its Broadband Network*" (at a price between R853 million and R1 billion), and that "*The service provider will sign a 12-year contract to own the asset, maintain and upgrade it and commercialise the network*." The article did not identify the potential buyer, but noted that Vodacom, MTN, Telkom In Race To 'Buy' Joburg Broadband Network.

Clearly, the city of Johannesburg had excellent motives and ambitions for the residents of Johannesburg when it embarked on its smart city venture, but did not anticipate the complexities of the project, and the massively negative unexpected outcomes resulting from this complexity. The complexity of the project was not technical – the South African ICT industry has the technical competency to undertake a project of this nature; the challenges were very human – politics, greed, and executive incompetence prevailed where advanced technical, business, and managerial excellence were required.

Cape Town: Cape Town's Smart City venture: In 2002, the City of Cape Town embarked on its version of a smart city, setting up a "smart public partnership" the Cape Town Partnership (website for sale in 2021), to plan, build and operate the smart city network. Excellent overviews of Cape Town's Smart City strategies have been provided in the following online documents, amongst many others:

- The TM Forum, a "*global alliance of companies working together to break down technology and cultural barriers between digital service providers, technology suppliers, consultancies and systems integrators*" outlines Cape Town's smart city strategy in its 12 August 2016 review "*Can South Africa deliver on its smart city dreams?*". This document provides an excellent historical record of Cape Town's smart city strategy 14-years after its launch, and introduces the "Cape Town Partnership" set up for the purpose, which was subsequently abandoned in July 2017 (see Cape Talk article here) in favour of a commercial (profitable?) model of development for the city. The Cape Town Partnership website is currently being advertised for sale.

  Key takeaways that can/must inform South Africa's city developments from this review of smart cities include:

  - The first pronounced objective of the City of Cape Town at the launch of its smart city initiative was "to create South Africa's own – and first – e-city", progressive emulation of New York's Greenwich Village, a fashionable high-cost New York centre of arts and culture, and Dubai Internet City (see alternative description here);
  - In September 2014, the Executive Mayor of the City of Cape Town expressed the city's ambition to become "the first truly digital city in Africa";
  - The report includes a statement by a spokesperson from the Office of the Mayoral Committee in Cape Town that "*the City of Cape Town has invested just over R10 million ($700,000) in Citi since 2011, some of which has been used to fund CapaCiti, a job-readiness programme born out of the need to meet the ICT-related requirements of industries such as insurance, asset management, and retail which were offshoring their software development skills outside of the region. Since its inception, this initiative has skilled more than 900 underprivileged youth from low-income areas such as Delft, Khayelitsha, Gugulethu and Mitchells Plain in scarce IT skills*". For context, it is necessary to note that the population of the "low-income areas" of Cape Town is nearly 2 million mostly very poor and poorly educated unskilled citizens;
  - The conference to which this informative report refers, concluded with positive statements like: "*Cape Town is making significant improvements. But, no, we are not there. And yes, some of the projects have failed or not delivered as they should. But the improvements are coming and I think the city will be smarter and smarter year on year*"; and "*The evolving South African citizen of the future will be highly knowledgeable and more tech-savvy than ever before. They will expect enhanced, highly personalised service from cities and will move between cities to get what they want. Cities, in effect, will become competitors for the top talent that, in turn, attracts businesses. To satisfy this new breed of citizen and so expand their tax bases, South African cities will have to*

see them as customers. This will require our cities to evolve considerably as they struggle to meet a new set of needs and to improve the quality of inhabitants' lives".

To meet the above very hopeful closing statement, the whole nation, and all cities and towns, will need to do much more to reduce the massive inequalities of opportunity in education, skills acquisition (they are not necessarily the same), income, and the numerous daily livelihood constraints discussed in this document. The primary objective and focus of all city developments must be ALL people first, with technology playing a central role in realizing that primary objective and focus.

- Overview and Analysis of Cape Town's Digital City Strategy: a study by the Urban Real Estate Research Unit (URERU) of the University of Cape Town (UCT). This highly informative study undertaken by: (a) the highest ranked university in Africa (and therefore in South Africa, ranked by U.S. NEWS); (b) located in what some analysts claim to be the most beautiful city on the African continent; (c) one which hosts the most expensive private residence in the country:

  > A private family residence sold In 2020 for R 150 million in the Fresnaye suburb, a wealthy Cape Town suburb with a population of 2,000, population density of 2800/km^2, race 83% white, which is located just 25 km from Nyanga, nicknamed "the murder capital of South Africa", home to 58,000 residents (2011 census) squeezed into 3km^2 (density 19,000/km^2), 99% of whom are black, according to the nation's "race" classifications.

  The above scenario stands in stark contrasts to the contents of this otherwise excellent study. The scenario offered above suggests that extremely deep socioeconomic inequalities shape the nation, and Cape Town in particular. The levels of inequality, poverty and unemployment in the country and its urban settlements are verified by all demographic statistics generated by and for South Africa, and are depicted in Section 1.0 of this document. The reference document discussed in this section mentions just once, the terms "inequality" (on page 8/22 of the report), and the related "poverty" (on page 6/22 of the section "Setting the Scene), and no mention of the terms "crime" or "murder", and their links to the city of Cape Town, in which the nickname "murder capital" shifts from the Cape Town "suburbs" of Nynaga to Delft and Khayelitsha, closely followed by Inanda in KwaZulu-Natal (News24 report of 31 July 2020).

  Why are the extreme social challenges of the City of Cape Town, and of the South African nation in general, excluded from this discussion of "Smart Cities"? Perhaps the question should be rephrased as "*can a city be 'smart' if it hosts extremes of inequality, poverty, unemployment, and extreme differentials in the social services provided to its citizens?*" This question raises the definition of what a "smart city" should be, or can be, discussed in this UCT-based study in the introductory section "Background to the City's Digital City Strategy". The key observations from the report are that *"… the original vision was created by the CoCT to devise ways to use technology to meet key development objectives and to best serve its citizens"*, and "*the term digital and smart are ambiguous and there is no clear definition of what either of the concepts mean*".

  The definitions preferred by the United Nations family, interpreted by UN Habitat as "*Ultimately, the deployment of frontier technologies and sustainable urban development needs to pay particular attention to underserved populations in order to address inequalities and bridge social and spatial divides*", must provide guidance to the City of Cape Town's vision of Cape Town as a truly smart city, one that is built by and for all its citizens, and shaped and defined by these same citizens, whatever their economic or social status may be.

  The UCT study provides very useful insights and details of the visions and strategies of Cape Town's long journey towards its dreams of a "digital city", an "*exciting and challenging digital journey*", as stated by the authors of the UCT study.

  The author of this document identifies a very basic concern over the sentiments and conclusions expressed in the UCT report: is it a "digital journey" that Cape Town's city fathers, mothers and citizens must embark on, or should it be a long journey towards rediscovering and restoring the humanity and

dignity of all who live in Cape Town and its environs, that began more than 100,000 years ago in the Cape province? Can the strategy be readjusted to one that uses the full range of digital, and any other technologies available or yet to come, to reduce the numerous social challenges that renders the whole of Cape Town city "un-smart"? Technology must be regarded as one important tool in a very broad arsenal of tools needed and used in the fight against the nation's triple threats of inequality, poverty, unemployment.

The use of technology in the struggle for egalitarianism must be maximised as part of the day-to-day management functions across all industries and disciplines, the clear targets must remain all citizens, not just the bureaucratic administrative processes of the city. Technology must never become the primary object of development, the objective for all city architects and their wide-ranging public/private partners must remain the whole human population of the cities, and this objective must prioritize the socioeconomically weakest links in the citizen body – the children of the poor.

The above notion is well-stressed by the WEF19 in its article "*Smart cities must pay more attention to the people who live in them*", positioning the full range of technologies, including ICT, to serve this primary "people-centred" development objective, subordinating all other sub-objectives to serve and support that primary objective.

In conclusion of this very brief summary of Cape Town's "*exciting and challenging digital journey",* a new mantra is proposed for Cape Town's city architects: "*a new exciting and challenging continuation of humanity's journey in its quest for its lost humanity that began at Blombos Caves in the Cape Province more than 100,000 years ago*". All technologies must be used simultaneously for that purpose, irrespective of how profitable they may be in business, how scientifically interesting they may be to academics and engineers, or how prone they may be to abuse. Technology must serve people, rather than people serving technology as most poor people must do when they pay a large percentage of their survivalist income just to play a very small part in this technological age.

The immensity of Cape Town's smart city challenges is summarized in the visual images of Annex 2.7.3.2, the first view of Cape Town by local and foreign visitors arriving or departing through Cape Town's International Airport. Balancing the extremes of poverty and wealth, so visible to all visitors and residents along the route, needs to be addressed, urgently, progressively, and continuously in the short, medium, and long-term development of the city. One excellent possibility is to reorient the technological components of this balancing act towards a "smart people" concept. A change in planning focus is needed, a change that focusses on people first, and the use of all available technologies in day-to-day city management for efficiency improvements.

Smart Cities in other South African provinces and urban centres:
Virtually all South African Provincial Governments have shown great interest in smart city type projects, often under the aliases "broadband", "E-City", "digital city", "smart grids", "intelligent systems", etc. Most have experienced the same shortcomings of the concept as Cape Town and Johannesburg have. A few examples are:

- **KZN**: R1.2 billion fibre optic tender scandal: Business Tech 26 August 2013: Johannesburg's B-Wired extends its interest to Pietermaritzburg: "*A R1.2 billion project to build and operate a fibre optic cable network around Pietermaritzburg, in KwaZulu-Natal has come under the spotlight after the Sunday Tribune revealed that it did not go to tender*"
- **KZN**: "Durban Wins IBM Smart City Challenge Grant": eThekwini Municipality, 26 March 2914: "*Durban has won the IBM Smarter City Challenge that will see IBM experts providing expertise and working with the City's leadership to develop a roadmap to a smart city which is aligned to the economic development and job creation plan for the City*". Searches for progress in this challenge in 2021 failed to return any useful results after the eThekwini Municipality officially accepted IBM's first report on 13 February 2015. Further searches of progress in this potentially sound partnership produced nil results.
- **KZN**: Government shows off plans for massive new smart city in KwaZulu Natal: 16 September 2019

- **Limpopo**: Limpopo's R580m broadband fiasco: IOL 12 August 2018: Extreme stress levels within and between a public/private partnership set up to deliver broadband and promote SMME participation in the province.
- **Gauteng:** SMEs accuse Gauteng Broadband Network of corruption: ITWeb 13 June 2019: "*A group of SMEs has accused provincial finance and e-government officials of maladministration, greed and nepotism, as the small business owners cry foul for being side-lined from the lucrative project*".

South Africa needs to re-think its smart city strategies. This would entail an even bigger rethink of the nation's relationship with technology, especially the ICTs. Using ICTs and the whole range of related 4IR technologies for city planning, operations and management must become the norm, not the exception. Can ICTs be positioned to reduce the city's multidimensional social challenges and threats, rather than the current predominant focus on bureaucratic management processes? What are the possibilities of the city "fathers" focusing on the "base of the pyramid challenges" first, and leaving current neo-liberal market economic models to address the connectivity challenges of the rich? This would probably have far greater impact on economic growth with societal stability than the current strategies employed by the South African nation as a whole.

Smart Cities throughout human history have always been built by "smart citizens". The Pyramids of Egypt (circa 2500 BCE) were built by ordinary citizens of Egypt who acquired the immense technological skills needed at the time, entirely on their own, using education and skills development systems very different from those of today, but clearly very effective. They were certainly not built by the Pharaohs, whose roles were to finance and coordinate the work of up to 30,000 highly competent, motivated, and well-paid Egyptian workers (read Harvard Magazine at https://harvardmagazine.com/2003/07/who-built-the-pyramids-html, and numerous similar research publications).

Other very smart cities (for their time), included the civil engineering geniuses of ordinary citizens of Machu Picchu about 500 years ago - the city's water, sanitation and road infrastructure remains a marvel of human ingenuity and innovation even today (see National Geographic "*Machu Picchu's Engineering Marvels*" and the short video "*Machu Picchu Water Management System*"). There are many more exquisite historical examples that suggests that smart cities are built by smart people, not by broadband or any other technology. Smart people acquire technological knowledge and competences so that they can apply these technologies to their day-to-day occupations, building progressively smarter cities, emulating their ancient ancestors who built very smart cities with very different technologies. Highly informative studies, like the Smithsonian Magazine's article "*Modern Cities Grow the Same Way As Ancient Ones*" should help South Africa to begin to address the nation's massive social challenges through inspired people-centred smart city development.

2.8.5: SDG12: Ensure sustainable consumption and production patterns:

The Sustainable Development Goals (SDGs) Indicator Baseline Report published by Statistics South Africa (STATS SA) in November 2017 (http://www.statssa.gov.za/MDG/SDG_Baseline_Report_2017.pdf), updated in June 2019 (http://www.statssa.gov.za/MDG/SDGs_Country_Report_2019_South_Africa.pdf), states that no data is available for the high-level goal 12: *12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP.* The more recent 2019 report summarises South Africa's response to the list of eleven SDG12 targets:

South Africa's response to SDG12 challenges: Comment on page 39 of 318 of the available for perusal and download at http://www.statssa.gov.za/MDG/SDGs_Country_Report_2019_South_Africa.pdf*:*

"Sustainable consumption and production (SDG 12) was neither included nor addressed in the MDGs, although it has been on the international agenda since the early 1990s (Clark, 2007). The omission of SCP from the MDGs is viewed as a 'missed opportunity' (UN, 2013), since the implementation of the MDGs coincided with an increase in production, consumption and waste in developing countries (Akenji & Bengtsson, 2014). This situation has now been rectified by the inclusion of SCP in the SDGs. The MDGs focused on developing countries, with funding support from developed countries. By contrast, all countries, irrespective of their development status, are expected to work towards implementing the SDGs, and for SDG 12 specifically this means decoupling economic growth and consumption of resources and the associated waste generation".

SDG12 Targets

12.1: Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns;

12.2: By 2030, achieve the sustainable management and efficient use of natural resources;

12.3: By 2030, halve per capita global food losses and waste at the production, supply chain, retail and consumer levels;

12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, and reduce their impact on all seventeen SDGs – i.e., the whole South African ecosystem;

12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse;

12.6: Encourage all companies, local and external, to actively integrate sustainable practices in their business processes;

12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities;

12.8: By 2030, ensure that all South Africans have access to all information and knowledge needed to address all SDG challenges;

12.a: Strengthen scientific and technological capacities to enable sustainable patterns of consumption and production;

12.b: Develop and implement tools to for sustainable tourism, job creation, and cultural protection;

12.c: Develop sustainable responses to inefficient fossil-fuel subsidies and wasteful consumption. The tools to do this range from rectifying market distortions, fiscal and taxation policies, and the full range of constitutionally mandated remedies, including the sanctions and penalties prescribed in the national constitution and criminal justice systems.

It is clear now, especially with the devastating impact of the global Covid-19 pandemic and its consequences on global and national economies and social fabrics, that the ambitious targets outlined by STATS SA above will not be met by year 2030. Target 12.4, to be achieved by year 2020, has already passed its target date, and the challenge, and those closely related to it, continue to rise. For example, can the alarming sanitation crises depicted and discussed in Annex 2.6.1 be controlled and reversed while the environmental and social challenges that caused them continues unabated? There are direct causal relationships between SDG12 and the root causes of the crises discussed in Annex 2.6.1.

It is also clear from the list of SDG12 targets, that the success of each target depends on the alleviation of all other SDG challenges. For example, target 12.3 – "*By 2030, halve per capita global food losses and waste at the production, supply chain, retail and consumer levels*" must be vigorously and urgently focussed and localized to: (a) reduce poverty through SDG1 with SDG12; (b) grow the nation towards zero hunger through SDG2 with SDG12; (c) improve the health of parents and their children from socioeconomically marginalized populations through access to improved food, in SDG3 with the success of SDG12; (d) educate the whole population, especially the future generations of adults (children) on how to access affordable and available food, and to reduce food wastage in SDG12, all through SDG4; (e) perhaps most importantly, reduce the alarming gender-based abuse and discrimination that deprives the nation of nearly 50% of its human capacity and capability, through SDG5. Food shortages in the face of plenty are known to contribute towards violence against the weakest, hence GBV; and finally (f), reinforce and expand SDG17 to ensure the 4Cs of collaboration, coordination, cooperation, communications are central in successfully alleviating this SDG12 challenge.

The link between SDG12 and SDG8, Work, must be obvious from the above discussion. Work opportunities are available throughout the distribution channels required by the process of reducing food waste and improved food distribution. Furthermore, the knowledge of the availability, value, and efforts needed on where and how to access food when commercial outlets are unaffordable, brings in the roles of SDG4 with SDG8 and SDG12.

2.9: SDG16, SDG17, and their relationships with SDG8:

2.9.1: The nexus of SDG16 and SDG8 – Peace, Justice, and Strong Institutions built and designed by and for South Africans so that they can further develop the jobs and work ethics of the future, the "decent work" that leads to unimpeded and welcome economic growth.

South Africa has an excellent Constitution and Bill of Rights, and excellent justice systems, all of which regularly receive much praise from all corners of the world. This Constitution and its Bill of Rights and the national justice systems supports all goals, targets, and indicators of this SDG16, and in many ways, all other SDGs.

But, implementation and enforcement of the main provisions of the Constitution and its Bill of Rights, and the provisions of the justice systems, remains problematic. The national and international news media publicises numerous breaches of all these national provisions. Typical examples are:

- **The Judicial Commission of Inquiry into Allegations of State Capture, Corruption and Fraud in the Public Sector Including Organs of State:** Launched on 8th February 2018 (gazette notice 105 of 9th February 2018), this commission was set up in response to allegations and counter allegations, accusations and counter accusations, of major breaches of South Africa's Constitution, Bill of Rights, and numerous national laws in all branches of government and state agencies, and at all hierarchical levels including the nation's head of state. Following numerous extensions, the Judicial Commission is approaching closure at the time of preparation of this document.

  While South Africa correctly grapples with its own debilitating scourge of state capture, there is another even more dangerous form of capture under way – the global capture of Homo sapiens' humanity by the post-Neolithic economic models favoured by modern humans, in which Homo sapiens have become resources, assets, capital, "captured" by the vile maxim of the masters of mankind.

- **The Marikana Massacre of August 2012** and its aftermath: Is justice delayed justice denied for the relatives of the Marikana victims? A total of 34 mineworkers struggling for the "decent work" so eloquently described in the introduction of SDG8, were gunned down in cold blood by post-apartheid law enforcement agencies on 16th August 2012, with a further ten deaths in the lead-up to the tragedy. Many bereaved families still await the compensation promised to them more than eight years ago:

  DispatchLIVE, 20 August 2020: Justice and compensation for Marikana victims remain elusive, eight years down the line

  Dr Wayne Malinga: *"For eight years, widows and family members of the slain and injured mineworkers in this tragic, gruesome and horrifying massacre of their loved ones have been waiting in pain, hurt and anger as justice has not taken precedence to book those who were behind this unfortunate event."*

  The Marikana tragedy is not a stranger to South Africa. It merely demonstrates very deep historical societal fissures that survived apartheid well into the post-apartheid era – major disconnects between the public protection offered by the nation's constitution, the bill of rights, all legal provisions, and the application of them all. Nearly all aspects of these public protection policies, especially the specific provisions of the Bill of Rights, were breached in the Marikana massacres, as they are regularly breached on a daily basis in the nation's immense inequalities in educational opportunities and outcomes (Section 2.4 – SDG4 – Education). These breaches set the frameworks for all societal challenges contained in all SDGs. The small selection of references concerning this very complex human challenge that follows serves only as an introduction for further action-oriented applied research needed to support the wide range of disciplines that constitutes a holistic approach to resolving this and all other SDG challenges:

  - **History as a system of wrongs - examining South Africa's Marikana tragedy in a temporal legal context**: Buitendag, Nico (Department of Jurisprudence. University of Pretoria, South Africa); Coetzer, Neil (Senior Associate, Cowan-Harper Attorneys, South Africa: http://hdl.handle.net/2263/52193, November 2015.

    The authors of this excellent analysis of the tragic Marikana massacre provides a vital historical context to the disconnects between constitutional and legal public protection, and the realities of South Africa,

past, present, and potential future. The following quotations from the study suggest this context, and invite further examination of this highly informative study:

- "*This paper suggests that rather than a turning point, the tragedy at Marikana is perhaps only the newest instalment in a century-long cycle of industrial action and government violence in South Africa's labour history. Marikana is thus not a turning point, but rather a restatement of the ineffectiveness of law"* and: "*Although many consider Marikana a 'founding myth' for a popular uprising in South Africa, the article cautiously suggests that it is in fact just 'business as usual'"*
- The authors proceed to quote the opening statement from Thomas Piketty's best-selling voluminous yet very highly regarded book "*Capital in the Twenty-first Century*", which begins with a direct focus on the Marikana tragedy, posing the question "*Does this kind of violent clash between labour and capital belong to the past, or will it be an integral part of twenty-first century history?*"
- The authors also remind their readers that the "black-on-black" Marikana massacre was not the first in South Africa – numerous precedents of "white-on-black" and "black-on black" and "white on white" violence are well-documented in South Africa's history, and must include the "white-on-white Rand Rebellion" of 1922, in which the full might of the South African Armed Forces was used to quell white miner's demands for better wages, labour conditions, and maintenance of apartheid's racial divisions of labour. This 'rebellion' resulted in the deaths of up to 230 mainly white miners, and more than 1,000 injuries.

  - Other useful sources of information on the Marikana Massacre include mass media coverage:
    - Open Canada, 14 January 2016: *Inequality Explained: Lessons from South Africa's Marikana massacre.* **"***When tension grows between people and profit, communities must learn how to extract, manage and share resources in a just way*".
    - Mail & Guardian, 15 May 2014: Mining strike: The bosses eat, but we are starving. "*… it becomes impossible for an underground worker at the company to earn in a lifetime what the average director pockets in a year. To equal the annual pay of the company's chief executive, an underground worker would have to live a bit beyond 130, start work as soon as he legally can, and work until he drops dead*".

  Must South Africa continue "business as usual" deep into the future, or can the country begin to build a better society for all its future generations through the very long process of resolving all the integrated SDG challenges in a systematic holistic manner?

- **National Policy versus Reality**: General public comments on South Africa's constitutional protections and the reality for most South Africans:
  - Statistics South Africa (STATS SA), 11 October 2018: 'While crime increases, fear rises and trust in criminal justice system drops". Victims of Crime Survey, 2017/18: "*Crime prevention and ultimate elimination is one of the top priority goals of the National Development Plan (NDP)... Such understanding is vital for planning targeted interventions and assessing progress made towards achieving a crime free nation where 'people living in South Africa feel safe at home, at school and at work, and they enjoy a community life free of fear. Women walk freely in the streets and children play safely outside'"*
  - The Conversation, 30 March 2021: South Africa needs to address the lingering legacy of its police using excessive force. "*South Africa has a painful history of police using excessive force against protesters. In one of the worst incidents under the apartheid government 69 protesters were shot in cold blood by police outside a police station in Sharpeville in 1960……. A quarter of a century later South Africans need to be reminded of the past they seek to leave behind. When he signed into law the Constitution of the Republic of South Africa, 1996, President Nelson Mandela chose to do it at Sharpeville. To him the constitution was brought into being*"
  - Institute for Security Studies, 25 Feb 2020: Old solutions won't fix South Africa's deteriorating police service. Critical comments on South Africa's police service and its relationships with the nation's leaders.

- SAGE Journals, 12 April 2021: Safeguarding the Republic? The South African Police Service, Legitimacy and the Tribulations of Policing a Violent Democracy:

Abstract
Since 1994 the South African Police Service (SAPS) has undertaken various efforts to build legitimacy in South Africa. Extensive community policing resources have been made available, and a hybrid community-oriented programme (sector policing) has been pursued. Nevertheless, public opinion data has shown that there are low levels of public trust in the police. Using Goldsmith's framework of trust-diminishing police behaviours, this article suggests that indifference, a lack of professionalism, incompetence and corruption on the part of the police, particularly in high-crime areas, have eroded public trust in the SAPS. Furthermore, in an effort to maintain order, reduce crime and assert the authority of the state, the police have adopted militaristic strategies and practices, which have contributed to numerous cases of excessive use of force, which has consequently weakened police legitimacy in South Africa

South Africa's SDG16 challenges are deeply entrenched in the nation's history, and cannot therefore be resolved in the short term, irrespective of the quality or relevance of the high-level public protection policies, legal instruments, or powers of the law enforcement agencies. The triple threats of inequality, poverty and unemployment permeate every aspect of SDG16, which is also vulnerable to every other SDG in varying degrees. In particular, the importance of the ten specific 4IR skillsets listed on page 8 of https://www.sakan.org.za/Docs/ICT4SDG4.pdf extend far beyond the realms of technology, they are vital day-to-day skills in any profession, especially in law enforcement. The most important competencies for law enforcement derived from this list, used in conjunction with the standard compulsory literacy skillsets required for all modern occupations, are:

Complex problem solving: Humans are extremely complex, be they law creators, enforcers, and evaluators (judges), criminals of all shapes and competencies, victims of crime, innocent bystanders, children and women, rich or poor, antagonistic or friendly. The best law enforcement agencies are taught/trained to deal with this complexity on a day-to-day minute-by-minute basis. Failure to do this can/will at worst result in violence like the Marikana situation discussed above, and at best peaceful non-violent expressions of the freedoms of expression contained in South Africa's Bill of Rights.

Critical Thinking: South Africa faces immense challenges inherited from its ancient and recent histories, and generated by the changing world. Addressing these known and unknown challenges without exacerbating them, requires instant, creative thinking and fast resolution of whatever problem (challenge) must be addressed at any given time and place.

Creativity: There are no "one size fits all" solutions to any human problem, and if fashionable clichés and idioms are to be used for clarity, all law enforcement agencies must be able to "walk and chew gum at the same time" while "thinking outside the box" (a Malaysian high ranking planning official advised this author to "*just throw away the box and think*" – this in connection with Malaysia's broadband strategy). The absence of creativity in law enforcement has led to severe social problems everywhere, throughout history.

Emotional Intelligence: South Africa is a complex, multi-cultural, multi-ethnic, multi-racial, multi-lingual, multi-pigmented, multi-complex society. Emotional intelligence in law enforcement is vital if the law enforcers multi-xxx individual sensitivities and preferences are to be suppressed in favour of finding the best compromise solutions to very difficult human challenges. Emotional intelligence enables the use of the full suite of available information, knowledge and skills instantly to resolve often very difficult, and even dangerous human challenges.

Negotiation: In a complex society like South Africa, sending in law enforcement agencies without high levels of negotiating skills to appease hostile and volatile crowds should be classified as a crime – a crime of leadership failure that can and has resulted in situations like Marikana and the full range of pre- and post-apartheid outbreaks of violence during justified and rational, or irrational and unjustifiable public protests.

Cognitive Flexibility: Eminent scientists agree that the cognitive capacity of Homo sapiens emerged more than 200,000 years ago in Southern Africa, and was subsequently "exported" to Europe about 155,000 years later – Christopher Henshilwood, Centre for Early Sapiens Behaviour, South Africa. The cognitive capacity damage

done to South Africa's children today, due to poverty, makes a mockery of this evolutionary history, and in turn shapes many of the ill-conceived decisions made by South Africa's law enforcement agencies today (see PMC/NCBI 2016 article "Poverty, Stress, and Brain Development: New Directions for Prevention and Intervention").

There are no "quick fixes" to this deleterious South African challenge, it demands fundamental transformation of the nation's educational systems, parenting, and the whole range of societal reengineering. The nation must begin the very long-term process now, starting with children and youth, using the SDGs supported by information and knowledge-delivering ICTs, as just one of many vehicles to guide this very long-national journey to a better future.

2.9.2: SDG17: Strengthen the means of implementation and revitalize the global partnership for sustainable development:

The United Nations Department of Economic and Social Affairs (https://sdgs.un.org/goals/goal17) lists eight "Related Topics" in this SDG: (i) Capacity Development; (ii) Finance; (iii) Financial Institutions; (iv) Multi-stakeholder partnerships and voluntary commitments; (v) Science; (vi) Technology; (vii) Trade; (viii) National Sustainable Development Strategies (NSDS), and an "Overview" comprising five interventions to strengthen SDG17:

a. Before Covid-19: Inadequate Overseas Development Assistance (ODA);
b. Declining Global Foreign Direct Investment (FDI);
c. Covid-19 Implications: Remittances to low- and middle-income countries – an economic lifeline for many poor households, are expected to fall;
d. Fixed Broadband Subscriptions per 100 inhabitants were 33.6 in developed countries, and 11.2 in developing countries;
e. International Funding for Data and Statistics was only $690 million in 2017, only half what it needs to be.

The above priority "Related Topics" and priority areas for interventions are relevant yet problematic. They all assume or imply that the best way that developing countries can improve through SDG17 is via international aid – there seems very little, from this "front page" summary, that developing countries can/must do for themselves to overcome the whole range of SDG challenges. The "front page" of this UN outline of SDG17 also encourages the (erroneous?) perception that the primary objectives of the SDG processes as a whole is to enable the success of the SDG processes themselves, and in doing so, the benefits will "trickle down" to the national targets, led by the poor in the critical SDG1 – "*End poverty in all its forms everywhere*". The global population cohort in this SDG should be poor people everywhere - how can these poor people be repositioned to the centre of SDG17, and not, as per the perception generated by the wording, the recipients of the trickle-down beneficiaries of the success of the SDG processes themselves. This perception is clear from the wording of "Related Topic (v) – Science", which is central to this discussion on ICT4SDG:

Related Topic (v) – Science
(paragraph 70 of the 2030 Agenda reads): *"the Technology Facilitation Mechanism will be based on a multi-stakeholder collaboration between Member States, civil society, private sector, scientific community, United Nations entities and other stakeholders and will be composed of a United Nations Interagency Task Team on Science, Technology and Innovation for the SDGs, a collaborative Multistakeholder Forum on Science, Technology and Innovation for the SDGs and an on-line platform."*

As this document argues in Section 2.4 – Education and Work – scientific knowledge lies at the root of what and who we are (Homo sapiens); what our living environment is, and this includes the greater universe; how they all relate to each other; and how the underlying scientific knowledge of these relationship can underpin the survival of the species within its current living environment, or destroy it through absence of application of this scientific knowledge, or its deliberate misapplication.

Do we need to devote most of this critical component of the vital SDG17 attention to the "*Technology Facilitation Mechanism*" of the multi-stakeholders listed in the statement above, or can/should we divert this attention directly to the people who need scientific knowledge and technological support the most?

The primary targets, who should be central participants in the "*Technology Facilitation Mechanism*", are: first, the global poor who are generally excluded from all the means of development, especially science and technology knowledge acquisition and usage; secondly, the global and national, especially political decision makers of today. Too many of the latter can be considered scientifically and technologically illiterate, in both developed and developing countries, but they wield immense power over the scientific and technological community, and the SDG targets. The last but not least, are the global leaders of tomorrow, i.e., the children of today, especially those that struggle to escape the ignorance and poverty traps into which they were born. The perception that SDG17, and nearly all other SDG challenges, were designed to support the above high-level multi-stakeholders should change towards a conscious, stated, recognition that these powerful, highly influential high-level multi-stakeholders have undertaken to serve the victims of the SDG challenges, and not themselves or their well-intentioned agendas.

Concerning the "*Fixed Broadband Subscription per 100 inhabitants*" indicator of "*Overview item d*.", this indicator has very little meaning or value. It is being updated and rendered obsolete or redundant within the global ITU processes (see ICT Development Index 2020: A proposal – ITU). It is impractical to perceive a "fixed broadband penetration" of 100 per 100 persons, human beings are not fixed to any geographic location, technology, or gadget, whereas a "fixed broadband" is. The age and affordability capacities of the population adds to the complexity of the indicator - young children counted in population censuses cannot be part of this "fixed broadband per person" indicator. In South Africa, for example, the reported fixed broadband penetration for 2019 was a very low 2.1 per 100, this indicator masks the vital growth opportunity of many poor people sharing this fixed broadband – in homes, offices, schools, and the full range of public and private sector institutions and organizations. The percentage of households with fixed internet access is a much better but imperfectly measured indicator of the value of ICT usage. In South Africa, this "Internet Connected Household" indicator remained stagnant at approximately 10% between 2011 and 2018, as shown in Table 3.0.2 (a) in the section that follows, copied directly from ICASA Graph 3 on page 13 in "State of the ICT Sector Report in South Africa 2020". Table 3.0.2 (a) presents a 5-nation benchmark of the growth and economic impact of this indicator, and Table 3.0.2 (b) adds some detail to the economic contribution of this indicator measured against the experience of the 5 countries included in the benchmark.

In evaluating, or just discussing this "broadband penetration" indicator, it is useful to closely examine the growth path of South Korea. In 2019, South Korea's broadband penetration was 42.8 per 100 population, but the broadband connected homes reached, and perhaps exceeded 100% if multiple fixed connections and connected non-residence premises are counted. The world needs to update this vital indicator of ICT4D – it must focus on access to information from birth to the grave for all household members. As currently stated, measured and used, it has very little meaning, and may even be misleading in the context of ICT4D or ICT4SDG.

The second ICT related indicator, funding for data and statistics (item e. in the "Related Topics"), is useful as a "top-down" and hopefully "trickle-down" driver of economic development, and better still, a driver of human development. But as currently stated and used, data and statistics seem to have little impact or relevance on the masses of poor "digitally illiterate" and "digitally disconnected" masses that dominate the developing world. The best that big data and accurate/relevant statistics can do for the global poor is: (a) to help expand national macroeconomies, at the top of the "food chain" that uses digital services productively, so that the benefits they realize can better "trickle-down" to the poor; (b) to increase the wealth of the already wealthy so that some of their wealth may better "trickle down" to, and "rub off" on the poor, maybe in the form of fairer taxes (e.g., to support UBI?); (c) that a small but very significant portion of the big data and statistics will be about the poor, expressed in a way that will encourage all stakeholders, especially governments, to use these data and statistics to tackle each nation's integrated SDG challenges; (d) to position some of these data and statistics to target the poor directly, so that they too can understand and appropriate them, and thereby be "empowered" and "transformed" - the popular or politically correct modern jargon of development – and

therefore use them to help themselves, their families, and their communities to rise out of their current poverty traps in which they find themselves.

SDG17 Summary: "*Strengthen the means of implementation*" – vital, urgent, through the 4Cs for all SDGs, avoiding any tendencies towards "Pilot-itis" and "Silo-itis" as discussed in Section 1.1.2 of this document; "*and revitalize the global partnership for sustainable development*". This must be extended aggressively, deliberately, and visibly towards broad-based national partnerships - **Everyone is needed!** - as recommended in the United Nations 2030 Agenda which will be discussed in greater detail in paragraphs that follow.

Transforming our world: the 2030 Agenda for Sustainable Development:

"We resolve, between now and 2030, to end poverty and hunger everywhere; to combat inequalities within and among countries; to build peaceful, just and inclusive societies; to protect human rights and promote gender equality and the empowerment of women and girls; and to ensure the lasting protection of the planet and its natural resources. We resolve also to create conditions for sustainable, inclusive and sustained economic growth, shared prosperity and decent work for all, taking into account different levels of national development and capacities."

South Africa will not meet these ambitious goals and targets by 2030, hence the urgency to start creating the required PARTNERSHIPS NOW – "**Everyone is needed!**" - "*The 2030 Agenda needs the bright minds and relentless dedication from all of society — Governments and the UN cannot do it alone.*"

SDG17 is perhaps the most important of all the SDGs – it has the potential to build mechanisms for the coordination, collaboration, cooperation, and communication (the 4Cs) that are vital for the holistic implementation of an extremely complex range of interdependent human challenges, i.e., all the remaining sixteen SDGs. SDG17 has the potential of dismantling the very human habits of *Silo-itis*, the "me first and only me" factor of complex programme implementation. And similarly, dismantling the waste of Pilot-itis, the focus on pilot projects that fail to scale once completed. This applies especially to internationally funded projects, e.g., there exists a significant body of research evidence decrying the failure of eHealth (ICT in Health services) and mHealth (mobile telephony in Health services), including a World Health Organization (WHO) SWOT analysis searching for common factors in the general failure of mHealth projects in Africa. Other Pilotitis references include "*In 2008, Uganda started coming down with a condition well known to the international development community. It wasn't a virus or disease; it was a case of "Pilotitis.*" – an excellent commentary on Pilotitis in mHealth services by **Kate Wilson** – "Fending Off 'Pilotitis' in Global Tech; May 23, 2016".

The "top-down" focus of the international community in this SDG is understandable – it is nearly impossible to merge so many disparate yet interdependent challenges to match the needs of all developed and developing countries. The developed nations may have the resources needed to deal with their specific internal SDG challenges, but too many developed country SDG challenges, like climate change (SDG13), environmental degradation (SDGs 6; 7; 12; 13; 14; 15), often spill over into developing countries with devastating results. The "one size fits all" phenomenon does not fit the SDG challenges at all, nor can the UN family amass the required resources to assist all developing countries directly in so many different ways. It is thus up to each country to craft an effective SDG17 strategy, no matter how difficult this may be. The critical skillsets listed in the preceding discussions on SDG16 are vital for success, and if they are not available, they must be developed, irrespective of how long this may take.

2.10: Concluding observations from this section and introductory remarks for the following section:

The whole of Section 2, and the all the remaining sections of this discussion document, are about the information exclusion and information poverty inflicted on the bulk of South Africa's population who are poor, estimated at 55% of the total population by STATS SA in 2015 (http://www.statssa.gov.za/?p=10334), and updated to 76% in the NIDS 2019/2 report: Table 8 on page 23 (25 of 42), the sum of the "Chronic poor" (48.79%), the "Transient poor" (11.75%), and the "vulnerable" (15.09%).

An excellent starting point to qualify and quantify this information exclusion is the analyses provided by the International Telecommunication Union (ITU) in its most recent celebration and commemoration of the World Telecommunication and Information Society Day 2021 (WTISD 2021), using the theme "*Accelerating digital*

transformation in challenging times". This section of the discussion document focuses on ICT affordability in South Africa, a central focal point of WTISD 2021.

2.10.1: WTISD 2021: Impact on South Africa's pro-poor ICT access and usage

In the search for "transformative digits" - a.k.a., ICT, this section of the discussion document draws extensively from the background documents provided by the International Telecommunication Union in preparation for WTISD 2021. The WTISD 2021 supporting document Connect 2030 Agenda recognises that ICT affordability is the major challenge in virtually all developing countries, especially South Africa with its world record income inequality levels. Given the depth of this affordability challenge, the ITU, through the Connect 2030 Agenda, strongly recommends the establishment of nation-wide highly scalable public broadband access facilities to meet the needs of the poor at prices that they can afford. The Connect 2030 Agenda goals and targets sets 2017 as the affordability baseline year – the "*2017 Affordability Report*":

"Goal 1 Target 1.3: By 2023, Internet access should be 25% more affordable (baseline year 2017)"

The 2017 Affordability Report discusses "Public Access Solutions" in some detail in Section 3 on page 14, and follows this with further discussions, supported by case studies, in the 2018, 2019, and 2020 editions of the Alliance for Affordable Internet (A4AI) reports. The following selected extracts from the ITU Connect 2030 Agenda provides a first glimpse of the goals and targets that must be addressed by South Africa in its search for affordable broadband for its 76% economically stressed population:

Goal 1 Target 1.1: "*By 2023, 65% of households worldwide with access to the Internet*". Applicable definition: percentage of household equipped with 24/7 always on Internet irrespective of technology, excludes mobile broadband as the only household connectivity mode.

South Africa's stagnant Internet household penetration of about 10% between 2011 and 2019, is depicted in Tables 3.0.2 and 3.0.2 (a) in Section 3.0 of this discussion document. Both tables and the graph were derived from Graph 3 on page 13 and Table 1 on page 14 of ICASA ICT Report 2021; the World Bank database as per the hyperlink provided; and this report's Tables 3.0.2; and data from Statistic South Africa's General Household Surveys for years 2011 to 2019. Clearly, South Africa will not and cannot meet Goal 1 Target 1.1 within the prescribed two years. ICT affordability remains the principal barrier that stands in the way of 76% of South Africa's population accessing and using "transformative digits" for their personal and family protection and development, especially in these challenging times. The only way that South Africa can get anywhere close to this target is by building highly scalable mass public access solutions as recommended by all ICT Affordability Reports.

Goal 2 Target 2.6: "*By 2023, broadband services should cost no more than 3% of average monthly income in developing countries*". The 2017 Affordability Report recommends a broadband price target of "1 for 2" – 1GB of data priced at 2% of monthly income. This latter target begins the vital discussion on the quantification of "broadband" – how many GB delivered at what speed are enough for "digital transformation", with and without the pressure and urgency of these "challenging times"? This affordability target is approximately one sixth of the lowest South African price for 1GB per month of data, at the time of preparation of this discussion paper. There are no ICT service providers in South Africa that can meet this affordability target and remain commercially and competitively viable under the present South African national social and economic growth models. The levels of income inequality and poverty in South Africa are far too deep for traditional free market methods of delivering affordable ICTs to all citizens.

Goal 3: 5 Targets - a focus on Sustainability: Manage emerging risks, challenges and opportunities resulting from the rapid growth of telecommunications/ICT. The 5 targets all recommend delivery by 2023, in less than 2 years, of (a) Improved cybersecurity preparedness; (b) 30% recycling of all e-Waste; (c) develop or update e-Waste policy and legislation; (d) Greenhouse Gas abatement increased by 30% over the 2015 baseline; (e) Improved or updated National Emergency Telecommunication Plan as part of their national and local disaster risk reduction strategies.

These are excellent targets for South Africa as a whole, but what relationships do they have with the 76% South African population living in chronic poverty? Will the village-residing "granny" referred to in the opening

paragraphs of https://www.sakan.org.za/Docs/ICT4SDG2.pdf be concerned about any of these vital targets as she struggles to maintain the mobile phone she has and depends on for survival, and pay for the data she uses to "*put food on the table*" for her dependent children, grandchildren, and extended family members that she must care for? Can South Africa deliver on all these complex goals and targets, with about 76% of its population unable to participate in the design, planning, and implementation of these onerous goals due to their lack of ICT access and use for whatever reason? The "*emerging risks*" built into this goal must remind us that the Homo economicus side of our human nature has indeed led to significant abuse and existential risks of this age-old instrument of information and knowledge sharing. Abuse and misuse of ICTs and related technologies may lead to our demise, as warned by a growing number of respected intellectual thinkers, including historian Yuval Noah Harari: "*will AI-driven biological inequality add to our current species' woes of economic inequality?*". Our inability to provide the requisite information and knowledge to our poorest majority population and to empower them to use it productively to meet these goals and targets, may render all our efforts futile.

Goal 4 – Innovation – **Target 4.1:** "*By 2023, all countries should have policies/strategies fostering telecommunication/ICT-centric innovation*". South Africa has always had excellent capability for this goal throughout its 160-year history of ICTs, a goal and target fully supported by the nation's constitution and national ICT policy provisions. The country has built numerous capable institutions (e.g., CSIR, the Innovation Hub); universities and related education and training facilities (e.g., Tshimologong Digital Innovation Precinct at Wits, UWC's Zenzeleni project support); Civil Society and private sector initiatives – e.g., SIYAFUNDA CTC, the once-influential SANGONeT/NGO Pulse; and many more. They all have been unable to refocus South Africa's ICT innovative capacities and capabilities to service the nation's 76% "information poor" population. How can/must this change?

Goal 5 – Partnership: "*Strengthen cooperation among the ITU membership and all other stakeholders in support of all ITU strategic goals***"** - *https://itu.foleon.com/itu/connect-2030-agenda/partnership/*.

The ITU emphasis on partnerships amongst ITU members, and all other stakeholders, "*in support of all ITU strategic goals*", could, perhaps should, be redirected towards direct support of the "folks who live at the bases of the development pyramids" of the organization's members. As stated, the perception is that the ITU seeks partnerships and member state support for the institution's own strategic goals. In a perfect world, ITU's strategic goals should/would be the same as the member states and stakeholder's own goals and strategies. As stated, they can be effective only if they could "trickle down" from the headquarters and regional presence of the ITU to the folks who need them most at the base of the global development pyramids.

This Goal 5, and its single *Target 5.1: By 2023, increased effective partnerships with stakeholders and cooperation with other organization and entities in the telecommunication/ICT environment,* draws directly from the United Nations General Assembly Resolution A/RES/70/1: *Transforming our world: the 2030 Agenda for Sustainable Development*, adopted on 25 September 2015:

> **Extract from A/RES/70/1:** *"All countries and all stakeholders, acting in collaborative partnership, will implement this plan. We are resolved to free the human race from the tyranny of poverty and want and to heal and secure our planet. We are determined to take the bold and transformative steps which are urgently needed to shift the world on to a sustainable and resilient path. As we embark on this collective journey, we pledge that no one will be left behind"*

The resolution identifies five key focal areas (a.k.a. the 5 Ps):

1. ***People:*** "*We are determined to end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment*."
2. ***Planet: "****We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.*"
3. ***Prosperity: "****We are determined to ensure that all human beings can enjoy prosperous and fulfilling lives and that economic, social and technological progress occurs in harmony with nature.*"

4. ***Peace: "****We are determined to foster peaceful, just and inclusive societies which are free from fear and violence. There can be no sustainable development without peace and no peace without sustainable development*."
5. ***Partnership:*** "*We are determined to mobilize the means required to implement this Agenda through a revitalized Global Partnership for Sustainable Development, based on a spirit of strengthened global solidarity, focused in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all people*."

"*The interlinkages and integrated nature of the Sustainable Development Goals are of crucial importance in ensuring that the purpose of the new Agenda is realized. If we realize our ambitions across the full extent of the Agenda, the lives of all will be profoundly improved and our world will be transformed for the better."*

These 5 focal areas were expanded and further qualified by UNDP in December 2018: "*5 things you need to know about the 2030 Agenda for Sustainable Development"*:

a. **The 2030 Agenda applies to all countries and actors:** It is universal, all countries, rich and poor, impact and are impacted by all SDG challenges in one way or another. The solutions are universal, even if the degrees of SDG challenges and their solutions differ from country to country.
b. **All SDGs are interlinked:** They demand holistic solutions. Success in one SDG may exacerbate another, failure in another may lead to failure of them all. For example, failed statehood resulting from extreme inequalities may reinforce all other SDG challenges; climatic catastrophe *will* be catastrophic for nearly all other SDG challenges.
c. **Leaving No One Behind:** The Sustainable Development programme is designed to improve the lives of everyone on earth – "*Leaving No One Behind*" – but there is much more to that statement - those that are left behind have, throughout history, "levelled" the playing field over time, often most violently, using the imagery of Walter Scheidel's "Four Horsemen of the Inequality Apocalypse" (The "Great Leveler" - see discussion in section 3 that follows). In Section 2.5.1 of this document - "*Education for Whom and for What?*", Noam Chomsky paints a disturbing picture of the cynical misuse of this over-used cliché – "'*no child is left behind' in the cycle of deficient 'education', in which 'empty leaky vessels' are filled with 'knowledge deemed necessary' to serve 'the vile maxim of the masters of mankind - the new spirit of the age to gain wealth, forgetting all but self'*". The final destination into which "no one must be left behind" must be clearly recognised, understood, defined and enacted, with the help of well-designed and focussed ICT content, programmes and infrastructures that promote equitable human development instead of the currently favoured economic drivers that "*Leave No One Behind*" in the service of the "*masters of mankind*".
d. **Development must be smart — if it's not risk-informed, it's not sustainable:** It is far easier, and cheaper, to destroy than it is to build – the gains of development, the SDGs by any other names, can and have been very easily reversed, unless the mitigation and development strategies are fully risk informed.
e. **Everyone is needed!** "*The 2030 Agenda needs the bright minds and relentless dedication from all of society — Governments and the UN cannot do it alone.*" Nor can it be done without the full active inclusion, participation, and understanding of the victims of the SDG challenges themselves – the poor and societally marginalized, irrespective of their ages, capabilities, capacities, levels of pigmentation, or cultural belief systems. They too must be central partners in the Connect 2030 (and beyond?) Agenda. "***The multi-stakeholder approach*** *defines the core of the 2030 Agenda and SDGs: we are all in this together*."

What does this mean for South Africa's more than 55% to 76% residents who are poor?

2.11: ICT Affordability in South Africa: Recommended Cost to Communicate for South Africa's Poor:

A first estimate of the affordable cost to communicate target for this population cohort, based on the international average of 5% of income or expenditure, amounted to R 38.00 per month. The data sources and methodology used to arrive at that conclusion are detailed in "*Chart 7: Poverty and individual consumption in*

households earning below the national poverty lines", available on page 10 in the submission to the Data Services Market Inquiry 2019. A revised ICT affordability target based on the "1 for 2" recommendation in the 2017 Affordability Report leads to the following:

- Approximate national average income in South Africa [GNI per capita, Atlas method (current US$)] US$ 6,040 per annum, or ≈R 7,295 per month;
- Recommended price for 1GB of data at 2% of national average income (GNI per Capita): R 145.9 per month;
- For the 30.4 million South Africans who are poor as reported by STATS SA (Chart 7 in Data Services Market Inquiry 2019), subsequently increased to 46 million or 76% of the population estimated by competent state authorities in the NIDS 2019/2 report, the recommended price for 1GB at 2% of average income or expenditure per month (R 768) reduces to **R 15.40 per month**.
- **Current South African broadband price** per 1GB after Competition Commission South Africa interventions as reported on 17 April 2021 in Vodacom and MTN slashed prepaid mobile data prices – 40% savings on 1GB:
  - MTN: R99 per month (down from R149) ≈ 6.4 times recommended affordability (643%) (subsequently revised downwards to equal Vodacom's price level)
  - Vodacom: R85 per month (down from R149) ≈ 5.5 times recommended affordability (551%)

It is clear from the above estimates that the South African ICT industry will not be able to provide affordable pro-poor ICT services that the country needs to address its triple threats in the foreseeable future. Few ICT network providers will be able or willing to provide fast unlimited always on Internet services to all South African homes at R15.40 per month. The only option left is to adopt the recommendation of the 2017 Affordability Report: "*Employ Public Access Solutions to Close the Digital Divide*", for the 76% of information excluded citizens.

This option is examined through the internet connected household data provided in Table 3.0.2. below, a direct replica of Table 13.1 in STATS SA's General Household Survey P03182019 for year 2019.

Internet access at home is defined as a fixed broadband connection to the household, using either fixed cable (ADSL or fibre), or any last mile wireless service applied in its fixed mode (e.g., fixed LTE), with (usually) a wireless access router in the household providing 24/7 internet connectivity. Mobile access at home is far too unreliable for 24/7 on-demand use by adults and children of most poor households – costly mobile phone airtime is preciously guarded if available, or it travels to work and/or places of entertainment with its owner instead of being available at home where it is needed most. In addition, the quality of service of mobile broadband access services, including the new 5G services, are subject to environmental, user congestion, and geographic degradation, leading to services which are significantly inferior to those provided by equivalent fixed physical access networks.

Mobile ICT networks designed for profit maximization often result in user overloads and network congestion, exacerbated by the vagaries of environmentally-determined radio transmission characteristics (rain attenuation, geographic and physical signal barriers and obstructions, etc.). The aim of public Internet access must be to provide the highest possible qualities and quantities of broadband services to whole communities on a shared basis – "*the early bird catches the fast data worm*" possibilities for e.g., students to access faster download services for educational purposes during off-peak user hours in such public spaces.

Section 3.0: ICT4SDG: Positioning ICT for delivery against all SDGs:

This document is about ICTs, and how they can be positioned to assist nations to mitigate or to eliminate ALL their multidimensional SDG challenges. It is necessary therefore to review South Africa's ICT history, from its introduction, through today's ICT "market failures" and successes as they relate to the SDGs, and to peek into the future of how ICTs can or will impact the nation if the historical and current challenges are not resolved. Table 3.0.1 provides a summary of this history. Table 3.0.2 provides the most recent official assessment of the results of that 161-year-old ICT development history. This is followed by Table 3.0.2 (a) which provides a

benchmark against developing, developed, and global ICT leaders, and a nine-year record of South Africa's Internet household penetration.

Table 3.0.1. A brief history of ICT in South Africa

- 1860: First telegraph between Cape Town and Simonstown, just 16 years after Morse's 1844 launch;
- 1873: Expropriation of Telegraph Service: All telegraph lines belonging to the Cape of Good Hope Telegraph Company expropriated, compensation in the sum of £41,123, under Act No, 18 of 1872. The newly acquired state owned and operated telecommunication services were merged with the national postal services, the latter services originating nearly four centuries earlier in 1501 (the first "post office" was a boot beneath an ancient milkwood tree in Mossel Bay, South Africa). The institutional merger, generally referred to as the South African Posts and Telecommunications (SAPT), colloquially referred to as the "Post Office", lasted more than a century before the functional separation of postal and telecommunication services to form two sate-owned entities in 1991 – the Post Office Amendment Act 85 of 1991.
- 1878: First telephone lines in South Africa, just 2 years after Alexandra Graham Bell's patent;
- 1879: First undersea cable between South Africa and Europe; 89 years later, SAT-1 South Africa to Europe submarine cable launched. Major upgrades 41 years after that, Seacom and EASsy fibre optical submarine cables launched (130 years after the launch of the first international submarine telecommunications cable);
- 1898: Public telephones were introduced in Kimberley. These "call offices" were to serve the communication needs of the settler community who could not afford direct home connections;
- 1898: First RFQ for a wireless telegraph system intended for use in the Anglo-Boer wars of the late 19th century;
- 1991: In August 1991, the World Wide Web was authorized for public use. Four months later, in November 1991, South Africa introduced Internet services;
- 1994: 96-years later, South Africa becomes a democracy, introduces cellular mobile telephone services;
- 2004: 106-years after first wireless usage, ICASA publishes Spectrum Band Plan for 20MHz to 70GHz;
- 2019: Nearly 30 years after the launch of Internet services, just 9.1% of South African households had 24/7 access to the Internet (Graph 3 on page 13 of ICASA 2021 Report);
- 2019, March 28th: 121 years after introducing wireless technologies, the Minister of Communications reiterates the department's commitment to finalising the policy directive on licensing high demand spectrum;
- 2017: Entry Level fixed broadband price basket was 2.73% of GNI per Capita (Table 4.6 of ITU MIS Report V1 of 2018)[49]; The equivalent price basket for 30.4 million (55.5% population)[50] living below the national poverty lines was approximately 23% of average monthly expenditure, falling to 14% for 500MB mobile broadband per month.
- 2019: MNOs scramble for 5G spectrum fuels "Big Data" price competition: bundle prices for 20 to 50GB "anytime" data per month range from 26% to 66% of average monthly expenditure levels of 30.4 million South Africans.
- 2019: In a renewed attempt to render national ICT prices affordable by the majority of the nation's citizens, the South African Competition Commission published its "*Provisional Report on the Data Services Market Inquiry*[51]" on April 24th 2019.
- WTISD 2021: On 17th May, the International Telecommunication Union (ITU) celebrating the 156th anniversary of the organization's formation, recommended an affordability target of 1 GB of data for 2% of average income levels.
- Data provided by the South African Government indicates that 76% of the South African population are classified as chronically poor, or vulnerable to chronic poverty, and cannot afford this recommended price for the ICT services they need for development. WTISD 2021 recommended pubic broadband access for this vital community: *Connect 2030 – An agenda to connect all to a better world: https://itu.foleon.com/itu/connect-2030-agenda/home/*

[49] Measuring the Information Society Report 2018 - Volume 1: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf (Note: estimates based on comparative prices in US$ using exchange rate of 14:1)
[50] Poverty Trends in South Africa: http://www.statssa.gov.za/publications/Report-03-10-06/Report-03-10-062015.pdf
[51] Competition Commission South Africa 2 December 2019: DATA SERVICES MARKET INQUIRY FINAL REPORT NON-CONFIDENTIAL: https://www.compcom.co.za/wp-content/uploads/2019/12/DSMI-Non-Confidential-Report-002.pdf

Table 3.0.2: Household access to the Internet by place of access, urban/rural status and province, 2019

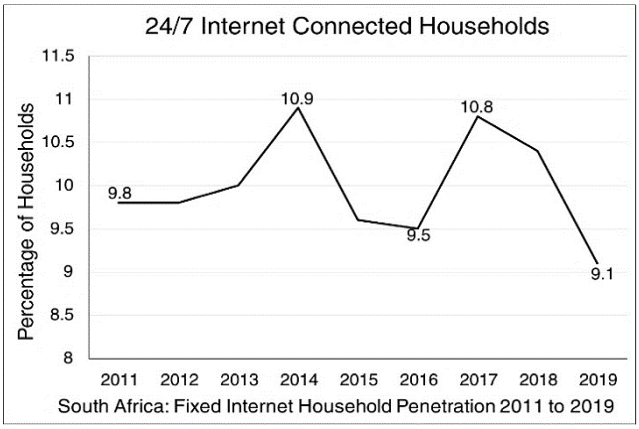
Place where Internet is accessed	Rural/Urban status	Province (%)									
		WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
At home	Metro	25.0	6.8	-	8.3	9.9	-	15.7	-	-	15.4
	Urban	16.1	3.5	5.8	4.3	6.5	3.9	9.4	6.2	5.6	7.2
	Rural	10.5	0.3	6.2	4.1	1.1	1.1	9.0	0.9	0.7	1.2
	Total	**21.7**	**3.2**	**5.9**	**5.4**	**5.8**	**2.3**	**14.9**	**3.2**	**1.6**	**9.1**
At work	Metro	28.1	24.9	-	15.3	28.7	-	29.1	-	-	28.0
	Urban	21.9	11.6	17.8	10.8	20.6	13.8	21.5	15.6	16.9	17.1
	Rural	9.8	5.1	10.4	7.1	4.7	4.8	5.5	5.2	5.0	5.2
	Total	**25.4**	**13.4**	**15.7**	**11.7**	**17.7**	**8.8**	**28.8**	**9.7**	**7.2**	**18.6**
Using mobile devices	Metro	72.3	65.8	-	67.8	58.2	-	69.4	-	-	67.8
	Urban	54.2	48.6	53.8	54.4	58.0	66.2	63.3	74.8	50.5	59.5
	Rural	34.5	39.0	42.3	47.8	41.3	50.2	29.4	60.1	37.6	44.0
	Total	**65.2**	**50.3**	**50.5**	**57.7**	**51.7**	**57.2**	**68.4**	**66.4**	**40.0**	**58.7**
At Internet Cafes or educational facilities	Metro	18.9	15.8	-	13.2	11.3	-	17.6	-	-	16.6
	Urban	8.6	5.8	5.8	9.9	10.8	11.3	12.9	6.5	4.3	9.1
	Rural	1.1	3.1	1.8	6.9	2.2	6.2	0.0	2.7	1.7	2.9
	Total	**15.0**	**8.1**	**4.6**	**10.6**	**7.7**	**8.5**	**16.9**	**4.3**	**2.2**	**10.7**

Data source: Page 52 (61 of 192) in http://www.statssa.gov.za/publications/P0318/P03182019.pdf

Table 3.0.2 (a).: Percentage of Households with 24/7 Internet Connections; Economic Impact (2019)

Developing		Developed		Global Leaders	
Country	Value	Country	Value	Country	Value
Argentina	63	USA	88	France	100
Vietnam	55	Australia	86	Switzerland	100
Colombia	48	Ireland	84	S. Korea	100
Thailand	45	Uruguay	82	Netherlands	96
S. Africa	9	Estonia	75	Denmark	92
Benchmark Countries: GNI per Capita (2019 US$ 000)					
Argentina	11.13	USA	65.9	France	42.5
Vietnam	2.6	Australia	55.1	Switzerland	85.5
Colombia	6.51	Ireland	64	S. Korea	33.8
Thailand	7.26	Uruguay	16.2	Netherlands	53.1
S. Africa	6.04	Estonia	23.3	Denmark	64

1. Source: World Bank Fixed Broadband Subscriptions per 100: https://data.worldbank.org/indicator/IT.NET.BBND.P2
2. "Value" = estimated % of households with 24/7 broadband
3. Fixed Broadband household penetration: estimates derived from weighting "broadband subscriptions per 100" using average household size.



South African official statistics by STATS SA: General Household Survey series P0318 - 2011 to 2019, e.g., http://www.statssa.gov.za/publications/P0318/P03182019.pdf for year 2019

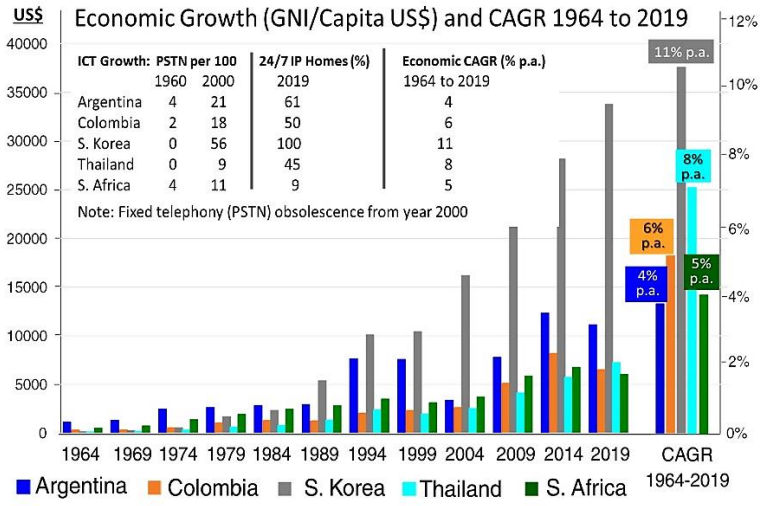
Before the "positioning" of ICTs can be discussed at any level of detail, a first review of the national ICT sector must be undertaken: (a) which population segments have unlimited and unimpeded access to information and knowledge-delivering ICTs? (b) which population segments are deprived of the information and knowledge needed for personal and community development that can be accessed and used via ICT? (c) what are the social and economic consequences of the resulting national gaps between citizens who are "*information-rich*" and those who are "*information-poor*" (see Oxford Reference here)? (d) Given the more than 161-year history of ICT development in South Africa, what are the explanations for the nation's high levels of information poverty suggested by the statistical data? (e) What is the socio-economic-political consequences of this "Information Divide", especially given that the "Digital Divide" has already been breached? ICASA State of ICT Report 2020 shows nearly 100% "digital ICT" population coverage in 2019: 3G - 99.7%; 4G/LTE – 92.8%; and a "digital smartphone penetration" of 91 per hundred people.

Table 3.0.2 (a) provides a 15-country benchmark of the critical 24/7 Internet connected household indicator, and an economic indicator suggesting the well-known relationship between broadband growth and economic development. South Africa's stagnant near-10% household connectivity reflects the nation's wealth divides – the SAHRC advised in 2018 that the 10% richest South Africans earned 90% of the nation's wealth.

The question that must be drawn from all three tables is - Why? Why did South Africa's growth of the vital broadband socioeconomic driver stall at about 10%, whereas the same indicator in the nation's equivalent economic and population peers – Argentina, Colombia, Thailand, and even much poorer Vietnam, progressed much faster to more than five-times higher by the end of 2019? The demographic and economic similarities between Colombia and South Africa, and the very different ICT growth trajectories of the two countries, must lead to further questions on comparative growth strategies: why and how Colombia's broadband development plan Vive Digital Colombia (2010 UNCTAD description here) enabled the achievement of 48% connected households by 2019, whereas South Africa's SA Connect broadband plan did little to lift the country out of its broadband growth stagnation illustrated by the graph. How did much poorer Vietnam, with an even more brutal colonial history than South Africa's, grow its broadband network so fast, to 55% connected households by 2019 compared to 9% in South Africa?

Table 3.0.2 (b) that follows reinforces the known link between ICT and economic growth, the latter expressed as GNI per Capita, over the period 1964 to 2019. The 55-year CAGR estimate shows that South Africa had the lowest economic growth rate of all benchmarked developing nations, with the exception of Argentina – Argentina's economic growth has begun to plateau at a level nearly double that of South Africa's in 2019. The adjoining text box demonstrates the very early recognition and understanding of the importance of ICT in global socioeconomic relationships by "western" political leaders, as stated by USA's President James Buchanan in his *telegram* to Queen Victoria of U. K. at the launch of the first trans-Atlantic ICT cable in 1858 (Message link here). This Morse code "telegram" was transmitted at 0.1 words per minute (10-minutes per word). The alternatives were hand-written notes sent by sail ship across the Atlantic (1 to 2 months?). Today's transatlantic cables exchange information at multiple terabytes per second transmission speeds, much less than one billionth of a second to transmit the full contents of the Bible across the Atlantic Ocean.

Table 3.0.2 (b). ICT Access and use supports economic and social growth



Data Sources: https://data.worldbank.org/indicator/NY.GNP.PCAP.CD
ICT Data: ITU World Telecommunication/ICT Indicators
Broadband household data derived from
https://data.worldbank.org/indicator/IT.NET.BBND.P2

Washington City, August 16, 1858:
To Her Majesty Victoria, Queen of Great Britain:
"The President cordially reciprocates the congratulations of Her Majesty the Queen, on the success of the great international enterprise accomplished by the science, skill and indomitable energy of the two countries.

It is a triumph more glorious, because much more useful to mankind, than was ever won by conqueror on the field of battle.

May the Atlantic Telegraph, under the blessing of Heaven, prove to be a bond of perpetual peace and friendship between kindred nations, and an instrument destined by Divine Providence to diffuse religion, civilization, liberty and law throughout the world.

In this view, will not all nations of Christendom spontaneously unite in the declaration that it shall be forever neutral, and that its communications shall be held sacred in passing to their places of destination, even in the midst of hostilities?"

James Buchanan

Argentina and South Africa had the highest telephone densities in 1960, at four per hundred population; South Korea had less than one per 100. In 1964, South Africa's GNI per Capita was second only to Argentina, about four times higher than both South Korea and Thailand, about double that of Colombia's. By 2019, South Africa lagged all selected countries in both indicators. South Korea "caught up" with South Africa's ICTs in 1978, then its GNI/Capita in 1984, and raced to 6 times higher GNI per Capita in 2019. The key question that arises from this very brief summary is: What did South Africa's peer group countries in these analyses do in the recent past, to perform so much better than South Africa, given the similarities between them all?

The GNI per Capita data in Table 3.0.2 (b) shows once more the value of government decisiveness and action. In 1964, South Korea's GNI per Capita was four times smaller than South Africa's, but with an average growth

rate of 11% per annum, South Korea entered 2020 with an economy nearly six times bigger than South Africa's. A South African Government Minister at a ministerial briefing of ICT executives some years ago suggested that the different growth rates in the two countries were due to South Korea having a "Benevolent Dictator" (Park Chung-Hee, 1917 to 1979), which South Africa did not have. South Africa's leaders, both political and economic, can do much more than wait for a "Benevolent Dictator" to ensure the participation of all South Africans in the development of the nation, and in the equitable sharing of the fruits of such development. The message from USA's president to Queen Victoria more than 160 years ago, just two years before South Africa launched its first electronic ICT, verifies that this value was well-known by political leaders even then.

The value of information shared must have been known to Homo sapiens' deep ancestors, otherwise the rise to evolutionary dominance by the species would not have transpired the way it did. Our modern scientific researchers tell us that the "natives" of the Kalahari, the Khoekhoen, the San, the J'hloansi, whatever our modern societies wish to name them, began their "Out of Africa" migration some 100,000 years ago by migrating from their Southern African homes, first to join their ancestral cousins in East Africa, before the very long "walkabout" that "Peopled the World". They must have refined their communication skills very well to succeed in this seemingly impossible journey without boats, busses, trains or aeroplanes. A few key references: (a) Nature 2019: "*A dispersal of Homo sapiens from southern to eastern Africa immediately preceded the out-of-Africa migration*"; (b) Smithsonian 2008: "*The Great Human Migration*"; (c) National Geographic Video Documentary 2003: "Journey of Man: A Genetic Odyssey", in which geneticist and anthropologist Spencer Wells traces the roots of humanity, and its pathways to peopling the world.

3.1.0: The search for Affordable ICTs in South Africa: Public Access Systems:

3.1.1: PSTN-type payphones:

South Africa recognised the value of ICTs early in its ICT history, and that the major challenge was affordability – poor people were not able to afford individual home connections during this early phase of ICT infrastructure development. The national response was to launch public telephone services for this market segment. The first public telephone, referred to as a "payphone" throughout most of its South African ICT history, was introduced in 1898 (https://www.telkom.co.za/history/TelkomHistory/), just seventeen years after Germany introduced the concept through its 'Fernsprech kiosk' – "Telephone kiosk" innovation in 1881. Most historical documents credit USA's William Gray, who "invented" the first public payphone in 1889, eight years after Germany's "Fernsprech kiosk", and nine years before South Africa launched its equivalent (Reference Smithsonian September 2014).

In the transition from apartheid to a democratic system of governance, the need to "restructure" the ICT sector to introduce competitive-driven growth was recognised, the requisite public discussion of the process began in the late 1980's and culminated in a new national ICT policy promulgated into law in 1996:

TELECOMMUNICATIONS ACT, 1996: "***Objects of Act:*** *The primary object of this Act is to provide for the regulation and control of telecommunication matters in the public interest, and for that purpose to - (a) promote the universal and affordable provision of telecommunication services.*" Online copy available at: https://cisp.cachefly.net/assets/articles/attachments/02977_telecomsact103.pdf

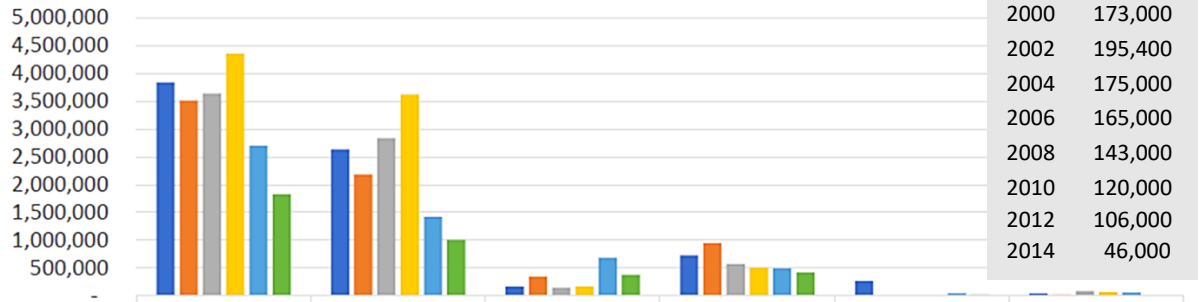
"*The Telecommunications Act gave Telkom a regulated monopoly for five years, extendable to six, in the following market segments: - public switched telecommunications network, national long distance, international, local access, public pay phones, and fixed line infrastructure for value added network services, mobile cellular network operators, and private networks (other than Transnet and Eskom)*." Reference James Hodge, 2000 in: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.555.9607&rep=rep1&type=pdf.

The Telecommunications Act of 1966 enabled the establishment of the national ICT regulator, the Independent Communications Authority of South Africa (ICASA - https://www.icasa.org.za/), and a national universal ICT service agency, the Universal Service and Access Agency of South Africa (USAASA - http://www.usaasa.org.za/). In 1997, ICASA, using its ICT regulatory mandate, introduced a series of universal service obligations (USO) on Telkom SA, one of which was for Telkom to add 120,000 public payphones to the network from a base of about 127,000 in 1997. Telkom, with mandated monopoly privileges in the fixed (PSTN)

and public payphone business, managed to add about 68,000 payphones to the existing network, reaching a peak of 195,400 in year 2002, before declining at a compounded annual rate of 22% to 2,166 by 2020, and a similarly rapid decline in PSTN subscriptions as shown in Chart 3.1.1.

Chart 3.1.1: ICASA State of the ICT Sector Report 2021 – Decline of publicly accessible ICTs.

Graph 26: Fixed line subscriptions, as at 30th September each year



	Fixed line subscriptions	Analogue fixed-telephone lines	VoIP subscriptions	ISDN voice-channel equivalents	Fixed wireless local loop subscriptions	Fixed public payphone
2015	3,846,332	2,637,753	165,425	731,034	268,454	43,666
2016	3,515,607	2,185,750	344,208	949,264	9,961	26,424
2017	3,645,837	2,840,096	142,224	575,476	4,507	83,534
2018	4,355,309	3,623,941	166,111	500,256	3,262	61,739
2019	2,698,989	1,419,506	683,347	490,459	44,552	61,125
2020	1,829,043	1,009,653	380,530	421,012	15,682	2,166

Addendum: Public payphones in prior years: Source: Telkom's Group interim results to Sept 2015

Source document: ICASA: State of the ICT Sector Report 2021: https://www.icasa.org.za/uploads/files/State-of-the-ICT-Sector-Report-March-2021.pdf AND https://www.htxt.co.za/2015/11/there-are-less-than-45-000-telkom-payphones-left/

The reasons for the steep decline in payphone usage included: (a) uneconomic: "*It would cost us something like R2,000 to send someone out to collect the money, and there was like 10c in the coin box — it really is uneconomical*" as stated by a Telkom spokesperson; (b) high levels of vandalism and therefore maintenance costs; (c) technological obsolescence – mobile phones and other feature-rich converged ICTs replaced fixed PSTN-type services very rapidly, worldwide, rendering both PSTN payphones and standard fixed line telephony uncompetitive compared to the convenience and ease of use of mobile telephony.

Another reason for the immense success of the "disruptive (technological) innovations" (read Harvard Business Review 2015), e.g., mobile telephony, was that the new technologies and the services they offered changed people from being "telephone subscribers" to become "telecommunications customers". The former "subscribers" were always at the mercy of the communication service providers, who determined the nature, type, scope and price of the (usually) monopoly services they offered. The latter "customers" acquired new freedoms of choice – able to choose the service they desired, when to acquire it, from whom, how, when, and for what purpose, and to a limited degree, what to pay for it. Regrettably, ICT affordability challenges continued unabated into the new disruptive innovations themselves. The self-perpetuating technological innovations that make up today's 4IR continue to offer humanity vast new choices and opportunities for development, but the economic models chosen for them by national captains of commerce and industry, and by their governments, undermine these choices, opportunities, and potential freedoms greatly, at least for the majority of the world's economically disadvantaged citizens.

South Africa, cognisant of the urgent need to "empower and transform" the masses of its citizens who reside at the base of the nation's development pyramid, through mass information and knowledge inclusion via ICTs, initiated numerous attempts aimed at such empowerment. Most attempts failed to reverse the disastrous legacy of apartheid's information (and economic) exclusion - none so far have been able to reach the massive scales needed to change the nation's ICT growth trajectory, to defeat the nation's world leadership in socioeconomic inequalities. The nation's stubborn ICT affordability gap continues to be a major cause of this failure, which will be perpetuated ad infinitum until the root cause – information and knowledge exclusion driven by the chosen national socio-political-economic[52] model and practice, is finally reversed. Human history has a tragic record of repeating itself, reinforcing the historical errors of judgment that caused so much human tragedy; waiting for reminders from messengers like Walter Scheidel in his masterpiece "The Great Leveler"; waiting for the arrival of his imagery of the "Four Horsemen of the Inequality Apocalypse":

The Four Horsemen of the Inequality Apocalypse – Walter Scheidel – "The Great Leveler":

Horseman 1: State Collapse: The socio-political-economic elites mismanage the economy and plunder state coffers, leading to economic collapse, which unleashes the effects of the remaining horsemen, leading to State Collapse;

Horseman 2: Disease – Pandemics – Covid-19: The current global pandemic – the global "challenging times", has been a regular occurrence throughout human history – pandemics have always occurred, will continue to recur, and do not discriminate. All social hierarchies are affected and infected, leading to socioeconomical restructuring, levelling the "Homo economicus" playing field, changing Adam Smith's "vile maxim of the masters of mankind" towards a more humane Homo sapiens species that survives even the pandemics;

Horseman 3: Mass mobilization warfare: The first and second "world wars" are a classic examples of the "levelling" effects of this horseman – the "third world war" may put us back into the more egalitarian societies of the stone ages, as predicted by Albert Einstein *""I know not with what weapons World War III will be fought, but World War IV will be fought with sticks and stones".*

Horseman 4: Ideological Revolutions: Authoritarianism versus Capitalism versus Communism versus Socialism versus Fascism versus Neoliberalism – etc. The most common reasons for revolutions and civil wars, are nearly all aimed at reducing inequality, often forcefully through transference of wealth from the top to the bottom. There are numerous examples in this age of Homo economicus.

Horseman 5 ???: Mass Extinction? This discussion document suggests a fifth horseman of the inequality apocalypse –Mass Extinction, may be in its infancy. When everything dies, there is neither equality nor inequality. Mass extinction may be triggered by human induced climate change, environmental degradation, biodiversity destruction – all SDG challenges combining to hasten the start of the sixth mass extinction (see discussion in Section 2.7.2 in this document).

A few of South Africa's attempts to bridge the nation's information and knowledge divides following the obsolescence of the Public Switched Telephone Network (PSTN, a.k.a. POTS or "Plain Old Telephone System), are briefly outlined in the paragraphs that follow. It is important to note that all these efforts were aimed at reducing post-apartheid South Africa's information and knowledge divides, they all used valid tried and tested technological solutions and seemingly logical "top-down" business models, plans and implementation strategies that seemed reasonable at the time. This discussion document will argue that the last observation and its implications, the lack of or failure of pro-poor business plans and implementation strategies, is the most likely cause of failure of all these national efforts to overcome the massive ICT scalability challenges that the nation faces. The intentions were good, the technology was valid, but the socio-cultural-economic fundamentals were grossly misjudged. A far deeper level of rigorous ethnographic research was and still is needed, research that links the behavioural motivations, patterns and sociocultural norms that separate South Africa's "economic and information haves" from the nation's "economic and information have-nots", and from those in transition between the two societal extremes. Such research was neither encouraged nor tolerated under the apartheid system of governance, unless it was undertaken to justify and reinforce apartheid. The opinion of a former South African political leader, Hendrik Frensch Verwoerd, explains this historical failing:

Dr Hendrik Frensch Verwoerd regarding "*Hewers of Wood and Drawers of Water*": *"What is the use of teaching the Bantu child mathematics when it cannot use it in practice? That is quite absurd. Education must train people in accordance with their opportunities in life, according to the sphere in which they live.":* Professor Noor Nieftagodien in SAHO 2016.

[52] ***South Africa**: When Strong Institutions and Massive Inequalities Collide*: March 2021: Brian Levy, Alan Hirsch, Vinothan Naidoo, and Musa Nxele: https://carnegieendowment.org/files/202103-Levy_etal_SouthAfrica.pdf

This attitude, perhaps unintentionally, survived the end of apartheid, and to a large degree, continues to shape the trajectory of the nation's ICT developments, even into this age of 5G mobiles and converged 4IR technologies and services. The assumption that the poor, dominated by the descendants of Verwoerd's "Bantu children", would bridge the so-called "digital divide" by merely having access to ICT, has always been, and continues to be flawed. The communicator seeking "transformation" has to leave work/job/home or other preoccupation to wander down to the nearest public community phone shop to make an important business or personal call. This from a terminal that allows only outgoing calls, no incoming calls or messaging services let alone data services, and for which the communicator has to pay a user fee that will sustain the network owner and service provider, and their "community entrepreneur" agents. All this while the "community public phone shop" owners throughout the chain of ownership and command/control, and their families and children, enjoy unlimited multimodal converged ICT services instantly, in their homes, offices, playgrounds, and pockets or handbags, at user prices that are tiny fractions of their incomes.

The "Community Public Service Phone Shop" summarised below illustrates this attitude through a highly "praised internationally acclaimed case study" summarised in the following paragraphs.

3.1.2: Fixed GSM-based public access systems:

Given the massive technological substitutions that shaped the evolution of the ICT industry – converged mobile systems replacing fixed PSTN systems; fixed ICT infrastructures with unlimited AI-driven capacities and functionalities with high levels of automation (e.g., NFV and SDN); and the troubling highly visible decline of the national public payphone infrastructure, it is not surprising that South Africa attempted to replace the PSTN payphones with GMS mobile technologies, but without the mobility that made mobile telephony so attractive. The following highly regarded case study provides a useful summary of one such attempt:

WHAT WORKS: **VODACOM'S COMMUNITY SERVICES PHONE SHOPS** - Providing telecommunications to poor communities in South Africa: https://pdf.wri.org/dd_vodacom.pdf.

The 2003 case study, published by the World Resources Institute, working in partnership with the World Bank's infoDev; USAID; Microsoft; Columbia Business School; University of Michigan Business School; University of North Carolina Kenan-Flagler Business School, was declared a resounding success:

> **EXECUTIVE SUMMARY:** *"Vodacom Community Services, a program of Vodacom, South Africa's largest cellular phone company, is a successful example of how business and government can work together to achieve significant social and economic goals. The phone shops are independent, entrepreneur-owned businesses, but the products and services they offer are simple and consistent. At any Community Services phone shop in the country, a consumer can make a phone call for a set rate of R0.85 (US$0.11) per minute, less than one-third the commercial rate for pre-paid cellular calls. Some phone shops also provide fax and data services, and the number of phone shops offering these services is expected to increase. However, phone shops cannot accept incoming calls and thus do not provide voicemail or other ways for customers to receive messages. While it is technically possible to receive incoming calls, issues such as availability of phones to accommodate incoming calls and calculating prepayment make it logistically impractical today."*

Even whilst acknowledging its severe shortcomings.

Key components of the above "pro-poor" business plan included (in 2003):

- Entrepreneurs from disadvantaged communities needed to raise R26,000 to procure a "franchise to operate five cellular lines in a pre-approved location" (≈R60,000 in 2021). The mobile phone operator/service provider typically invested R30,000 (2003 value) for the phone shop housing – a modified shipping container;
- Typical monthly revenues from the community phone shops were up to R27,000, of which ZR18,000 went to the service provider to pay for the "air time", and R9,000 to the "community service entrepreneur";
- The successful "Digital Dividend" community phones had a set user rate of R0.85 per minute, for outgoing calls only, no incoming calls, no SMS, no data. Services missing were SMS, standard price in 2003 was R0.80, and data, the equivalent price of data ranged from R0.60/MB to R10/MB - Allan Knott-Craig, Sept 2009;
- An ITU low-cost mobile telephone user basket comprises 70 minutes + 20 SMSs +500MB per month (ICT Price Basket subgroup – EGTI 2020). This "Digital Dividend" would thus cost a township dweller (70x0.85)

R59.50 per month for low user outgoing only calls. If the SMS (R16.00 per month) and data (R300 per month for 500MB at the lower data price) components of the price basket were added, this would raise the pro-poor ICT price to R375.5 per month. The "Upper Bound Poverty Line" in 2005 was R428 per month, with a headcount of 54.7% of South Africans living below it (Stats SA 2008/2009). Thus, 54.7% of South Africa's population would need to pay 88% of their monthly income or expenditure for the full low-cost ICT user basket, or 14% of their total monthly budgets if they used only the one-way voice services provided by these pro-poor public ICT services.

These community phone shops cannot/must not be deemed "*a successful example of how business and government can work together to achieve significant social and economic goals"* as stated in the case study report. As other related studies show, their existence, and distraction from the real challenges facing South Africa's poor, may in fact exacerbate inequality and poverty. The user prices, even at "*less than one-third the commercial rate for pre-paid cellular calls"* remained far too high for the 54.7% (55% in the STATS SA 2017 report, updated to 76% in NIDS 2019 report) of South Africans who are impacted by chronic poverty. They also offer an extremely limited range of ICT services, which cannot under any stretch of the imagination today, constitute **"***Accelerating Digital Transformation in challenging times*". Todays converged "telecommunication" services, a.k.a. broadband Internet, (very few analogue ICTS exist in this 4IR age) provide every conceivable content that needs to be "telecommunicated" – traditional voice services like "Yebo Gogo", big data that drives modern economies, every conceivable format of audio/video content, vital entertainment and news for human development and personal/national safety and security; and alternative "big data" with AI-driven Botnets delivering fake news and dangerous criminal online activities, etc. Besides the criminal elements, pro-growth services are not generally accessible in any pro-poor public ICT service used in South Africa today. The lack of pro-poor high-growth ICT services adds to the debilitating triple threats that plague the nation.

There are numerous excellent research-based studies and reports available in South Africa today, a very small selection will be provided at the end of this section. Directly related to the bibliography available is the excellent but seemingly undervalued 2005 study by Andrew Skuse and Thomas Cousins, in their highly relevant analyses of rural poverty and ICT in the Eastern Cape province of South Africa:

Managing Distance: Rural Poverty and the Promise of Communication in Post- Apartheid South Africa, February 2007: Andrew Skuse, Thomas Cousins:
https://journals.sagepub.com/doi/10.1177/0021909607074867 (Open Access copies here (1) and here (2))

Demographic and Social Context: (Page 10 first paragraph): "*The area, including Mount Frere Town, has a population of 290,000 people (Statistics South Africa, 2001). The terrain is mountainous and many villages within the district are difficult to access. This has meant that infrastructure development, especially health services and transport, has significantly lagged behind other areas of South Africa and consequently poverty is widespread and often chronic (Aliber, 2001; De Swardt, 2003)."*

(Page 4 of the report): "*90 per cent of rural households in the Mount Frere district live well below the South African 'official' poverty line of R352 (US$56) monthly income per adult (De Swardt, 2003). The average monthly income per adult in the region is a meagre R93 (US$15) and consequently there exists a high dependency on social welfare grants and remittances from urban kin that in turn can be correlated against the very high levels of rural unemployment*."

(From page 15 of the report): "*The broader communication technology usage survey data derived from 50 poor village households in the Mount Frere district reveals that on average each spends R26 (US$4.17) per month on telecommunications (calls made). With monthly household incomes that are as low as R200 (US$32) this constitutes a considerable proportion of monthly household income."* (Note: this represented 13% of expenditure capacity per month at the time of the research – recommended ICT pricing is 2%, or R4.0 per month).

Stated Purpose of the research and article: - to: "(i) *question existing notions of telecommunications access;* (ii) *assess the extent to which rural inequalities are exacerbated or ameliorated by telecommunications access; and (iii) examine the extent to which telecommunications are enlisted as a strategic tool by poor households for maintaining kin-based redistributive networks and enhancing livelihood sustainability*."

Comment/Observation 1: In the Introduction: "*Emerging technological extension and complexity, combined with rapidly deepening technological literacy, free market ideologies and rural market penetration, though helping to facilitate telecommunications access, are the same factors that also allow for profits to be siphoned off from economically marginal rural areas."*

Comment/Observation 2: State of the ICT Network in 2003, (extract from page 6 of the report): *"---- observational data from Mount Frere Town and the outlying villages in the district reveals that the universal fixed line service promises of Telkom have not been realised. Ranks of vandalized payphones line the main streets of many small towns in Eastern Cape, and the only fixed-line infrastructure in evidence in villages – typically phone lines to post offices and the residences of tribal chiefs – last functioned in the late 1980s as the Apartheid system and its support infrastructure was coming unravelled (see also Harvey, 1999)".*

Comment/Observation 3: The preamble on page 2 discusses the "contemporary neo-liberal thinking" that casts SMMEs, equipped with numerous institutional and regulatory support mechanisms which includes the BEE programme, as the "*dynamic and efficient panacea to economic development and socio-economic inclusion woes*": (a) "*the state's faith in the SMME sector and the efficacy of its support structures has been criticized for failing to reach the poorest, and especially the rural poor"; (b) "The potential for small enterprises to deepen inequality runs counter to the renewed focus in development economics on growth as a notional public 'good' and this is because the few enterprise opportunities available in rural areas inevitably accrue to those rural elites that are in a position to capitalize upon them."*

Comment/Observation 4: Skuse and Cousins noted that the Vodacom Community Services Phone Shops, which they referred to as "container phones", were too costly to build and operate in deep rural areas, and were thus available only in rural towns like Mt. Frere. Rural dwellers used these only if they had occasions to travel to town. The vast majority of rural dwellers of Mount Frere District preferred, and used, the unregulated private enterprise-run cellular public phone services, run from bedrooms, kitchens, taverns, spaza shops, and any convenient location in the rural village. These "Adondo" "fixed mobile public telephones" (see 2021 advertisement for a Vodacom model costing R1,200, and Soweto article predicting their demise) cost more than the "container phones (R2.00 versus R0.85 per minute), but their accessibility, user friendliness and the social relationships they enabled rendered them preferable even for rural cell phone owners who could not afford regular airtime. At the time of the research, only 6% of rural dwellers used their own cell phones regularly, 10% used the container community payphones whenever they visited towns where they were located, and 68% used the privately-owned cellular public phones located within 30 minutes walking distance. Only the wealthier rural dwellers could afford to own and operate these unregulated public phone services.

This discussion posits that urban inequality and poverty presents even greater, immediate, and dangerous threats than rural poverty alone – the poor rural dwellers migrate into the cities as soon as they can, joining the burgeoning masses of the nation's poor, who, by their actions in response to poverty and hopelessness, "invite" Scheidel's four horsemen of the inequality apocalypse, starting with Horseman #4 – Revolution – as they did during the costly end of apartheid.

3.1.3: Internet-based public ICT services.

In the over-hyped world of "digital technology", in which much of the world's technological leaders aspire to live in a "digital world", and are preparing for the "digital universe" to come, "computer science" a.k.a. the Internet, became the *de facto* mode of inter-personal communications worldwide. The warnings of one of the lead creators of today's Internet, Dr J. C. R. Licklider, that "*It is not proper to think of networks as connecting computers. Rather, they connect people using computers to mediate. The great success of the Internet is not technical, but in human impact*", were largely ignored. The most powerful means of communications known to humankind in this era became a branch of "computer science". As a result, providing computers to economically disadvantaged and frequently technologically illiterate rural dwellers of all demographics, via Telecentres, became the developmental model of choice in many countries, including South Africa.

3.1.4: Telecentres:

Definitions. An online search for formal or official definitions of "Telecentres" resulted in the following very limited range of definitions for one of the most vaunted and internationally funded technological interventions for the "digital transformation" of the economically and technologically excluded global citizens:

Definition 1: infoDev/World Bank, significant financiers of the global telecentre movement: https://www.infodev.org/articles/quick-guide-telecentres-international-institutions-and-donor-agencies:

"*Telecentres, Internet cafes, community multimedia centres, village computing: There are many names for similar initiatives that seek to provide shared public access to computers, the Internet and related technologies to serve a variety of often inter-related developmental objectives. Various versions of 'telecentre models' can be found in most countries, although questions of long-term sustainability are becoming increasingly acute for many initiatives in this area*"

Comment: The priority purpose is to "*provide shared public access to computers*". Do we really expect the poorest, unemployed, inadequately educated and socioeconomically stressed rural dwellers of all ages and literacies, some barely able to read or write, to show great enthusiasm for the opportunity to "compute"? Are "Internet and related technologies" the top developmental objectives of all poor rural dwellers? Are misaligned developmental objectives the reason why long-term sustainability of telecentres is increasingly being questioned?

Definition 2: International Development Research Centre (IDRC): A major donor and champion of the global Telecentre movement: https://www.idrc.ca/sites/default/files/openebooks/263-5/index.html#page_3:

*"**Telecentre** appears to have no universally accepted definition, beyond the general concept of a physical centre to provide public access to long-distance communication and information services, using a variety of technologies, including phone, fax, computers, and the Internet. Telecentres can be publicly or privately owned, be part of a public or private franchise, or be provided by international donors. They run the spectrum from "phone shops" through to 'cybercafés,' cottage telecentres for telework or telecommuting, and specially constructed multipurpose community telecentres (MCTs), some with advanced services, such as medical diagnosis and telemedicine"*.

Comment: After spending billions of donor funds to promote a concept with "no universally accepted definition", IDRC has funded numerous invaluable telecentre reviews and evaluations, including the comprehensive 2005 report by Sarah Parkinson: "*Telecentres, Access and Development Experience and Lessons from Uganda and South Africa*", which presents key findings and recommendations with eleven vital "lessons with recommendations where appropriate". This, and other similar documents, must be inputs to renewed intensive research into solving the communication challenges of the poor, reshaping and repositioning the telecentre concept and all its "digital transformational" baggage to better serve the global, and South African humanity that have been excluded from the fruits of human progress. The "digits" that underpin computers and the Internet must be redefined, repositioned, and returned to humanity as "*a communication medium between people"* that dwarfs into insignificance its technological origins that now fuel the tragic reality of all SDG challenges.

Definition 3: Wikipedia: https://en.wikipedia.org/wiki/Telecentre: "*A **telecentre** is a public place where people can access computers, the Internet, and other digital technologies that enable them to gather information, create, learn, and communicate with others while they develop essential digital skills"*

Comment: This definition includes a short summary of the "Evolution of the telecentre movement" – " *(*its) *origins can be traced to Europe's telecottage and Electronic Village Halls (originally in Denmark) and Community Technology Centers (CTCs) in the United States, both of which emerged in the 1980s as a result of advances in computing*". If the telecentre movement emerged "*as a result of advances in computing*", then it is not surprising that the enthusiasm for the "movement" by very poor rural dwellers the world over was very low. The 2005 research by Andrew Skuse and Thomas Cousins summarised in Section 3.0.1.2 of this document, reports an adult monthly income of R93 for 90% of the population in South Africa's Mount Frere rural area. This translated to about US$ 15 per month then, now about US$ 6.00 per month. Would "advances in computing" help these adults to feed their families on R93 per month? If J.C.R. Licklider's vision of the

"intergalactic network" (discussion in Section 1.1.1) as "*a communication medium between people that dwarfs into relative insignificance the historical beginnings of the computer as an arithmetic engine"* had prevailed, and the "*advances in computing, the Internet and other digital technologies*" which are central to this definition had delivered on the promise of low cost high quality and high value communication even within the very low earning capacities of the subjects of the study, then telecentres would have survived, thrived, and delivered on other potential knowledge capabilities beyond the "digital transformation" of Homo sapiens.

Definition 4: Cambridge Dictionary: https://dictionary.cambridge.org/dictionary/english/telecentre:
"*a public building with computers, etc. that people can use as an office instead of travelling long distances to work*":
Comment: Cambridge defines "Computer" as "an electronic machine that is used for storing, organizing, and finding words, numbers, and pictures, for doing calculations, and for controlling other machines". …..So, "*people*", a.k.a. "men, women and children" need to use an electronic machine that calculates data very quickly, which can also be used for storing, writing, organizing, and sharing information electronically, or for controlling other machines, which the "men women and children" can use as an *office*, a.k.a. "*a room or part of a building in which people work, especially sitting at tables with computers, phones, etc.,*" instead of travelling long distances at prices which they cannot afford, to travel to work which they don't have.
With such a definition, should we be surprised when rural dwellers who can barely put food on the table for their families, find it very difficult to take telecentres seriously?

Definition 5: Definitions.net: https://www.definitions.net/definition/telecentre : (a) "*A place where members of the public may access personal computers (and other digital equipment) and the Internet, in order to acquire or improve skills." (b) "A telecentre is a public place where people can access computers, the Internet, and other digital technologies that enable them to gather information, create, learn, and communicate with others while they develop essential digital skills. While each telecentre is different, their common focus is on the use of digital technologies to support community, economic, educational, and social development—reducing isolation, bridging the digital divide, promoting health issues, creating economic opportunities, and reaching out to youth for example. Telecentres exist in almost every country, although they sometimes go by a different name: public internet access center, village knowledge center, infocenter, community technology center, community multimedia center, multipurpose community telecentre, Common/Citizen Service Centre, school-based telecentre, etc.*"

Comment: The key words in this definition are: (a) computers; (b) other digital equipment; (c) the Internet; (d) essential digital skills; (e) "*community, economic, educational, and social development"*; (e) isolation, bridging the digital divide; etc. The assumption is that access to computers and other digital equipment will do all this for "*people*", a.k.a. "men, women and children" according to the Cambridge definition, most of whom can barely afford to eat, let alone travel to these computers and other digital equipment for the benefits listed in this definition.

General comments and observations on South Africa's and peer country experience of Telecentres:

Brief extracts from a very large body of telecentre research in South Africa and everywhere else they have been used, provides invaluable insights into their effectiveness:

- Telecentre functionality in South Africa: re-enabling the community ICT access environment: Authors: Attwood, Heidi; Diga, Kathleen; Braathen, Einar; May, Julian:
  Alternative link: http://repository.uwc.ac.za/xmlui/handle/10566/3147

  Introduction: "*Despite the availability and capabilities of Information and Communication Technologies (ICT) in low and middle-income countries, the use of these constantly evolving tools remains limited for the majority of resource-poor citizens*"
  Policies and Visions - page 12: "*While they charge for computer training, computer use, photocopying and so on, the manager explained that, '…there are many times when a person would have spent all their money on transport and cannot pay for the photocopy, so what do you do? You can't turn them away, so they don't pay*.'"

In an earlier publication, two of the above authors stated in "Telecentres and poor communities in South Africa: What have we learnt?" "*Between 1997 and 2000, USA had helped establish 65 telecentres. An evaluation in 2001 showed that 32% were not operating or had been shut down. Although they were all fully equipped at the outset with between one and four computers, telephone lines and internet devices, only 8 percent offered access to internet (Benjamin, 2001a). The primary reasons given for their non-functionality were: (i) burglary / theft; (ii) technical problems (such as lack of power supplies, faulty telephone lines); (iii) managerial weakness (unskilled or otherwise incompetent management led to the collapse of the centre); and (iv) financial problems (such as insurmountable debt, mostly a telephone bill they could not pay). Just under a third of the telecentres could afford to pay a salary to their staff. Benjamin concludes that the majority of the telecentres were neither effective nor sustainable*."

- Making the Connection: Scaling Telecentres for Development: A highly informative report covering the global telecentre movement, funded and supported by Microsoft, Academy for Educational Development (AED), and telecentre.org, compiled by Barbara Fillip and Dennis Foote representing AED, was published in 2007. The 257-page book covers case studies from more than a dozen countries, and presents an excellent opportunity for future interventions in ICT4SDG to draw from this history in order to shape the present and the future use of ICT by the poor. A very limited selection from this book includes:

  Case Study: Chenai, India, page 63: 20% of the rural families in the 13 villages surveyed (population 20,000) lived below the national poverty line, with half of them living on a total family income of about US$25 per month. Most of the 12 public telephones were dysfunctional, the 27 available private telephones were used almost exclusively by their owners. The success of the telecentre project was undermined by (a) lack of financial sustainability; (b) the inability of a market-oriented approach which was deemed necessary to meet the sustainable income requirements of the pro-poor information services.

  Case Study: Gyandoot, India, page 87: "*Entrepreneur Model: In this model, a local entrepreneur registers as a kiosk owner and assumes all expenses. Entrepreneur soochaks (*Telecentre manager/operator*) are required to pay an annual licensing fee of Rs.5000 (approximately US$100) to Gyandoot Samiti to own and operate a kiosk. The average Gyandoot-generated income for the kiosk operators is around US$35 per year. Their calculated break-even point is nearer to US$100 per year. As a result, the soochaks have had to find other income-generating ideas, which,* ***in some cases, have involved closing their kiosks as they seek their fortunes in other ways***".

  In a 2018 review of this project by Rridhee Malhotra, "Gyandoot: E-Governance Project in India", the winner of the Stockholm Challenge Award in Best Public Service (IT) category 2000, the project was judged a failure due to several reasons, the top three being: (a) "*Government simplistically assumed Gyandoot to be a technology program. But e-government is not about technology, it is about reform*"; (b) "***The Silo Effect:*** *By merely putting up a Web-enabled front office to existing back-offices without re-engineering their internal functions and networking of the back-offices, can be a recipe for disaster*"; (c) "***Vendor Driven e-Governance:*** *The project consultants hired promised the moon to the department*" (but delivered little).

- **Dr Michael Gurstein**, 1944 to 2017, Canadian internationally renowned academic and specialist in Community Informatics (definition published by Cornell University here), well-known in the South African academic, ICT and related NGO sectors, champion (albeit frustrated) of ICT4D and Mobiles for Development (Mob4D?), and Telecentres. Michael was a prolific author of ICT as tools for human development. After more than a quarter of a century promoting ICTs as potent tools for community development and empowerment, Michael became a fierce critic of the global and national ICT4D movement, as demonstrated by the select comments that follow:
  - 2003: Effective use: A community informatics strategy beyond the Digital Divide: "*This paper examines the concepts and strategies underlying the notion of the Digital Divide and concludes that it is little more than a marketing campaign for Internet service providers. The paper goes on to present an alternative approach — that of 'effective use' — drawn from community informatics theory which recognizes that the Internet is not simply a source of information, but also a fundamental tool in the new digital economy.*" AND, criticising the impending launch of the UN/ITU WSIS in December of the

same year, observing that "*What seems to be missing so far from any of the 'official' involvements in the WSIS is the sense of building a common future with a remarkable and incredibly powerful new set of tools; of going beyond the 'market building' and 'market failure' rhetoric of much of the 'Digital Divide' (DD) discussion; and, of moving toward opportunities for effective and active use of ICTs to enable communities, active citizens, and democratic participation*"

- Eight years later in June 2011, after intensive participation in the global Telecentre movement, Michael concludes that "Telecentres are not 'Sustainable': Get Over It!", a thought-provoking submission in preparation for an ITU sponsored workshop on Telecentre sustainability in Bangkok, May 23-25, 2011. Michael noted, as many in South Africa with experience in Telecentres have done, that: "*Almost since the very beginning of Telecentres/public access centres the nagging from funders – mostly governments but major NGO's as well – has been directed towards making sure that these would somehow/sometime become financially self-sustaining i.e., 'sustainable' ……. that Telecentres would somehow magically be able to transform themselves into 'social enterprises' which could get enough revenue from their local communities*". AND "*Given that the Telecentres were established in the first place and located where they were precisely because the local population was for the most part poor, isolated, and otherwise marginalized i.e., not in a position to pay for their own computers, Internet access etc. seems to have escaped the attention of those leading the demands for 'sustainability'*".
- Numerous South African researchers came to the same conclusions as Michael, before and after his opinions stated above. Two leading local authorities on the subject include Dr Peter Benjamin, who from the University of the Witwatersrand's LINK Centre, asked in year 2000: "*Does 'Telecentre' Mean the Centre is Far Away? Telecentre Development in South Africa?*" The concept of distance from any Telecentre, rural or urban, posed significant barriers to its utility, an observation verified by Heidi Attwood et al in the opening reference of this sub-section: Page 14 - Financial, Time and Opportunity Costs: "*some participants had to walk for three hours to reach the telecentre, and at TC1 some had to pay up to R60 for public transport for a one-way trip to the telecentre. With half of all participants having R100 or less for their free disposal each month, such costs clearly prohibit regular computer use at telecentres, even before the issue of whether they have to pay for actual use or not, was considered*"
- Michael Gurstein, Peter Benjamin, Heidi Attwood, Kathleen Diga, Einar Braathen, Julian May, and many more, all state the obvious truism in this era of fake news and mass obfuscation: "*Telecentres are not 'Sustainable': Get Over It!*" Furthermore, all recent evaluations of South Africa's telecentre programmes operated by USAASA paint a dismal picture of failure to build and sustain them, and to provide the transformative quality of services to the socioeconomically marginalised target communities. In 2013, the South African Communications Forum (SACF) prepared an analysis of the workings of South Africa's *Universal Service and Access Agency of South Africa (USAASA)* for the nation's Parliamentary Portfolio Committee on Communications, which included a focus on Telecentres. The available evidence showed that the South African Government set a target of 282 new telecentres to be built between 2006 and 2012, just 44 (16%) were completed. Explanations for tardiness ranged from (a) funds diverted to rehabilitation of defunct telecentres; (b) tenders readvertised; (c) management crisis at the agency.

  The SAFC report observes that "*Despite the challenges and the unison of voices that decry the programme's* (the telecentres) *ability to be sustainable and its contribution to UAS, USAASA stubbornly remains married to Telecentres. Notably, it has not conducted impact assessments to review the efficacy of the model or its contributory role to UAS"*. In addition, the report notes that "*More than half of its operational budget (USAASA's) is spent on employee compensation and benefits. Performance bonuses for the financial year 2011/12 to the tune of R987 000 were paid to staff despite the majority of planned projects having missed their delivery targets, according the agency's Annual Report*"

The national ICT line department and the ICT industry as a whole recognised the above as most likely arising from institutional structural flaws at USAASA, and recommended in the still yet to be implemented National Integrated ICT Policy White Paper of 2016, that "*USAASA be dissolved and the existing Universal Service and*

Access Fund be transformed into a stand-alone funding agency to support universal service and access". This of course would not be enough on its own, but the improved funding and its control could lead to effective solutions for the achievement of universal service, given the immense affordability and capability challenges discussed in section 2.10. of this document.

3.1.4.1: Living Labs:

Living Labs are similar to telecentres in many ways, most of them are computer-centric and university-centric, e.g., March 2015: "Siyakhula concludes another session of basic computer literacy training in February!" after which certificates were awarded to community participants in "*ICT use on communal, shared fixed computer devices, based on beginner content such as Word, Calc, internet and email*".

The fundamental difference from telecentres is that Living Labs have strong top-down academia dependencies. MIT, the originators of the concept in circa 2004, described the concept as:

MIT - Discover Living Labs
"MIT has embraced a unique place-based research platform that utilizes the college campus as a test-bed for innovation and the co-production of knowledge. The living lab concept may be thought of as a variant of the experiential learning model that involves concrete experience followed by observation, reflection and the formation of new concepts and testing in new situations"

Are Living Labs sustainable or scalable enough to defeat South Africa's growing information and knowledge divides? A few key references are listed below to begin to answer this question:

(a) 2017: https://www.sciencedirect.com/science/article/pii/S1877705817318428: "*If Living Labs are the Answer – What's the Question? A Review of the Literature*"; (b) Siyakhula Living Lab - https://siyakhulall.org/ - started in 2006 through a partnership between Rhodes and Fort Hare Universities located in the Eastern Cape. The search for scale to meet the needs of 76% of poor South Africans, especially their children who number more than 65% of the nation's child population, continues fifteen years after its establishment; (c) HSRC 2019: "*South Africa's Living labs: What inclusive development looks like*" - http://www.hsrc.ac.za/en/review/hsrc-review-dec-2019/sa-living-labs. This article introduces the creation of the Zlto, "*a South African-developed mobile and blockchain platform*", a form of digital currency used by Living Labs in Cape Town to partially compensate young volunteer workers for their voluntary work in non-financial gifts and donations by supporters to assist them search for jobs; (d) https://www.tia.org.za/blog/2021/05/20/virtual-living-labs/: More "*Living Lab Pilot Studies in 2021: "The Department of Science and Innovation (DSI) and the Technology Innovation Agency (TIA) are calling for the submission of funding applications for the extension of the Living Labs Pilot Programme. This is a call for "Virtual Living Labs" in marginalised communities of South Africa*"

Clearly, the Living Lab concepts has the support of very high level and highly regarded academics, government and institutional leaders, but can the concept be restructured to address directly the technological appropriation needs of South Africa's poor and their children? Can it change the perceptions (stated in the call for submissions) of being a victim of Pilotitis as discussed in Section 1.1.2 on page 12 of this document?

South Africa has an abundance of high-level articles about the Living Lab concept, most universities in the country have engaged with the concept in one form or another. The concept must be considered as one of many possibilities in the nation's search for effective ICT4SDG, but their shortcomings for mass pro-poor access to ICT must be addressed.

3.1.5: Cybercafés and similar:

Internet Café, LAN House (Brazil), PC Bang (South Korea, rough translation "PC Room"); Wangba (China, literally "net space"); Manga Kissa in Japan, which grew from Japanese comic (manga) libraries with internet access, to affordable overnight accommodation with internet connections and ablution/food facilities. Prices range from about R14.00 to R40 per hour, or R200 to R350 for full overnight accommodation with fast internet services. Wherever the Internet was not available, or access and use was too costly for non-rich people, public spaces where this could be done were created in many countries by entrepreneurs, very seldom by governments as pro-poor public services. South Africa is very familiar with the concept, but most applications have been for commercially-oriented competitive applications which are/were unable to address the needs of the poor, at the price target of R 15.40 per month.

The world's first Cybercafé is said to have been started in July 1991 by Wayne Gregori in San Francisco, the SFnet Coffeehouse Network, just 22 years after the first connection between two computers separated by distance was created by ARPANET (https://www.computerhope.com/jargon/c/cybercafé.htm). For a user fee of US$4.00 per hour, members of the public could access the expanding Internet, while consuming coffee and other victuals in the SFnet Coffeehouse Network. This amounted to about 6.5% of the average daily GNI per capita in 1991 USA. This fee would have amounted to 48% of daily average GNI per capita in South Africa in 1991, but South Africa had to wait another four years before the nation's deep-pocketed users could enjoy this technology at an Internet café.

South Africa introduced the Internet in 1991, the same year that Wayne Gregori launched his Cybercafé. Four years later in 1995, the first Internet Café in Africa was opened in Yeoville, Johannesburg. The popularity of concept in 1995 was well-captured by the observation in the report: "*A line of patrons waiting up to two hours to get into the café is a common sight - especially on Sundays, when young people get to surf the e-waves free of charge. Yeoville's patrons are a mix of businesspeople in the process of setting up an IT business, university students doing on-line research and teenagers chatting with e-pals around the world*": (https://www.itu.int/newsarchive/wtd/1999/iht10/tra-02.html).

The Internet café concept grew significantly throughout South Africa, many Internet Cafés are still functional and popular in middle- and high-income suburbs and shopping complexes, a near-standard fixture of the numerous private sector courier, postal and document production services like the award-winning PostNet franchise. Very few serving impoverished neighbourhoods have survived under the current business environment and motivations. Those that have survived have tended to change the business model from one of providing connectivity to "training" – the national hunger for education which would lift whole communities out of poverty remains insatiable to this day. Examples of such successes, and failures, include:

Silulo Ulutho Technologies: Luvuyo Rani, a fully trained educator frustrated in his profession became an IT entrepreneur, a start-up Internet Café that "transformed" into fully-fledged nation-wide training institutions that offer courses in: (a) Business Administration starting at R5,100; (b) Office Administration also starting at R5,100; (c) "Digital Skills", "Computer Support", and "Retail Practices", each at R5,100; and (e) "Computer Literacy" comprising introduction to "Windows", "MS Word", "MS Excel", "MS Power Point", "Internet & Email", starting R4,200 "once off".

Essential as such training may be nationally, it cannot be classified as "pro-poor". Sustainable business models even in the lucrative ICT industry are not possible with a primary focus on the ≈ 76% of the South African market officially classified as living in chronic poverty. In general, the entrepreneurs that start such businesses are generally from the mid-to-wealthy social classes, and are therefore driven by the competitive business objectives of the nation's market-driven economy. Pro-poor business models based on the ICT affordability limits outlined in Section 2.10.1 (WTISD 2021) of this document, have yet to be developed nationally.

Siyafunda CTC (Community Technology Centres): South Africa's much loved and respected social entrepreneur Ahmed "Smiley" Ismael has dedicated his life to the upliftment of his poorer compatriots through technology. His technology centres have received significant industry and government support, enough to expand to more than 200 centres countrywide. This is indeed a success story, but is it scalable enough? Is it pro-poor focussed enough to serve as a model for the 76% of South Africans living in poverty? Is it "training" that up to 46 million South Africans need? Or should it be "bits of the string" of self-driven learning provided by affordable ICTs, as suggested by Noam Chomsky in Section 2.5.1 of this discussion document (*Education for whom and for what*)?

Progressive developing and developed countries do not teach children "computer sciences" – they enable learning to take place, using computers as bits of the "string" along which children, and adults, can acquire knowledge about all disciplines necessary for the "*search for dignity for the individual, stability for the family and peace in the community"* as per the statement by Juan Somavia in the opening paragraph of this discussion document.

Anecdote: One of South Africa's leading "ICT Guru's", Mark Shuttleworth, reported at an iWeek conference some years ago, that the leading high-growth developing economies, naming Costa Rica as one (*very high growth, lowest poverty rate in Latin America*) in particular, had "banned computer science education" in all their school curricula. They provided fully internet-connected "computers" to all their learners as learning tools – comprehensive online libraries covering all subjects, including "computer science", instantly accessible by children of all ages and latent competencies. Mr Shuttleworth had just concluded a multi-nation tour to find out how developing countries used computers for education, in preparation for his participation in a "Presidential National Commission on Information Society and Development (*PNC on ISAD*)" as a key member of the annual "imbizo".

Numerous young entrepreneurs like 24-year-old Lolwetu Maliwa (Young businessman from Khayelitsha a winner with gaming café) will attempt to beat the very high odds against success, most will probably fail unless the nation as a whole finds a way to support him and his fellow SMMEs, even with the very high failure rate of SMME start-ups. All nations experience high SMME start-up failures, the nations that have succeeded in leveraging the exceptional value of such start-ups are those who have provided safety nets and national support mechanisms for such entrepreneurs. Wise governments and societies celebrate and support such failures as learning curves, irrespective of their chosen national socio-political ideologies and cultures.

There are numerous national-scale initiatives that range from historical programmes like the Telecentre networks described in sub-paragraph 3.0.1.4 in the preceding section, through academic and government supported technological development hubs like the Wits University's Tshimologong Precinct "digital hub"; the Nelson Mandela Bay iHUB; and excellent efforts in deep rural areas like Mankosi in the Eastern Cape, the Zenzeleni Networks project. The latter self-help project is building a community-owned ICT connectivity network with the help of a few friends and supporters like the University of the Western Cape, in an attempt to share a single broadband backhaul link, probably less than 10Mbps, amongst a population of more than 6,000 generally impoverished unemployed adults and their children, in the hope that they will "catch up" with their wealthier urban compatriots who enjoy unlimited fibre, 4G/LTE, and now 5G broadband services at home and in their pockets.

Clearly, South Africa's challenges of "Accelerating Digital Transformation", with and without the current "Challenging Times" of Covid-19 health and economic hardships, as per the WTISD 2021 theme discussed in section 2.10.1 of this discussion document, are daunting. But they can be overcome through renewed vigour within the collaborative agenda of SDG17, as many of South Africa's developed and developing country peers have done or are doing even before SDG17 was even defined. Long before the imperatives of CIVID-19 emerged to threaten the whole world. South Africa needs a renewed national will to test and apply the lessons that can be derived from the nation's peers, developed and developing.

The following is a very brief outline of media coverage concerning how the South African Government and national ICT industry, and others tried in the past to bridge the nation's ICT affordability divides through the Cybercafé model, and failed:

- **ISPA**: Since its establishment in 1996, the Internet Service Providers Association of South Africa has been very much aware of the ICT affordability gap, and strived in the early 2000s to promote Internet business development by and for all segments of South African Society. The major barriers encountered were mainly in the national regulatory arena (SATRA, now ICASA), which seemed to adopt an authoritarian power-based relationship with the ICT industry, as illustrated by ISPA's early entreaties for pro-development and pro-poor regulatory developments:
  - ISPA presentation by Masedi Molosiwa and Ant Brooks, early 2000, in which they appealed to ICASA for a pro-development regulatory framework for Internet Service Providers and Internet Cafés. An example is slide 20 of The Internet: An Overview of the Internet which states: "*Internet Cafés and "Virtual" ISPs might be considered to be 'resellers' on Internet access*", creating insurmountable hurdles for their development in the absence of pro-growth regulations governing such emerging enterprises.
  - "*The Internet Café Industry in South Africa Ramon Thomas*", September 2004: "*In most developing countries Internet cafes are the main locations for people to access the internet*". In 2021, this statement must be reinterpreted to: "*In South Africa, Internet Cafés still remain potential locations*

where poor people can afford to access the Internet in adequate qualities and quantities, and to develop the user skills, that they need"

- 30th July 2009: "*ISPA helps SA's next wave of BEE Internet entrepreneurs to build their skills*" followed in July 2012 by "ISPA ISPs/Internet Cafés Training Course: Regulations /Legislation" – vital training given, but based on current market economic models which are mostly unsuitable for pro-poor operations, ownership and use of Internet Cafés.
- My Broadband, 6 July 2010, Member's discussion forum: "*Which ISP is best for internet cafe business? - I am new to the forum so please excuse any missteps. I wish to open an internet cafe with approximately eight stations excluding the server. I'd be grateful if someone could give me an idea of the ISP that would be most suited for my needs. I reckon I'll use about 30gb per month for browsing and petty downloading. Speed, of course is of the essence*"; RESPONSE: "*If you push a lot of traffic, look at MWEB Business uncapped or Vodacom Business uncapped. If you only do around 30GB per month you can consider a provider like Web Africa or Axxess with cheap top-ups in case you need more data.* ***Make sure to be sitting down before checking prices though***"

- November 2008: Vodacom, GSMA and Qualcomm bring high-speed Internet cafes to Tanzania: "*Tanzanians will be able to pay a small fee to use the computer terminals, which will enable them to access the Internet to find important information about everything from education to health to commodity prices to weather forecasts*"

  Vodacom supported numerous Internet Café business start-ups over many years in South Africa, none of which succeeded in bridging the nation's ICT affordability challenges. Both capital and operational costs, and therefore user prices, were far too high for the nation's 76% population deemed to be chronically poor.
- February 2010: The Soweto Wireless Users Group: Established with the help of the Internet Service Providers Association (ISPA), the Soweto Wireless Users Group (SOWUG) struggles for survival against insurmountable competition from the major operators in South Africa – their market is restricted to poor Soweto residents and small businesses. Their promotional video is available for scrutiny at https://www.youtube.com/watch?v=CiYCx_ca6WY. In September 2020, SOWUG reported that the primary focus had shifted to "digital literacy training", and listed amongst its major challenges: "*lack of access to* (network*) devices*"; "High cost of deployment", which includes unaffordable and unsustainable regulated license fees; rents; network access prices; technical skills for network design, construction and operations, and user skills of the customers.
- Circa 2012: Internet Solutions, Cyber Influx: "*Today, thanks to LTE-Advanced from Internet Solutions, Cyber Influx can connect even more users over our extensive and reliable network, essentially putting an Internet café in every home, school or business that needs it*" **Note**: The original outline of Cyber Influx, accessed in June 2019 via https://www.is.co.za/about-us/case-studies/cyber-influx/, has been rerouted to https://www.dimensiondata.com/, the reference to Cyber Influx has been removed.
- November 2013: MTN launches eStreet mobile internet cafés: "*As smart devices are becoming part of our everyday lives and digital communications are becoming the norm, it is essential that consumers feel comfortable using these devices and are made aware of all the benefits, applications and digital platforms available*"
- May 2015: Telkom launches R100 million FutureMakers programme: "*The vibrant and inclusive information society that is envisaged by the National Development Plan will remain out of reach, until we collectively bridge our nation's digital divide*", Sipho Maseko, Group Chief Executive Officer, Telkom. "*By 31 March 2016, FutureMakers aims to deliver 80 internet cafés in disadvantaged areas across South Africa*"
- April 2018: A South African Success: From an Internet Cafe in Sandton to an ISP owner: A success story by two South African entrepreneurs - an entry level Cybercafé in up-market Sandton, to an ISP located in up-market Rosebank, offering a wide range of products to up-market customers. The original Cybercafé addressed the public access needs of the middle- and high-income market – it survived and expanded to become the very popular ISP - Cool Ideas: https://coolideas.co.za/.

- June 2019, set up costs: Gumtree, “Internet cafe" in “Businesses for Sale in South Africa”. Prices range from R35,000 to R600,000 in various South African towns and locations;

Summary: Approximately 46 million South Africans do not have access to broadband at home, are most unlikely to get broadband at home due to affordability and the pro-rich national market structure, under any national policy or regulatory instrument that does not address the root cause of this “market failure”. Are 46 million very poor South Africans a “market” that has failed?

South Africa’s Broadband Policy SA Connect, approved by Parliament in December 2013, introduces “The Challenges of Broadband” with: “*In South Africa, the lack of **always-available**, high-speed and high-quality bandwidth required by business, public institutions and citizens has impacted negatively on the country’s development and global competitiveness”*. In setting the national broadband targets, the National Policy adopts a baseline broadband penetration of 33.7% and a target of 100% at 10Mbps by 2030. The accepted definition of the indicator is “*households where at least one member had access to or used the Internet either at home, work, place of study or Internet café*”. At the time of policy formulation, the ITU definition of an “Internet user” was “*Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc*.” Using this measure, if all 60 million South Africans accessed the internet once in 3 months, could we conclude that the national “digital divide” has been breached? That the country has 100% national internet penetration? That “digital transformation” has been achieved? Fortunately, SA Connect set meaningful targets, even if they now seem to be more challenging than the challenging times we now live in.

There is no acceptable option to 24/7 broadband access, and the ability to use it productively, for all persons young and old. Table 3.1.5 illustrates a first approximation of how South Africa’s peers, especially those in the BRICS community have progressed in this critical ICT4SDG indicator. The table is useful as a discussion platform for how these peers used the Internet Café model as a public ICT access platform while they built the more permanent and desirable fixed broadband coverage of every home, office, and institution in the land. The 24/7 household penetration result is approximate, accurate household data is costly to compile, and not readily available. This approximation may differ marginally from more specific data available for the countries listed.

Table 3.1.5: Benchmarking South Africa’s Broadband Connected Homes (2009 to 2019):

Country	[1] Number Households (2019)	[2] Fixed Broadband Subscriptions (2019)	5-year CAGR (% per annum)[3]	10-year CAGR (% per annum)[3]	[4] Households with 24/7 Broadband
Brazil	72,395,000	32,906,998	7%	11%	45%
Russia	55,380,000	32,857,614	6%	10%	59%
India	248,800,000	19,156,559	4%	9%	8%
China	479,310,000	449,279,000	18%	16%	94%
South Africa	17,160,000	1,250,356	-6%	10%	9%
Colombia	14,000,000	6,949,852	7%	13%	50%
Thailand	21,300,000	10,108,819	13%	14%	47%
Vietnam	26,870,000	14,802,380	20%	17%	55%
South Korea	20,890,000	21,906,172	3%	3%	105%

Sources, Definitions, Methods: (Approximations used if official statistics data unavailable)
1: Individual searches, e.g., S. Africa: https://www.statssa.gov.za/publications/P0318/P03182019.pdf
2: ITU-D: FixedBroadbandSubscriptions_2000-2020.xlsx: Definition: all technologies excluding mobile
3: Growth of fixed broadband subscriptions over 5-years and 10-years
4: Method: Approximation based on fixed broadband subscriptions divided by household numbers - % households – in 2019.

Data from Table 3.1.5 that needs further intensive review and analysis:

South Africa’s compounded annual growth in broadband subscriptions between 2014 and 2019 was negative 6% per annum. Why? The obvious explanation is that the highly visible fibre optical, 4G/LTE, and now 5G network expansions addressed broadband quality more than the much-desired broadband access, coverage and penetration. Such growth served only the non-poor South Africans who already had access to, and could afford, even better-quality ICTs than those they already had. Approximately 46 million South Africans officially classified as poor continue to be excluded from the developmental opportunities presented by affordable high-quality ICTs. The key data used to derive the table was drawn from the broadband statistics published by

ITU at https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx, and South Africa's household data published by STATS SA in all its annual household surveys. Tables 2.2 and 13.1 on page 6 (15 of 192) and 52 (61 of 192) respectively in STATS SA P03182019 were used to confirm the household-related data – urban household growth exceeded by far the household ICT penetration growth. The stagnant or shrinking rural economy drives urbanization and therefore household growth. The primary rural/urban migration destinations are the Gauteng and Western Cape provinces. The stagnant or declining fixed broadband household penetration levels, coupled with the growth of households in poor residential areas, are the root causes of the South Africa's ICT4SDG challenges, and the nation's clear un-competitiveness against its peers illustrated in the table.

While all the other non-BRICS country data provided in Table 3.1.5 are interesting, they also have valuable lessons for South Africa: (a) How did Colombia, with similar economy, demographics, and inequality levels, achieve the high ICT growths that resulted in a minimum estimate of 50% fixed broadband household penetration by 2019? (b) How did Brazil, with its difficult political dynamics, exceptionally difficult terrain for ICT development, high levels of poverty and inequality, succeed in achieving 45% fixed broadband household penetration, and the admiral national SDG-related performances discussed in the following paragraphs? (c) How did much poorer Vietnam achieve a 5-year record 20% per annum growth rate in fixed broadband, resulting in approximately 55% fixed broadband household penetration, verified using different data sources in Table 3.0.2 (a) in Section 3.0? (d) what must we learn from South Africa's mediocre growth rate of broadband-connected homes, which deprives up to 76% of South Africans from nearly all knowledge-related growth opportunities?

The discussions that follow review how South Africa's BRICS partners used cybercafés to support ICT4SDG.

3.1.6: Brazil:

Freedom on the Net Summary 2021: 100% excellent, 0% poor:

Net Freedom	Obstacles to Access	Limits on Content	Violations of User Rights
Partly Free: 64% (64/100)	80% (20/25)	69% (24/35)	50% (20/40)

In 2010, Luiz Inácio Lula da Silva, then President of Brazil, undertook a state visit to South Africa, accompanied by a high-level technical team. At a Multistakeholder Forum hosted by South Africa's Department of Trade and Industry (DTI, now DTIC), the Brazilian delegation presented the country's broadband development strategy, a refreshing focus on the plight of Brazil's poorest communities, using all available ICTs. The presentation, available at https://www.sakan.org.za/Docs/MultiStakeholder_Forum.pdf, indicated strong government support and use of the of Cybercafé model as a pro-poor connectivity and use solution. This presentation inspired the author of this discussion document to conduct a desktop survey of Cybercafés or LAN Houses as they are called in Brazil, in his ongoing search for solutions for South Africa's ICT4SDG shortcomings. The results of the survey, with elaboration of some of South Africa's own SDG challenges and possible solutions, is available as a PowerPoint presentation at https://www.sakan.org.za/Docs/SA-LAN.pptx.

The most impressive aspect of the presentation was how Brazil positioned the well-known Cybercafé systems, or LAN Houses, to focus on Brazil's poorest populations, especially the nation's children. The country, like many others at similar stages of development, including South Africa, had built ICT4D strategies based on telecentres and related Community Technology Centres (CTCs). These were not effective as discussed in the previous section. Brazil then changed its policy focus to the use of SMME operated and owned LAN Houses to drive Internet access and use in economically marginalized rural and urban communities.

While the Brazilian delegation to South Africa was either preparing for, or delivering their presentation in South Africa, several Brazilian researchers were actively studying the LAN House phenomenon, a powerful social inclusion tool that contributed well to the nation's information society. Three key research outputs, amongst many others were:

- 2010 USC Annenberg School for Communication & Journalism: "*LAN Houses: A New Wave of Digital Inclusion in Brazil*" by Ronaldo Lemos, a Brazilian lawyer, expert in technology, media and intellectual property, and fellow Brazilian Paula Martini, a Project Leader and Researcher in culture, technology, and

new business models at the Centre for Technology and Society. These two researchers provide useful details about Brazil's social use of the Internet, and prepared an access and usage table summarised below:

Table 3.1.6: LAN House Access and Use in Brazil - 2010:

Demographic and place of access	Lan Houses (%)	Home (%)	Work (%)	Friends and neighbours (%)	School (%)	Telecentres and similar CTCs (%)
Illiterate and Early Childhood	54	29	4	21	19	4
Higher Education	26	66	44	19	23	3
Ages: 10 to 15	64	29	1	24	22	4
45 to 59	14	69	32	12	3	1
Family Income: Lowest	82	7	3	16	11	5
Highest	15	88	43	16	13	3

Other interesting extracts from this report include: (a) The city of Fortaleza is highlighted, a city with ancient and modern historical links with South Africa and Southern Africa: (a1) the historical landing point for African slaves in the early sixteenth century; (a2) the landing point for the first direct transatlantic broadband submarine cable system between Africa and the Americas, in February 2018 – the Luanda – Fortaleza South Atlantic Cable System (SACS); (b) The population of Fortaleza is predominantly black and poor, a heritage of Brazil's colonial and racist/slavery history: (b1) in the hey-day of LAN Houses, large numbers lined the streets of Fortaleza side-by-side, their owners comfortable with the congested competitive environment, unable to meet the public demand; (b2) an example of the success of the LAN House phenomenon – many poor residents of Fortaleza have graduated out of the public access mode and acquired their own private internet connections, especially with the help of mobile networks and services and the numerous international broadband cables that land in Fortaleza.

Clearly, the LAN Houses or Internet Cafés outperformed telecentres and other "top-down" CTS by large margins. Virtually all economically and educationally marginalized populations preferred the informal self-driven community spirit engendered by these privately-owned but government-supported bridges to the information society. The LAN Houses have been overtaken by affordable national broadband infrastructure, the desired end result of successful ICT4D.

- An excellent ethnographic study of how Brazil's favela dwellers, especially the children, were able to appropriate technology through the use of all public access technologies, systems and networks, was undertaken by Brazilian researcher David Nemer published in his 2015 dissertation "Rethinking Digital Inequalities: The Experience of the Marginalized in Community Technology Centers. David has become an internationally recognised authority on most matters related to ICT4SDG, and continues his vital contribution to ICT4D from his current association with the University of Virginia. David's vital study results and insights are available in numerous online publications, presentations lectures and speeches, vital reference sources for all ICT4SDG development.

  In a related 2015 publication, "Digital Favelas: What Cities of Tomorrow Can Learn from the Slums of Today" David Nemer introduces an excellent photographic-rich essay with words that harmonize deeply with the societal challenges of South Africa's poor:

> *Favelas are the urban slums of Brazil. Slums—the image is already filling your mind—are marginalized areas of society without state investments, without basic needs: infrastructure, sanitation, road systems, health, education. They also lack access to information and communication technologies (ICTs). Why, then, are they important places for studying "advanced" topics like technology, knowledge economy, and sociotechnical practices? What could they have to teach us?*

Brazil's favelas are the "informal settlements", "townships", "squatter camps", "locations", of South Africa. The poorest South Africans, numbering up to 76% of the population, suffer the same tragedies as Brazil's favela residents did before LAN Houses came to their rescue. Cybercafés in South Africa could be equally important places to study advanced topics as suggested by David, but they need to be positioned to do so first. If ignored,

they are the important places that will demand the help of some of Walter Scheidel's apocalyptic horsemen to defeat poverty and inequality. Apocalyptical Horseman 1, – state collapse, may be at the forefront of this societal transformation, with horseman 4 – revolution – riding alongside as discussed in section 3.1.1 of this document. The poor will seek the aide of Scheidel's apocalyptical horsemen only if highly visible and highly inclusive efforts to reduce and remove the factors that cause poverty and inequality are not in place.

In the reference link immediately above, David describes a highly creative community of economically disadvantaged Brazilians, "stealing" broadband from wealthier connected relatives within the neighbourhood, with their permission of course, but against the ICT regulations concerning broadband sharing. The favela LAN House owners and their families learned through *You Tube* accessed in their own LAN Houses, the art of technology maintenance, repair and upgrading, thus providing critical services to their communities at affordable prices.

LAN Houses in 2020: In this third decade of the twenty first century AD, the traditional LAN Houses of Brazil have largely concluded their work of raising the level of Internet access and usage by Brazil's socioeconomically marginalized classes from near zero in year 2000 to about 76% in year 2018. The furious march of technology has rendered their original purpose obsolescent. While equivalent data for South Africa (ICT usage by the poor) is not readily available, the closest representative statistic, and most relevant in ICT4SDG, is 24/7 household internet penetration. Both Brazil and South Africa entered the 21st century with near-zero household broadband penetration across all social divisions, and entered the 3rd decade with Brazil achieving approximately 45% in 2019, while South Africa's achievement stagnated at a level in the order of 10% as illustrated by the official statistics in Table 3.0.2 (a) in the preceding section of this document.

An interesting outcome of Brazil's growth trajectory is the reduction of extreme poverty – SDG1 - aided and abetted by ICT4SDG. Between 1996 and 2014, Brazil sustained a 5% per annum reduction in poverty, while South Africa achieved just 1% per annum (World Bank Poverty Headcount Ratio).

The LAN Houses that still remain functional in Brazil, after having raised individual internet access and use to nearly 100% of the population, are seeking new business models for sustainability. A significant number are transforming their business models into high quality high value gaming and e-sport venues, as per the modern South Korean PC Bang model, which was used to introduce the Brazilian LAN House in the first place. While this LAN House transformation was taking place, the Brazilian Government, with the support of international partners like the Ford and Mozilla Foundations (in the spirit of SDG17), actively search for ways of using the LAN House model "*to promote digital empowerment of community networks, based on the transformation of Lan Houses into decision-making spaces*". The relevant report "Rethinking Digital Inclusion: Makerspaces and Digital Literacy in Rio de Janeiro", is a vital reference source for South Africa's strive for similar empowerment through digital inclusion. The primary purpose of the "maker culture" of the programme is to move on from "digital inclusion" driving an "information society" into a national "doing culture" that is creative and innovative in the face of the 4IR-driven changing nature of work. *Positioning people before digits in the national empowerment and transformative agenda is a top priority, all technologies must be positioned to support this agenda*.

To conclude this brief introduction of the Brazilian LAN House phenomenon, a McKinsey & Company 2020 report has some very useful additional insights:

Brazil 2020 Opportunity Tree: McKinsey & Company, 2019, updated 02 October 2021:

- *"At a time when disruption is impacting the world and historic trading relationships are being impacted by geopolitics and technology, Brazil stands out as a country where opportunities for growth appear compelling and there to be seized"*
- *A vibrant knowledge-driven energy sector that is rapidly migrating to renewable energy sources: the "National Power System Regulator (ANEEL) has proposed an 11% tariff reduction over the next 4 Years"*
- *"Brazilian consumers are ready for technology-led disruption – rapidly increasing internet penetration and the 2nd highest online engagement in the world are huge enablers for customer-centric value propositions"*
- *"~9.5 hours spent per user, per day, on the internet – 2nd most-intensive internet users in the world"*

- *Highest Internet user growth by poorest communities – 36% per annum between 2015 and 2018 to reach 76% internet access for lower middle classes citizens.*
- *Very high levels of entrepreneurship and innovation across all segments of the population: SMMEs (microenterprises) contribute 61% of all wages in Brazil; 27% of Brazil's GDP; 99% of Brazilian companies; 76% of Brazilian jobs.*

Russia, India, and China:

These remaining South African BRICS partners are grouped together in this summary due to the paucity of valid and relevant statistics and details freely available online, about how they introduced and used their very significant cybercafé businesses to drive national digital inclusion. In general, all three embraced the cybercafé concepts as soon as they introduced internet services. Most were driven by private sector entrepreneurs. There are valuable lessons that can be derived from each country's use of public access to the internet, which may/should be the subject of more intensive research into how South Africa can use the concept, even after these three BRICS partners have eked out maximum benefits from it, allowing the concept to approach obsolescence. Altering cybercafé business models to keep up with: (a) changing technologies; (b) user preferences; (c) the changing nature of business and work; and (d) societal value systems and norms, has become a priority for community-owned survivalist "digital transformation" endeavours.

Table 3.1.7: Freedom on the Net Reports for Russia, India, China and South Africa (2020 or 2021)[1]

Click to access	**Net Freedom**	**Obstacles to Access**	**Limits on Content**	**Violations of User Rights**
Russia	Not Free: 30% (30/100)	44% (11/25)	31% (11/35)	20% (8/40)
India	Partly Free: 51% (51/100)	48% (12/25)	60% (21/35)	45% (18/40)
China	Not Free: 10% (10/100)	32% (8/25)	6% (2/35)	0% (0/40)
S. Africa	Free: 70% (70/100)	64% (16/25)	83% (29/35)	63% (25/40)

[1] Is Freedom on the Net ideologically and politically biased? This is the subject of significant differences in public opinion: see e.g., EU 2011 opinion at https://ecpr.eu/Events/Event/PaperDetails/9034 and Al Jazeera 2021 opinion. The report, biased or not, nevertheless provides timely alerts for self-evaluation and policy reconsideration.

3.1.7: Russia:

Russia introduced cross-border Internet connections in circa 1990, seven years after one of the Internet's official birthdays (1983 - birth of TCP/IP). Internet café services were introduced in 1997, to provide services to Russians who could not afford individual connections. These expanded to about 1,000 cybercafés by 2003. According to recent reports, their value has been undermined by the march of technology, and by the government's concern over national security that led to rigid controls like the 2019 "sovereign internet law", which gives officials wide-ranging powers to monitor and restrict traffic on the Russian web. Nevertheless, Russia's Internet Cafés helped the Russian citizenry, especially the youth who frequented them the most, to acquire the technological skills and literacy they needed to compete globally in the information society. The most recent Cybercafé estimate in Russia amounted to 600 in 2020.

Russia's 24/7 household internet coverage was 50% in 2019, after a steady 6% per annum growth over the preceding five years. The nation's poverty headcount below the international poverty line of US$ 5.50 PPP was 3.7% in 2018, compared to South Africa's 56.9% in 2014, the most recent reliable statistic published by STATS SA (source: World Bank SI.POV.UMIC). South Africa's population living under the appropriate international poverty line is projected to exceed 60% after the Covid-19 pandemic.

Russians have acquired exceptional ICT skills, and positive and negative global perceptions of both beneficent and maleficent use of these skills in the modern ideologically and politically divided world. This is the primary reason for the low Net Freedom scores assigned to Russia in Table 3.1.7, a logical outcome of the nation's new sovereign internet law.

There have been impressive international successes of high-level business, engineering and scientific applications of Russian ICT knowledge and skills. These range from impressive scientific contributions in nearly all scientific disciplines to a highly visible lay-persons' global market successes of e.g., the *Ziferblat* Anti-cafés – the Russian phenomenon taking the UK (and the world) by storm. This "pay for just being there" cybercafé

model provides Internet access, all foods and beverage, and comfortable private or group meeting facilities free of specific charges. A very brief outline of the concept follows:

11 March 2020: Ziferblat, a pay-by-the-minute café, has launched in London: *Ziferblat, which translates roughly to 'clock face' in Russian and German, also has branches in Russia, Slovenia and Ukraine and is a response to the changing patterns of 21st-Century working. Everything, from hot drinks and snacks to sockets and super-fast Wi-Fi is free; except the time you spend there. Events and group working are popular, all ages are welcome. The fee is 4p/minute for three hours and a fixed rate of £12.60 for four hours or more.*

The *Ziferblat* concept was founded in 2010 by Russian Ivan Mitin, the first functional branch opened in Moscow in September 2011, before being exported worldwide.

Are there any creative innovators in South Africa who can "bend" the Ziferblat concept to a pro-poor sustainable application in South Africa's townships for all economically deprived children, youth and adults, at user prices that these poor communities can afford? The possibilities are endless.

3.1.8: India:

India and South Africa share deep ancient, recent, and modern histories:

This short review of India's ICT growth trajectory is presented in view of the close affinity between India and South Africa that extends from very ancient geological times right through to the modern era: (a) the Indian sub-continent broke away from Africa and migrated north-east about 120 million years ago (MIT 2015); (b) India's African roots traced by numerous scientist, told in many genetic and archaeological platforms, e.g., "An Ancient Link to Africa Lives On in Bay of Bengal"; "Journey of a man", tracing the roots of the Out of Africa migration narrated by Jaya Menon in June 2006; (c) a similar colonial and modern history, e.g., sharing of the life and times of Mahatma Gandhi; The shared successes and errors of judgment in ICT4SDG of both nations present immense potential to learn from each other under ICT4SDG17, via, if necessary, the shared partnership in the BRICS community.

India is a land of immense contrasts and extremes:

- The largest democracy on earth and the world's second most populous country;
- A significant population of world-class intellectual leaders across all disciplines, living amongst massive populations of very poorly educated and economically deprived populations – 22.5% of the population, more than 300,000 people, live at or below the lowest international poverty line (World Bank SI.POV.DDAY at US$1.90, publication 2021), with inadequate access to ICTs in spite of some of the lowest ICT prices in the world – see Table 3.1.8 below;
- World-renowned intellectual leaders and doers like Amartya Sen who democratized the global human development process through his contributions towards the formation of the United Nations Human Development Index (HDI); World-leading ICT Gurus like Dr Sam Pitroda, also known as "The father of India's communication revolution", who influenced the ICT growth trajectories of many countries ranging from China, the former Soviet Union, Vietnam, his home country India, and many other countries in the developed and developing world. He was the victim of significant abuse and health set-backs for his efforts. Read one of Sam's very few books about his life and works (Sam does not like writing – he prefers to speak from his heart and his mind) - his abbreviated life story and how he thinks humanity should be "*Redesigning The World: A Global Call to Action*" (numerous online excerpts including "The Wire"). Sam's commitment to his country and the global poor must have influenced his younger compatriot Satya Nadella who now heads perhaps the most influential ICT company in modern times – Microsoft; and the multitudes of exquisite health professionals fighting the global Covid-19 pandemic globally (every seventh doctor fighting Covid-19 in US is Indian).
- The impressive credentials of India's high-level thinkers fade into insignificance when viewed against the vast populations of unconnected, untrained, economically poor Indians, as indicated by the benchmark summary in the table that follows.

The largest democracy in the world experiences numerous growth challenges and tensions, many self-inflicted by a rigid bureaucratic "top-down" development system, especially in the ICT sector, trying to balance mass poverty, educational and technological illiteracy against exceptionally high levels of techno-literacy typified by the Eastern Silicon Valley of Bangalore – read "How Bangalore became Asia's Silicon Valley". These tensions are statistically reflected in the benchmarks of Table 3.1.8.

Table 3.1.8: BRICS relevant benchmarks, 2019 (or most recent data available):

Country/Indicator	Population (Millions)	[1] Poverty % below relevant international poverty line	[2]Inequality GINI Index (most recent year)	[3] Education/Youth Unemployment (% graduates/% labour)	[4] 24/7 household broadband (%)
Brazil	211	19.6 (2019)	53.4 (2019)	27/31 (2013/2020)	45
Russia	144	3.7 (2018)	37.5 (2018)	58/17 (2018/2020)	59
India	1,370	22.5 (2011 - US$1.90 PPP))	35.7 (2011)	28/22 (2019/2019)	8
China	1,400	24 (2016)	38.5 (2016)	34/5 (2019/2020)	94
S. Africa	58.6	56.9 (2014)	63 (2014)	11/59 (2018/2020)	9

1: All data from https://data.worldbank.org/topic/11 all countries US$5.50 PPP per person per day, except India at US$1.90 PPP. At India's current classification as a "lower-middle-income economy, the poverty headcount at US$ 3.20 PPP was 61.7%
2: GINI Coefficient: World Bank https://data.worldbank.org/indicator/SI.POV.GINI
3: Education: https://databank.worldbank.org/source/education-statistics-%5E-all-indicators/Type/TABLE/preview/on# Youth Unemployment (years 15-24, % of total labour force): https://data.worldbank.org/indicator/SL.UEM.1524.NE.ZS
4. 24/7 household broadband: See Table 3.1.5 for sources and methods
NOTE: All estimates compiled from World Bank Data, some reporting variations from other sources especially in poverty ratios.

South Africa's multicultural multi-ethnic multilinguistic nation faces similar challenges and stresses as India's, but on a much smaller scale. Table 3.1.8 compares relevant statistics between India and South Africa, with the remaining three BRICS members added to enrich the benchmark.

There is little doubt that India's "Eastern Silicon Valley" expertise began in Internet Cafés. India's Internet began life under the leadership of Dr Srinivasan Ramani, as an educational network – Indonet - in 1986, which became a public network nine years later in 1995. The first cybercafé in India was launched a year later in 1996.

The history of the Internet in India is told by Dr Srinivasan Ramani himself in "*The story of how the Internet came to India: An insider's account*", published by News18 of India in August 2015.

In 1986, at the birth of Indonet, India's telephone density was just 0.44 per hundred population, growing to 1.25 per 100 by 1995 when public access to internet services was launched. With dial-up as the prevalent Internet access mode at the time, the maximum number of Internet subscribes would be limited to 12.5 connections per thousand citizens. Ten years later in 2005, telephone penetration had risen to 4.37 per hundred, fixed Internet penetration to 0.62 per 100, and mobile Internet connections had to wait for their introduction in 2011, according to data reported by the International Telecommunication Union (ITU) (source https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx). Thus, ten years after the introduction of the Internet in India, the maximum possible individual Internet connectivity was 43.7 out of every thousand Indians, or 4.37 per 100 in the preferred indicator. The reality, given the impossibility of providing Internet connectivity to everyone with a PSTN connection, was just 6.2 Internet connections for every one thousand citizens.

25 Years of Internet: Remembering India's Cyber Cafes, Where We First 'Surfed' the Web
"Cyber cafes were the portal to internet back at a time when most households did not own PCs, and today form relics of memories of a time gone by" A young Indian mother is pictured deriving both joy and value from an Internet Café, while "nurturing" her child for an information and technologically rich future. Was this preparation for the child's entry into the Asian Silicon Valley in Bangalore, or/and the real Silicon Valley as preferred knowledgeable immigrants in San Fransisco, USA?

The only option available to most Indians wishing to access the Internet for any reason ten years after its launch was at public spaces. For ordinary Indians, these were Internet Cafés, virtually all privately built and operated. The Indian Government also placed its early pro-poor ICT strategy on telecentres, with well-publicised mixed results which did little to raise Internet use and ICT-literacy amongst the nation's poor. An

excellent representation of this fact was published by Indian media house News18, a popular Indian media outlet operating in partnership with CNN of the United States (image and extract above).

The Cybercafés of India have served their purpose, shaping the future builders of India's Silicon Valleys. But, India's Government and its public sector institutions, including the state ICT regulator Telecommunications Regulatory Authority of India (TRAI), were not supportive. Wikipedia expresses this government antagonism, misgiving, and suspicion of cybercafés well:

> https://en.wikipedia.org/wiki/Internet_caf%C3%A9#India "*In India, Internet cafés used by traveling people and business are declining since the arrival of widespread mobile Internet usage. A set of other services are also offered, such as printing of documents or webpages. Operators also help computer illiterates through some government processes (as a part of e-governance in India). Low speed of mobile Internet and these services offered by Internet cafés help its survival. In India a positive government ID is compulsory for Internet café users in most states.*
>
> *In 2008, there were 180,000 cyber cafes in India but by 2017, it declined to 50,000, one of primary reasons for decline was rules of IT Act, which caused licensing issues and other restrictions*"

In 2008, before the introduction of mobile broadband, India achieved a fixed PSTN subscriber penetration of just 3.16 per hundred population, enabling a dial-up Internet penetration of 0.44 per 100 people (source ITU Statistics 2020), the Economic Times of India raised alarm bells about India's restrictive laws governing cybercafés:

- Growth of cyber cafes declining sharply: "*Analysts attribute the decline to lack of support from the govt coupled with increased security concerns and harassment of cyber cafe owners*"
- "*The growth of cyber cafes, which are the largest source of Internet access in India, is declining sharply. According to a CII-IMRB Broadband report, the number of cyber cafes, which was growing at almost 60% in 2004 and 2005, has fallen to almost 20% in 2008*"
- "*Ridiculously, in some cities like Pune, to open a cyber cafe, one has to take permissions from a municipal health department, just because cyber has got a 'café' suffixed to it. (The literal meaning of a cafe is a place to have coffee and snacks). Moreover, across the country, the local police have to provide a no objection certificate in order to open a cyber cafe. Experts say that drastic decline of cyber cafes is due to harassment that owners face at the hands of the local police*"

Other Indian criticisms of the stringent regulations governing cybercafés included:

- SikhNet Gurbani Media Center 2011: *NEW DELHI — "New Internet rules that seek to enhance national security and limit offensive content have sparked an angry debate about free speech in the world's largest democracy"*
- Fast forward to 2021, when ITU reports that just 23.8% of Indian households had ANY mode of Internet connectivity in 2018 (ITU Core Household indicators 2021), fixed broadband subscriptions amounted to 1.44 per 100 in 2019, and mobile broadband subscriptions reached 52.54 per 100 in 2020.
- In Indian administered Kashmir, US-based Foreign Policy News reported in February 2021 that "Internet Shutdowns Leave Indians Struggling With Everyday Life". Further reports state that in the face of the devastating COVID-19 pandemic, "*Doctors and health care workers initially urged the government to restore 4G internet, but the government said it wasn't necessary for delivering medical services*"; and perhaps equally damaging "*For Jammu and Kashmir students, the shutdown has meant the loss of a whole year*"
- The IEEE, the world's largest technical professional organization for the advancement of technology, home professional institute of many leading Indian scientists and engineers in the ICT sector, published on 27 January 2020 a scathing report on India's application of rigid regulations to shut down selective internet networks and the regions they serve: How India, the World's Largest Democracy, Shuts Down the Internet. Snippets from this report include:
  - Since August 2019, Indian officials have maintained the longest Internet blackout ever to occur in a democracy, in the disputed Kashmir region between India and Pakistan;

- A conservative estimate by the Top10VPN website found that the 2019 shutdowns alone cost India's economy at least US $1.3 billion last year—not including the many cases where officials blacked out mobile communications within individual city districts for several hours;
- India's central government also gets regulatory power over the Internet from the Indian Telegraph Act, 1885, which originally gave British colonial officials authority over telegraph lines in India;
- The government usually justifies shutdowns as necessary to maintain public order and prevent violence during times of unrest. But Rydzak's research has found that India's Internet blackouts have not reduced levels of protest, and may have even worsened violence during such periods.
- A ray of hope: ***UPDATE 27 JANUARY 2020*** (from August 2019): *News reports state that India's government has restored Internet access to the Kashmir region, though residents there can currently only browse 301 websites approved by the government and still cannot use social media. Mobile Internet is only available at very low speeds, according to a report from The Wire.* This follows a 10 January ruling by India's Supreme Court that the ongoing Internet shutdown and other suspensions of civil rights in Kashmir represent a violation of constitutional fundamental rights.

This review of India's ICT sector concludes with a few snippets from Sam Pitroda, an eminent Indian ICT Guru:

2 May 2021: Infinite exponential economic growth is a myth, says Sam Pitroda:

In 'Redesign the World', Sam Pitroda argues that hyperconnectivity and Covid-19 have offered a unique opportunity to redesign the world to meet future challenges.

- "*Today, in most management and economic theories, the link to the broader ecosystem—nature herself—is missing, causing enormous, negative consequences. Today capitalism and the financial system are growing at an unhealthy rate for the overall system's survival. Consider them like the uncontrolled growth of cells which leads to cancer*"
- "*Capitalism has developed into a monstrous, web-spinning, self-organized system, encompassing the entire globe. The financial crisis of 2008 left even financial experts in despair. They were primarily fuelled through excessive liberalization and privatization, which benefited the 1 per cent on top and took away from the other 99 per cent. Besides, our current economic system is premised on the idea of single-minded growth, ignoring the finite boundaries of the biosphere and the laws of physics. Our financial and economic system can only function if it serves humanity and our planet as a whole. Today, society and the planet are serving the needs of financial and economic growth in an unsustainable manner, to such an extent that it is threatening our survival as a species. Today, it is not about the politics of liberal vs conservative or right-wing vs left wing. These debates are outdated and fall short once we realize and understand our current problem's root cause*".
- "*Is it necessary for a nation or economy to continue to grow forever? Is growth an excellent objective to chase? Is it possible to have zero growth and still be happy and content? Can we reach a state where needs are met before wants? Is it acceptable to have slow growth for rich countries and high growth for emerging countries? Can we design economic theories to expedite inclusion, equity and equality?"*

11 **September 2020***:* Not Safe to Open Schools in India: Sam Pitroda on Connectivity and Covid-19

Excellent video presentation at https://www.youtube.com/watch?v=2CbnZe33oLY&t=122s

- *"If we can't expand digital education – which we can't today – we must bite the bullet and say that this is a void year,"* says Sam Pitroda, technocrat and former advisor to ex-Prime Minister Dr Manmohan Singh.
- "*We don't have reliable access to broadband that you need for education, because education is not just about text and voice – it is about graphics, video animation and interaction*"
- *"Just because you provide digital devices and access, it doesn't assure that you will be able to deliver education. Because teachers themselves don't know how to operate computers. What are you saying? In village schools, they have never operated digital devices. So, it is a huge task that we are not willing to accept"*
- ***"FOCUS ON TEACHER TRAINING, CONTENT CREATION -*** *Simultaneously, we need to train our teachers. Along with that we need to create right content. Along with that we need to create right platforms. So, you need to start on multiple fronts right now with huge commitment of financial resources*"

Clearly, India and South Africa have many similar experiences, good and bad, that can be of immense benefit for learning how and how not to provide effective ICT4SDG. Can the partnerships that already exist between the countries be strengthened for expedited ICT4SDG development as part of ICT4SDG17?

3.1.9: China:

China's Internet Timeline:

- Internet technology was introduced in the mid-1980s, restricted to research and government examination.
- First email sent in 1987, research collaboration between China and a collaborating university in Germany:
  - On Sept 14, 1987: "*Across the Great Wall we can reach every corner of the world*." Source: China Daily 2014.
- Fully functional Internet became available in 1994, public internet services launched in 1995.
- First Internet Café opened in 1996, providing affordable access to both computers and internet connectivity when prices and Internet infrastructure were both beyond the reach of most Chinese citizens: In 1996, China's telephone density was just 4 per hundred population, limiting dial-up Internet connections greatly.
- Massive state-led expansion of Internet access, in spite of major government reservations on freedom of information and security, led to an explosion of cybercafés and users, the former peaking at 152,000 in 2016, the latter exceeding 20-million users per day.
- China's rapid ICT growth is best illustrated by the growth of fixed and mobile broadband:
  - Fixed Broadband: start year 2000, expanding to 22.8 per 100 by 2016, and 33.6 per 100 by 2020 (Note: with approximately 3-person households, household fixed broadband penetration in 2020 was close to 100%);
  - Mobile Broadband: Start year 2009, expanding rapidly to 68.9 per hundred by 2016, and 96.3 per hundred by 2020.
  - *Benchmark South Africa*: (a) Fixed Broadband: start year 2002; 2.05 per 100 by 2016; 2.2 per 100 by 2020: (b) Mobile Broadband: Start in 2010; 60.6 per 100 by 2016; 110.65 per 100 by 2020.

    Note: All data derived from ITU https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx. The ITU definition and use of the concept of fixed and mobile broadband penetration and use, both critical components of ICT4SDG, needs clarification. ITU defines these indicators on a subscriber basis; under what conditions and/or interpretations of definitions can the results exceed the population, as in the case of South Africa? What does 110.65 per hundred "subscribers" actually mean? Would a single company "subscribing" to 100 broadband connections for its branches or personnel be classified as a single subscriber or 100 subscribers? Are all broadband-based IoTs and other machine to human, human to machine, and machine to machine broadband links each classified as "subscribers"? Are all country reports consistent with the preferred definition of a broadband subscriber versus a broadband connection? Source: ITU releases 2019 and 2020 global and regional ICT estimates.
- China is now considered a formidable global competitor and leader in next generation broadband innovations and usage – high speed broadband for the country's robotics and artificial intelligence machinery to counter its ageing population and youth labour shortages. The country is globally competitive in both space and military technology, and a global leader in 5G and beyond.
- In 2021, significant publicity emerged on how China is attempting to promote the redesign of the Internet to enhance its global security, currently under much-publicised and highly significant threats. China is not alone in this regard:
  - Sir Tim Berners-Lee, considered a "Founding Father" of the World Wide Web has strong non-political criticisms of the current evolution of the Internet: (a) The Independent April 2017: "*Sir Tim Berners-Lee slams internet's evolution and risks it poses to privacy*"; (b) Tech Insider July 2018: "*The web had failed instead of served humanity*"' (c) The Guardian March 2019: "*We can get the web we want*"; Engineering and Technology March 2020: "*Web 'not working' for women, warns Sir Tim Berners-Lee*"; The New York Times January 2021: "*He Created the Web. Now He's Out to Remake the Digital World*"

- MIT Technology Review July 2020: "*Dfinity* (Swiss-based Tech NGO) *wants to allow the creation of apps that can run on the network itself rather than on servers owned by Facebook, Google or Amazon. Can it succeed where others have failed?"*
- China's Plan: TechCentral October 2021: "*China to step up efforts to build 'civilised Internet":*

  "Young Internet users should be guided to develop good cyberspace habits: The party should take advantage of the Internet's ability to facilitate communication, he said, and use it to "let the party's innovative theories 'fly into the homes of ordinary people'".
- China is also concerned about Internet addiction and the impact of excessive screen time on the cognitive and intellectual development of young minds, recognising that this is a growing international problem:
  - BBC 25 October 2021: "*Is internet addiction a growing problem?*" Canada, United Kingdom, and USA mentioned in this well-balanced article;
  - Business Insider South Africa 30 August 2021: "*China cuts video game time for kids to 3 hours each week*". The clamour for screentime limits for adults and children has been growing: (a) numerous countries ban broadband connected handheld devices in schools unless they form part of an accepted curriculum – the debate in the U.K. continues; WHO 14 September 2018: The World Health Organization defines "Gaming Disorder" related to online addiction as a disease, impacting negatively the cognitive development of all children.

The above brief history of the Internet in China suggests that the Internet is indeed a potent driver for human development, a vital tool for the resolution of all SDG challenges, but it can also be abused, becoming a pyrrhic victory in the strive for human development. Online abuses are multiplying, often aided and abetted by big business in a near perfect application of the Homo economicus model: profits above humanity, at any cost: "*The era when tech giants could amass vast power without responsibility is thankfully drawing to a close*" Guardian 7 October 2021. Nations choose different paths to balance these often-conflicting outcomes of an excellent tool for human development. "Throwing technology at the problem" could exacerbate the challenges being addressed, and yet ignoring the power of technology to solve those same problems is perhaps even more harmful for human development in all its multidimensions.

Before embarking on a historical discussion of the enigma that is China, it is useful to review a few ICT and SDG related statistics that set a framework for the discussions. The best indicator of ICT4D is clearly the percentage of households with 24/7 broadband connectivity, which enable whole families representing all generations and demographics, to participate in the unfolding info-technology-driven society, and to share all the information, knowledge, and machine controls available to humankind.

Text Box 3.1.9: China's broadband and related relevant statistics compared:

- **World**: Population 7.7 billion: Fixed broadband subscriptions 15.6 per 100;
- **High Income countries**: Population 1.2 billion: Broadband 34.7 per 100
- **Upper-middle income countries**: Population 2.5 billion: Broadband penetration 24.7 per 100
- **Low Income countries**: Population 0.65 billion: Broadband 0.41 per 100
- **Sub-Sahara Africa**: Population 1.14 billion: Broadband 0.55 per 100
- **South Africa**: Population 0.06 billion: Broadband 2.1 per 100.
- **China**: Population 1.4 billion: Broadband 31.3 per 100. China is an "upper-middle" income economy like South Africa, but one which portrayed the highest economic growth in modern history. GNI per capita grew to 116 times its value between 1964 and 2019, from US$90 to US$10,410, compared to just 12 times over the same period in South Africa, US$520 to US$6040.

Did China use its access to information and knowledge via broadband ICTs to fuel its globally impressive social and economic growth?
Data sources: Population: https://data.worldbank.org/indicator/SP.POP.TOTL;
Fixed Broadband per 100 population: https://data.worldbank.org/indicator/IT.NET.BBND.P2

Text Box 3.1.9 presents fixed broadband population penetration and related key socioeconomic demographic statistics for China, as reported by the World Bank for year 2019 or nearest. Broadband is today's de facto mode of telecommunications – it is technologically neutral, covering all modes of human to human, human to machine, machine to human, and machine to machine communications, unlimited by any natural geographic or physical barriers besides those created by humans. Credible, high-quality broadband connected household statistics have yet to be developed and compiled globally. In their absence, a useful proxy is fixed broadband

subscribers per hundred population, weighted for household size; both are regularly estimated and compiled by state statistical agencies and published by international agencies such as the EU, ITU, and World Bank.

The rough guide used to estimate household broadband coverage in this document is simply to multiply the broadband subscriber density by the average household size, correcting where possible using any published data on household broadband connectivity. In South Africa, household penetration statistics are extremely difficult to compile and manage – (a) the cost of detailed population censuses – the last formal census in South Africa was 2011; (b) the number of households has grown far faster than the broadband infrastructure over the last few years, driven by mass urbanization resulting from high levels of inequality, poverty and unemployment.

A logical question that arises from the data in the above text box is: What did China do that South Africa did not? Are there any similarities between China and South Africa that could provide insights in finding an answer to this question? The following brief discussion is the proposed beginning of a search for clues.

The celebrations marking WTISD 2021 on 17 May 2021 were convened under the leadership of ITU Secretary-General Mr Houlin Zhao, the first Chinese national elected as Secretary-General of the UN agency in its 156-year existence. A key outcome or recommendation of WTISD 2021 was the promotion of story-telling as a means of accelerating "digital transformation", translated in this document to mean improving the human condition through appropriate application and use of the information and knowledge that can be derived from the global ICT infrastructure.

This discussion document proposes a far deeper story-telling mode than the technocentric limitations of digital transformation: the very deep relationship between the people of China and South Africa, and what each country can learn from their relative experience with ICT4SDG. Such historical reviews can set the framework for common understanding, and therefore the framework for the Coordination, Collaboration, Communication, and Coordination (the 4-Cs) that are so vital for achievement of all SDG challenges via ICT4SDG17.

Who are the Chinese? And who are the South Africans? A short genetic odyssey:

- All of humanity today owes its existence to pre-human African ancestors like *Australopithecus africanus*, "unearthed" at South Africa's Makapansgat, Sterkfontein, and Taung, estimated to have lived from 3.67 to 2 million years ago. These South African fossils were judged older than Ethiopia's 3.2 million-old Lucy, and were perhaps evolutionary "uncles and aunts" of Kenya's 1.5-million-old Turkana Boy.
- Scientists believe these ancient hominids were the progenitors of Homo erectus, the oldest known human ancestral fossil also originating from South Africa's Cradle of Humankind. Homo erectus wondered far and wide, probably the first "Out of Africa" hominid migrant circa 2 million years ago, into all of Eurasia, via East Africa's Great Rift Valley, through the Middle-East and South Asia, all the way to Georgia, China, Indonesia, and even as far as the Philippines.
- Homo erectus arrived in China about 2 million years ago, settled, thrived for more than a million years before being joined by several new waves of more recent African evolutionary hominids who arrived via Europe – Neanderthals. The Neanderthals interbred with whomever they encountered, evolving to become Denisovans, who also interbred with whomsoever they encountered. This blending of human genes continued, waiting for even more genetic variants contributed by the arrival of a new wave of Out of Africa migrants, and the emergence of the new dominant species Homo sapiens – us – Chinese and all South Africans alike.
- The new, and ultimately only surviving Homo descendants, arrived in China and neighbouring regions between 120,000 and 80,000 years ago, thrived, and expanded in all directions east, west, north and south, carrying their genetic admixture to all corners of the inhabited globe.
- The facts of these ancestral journeys are no longer in doubt, the timelines are being validated and updated through new scientific analyses and discoveries.

Why are these stories of the human genetic odyssey important in this discourse about ICT4SDG? If all humans share the same South African genetic origins, why then have some who left their continent of origin prospered through the use of ICTs and their predecessor technologies, while those left behind stagnated or retrogressed in the key indicators of progress? Perhaps some answers to these questions can be gleaned from the intriguing stories of the Chinese and South African genetic odyssey.

The story of China and South Africa extends back into very ancient times, as elaborated by numerous international, Chinese, and South African research scientists covering nearly all scientific disciplines useful to

humankind. A very brief summary of this very long story is provided in the text box above, presented as an introduction to the recommended additional multidisciplinary research needed to answer the question posed above – what did China do in evolutionary and recent times to realize the rapid growth of its ICT infrastructure, and therefore its economy, that South Africa did not do?

Clearly, the answer to the question posed has little or nothing to do with who the Chinese and South Africans are – it is centred around how each country's social, cultural, and political systems evolved over time, the strengths and weaknesses of each evolutionary model, and how elements of the seemingly successful Chinese model can be used to begin to lift South Africa out of its crippling inequality, poverty and unemployment morass. The SDGs, and the ICTs, are just a few of many instruments available to humanity to deal with these challenges, irrespective of the socio-political ideologies stated, preferred, or followed by individual countries.

China's rapid ICT growth

China entered the 21st century with a GNI per capita of US$ 940, and with that, began building its vital fixed broadband networks. The country exited the second decade of the 21st century in 2020 with a GNI per capita of US$ 10,410, more than ten times its start in year 2000 (World Bank GNI PCAP 2021), driven by a growth in fixed broadband penetration from near-zero in circa 2000 to 450 million by 2019, giving rise to a fixed broadband penetration of 33.6 per hundred, approximately equivalent to all households in China connected to the internet (source ITU 2019/2020).

South Africa also began its fixed broadband rollout as the 21st century began, with a GNI per capita of US$ 3070 to pay for it (3 times higher than China's), exiting the second decade in 2020 with a fixed broadband penetration of just 2.2 per 100, (15 times lower than China's), and a GNI per capita of US$ 6,040, 58% of China's 2020 GNI per capita.

Why? What were the key reasons why South Africa remained a laggard in the ICT4SDG challenges, while China excelled? Is there anything in the very long histories of the two countries to give a hint of some of the multidimensional causes for the success of one and the stagnation of the other? What specific roles did the key factors of culture, socio-political ideologies, demographics, play in the growth trajectories of each country? What lessons of what to do, and what not to do, can be derived from such a comparison, and which lessons can be practically applied in the short, medium, and long terms in South Africa?

A detailed analysis of the Chinese enigma is clearly beyond the scope of this discussion document, but it can, perhaps must, be done. Is it possible to steer some of the 10% South Africans who graduate each year (see chart 1.6b in Section 1.26 on page 24 of this discussion document), and some of the wannabe matric graduates who desire a research-based career in the near future, towards the required multidisciplinary research, in partnership, if possible, with some of their Chinese counterparts in the spirit of the BRICS and SDG17 partnerships? Can South Africa begin to build the internal private/public partnerships necessary for the scalability of any pro-poor development, particularly in ICT4SDG?

The Chinese model, and virtually all other models deemed successful irrespective of ideological persuasion, continue to depend entirely on mass population understanding and support. Nations with vastly different socio-economic-political ideologies like the Nordic countries, The Netherlands, Chile and Costa Rica on one hand, and the succeeding former Eastern Bloc countries and e.g., Estonia, Lithuania and Vietnam on the other, have successfully balanced their preferred socio-political ideologies and structures with pro-poor development models that go far beyond mere national ICT policies. Can South Africa do the same?

This section is about the role of cybercafés where economically marginalized populations are able to access affordable developmental qualities and quantities of Internet services. It is useful to note that most successful countries adopted this model in the early days of their Internet development, and prospered as a result:

As long ago as April 16, 1998, Michel Marriott of the New York Times reported that "*In San Francisco, Jonathan Nelson, chief executive of Organic Online, an interactive design and communications company there, said cybercafes were a logical beginning for people in countries like Russia and China, where the Internet is still a novelty*". This article is still available online at https://www.nytimes.com/1998/04/16/technology/the-sad-ballad-of-the-cybercafe.html, but sadly, in a classic example of Homo economicus, a subscription to the new York Times is now required to read this 23 year old short but informative article.

The Internet may not be a novelty any more in South Africa, but its utility as a pro-poor instrument for development is the same as it was in 1998 - vital.

The rise and fall of Internet Café's in China, summarized below, is most informative, suggesting that the model remains valid in South Africa as it was in China before the dawn of the 21st century:

3.1.9.1: The turbulent story of Chinese cybercafés:

- As per the statement quoted above, cybercafés emerged in China circa 1996 as a "*logical beginning for people where the internet was still a novelty*" – i.e., most Chinese could not get internet connectivity either because the infrastructure was not yet available, or because they could not afford the user devices and/or the connectivity as the infrastructure expanded nationally.
- In January 1999, a massive "e-government campaign" spurred the development of government websites, encouraging e.g., Chinadotcom Corporation in July to become the first Chinese Internet company to list on Nasdaq in the United States. The company survived a turbulent history typical of many Internet start-ups at the time, with revenues soaring from US$20 million in 1999 to over $120 million by the end of year 2000. The company, like many other global Internet companies, was caught up in the " Dotcom Bubble" melt-down of the mid-2000s, filing chapter 11 bankruptcy in September 2012. The Chinese companies that survived this global turmoil became the global giants Huawei, JD.com Inc., Alibaba Group Holdings Ltd., Tencent Holdings Ltd., etc. Could the successes of these companies, and their supportive local markets, have been "nurtured" in China's early cybercafé market drivers?
- The early demand for Internet connectivity was much higher than the Chinese infrastructure rollout could provide - the most immediate access solution for many Chinese citizens became cybercafés, even with official government discouragement and lack of support. According to a "Survey of China Internet Café Industry" by the People's Republic of China Ministry of Culture in 2005, Mainland China had 110,000 Internet cafés, with more than 1,000,000 employees, contributing 18,500,000,000 yuan (approximately US$ 2.3 billion in 2005) to P.R. China's GDP. More than 70% of Internet café visitors were within the ages 18 to 30 years old. 90% were male, 65% were unmarried, and 54% held a university degree. More than 70% of visitors preferred computer games. 20% of China's Internet users frequented Internet cafés.
- Two factors led to the demise of China's cybercafé movement: (a) the inexorable march of technological progress which saw broadband mobile connectivity, and the expansion of household Internet access and affordable terminal equipment, quickly replace cybercafés as the preferred access mode; (b) The Chinese governments continued and growing suspicion and suppression of the private sector-driven cybercafé movement through rigid regulatory controls and censorship:
  - September 2020: 6487 Internet Cafes shut down in first half of 2020: Covid restrictions and resulting increased operating costs, and a hostile regulatory and censorship regime, drove 6,487 Chinese cybercafés into bankruptcy in the first half of 2020, an estimated total of 12,000 for the whole year. Altogether, it is estimated that more than 130,000 closed down over the preceding six years. Still, an estimated 120,000 remained operational in 2021, all hoping for a changing regulatory environment, and striving for new sustainable business models.

    The same or similar dilemmas afflicted many SMME cybercafé business start-ups in South Africa, all sharing the miseries of failure with their Chinese counterparts:

    - Most were overwhelmed by overhead costs like rents, loan repayments, salaries, broadband access, the rising cost of living which exceeded by far the stagnating income of poor entrepreneurs and their customers;

- Many were forced to sell their equipment and office furnishings at huge losses: In China, chairs purchased at 570 yuan had to be sold at 50 yuan; Intel Core-i5 computers worth between US$447 and US$1,200 (2,900 to 7,700 yuan) were sold for 80 yuan each - a story very familiar to many young South African entrepreneurs from impoverished communities who attempted to start cybercafé businesses.

- There is a wealth of publicly available information and knowledge of this phenomenon, including but not limited to "Internet cafes in China face a dilemma in fast-changing landscape" published by the Chinese media house CGTN in April 2021. The number of (official) cybercafés in China peaked at 152,000 in 2016 before their decline: "*.. industry insiders believe the rise in e-sports could also lend weight to internet cafes, as many establishments have incorporated things like e-sports arenas for regular contests, in which cafe-goers can take part. They also offer exclusive rewards like in-game items provided through partnerships with game developers. Despite all the changes, one thing is clear – internet cafes in China are leaving no stone unturned to survive in the fast-changing landscape*".

  Could this be one of the many cybercafés models that South Africa could trial again for improved pro-poor public Internet access?

Besides driving China's Internet user base and techno literacy, China's cybercafés have had impressive successes at the base of the nation's development pyramid:

A Cybercafe Success Story, narrated by the New York Times of August 2009, summarized in https://www.sakan.org.za/SAKANSolutions.html: "*23-year-old Yang Fugan, a college student from a poor family, used e-commerce accessed initially from a cybercafe, to contribute towards his family's upkeep and pay for his tuition. His SMME trading business grew to US$75,000 revenues in 2008, twenty-four times the average GNI per capita at the time (updated from World Bank 2021 data). He employed 14 fellow young Chinese compatriots, and his experience encouraged an army of fellow university students to enter the fray, successfully operating SMME trading enterprises from their university dormitories*"

3.1.9.2: Concluding comments and observations on Chinese cybercafés:

There is little doubt that cybercafés helped to fuel China's race to economic and technological leadership in this competitive 21st century. China's economy grew at a global record rate of 11.5% per annum between 1980 and 2019, increasing approximately 67 times from US$ 215 billion in 1980 to US$ 14.5 trillion in 2019 (source World Bank GNP updated 2021), becoming the second biggest economy in the world behind the United States. China realized an equally impressive rate of growth in individual wealth, GNI PPP per capita rose from the lowly rank 114/118 in 1980 (5th lowest out of countries with published data), to a more competitive rank of 78/187 in 2019 (Source World Bank GNI per capita PPP, updated 2021).

Regarding the ICT sector, China also developed the tools to drive and sustain the above world record economic growths – a 10-year fixed broadband subscriber growth rate of 14% per annum (World Bank broadband 2021) to 34 per 100 population in 2020, enabling close to 100% household coverage.

Can South Africa emulate the impressive multidimensional growth rates of China without discarding its national cultural and ideological identities? There are as many positive lessons for development from China as there are negative practices that must be avoided.

3.1.10: Section Concluding comments and observations

All the world's nations, irrespective of their levels of development, have at one stage or another in their ICT evolutionary histories used the full range of available public access ICT (nee "telecommunication") systems and technologies to provide public access to information, and to bridge access and/or affordability divides. These ranged from Africa's "bush telegraph", date of invention unknown (talking drums – Smithsonian), through optical variants like smoke signals and Napoleon's semaphores (BBC 2013), to today's vast AI assisted online and direct interactive broadcast and individual ICT systems desired by humankind. In the modern era,

cybercafés, telecentres and similar public access facilities were introduced primarily to "bridge the digital divide" which separated the information haves from the information have-nots. Most such systems have served their communities and nations well, rendering themselves obsolescent as a direct result of their successes. Those that still exist in developed economies, and in some still developing economies, have found new innovative niche markets, and continue serving their customers even with fully developed mass public access to integrated fixed and mobile broadband telecommunication services.

A Cybercafé Success Story: South Korea's PC Bangs:

- **ICTs in South Korea:** (a) Ranked first or second in the global IDI from 2010 to 2017 – the IDI process ended in 2018 for revision and updating; (b) 100% household coverage of fixed and mobile broadband; (c) Average broadband speeds: Fixed – 213/202 Mbps, Latency 12 ms; Mobile – 203/22 Mbps, Latency 29 ms; (d) Government plans in progress to connect 50% of the population at 10 Gbps by 2022.
- **Cybercafé or PC Bang:** South Korea first to introduce the concept in 1988, which became popular as online gaming centres before receiving vital government support in 1997/1998 as a national response to massive unemployment and economic reversals brought about by the Asian Financial Crisis of 1997 to 1999;
- **Economic recovery:** Economy nearly trebled from 1999 to 2019, GNI per capita rising from US$ 16,620 to US$ 43,100 over the 20-year period (World Bak GNI per Capita 2021);
- **PC Bang population**: Unlike in many of South Korea's peers, PC Bangs survived even under the current COVID-19 pandemic – an estimated 20,000 remained functional in 2020, all providing high value e-sports, and some doubling as low-cost fully connected and serviced overnight accommodation priced at roughly R 150 per night, much cheaper than most other forms of lodging. Average fees in 2020 were approximately R 13.00 per hour, with full meals available at costs lower than most restaurants.
- **Cybercrime and Internet Addiction**: Like all other countries, South Korea is plagued by these twin social challenges, but chose to protect its citizens through light-touch but effective regulation, unlike many of its peers who chose heavy-handed prohibition, censorship and regulation, often "killing the proverbial goose that once laid the golden broadband eggs". The country recognised early that it is far easier to control and manage societal deviances in well-managed cybercafés, thus providing time and resources to control the potentially more pervasive cyber abuse through individual broadband fixed and mobile services.

Summary: PC Bangs continue to serve one of the fastest growing economies very well, as they did when the country needed them most – the 1997 to 1999 Asian Economic Crisis. South Korea is said to have been a critical factor in the region's economic recovery.

In the preceding sections 3.1.6 to 3.1.9 of this discussion document, the use of the cybercafé model by South Africa's partners in the BRICS community are presented. Brazil's LAN Houses began as an emulation of the South Korean experience, and grew to become significant tools for mass digital inclusion of the country's socioeconomically marginalized populations, raising their Internet penetration from near-zero to about 76% in just eighteen years. A detailed discussion of this mass information inclusion is beyond the scope of this discussion document, but such details must be central to any attempt by South Africa to reduce its own digital exclusion through ICT4SDG. There is a wealth of research data about Brazil's "Lan House Social Phenomenon", and to a lesser degree, research reports and media coverage of the remaining three BRICS partners. A short list of references concerning Brazil's successes, and failures, that follows suggest an avenue for the required South African research and programme design.

Abbreviated reference list:

1. Brazil: Socio-digital Inclusion through the Lan House Revolution: Paula Góes, 28 September 2009: (a) SMME entrepreneur owners have changed their lives, and the lives of their customers, through LAN Houses; (b) Attached to owners homes in many different ways, similar to South Africa's "Spaza shops", or the rural women offering "Adondo" GSM-based public phone services, as discussed in "Skuse and Cousins" in section 3.1.2 of this document; (c) Initially LAN Houses faced significant prejudices and legal/regulatory hurdles, which were overcome early in Brazil's ICT modernization, garnering significant state support and massive interest by the global multidisciplinary research community; (b) At the time of writing the reference document, there were 90,000 LAN Houses in the country compared to just 2,000 movie theatres and 2,600 libraries. LAN Houses became effective places for "Social inclusion through digital inclusion" – true transformation of the socioeconomically marginalised populations.

2. "Free, Social, and Inclusive: Appropriation and Resistance of New Media Technologies in Brazil" HEATHER A. HORST, University of California, Irvine, 2011: A highly informative article which includes an excellent anecdote related to ICT4SDG15 – Life on Land. During the soccer match between Brazil and North Korea played at the FIFA World Soccer Competition held in South Africa, June 2010 (Brazil won 2:1), an exited Brazilian supporter yelled and tweeted the phrase "*Cala Boca Galvão*". This statement and Twitter post generated a significant social media frenzy, triggering vital global discussions about the preservation of the rare "galvão" bird, endangered for its colourful feathers that dressed the world-famous Rio Carnival, amongst other national celebrations. Each retweet raised US$10 for the bird's preservation and protection – a fine representation of a holistic ICT4SDG response to the SDG15 challenge.
3. Dr David Nemer, PHD Dissertation 2015. Now with the University of Virginia, David has become a global authority on ICT4D through his prolific research outputs. His dissertation has invaluable insights for South Africa, which faces very similar challenges as Brazil did when David, a Brazilian national, undertook his ethnographic research. A simple Google search will turn out numerous highly relevant articles by Dr Nemer. Some of his recent work includes "*Living in the Broken City*", aptly named to reflect the condition of most poor urban areas in Brazilian and South Africa's cities, as discussed throughout this document. They are all "broken" in more ways than David's focus on the immense stresses of broken technological artifacts that poor people can barely afford to own or to repair.
4. From LAN To Scam? – Regulating Cyber Cafes 2011 discusses a new law that would require 32 million Brazilian users of LAN Houses to "*register themselves before being allowed to get online*"; closely related but more recent, David Nemer's 2018 interview on "*Policies on the Margins: The Case of Technology in the Favelas, Brazil*", (about cartels, drug barons and drug wars): "*They understand that by shutting down the LAN houses or the Telecentres it will upset the community because they really use those centres so they try to respect that."* Gangsters in many favelas actually protect LAN Houses and their users, understanding that they could not exist long if they angered the communities by depriving them of a tool they valued for social cohesion and vital communications.
5. Digital Favelas: What Cities of Tomorrow Can Learn from the Slums of Today, 2015: A photographic journey of LAN Houses by Dr David Nemer; numerous interviews with LAN House owners and users, illustrating their immense creativity that overcame the numerous economic, legal, regulatory, and social hierarchical prejudices that impeded the efforts of poor people helping themselves, their families and their communities through ICT. The examples provided, had they been understood and followed in South Africa, could have prevented many of the errors of judgment and wasted resources that occurred during South Africa's own attempts to build smart cities in areas with very deep poverty and deprivation of nearly all resources that make city life bearable. The relevant discussion on South Africa's smart city attempts is provided in section 2.8.4.1 of this document – a clear case of misapplication of ICT4SDG11.
6. The LAN House Phenomenon: Exploring the uses and symbolic functions of the Internet among the low-income Brazilian youth. Juliana Maria (da Silva) Trammel. Key quotations from the document suggests this could be an invaluable research reference for South Africa:
    - *"LAN houses played an important role in Brazil, providing access to the internet to almost 40 million Brazilians, including 74% of all Brazilians in the D and E classes (lowest income brackets). According to the Internet Management Committee, among the population aged 10–15 years, only 25% have access to the internet in their schools and, the majority, 61%, accessed the internet at LAN houses."*
    - "*The owners of LAN houses, in general, are nano-entrepreneurs working in an informal economy. Nano is often referred to as business smaller than microbusiness with low overhead and small-level investment that can make the business profitable right away. Ninety percent of all LAN houses were unlicensed*" This profound statement aligns very well with the daily struggles of SMME entrepreneurs in South Africa.
7. **The benefits, guidance, dangers and risks of Brazilian children's access and use of the Internet**. This is arguably the most important subject in the whole process of ICT4SDG which South Africa and the whole world, developed and developing, must face and address. ICTs in all their variants hold great opportunities for national development, and immense dangers and risks arising from missing out on such opportunities, or falling prey to the growing levels of malevolent use of the ICT development tool. The future of the

nation is wholly dependent on how children are nurtured to take advantage of the benefits of the information age, while suppressing and defeating the dangers that come with it.

Brazil has studied these issues deeply over the last two decades, generating numerous examples of what can be done, and what should be suppressed or prohibited, all vital information for the whole range of ICT4SDG. This discussion document cannot do justice to the importance of this topic, besides providing key references for further consideration and expansion as part of the nation's ICT4SDG strategy. A few selected references available freely online include:

- *Risks and Safety on the Internet – Comparing Brazilian and European Results: Alexandre Barbosa et al, November 2013*. This 2012 research project was published and posted online by LSE in 2013. This important research was done in partnership with the European Union in an excellent example of ICT4SDG17, within the framework of the EU children online multidisciplinary research project, http://www.eukidsonline.net/
- Children and Internet use: A comparative analysis of Brazil and seven European countries: Maria Eugenia Sozio et al, July 2015. In a 2013 Brazilian household survey, 75% of 10 to 15-year-old Brazilian children were found to be regular users of the Internet. 48% of the remaining 25% children in that age group declared their inability to access the Internet was due to difficulties in acquiring and affording Internet access. Numerous civil society groups worked with the Brazilian government to advance the protection of the rights and safety of children online, including attempts to control the excessive advertising that targets children and adolescents.
- Global Kids Online Brazil: An introduction with links to the 2015, 2016 and 2017 reports;
- Brazilian findings: more children read online news, 2017: "*The results show that more children are now online (85% of children aged 9 to 17 years), they mostly use a mobile phone to access the internet (93%), and receive more parental guidance on safe internet use*"

8. (a) Refurbishing an old approach to PC recycling: CNet 2008; (b) Asis&t February 2012: Computer refurbishing: Environmentally reducing the digital divide 2012; (c) Harvard 2018: Exploring the Three R's of E-Waste: Refurbish, Redesign, and Repurpose; (d) Recycle Coach 2021: How to Repair, Reuse, and Recycle Old Electronics [Avoid Holiday E-Waste]. These four reference documents provide vital insights for South Africa's ICT4SDG strategy – there have been numerous complaints or observations that "foreign nationals" are better equipped than South Africans at refurbishing the whole range of ICT devices, including the full range of mobile handsets. These perceptions have often led to xenophobic attacks and destruction of the foreign-owned repair shops, most of which relocated to up-market shopping complexes for security, far from the point of need. South Africa has, or could easily develop, the necessary competences, if a national commitment to action can be created. The process will also address several key SDGs related to e-waste and recycling as outlined in this Harvard research report. The Brazilian LAN House model as discussed in numerous preceding paragraphs, has shown what can be done, even with minimal top-level support.
9. Stanford University's Social Innovation Review discusses "A New Generation of Brazilian Businesses", published in 2011. "*Small businesses in the world's 13th most unequal country are leading the way in serving low-income communities*" How can South Africa, the most unequal country in the world, begin in 2022 to chart the way to serving the nation's 76% low-income population segment through knowledge-delivering ICTs? The Brazilian LAN House model discussed in this Stanford University publication, and in several preceding discussions and reference documents, has helped Brazilians. Can the model be updated technologically, and recrafted to suit South Africa's specific socio-economic-cultural norms, so that it helps mitigate the worst outcomes of being the most unequal country on earth today?

All the above discussions and references suggest a few key questions for South Africa: (a) Can the cybercafé model be revisited to address South Africa's deep information and knowledge inequalities, which in turn add to extremely difficult challenges in the country's efforts to mitigate all seventeen SDGs? (b) Is it the "digital divide" that South Africa must address, or is it the socioeconomic divides that render even the most advanced national ICT networks with nearly 100% national "digital" coverage, unavailable in developmental qualities and quantities to the majority of the nation's people? (c) Is it too late to trial on a massive scale the cybercafé

model that served South Africa's peers so well? (d) Can some of the significant investments in national ICT4D models like the telecentres, be diverted to recrafting, reshaping, and repositioning the cybercafé concept to suit South Africa's 76% population who are classified as poor? (e) Can the vast sums of underutilised finances assigned, in some cases in theory but not in practice, to serving the ICT needs of the poor, be refocussed on ICT4SDG programmes and actions that are directed specifically and exclusively on resolving the information and knowledge exclusion of up to 76% of the population who are deemed poor?

There are numerous examples of how the above questions can be answered, they include a complete review and repositioning of the numerous objectives and resources assigned to the nation's Universal Service and Access Agency of South Africa (USAASA). Such a review and repositioning were foreseen in the crafting of the National Integrated ICT Policy approved by Parliament in October 2016 but yet to be implemented. The provisions of the national policy that apply directly is the transformation of USAASA, or key components of the institution, all of which are included in the proposed Digital Development Fund (DDF), scheduled for implementation in 2023 according to media reports – e.g., "Communications ministry reveals key timelines for USAASA".

To reiterate, cybercafés were developed to resolve the very same ICT access and affordability problems that South Africa faces in this "digital" age. All technologies related to information and communication depend on digital technologies for their functioning somewhere within their circuits or networks of circuits. Global ICT coverage is almost 100%, using "digital" signal processing technologies on transmission media such as terrestrial and submarine cables, terrestrial and satellite-based wireless services, the latter with global footprints covering virtually every inch of the inhabited and uninhabited world. Technological progress, and therefore the ICT usage practices, logically and expectedly changed the way people relate to both the technology and the communications it enables. But, has the original purpose of cybercafés been rendered obsolete? Has the plight of the nation's poor, especially its socioeconomically marginalised children, been resolved by the numerous technological advances publicised in all the world's media? If any of the answers to these two questions is "NO", then the cybercafé model is just as relevant today as it was to Brazil, Russia, India and China when they first introduced the Internet more than four decades ago.

What can South Africa learn from the experiences of the nation's economic and social partners in the BRICS community, about the past, present, and future iterations, and best community-wide usage of this base of the pyramid ICT4SDG development tool?

The next, and concluding sections of this discussion document, examine the possibilities.

Section 4.0: A pathway towards socioeconomic inclusion via ICT4SDG.

The first ICT4SDG challenge that must be overcome, in South Africa and everywhere else where the challenge is severe, is mass recognition that the challenge exists, and that it is not technical – it never was. It is not about computers – in the clouds or firmly located on mother earth. It is not about digits, transformative, divided, or otherwise. The challenge is about people – poor people who will in time resort to Walter Scheidel's "Apocalyptical Horsemen" (see OXFAM 2017 explanation here) if their needs are not met. Socio-economic-political upheavals driven by extremes of inequality, poverty and unemployment have, throughout human history, caused immense destruction to whole countries, regions, communities, and individuals, always with far more losers than winners. South Africa's strive against apartheid falls within this category, as did the massively destructive first and second world wars.

Closely related to the above discussion, a key representatives of MIT published in November 2017 an important and relevant opinion titled "*Trump And Transforming Capitalism: Making Our Movement See Itself*", describing the new emerging global "Trumpian" version of capitalism as a "global wake-up call", posing the key questions: "*what are we waking up from?", "who are/is 'we'?*", and "*what is this new awareness that we are supposed to wake up to?*" The article is described very briefly below, its content has direct highly relevant links to this ICT4SDG discussion.

Oxfam, MIT, and Dr Scheidel on the Apocalyptical Horsemen Imagery:

In the interview referred to above, Oxfam asked Dr Scheidel whether climate change (SDG13) could become a fifth horseman. Dr Scheidel responded that the question always comes up when he presents his book, and agreed that yes, unless checked, runaway climate change could indeed cause all four horsemen to remount, but that would be a pretty thin silver lining, given the apocalypse that would ensue.

On a more positive note than Dr Scheidel's depressing historical record is an MIT spokesperson, who opines in the Huffington Post that "*it's increasingly clear that as our old economic structures and civilizational forms hit the wall of our planetary limits, a new world is taking shape that focuses on bridging the three major divides of our time: the ecological divide, the social-economic divide, and the spiritual divide*"; MIT's Otto Scharmer in Huffington Post: "*Trump And Transforming Capitalism: Making Our Movement See Itself*"

The opinion piece also promotes the MITx U.Lab – which includes free online learning MOOCs – "Massive Open Online Courses". The emphasis is "online" – but, how can MOOCs help families who can only afford at most 100 MB over just one day in any month, based on international affordability recommendations? If structured appropriately, pro-poor mass online public access can fill this access gap.

The above comments/statements raise critical questions, broad enough to encompass all SDG challenges in all corners of our world. But there are no short or easy answers. We may speculate on the full meaning of each comment/question/statement, and propose short sharp answers, but history, as interpreted by a growing number of globally-respected intellectuals including Walter Scheidel, MITs Otto Scharmer, Yuval Noah Harari (change, good and bad, can come from our collective imaginations), and a growing number of top economists like Paul Krugman, Joseph Stiglitz and Thomas Piketty (if inequality is illegitimate, why not reduce it?), suggest a much longer process.

The best approach to very long-term problem-solving is to begin with the children, equip them with the capabilities of critical thinking, complex problem solving, and the 4-Cs of SDG17, and other vital 4IR skills. AND engage all available adult thinkers and institutions in the building of this "movement", led by those who are willing to follow the ancient Greek proverb:

"A society grows great when old men plant trees in whose shade they shall never sit."

We must add women to this male-dominated maxim – women are better than their male counterparts at planting trees, nurturing those future generations who can and will enjoy the shades of those trees, and even sitting under shady trees themselves, but they carry an unfair proportion of the immense burden of nurturing and sustaining the aspirational societies that inspire old people to plant trees.

4.1: The ICT4SDG challenges that South Africa must face:

a. South Africa's socio-economic-political challenges are immense, multidimensional in nature, impacting and impacted by all the nation's SDG challenges, thus demanding a holistic approach to their amelioration and resolution, irrespective of the costs or complexities;
b. The SDG challenges are qualified, quantified and discussed specifically in section 1. – a statistical summary of the main components of SDG8, as are their interdependencies and relationship with all other SDGs discussed in section 2.0 of this document;
c. Section 3.0 and its sub-paragraphs examines the full range of pro-poor ICT technologies, structural models and support systems, and their effectiveness, all as a prelude to this summary and conclusions.
d. The most successful of them all in many developing nations, were clearly the Internet Café models, which in principle are technologically neutral, although much work is required to take advantage of this technological neutrality. They were created, usually by informal entrepreneurs from the affected communities, with very little state support, except partially in Brazil as discussed in Section 3.1.6 on page 125 of this document.
e. The bottom line for up to 76% of South Africa's population, whose average monthly income or expenditure, as estimated by competent state authorities at about R 768 per month, is that this population cohort cannot afford developmental qualities and quantities of ICT products and services, irrespective of

the state of development of the national ICT sector. The lowest price of 1 GB of data per month at the time of writing this report was R 85.00, 11% of the average monthly income for this group. The internationally recommended affordability price target of 1 GB of data is 2% of income or expenditure, which amounts to R 15.40 per month. This is enough to purchase just 100 MB of data valid for just one day as advertised by Vodacom, the leading mobile ICT network operator in the country (data accessed in November 2021). Is 100 MB of data valid for one day (affordable within the international recommendations), or even 1GB of data valid for thirty days (unaffordable for many), enough to Accelerate Digital Transformation for up to 76% of South Africa's population with or without the specified challenging times?

After having tried and tested various public access information technologies, platforms and systems, ranging from PSTN type public telephones and several mobile telephone variants, telecentres and academia-driven Living Labs, and even cybercafés, the conclusion must be reached that South Africa does not have a pro-poor ICT policy or strategy that works, despite the numerous well-intentioned revisions of the national ICT policy instruments. The first response to South Africa's ICT4SDG challenges must therefore be to acknowledge this deficiency, and begin the very lengthy corrective journey.

To a large extent, cybercafés targeting the poorest communities in South Africa were doomed to fail, given the lack of official government and effective industry support. Large profits to sustain the business model could not be extracted from South Africans whose monthly incomes were in the order of R 768 per month. The limited industry attempts outlined in Section 3.1.5 of this document were unable to address the ICT access, affordability, qualitative, quantitative and scalability challenges, particularly for the nation's rural poor who were too often obliged to migrate to the cities for improved job and learning opportunities, and for survival.

The question that arises from this conundrum is: must South Africa wait for any combination of Dr Scheidel's apocalyptical horsemen to "level" the nation's extreme inequalities? Perhaps climate change may become a fifth apocalyptical horseman, but as Scheidel suggests, it will most likely create an environment where all four horsemen remount and enact their destructive inequality levelling activities in concert.

4.2: Revisiting South Africa's ICT4SDG strategies for an improved base-of-the-pyramid focus:

Summary of the ICT4SDG Problem Statement:

- Based on Statistic South Africa's household surveys, updated and extended in 2019 by the National Income Dynamics Study (NIDS), up to 76% of the nation's population live in multidimensional poverty, on a monthly average income of R 768. Compared to the most recent STATS SA 2021 estimates of poverty lines, this value equates to ≈23% above the lowest Food Poverty Line of R 624 per person per month; ≈14% below the Lower-bound Poverty Line of R 890; and ≈42% below the Upper-bound poverty Line of R1335 per person per month.
- UNICEF, drawing on data compiled by STATS SA, reported in July 2020, two alarming statistics: (a) 62.1% of the nation's children are multidimensionally poor; (b) UNICEF observation that this value is consistent with related STATS SA findings that 67% of the nation's children are located in families living below the nation's upper-bound poverty line.
- The internationally recommended cost to communicate has been accepted as 1 GB of data per month for 2% of average monthly income. This equates to R 15.40 per person per month for up to 76% of the South Africa's population. This affordability value is approximately 18% of the lowest available price of 1 GB of data valid for 30 days from MTN and Vodacom. (See analyses in Section 2.11 on page 106 of this document).
- There are no developmental or transformative qualities and quantities of ICTs available from any source in South Africa today that fall within or near the cost to communicate limits for up to 76% of South Africa's population. The best this population cohort can do is to use the lowest cost 30-day mobile data bundles (MTN R 29 for 200 MB, Vodacom R 12 for 50 MB) to "put food on the table" – i.e., to use the airtime they can afford to seek help from extended relatives or friends to purchase food and other essentials, as described by David Fincham in https://www.sakan.org.za/Docs/ICT4SDG2.pdf, and by Andrew Skuse's and

Thomas Cousins' 2005 research findings in "Managing Distance: Rural Poverty and the Promise of Communication in Post- Apartheid South Africa, February 2007".

- As a result, up to 76% of the nation cannot productively use any ICTs to help ease their own or their country's multidimensional SDG challenges. South Africa needs to find solutions for this exclusionary state of affairs.

The International Telecommunication Union (ITU), in preparation for WTISD 2021, drew from the work of the Alliance for Affordable Internet (A4AI) reports, by supporting the principle that if poverty in any country is so deep that ICT affordability becomes a major challenge, then public access to ICT must be the preferred interim solution, pending mass economic inclusion and poverty reduction. The history of A4AI is well-described by Wikipedia as follows:

> **A4AI:** "***The Alliance for Affordable Internet*** *(**A4AI**) is an initiative to make the Internet more affordable to people around the world. The World Wide Web Foundation serves as the Secretariat, and major members of coalition include Google, the Omidyar Network, the Department for International Development, USAID, Facebook, Cisco, Intel, Microsoft, UN Women and many others from the public, private and civil society sectors*". **Purpose**: "*A4AI was created with the goal of obtaining global broadband internet access priced at less than 5% of average per capita income globally; the target of the UN Broadband Commission. It cites the lack of investment in infrastructure, competition in the market, and inefficient taxation, amongst other policy and regulatory obstacles, as being major constraints to reducing prices*"

A4AI was officially launched on October 7, 2013, in Abuja, Nigeria. The first A4AI Affordability Report was launched at the Sixth International Conference on Information and Communication Technologies and Development (ICTD2013) on Sunday, 8 December 2013, in Cape Town, South Africa. This first A4AI report proposed numerous key recommendations, the most relevant to this discussion document were:

(a) **Infrastructure:** (i) Target public infrastructure investment to areas where investments are deemed non-commercially feasible and develop investment plans through consultation with market players and stakeholders; (ii) Implement passive infrastructure sharing regulations and enforce implementation by monitoring the market and intervene if effective sharing is not taking place; (iii) Use USF to support rural infrastructure development, public shared access and locally relevant content and application development; (iv) Ensure sufficient broadband-capable spectrum is made available, allocated and used efficiently;

(b) **Users:** (i) Consider providing or facilitating free or paid public access points; (ii) Develop services and products that target specific segments and their needs (e.g., women, farmers, schools and health care); (iii) Research and assess development impact and cost effectiveness of various public sector broadband interventions in their countries and regions.

The second A4AI report published in 2014, the "*Case Study: Affordable Internet Access in Brazil*", reports that in 2013, one year after the official launch of Brazil's National Broadband Plan (PNBL), the take-up of individual fixed broadband, then priced at R$35 for a 1 Mbps connection (US$15.5 then, ZAR 244 today) was considered fare too low, the costs were unaffordable. Free Wi-Fi hotspots and more than 100,000 cybercafés or LAN Houses scattered throughout Brazil offered better "digital bridges" to the information society. Through the contribution of LAN Houses, their modernization and replacement by nationwide fixed and mobile broadband infrastructure as the PNBL progressed, Brazil earned the title of one of the most intensive users of the Internet in the world, with 76% of low-income users by 2018, and 15.6 per 100 population broadband subscribers leading to approximately 45% Internet connected households in the country (Table 3.1.5 on page 124).

All published A4AI annual reports, from 2013 to 2020 noted that public access to broadband remains the most effective, and perhaps the only short-term response to the ICT affordability divides that afflict most developing countries. A4AI 2017 and A4AI 2019 provide detailed case studies with invaluable advice and recommendations for nations like South Africa with very deep affordability divides, coexisting within environments where the "technological digital divide" has virtually been breached. South Africa has achieved

nearly 100% analogue to digital conversions in the national ICT network, and nearly 100% geographic and population coverage by digital mobile ICTs.

South Africa hosted and participated in the drafting of all the recommendations of the first A4AI report, and followed this up by finalizing and formally adopting the nation's broadband policy South Africa's Broadband Policy SA Connect in the same year. Eight years and eight Ministers of Communication changes later (full list of ministers here), the nation still waits in 2021 for delivery against virtually all the recommendations listed above, and those in the nation's broadband policy.

In concluding this short summary of the work of the A4AI, it is worth noting the invaluable collaboration of this entity with the International Telecommunication Union (ITU), and the vital output of this collaboration in the publication of the report "*Measuring digital development: ICT price trends 2020*", published by ITU on 24 May 2021. This report must be central to South Africa's efforts to reduce its massive ICT affordability divide.

The time for South Africa to revisit the whole national strategy for providing affordable access to ICTs for the estimated 76% excluded South Africans must begin as a matter of urgency, and the tried and tested model of cybercafés must be reconsidered as a valid state supported and funded option. Seed funding for this option can be made available through the Digital Development Fund (DDF) once it is enacted and implemented.

4.3: Critical considerations for an effective ICT4SDG strategic focus on South Africa's poor:

After some 7 million years of direct contribution to the evolution of the genus Homo (reference Natural History Museum to 2021), followed by about 400,000 years of Homo sapiens evolution, stretching up towards one million years with each new fossil discovery (Smithsonian February 2021), South Africa contributed genetically to the birth and evolution of Homo sapiens – us, all living modern humans on planet earth. There is mounting evidence that the seeds of technological innovation were planted firmly in South Africa during that evolution, evidence dating back hundreds of millennia ago, as referenced liberally throughout this discussion document.

The country went astray somewhere along its evolutionary path. Today up to 76% of its population struggle in the backwaters of technological creativity and use. 160 years of ICT knowhow, and yet the country still struggles to connect all its citizens to developmental qualities and quantities of ICTs.

South Africa needs to rethink its association with technology, specifically ICTs. All technologies, especially the knowledge generating and delivering ICTs, must be restored to their ancestral roles as tools for development, not the objectives of development as they seem to have become. ICT4D must be returned to earth from the lofty "digits in clouds" so that they can serve humanity once more, while still fulfilling the other developmental tool which has also become the objective of human development – the economy. SDG8, central to this discussion document, verifies this transition to a Homo economicus lifeform: "*Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all*". To meet this goal, Homo sapiens became "human capital", fully and productively employed as a resource utilised to achieve sustainable economic growth.

Is "*sustained, inclusive and sustainable economic growth*", for which we need "*full productive employment, with* (hopefully?) *decent work for everyone*" to drive it, possible? The concept of continuous economic growth is being increasingly challenged by a growing number of academics, anthropologists, economists, historians, intellectuals, sociologists, and multidisciplinary developmental experts:

(a) Overriding key insight*:* "Sustained economic growth is not achievable, therefore it is not sustainable": The European Environment Agency (EA 2021): *Growth without Economic Growth*": "*Economic growth is closely linked to increases in production, consumption and resource use and has detrimental effects on the natural environment and human health. It is unlikely that a long-lasting, absolute decoupling of economic growth from environmental pressures and impacts can be achieved at the global scale; therefore, societies need to rethink what is meant by growth and progress and their meaning for global sustainability*".

(b) 25 years ago: ***'Sustainable Economic Growth' is an Oxymoron:*** Original article by Herman Daly in 1996: *"Senior Economist at the World Bank, Herman E. Daly and Dr. Kenneth N. Townsend have proven that we can't grow our way out of poverty and environmental degradation. Sustainable economic growth is impossible, since*

the economy is an open subsystem of the Earth's ecosystem, which is finite, non-growing, and materially closed. As the economic subsystem grows, it engulfs more and more of the ecosystem in which it exists and is bound to reach a limit when it 'incorporates' (their word) 100 percent of the ecosystem, if not before. Thus, the economy's infinite growth is by Nature not sustainable"

(c) **The World Economic Forum (WEF)**, located at the pinnacle of the global economic discourse, shares the above view espoused a quarter of a century ago:

- February 2015, "*Is sustainable growth possible?*", quotes the above verbatim, seemingly sharing the significant departure from the popular belief that continuous economic growth is not only possible, it is a desirable target for all SDGs.
- February 2020, "*Addressing inequality is necessary to promote economic growth*". This article reviews Heather Boushey's book, Unbound: How Inequality Constricts Our Economy and What We Can Do About It. This is a vital reference source for South Africa's ICT4SDG strategy: "*Inequality at modern levels is not an accident. It is the result of policy choices that were influenced or swayed by relatively rich people. The pendulum can – and should – swing back in the other direction*"
- On 30 July 2020, the UN SDG Knowledge Hub, a UN SDG online resource centre, introduced two vital reports prepared by WEF concerning the critical relationships between the economy, business, and nature, the conflicts and contradictions between them, and the damage that unfettered economic growth can wreak on nature. The two reports, vital references for the proposed South African ICT4SDG strategy, are available online at:
  - Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy: https://www3.weforum.org/docs/WEF_New_Nature__Report_2020.pdf
  - The Future Of Nature And Business: https://www3.weforum.org/docs/WEF_The_Future_Of_Nature_And_Business_2020.pdf
- This is why human and nature capital must redefine wealth for a sustainable future WEF 28 October 2021: The WEF discusses at length a new World Bank report stating that "*economic growth is not sustainable unless renewable natural capital and human capital are treated with the same importance as traditional economic growth*". The World Bank 504-page book, "*The Changing Wealth of Nations 2021*", has exceptionally useful advice and recommendations for restoring humanity in developing countries like South Africa, except for the headline discussed by WEF. For 400,000 years or more, Homo sapiens survived with nature, without the need to exploit nature for economic gain as a "natural capital asset".

Regrettably for South Africa as it seeks to resolve its multitudinous SDG challenges, there are numerous very wealthy, very powerful adherents to the notion that humans (human capital), and now nature (natural capital), are resources that can, or must, be exploited for continuous economic growth, e.g., 13 October 2021: *Is Infinite Economic Growth on a Finite Planet Possible?*. These adherents are willing to risk everything in maintaining their "competitive advantage", described by "the father of capitalism" (Adam Smith) as "*All for ourselves and nothing for other people, seems, in every age of the world, to have been the vile maxim of the masters of mankind*".

With all the historical, current, and speculative future knowledge at South Africa's disposal to begin resolving its many interlinked SDG challenges, the immediate question is "how?" The best answer to this question is that South Africans don't have a clear answer, perhaps no one has. The best that can be done is to closely review the successes, and failures, of South Africa's peer developing countries, the early histories of developed countries when they faced the same challenges that South Africa faces today, and mix all these with the empirical and theoretical knowledge available to humankind, and "just do it"[53], disciplined trial, error, and correction. This approach is consistent with the recommendations of the nation's National Development Plan 2030 (NDP). One of the medium-term recommendations of the NDP states:

[53] "Just do it": A philosophical approach to development used by the United Republic of Tanzania, introduced to the author of this document in the late 1980's, and which was promoted by a Tanzanian delegation during South Africa's planning for SA Connect, South Africa's Broadband Policy. The explanation given was: "Please do not bother me with lengthy meetings, reports, tedious conferences, and studies: explain what you have in mind in simple terms, to my face, so that I/we can fully understand it, then we will 'just do it'"

Benchmark South Africa's performance against other countries. *"It is suggested that by 2020, strategic investment and regulatory guidance will result in the costs associated with internet access falling to match South Africa's peers. More generally, South Africa should aim to position itself in the top quartile of the International Telecommunications Union's ICT Development Index ranking of middle-income countries. It should also aim to regain its position as the continent's leader in both quality and cost of ICT services".* Page 119 of the NDP.

Illustration of the NDP Recommendation: Yet another useful benchmark: South Africa vs Vietnam

Country	Indicator	2002	2010	2020
South Africa	GNI per Capita current US$	2670	6190	5410
Vietnam	GNI per Capita current US$	450	1250	2660
South Africa	Fixed Broadband subs per 100	0.006	1.451	2.197
Vietnam	Fixed Broadband subs per 100	0.001	4.171	17.156
Data sources: World Bank 2021: ITU 2021				

1. South Africa introduced the Internet on 12 November 1991, with a national wealth of US$ 3000 per capita with which to do it. Fixed broadband subscriber penetration grew from zero to 2.2 per 100 by 2020, nearly 30-years later;
2. Vietnam introduced the Internet on 19 November, 1997, about 6-years after South Africa, with an economy of US$ 330 per capita to do it with. Fixed broadband subscriber penetration grew from zero to 17 per 100 by 2020, 23 years later.
3. Why the difference? South Africa addressed the broadband needs of its wealthiest citizens, Vietnam addressed the communication needs of all its citizens, especially the youth. Vietnam allowed privately run Internet Cafés to thrive, catering specifically for the youth who could not afford home connectivity:

   "*When you cannot bring the Internet to the people, bring the people to the Internet*" – 2007 statement by Yahoo at the launch of its network of cybercafés in Vietnam.
4. Other informative Vietnam sources: (a) "*A Brief History of the Internet in Vietnam on Its 20th Birthday*"; (b) "*The Internet turns 20 in Vietnam: P6 – Wi-Fi and household Internet*"

In 2012, with a GNI per capita of just US$ 1540 (South Africa US$ 7570), a fixed broadband subscriber penetration of 5.32 per 100 (South Africa 2.10 per 100), a mobile broadband penetration of 17.07 per 100 (South Africa 24.98 per 100), Vietnam began to compete with South Africa on South Africa's own doorstep. MOVITEL, a subsidiary of the Vietnamese VIETTEL group, began to build broadband infrastructure in Mozambique (source ITU MISR 2018).

South Africa's GINI Coefficient was nearly double that of Vietnams – 63 versus 36 (most recent estimates). Could this be the reason why Vietnam performs so much better than South Africa with so much less? Should inequality be South Africa's top priority?

This discussion document provides numerous performance benchmarks against selected peers of South Africa in all SDG related sectors. They all suggest that South Africa could do well by eschewing the part of the NDP recommendation aiming for high rankings or outright leadership on the continent and internationally – the primary objective must be to use international benchmarking as a guide to resolving the nation's internal challenges, irrespective of its ultimate ranking internationally, continentally, or even within the country's fragmented society.

4.4: Critical knowledge inputs for an effective pro-poor ICT4SDG strategy for South Africa:

4.4.1: World Bank Development Reports:

As suggested in the preceding paragraphs, there is a wealth of knowledge from which South Africa can draw to begin the resolution of the country's extremely difficult SDG challenges. The World Bank is a major highly respected knowledge source, much of this knowledge created in South Africa with full participation by South Africans, e.g., "*Overcoming Poverty and Inequality in South Africa, 2018*". Given this very rich information and knowledge contribution by the World Bank, a critical review of some of the high-level World Bank reports is

presented, with the intention of deriving some high-level philosophical issues which will help localization and implementation of some of the World Bank's proposals and recommendations, and identify those that are less relevant and therefore less valuable. This review begins with the World Bank's Human Capital Project of 2018.

In 2018, the World Bank launched its "Human Capital Project", "*a global effort to accelerate more and better investments in people for greater equity and economic growth*".

In its explanatory document, "*About The Human Capital Project*", the World Bank states: "*Without human capital, countries cannot sustain economic growth, will not have a workforce that is prepared for the more highly-skilled jobs of the future, and will not compete effectively in the global economy*". The document introduces the subject with an image of a very dark-skinned 3-to-5-year-old African child, probably from Malawi, judging from the text. The accompanying explanatory video – "*What is the World Bank's Human Capital Index?*" - uses hand-sketched characters with distinctive African features. This video stands in sharp contrast with a very similar video presented by Trevor Manuel, former Finance Minister and head of South Africa's National Planning Commission – "*Planning for Thandi's future - Diagnostic Report – November 2011*". Trevor Manuel's cartoon character "Thandi" has a very human "African" face, a very human life, and extremely dehumanizing challenges that she is most unlikely to overcome, simply because of the place, culture, societal level of where and when she was born. The World Bank's "Anna" on the other hand was born with a very low "Human Capital Index" or "asset value" for her country and the world's economic growth. Using the same measure for Trevor Manuel's Thandi, Thandi would have grown up with an "average asset value", or Human Capital Index, of 0.44 estimated for her country in 2018, according to the World Bank's estimate of "Human Capital Index (HCI), Female (scale 0-1)". This "statistic" positions South Africa's average "human asset value" at 49% of the global leader, Singapore, with an HCI of 0.9. South Africa ranks 116 out of 148 countries with valid HCI estimates for 2018.

This author prefers to focus on Thandi's and her compatriots' current human challenges wherever they are, irrespective of their superficial appearance or place of birth, or the natural resources at their disposal, which they can use or abuse to improve their own and their community's living conditions. Thandi's life, with all its immense handicaps and barriers, is, or should be, defined by her humanity. Anna's life seems to be defined by her economic value. Both Thandi and Anna's very ancient ancestors began their long journey to today's Homo sapiens some nine million years ago, evolving through pre-sapiens "archaic" hominins, surviving through the 400,000 years or so as us, Homo sapiens, before some of their compatriots evolved to become members of the Homo economicus subspecies, with measurable asset values. One must wonder what the "asset value", or "human capital value", of Anna's and Thandi's ancestors were during their epic journey to today. Some of them migrated "Out of Africa" to become Singaporeans at the apex of today's global "Human Capital Index".

The Human Capital concept is not necessarily wrong, it just has a distasteful historical legacy that is often ignored by many economic historians. It is intricately linked to slavery, as exposed by the 2013 research outputs by Harvard Business School, **"**The Messy Link Between Slave Owners and Modern Management", by Katie Johnston. There are numerous critics of the human capital concept, including Peter Fleming's 2017 essay "*What is Human Capital*", but there are more adherents, many of whom have not encountered the uncomfortable origins of the term. The concept may have a distasteful historical legacy, but the messages in the World Bank document have significant value.

Other valuable World Bank reports include:

World Bank Development Report 2015, https://www.worldbank.org/en/publication/wdr2015

- *"The World Bank is backing away from standard economic orthodoxy. Its recent flagship report points out that policymakers must take into account sociological and psychological arguments.*"
- *"Economics is a social science struggling with self-doubt. Even leading international institutions are increasingly questioning orthodox views they held for many years. The obvious reason is the scale of the global financial crisis that began in 2008, when Lehman Brothers, the investment bank, collapsed"* (Author's emphasis).

- *"Now the World Bank has abandoned standard economic reasoning. Its World Development Report 2015, which was published in late 2014, relies heavily on psychological and sociological arguments. It admits that "homo economicus", the concept of the rational, utility-optimising individual on which most economic modelling is based, is wrong in three fundamental ways": (a) human beings are not rational; (b) human beings are social, preferring cooperation and the common good; (c) human beings rely on habits, generally held convictions and social norms"*

The above are very brief extracts from a short review of the World Bank's WDR 2015, prepared by D+C Development and Cooperation, an international sustainable development thinktank originating in Germany.

The article, introducing WDR 2015, is appropriately titled "Human and social beings", with hyperlink title "*better-late-never-world-bank-abandons-homo-economicus*". There are only two references to "human capital" in the body of WDR 2015, the first on page 68 (88/237) provides an invaluable case study from India:

WDR 2015: Human Capital in India:

Children who did not know their "caste" classification performed as well, if not better, than children of higher castes. As soon as they were told of their cast classifications, the same children performed well below their peers.

The second reference to "human capital" appears on page 128 (148/237), in a discussion of motivational theories – monetary incentives may be the most prevalent, and popular modes of increasing "Homo economicus" productivity, but, "*As the chapters in this Report have shown, other cognitive, psychological, and social barriers—sometimes more difficult to observe—could also be interfering with the productivity of employees, entrepreneurs, and farmers and could also shape the effectiveness of monetary incentives*"

The only other reference to "human capital" in WDR 2015 appears in the references on page 141 (161/237).

The WDR 2015's emphasis on the social relationships that underpin the reduction of inequality, and therefore poverty, and seeks to find a sociological solution to the reality of unemployment is refreshing. South Africa will not solve its unemployment crisis easily, or soon, but the inequality that this unemployment breeds retains its incendiary potential, sociological solutions are urgently needed to complement the economic, or even technology-based solutions that become increasingly impossible to achieve.

A superficial examination of the 1,935 pages of the World Bank's Development Reports from 2016 to 2021 leads to a perception that they are dominated by the concept of Homo economicus and its "human capital formation" tools. It is useful therefore to review the official definitions of human capital in the World Development Reports:

- The World Bank, 8 December 2021 - What is human capital and why does it matter?: "*Human capital consists of the knowledge, skills, and health that people invest in and accumulate throughout their lives, enabling them to realize their potential as productive members of society. Investing in people through nutrition, health care, quality education, jobs and skills helps develop human capital, and this is key to ending extreme poverty and creating more inclusive societies*"
- Investopedia: Updated September 04, 2020: "*The term human capital refers to the economic value of a worker's experience and skills. Human capital includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality*"
- OECD, October 2021: "*The OECD regularly recommends to countries to reform their education and training systems. Economists often refer to this as improving 'human capital'. Yet, at the macroeconomic level, quantifying the effects of human capital on growth and productivity has often proven frustratingly elusive, both in the academic literature and in OECD work.* Preferred Definition: *"the knowledge, skills, competencies and other attributes embodied in individuals or groups of individuals acquired during their life and used to produce goods, services or ideas in market circumstances"*
- WEF June 2019: This WEF article does not specifically define the concept – it refers to its own annual Human Capital Report for a discussion on what the Human Capital Index measures, and a map of the world presenting the results of this measure for all countries. The WEF article presents a useful etymology of the term – it stems from the thinking of Adam Smith nearly 400 years ago, and its early use by English economist Arthur Cecil Pigou circa 1928.

An interesting comment by the WEF is: "*In 2004, a jury of linguistic scholars voted to banish the word Humankapital from the German lexicon. They said it minimized people's abilities and reduced them to mere economic quantities*".

Perhaps, unlike the German public opinions, the 19th century American slave owners took Adam Smith's concept seriously, and used the term to define their "human capital assets": *"9-month-old George Washington was valued at $150 by his owner; 26-year-old top-producing field hand, at $1,500; 48-year-old foreman, Hercules, was depreciated to $500. Harvard Business School Research, 16 January 2013*.

Clearly, the World Bank did not intend to associate this disgraceful record of human history with its promotion of the "human capital" concept, nor did it fully take into account the essence of its previous year's report, "*better-late-never-world-bank-abandons-homo-economicus*".

WDR 2016: Digital Dividends. This report focuses, through its title, on the core of ICT4SDG, the use of broadband, a tool that can/should be used in the extension of Amartya Sen's "human capabilities" approach, which began with the dawn of human cognitive capabilities, language, and the ability to communicate though evolving technologies, long before being overtaken by the Digital Dividends of today.

Even with the title "Digital Dividends", the report does not offer an explicitly definition of the term. The closest to a definition comes with the question on page 5 (31 of 359), "*What are the digital dividends?"* The answer offered is not what they are, but what their outcomes are: growth, jobs, services, business productivity increases, people finding jobs, governments delivering better public services. All outcomes tend to be "econocentric" (favouring one's own economic ideology – see Bretton Woods criticism).

Following the two mentions of "human capital" in the preceding WDR 2015 report, this volume has twenty references to this newly inferred potent weapon for economic development. The document infers that with the help of digital dividends, "*these improved* (digital) *opportunities, in turn, can increase investments in young girls' human capital*" (Box 2.10 on page 134 [160 of 359]), perhaps finally putting an end the alarming gender-based violence discussed in Section 2.6, SDG5 and SDG8, on page 61 of this document?

The "human capital" that South Africa has been "investing in" has had disappointing ROI in the ICT sector. Over the 160 years since the introduction of pre and post digital ICTs, and since the launch of "digits" in November 1991 (see ICT History in Table 3.0.1.), South Africa has failed to realise the real "digital dividend", which the country defines as the dividend accruing from the release of valuable radiofrequency spectrum confined in obsolescent analogue broadcast services. The process of regaining this "digital dividend" began in 2006 with a national target of 2011, four years before the international target of 2015, which in turn was subsequently missed, and a new national target has been set for 2022, sixteen years after the launch of the process (SABC October 2021).

Does this mean that South Africa's Human Capital is flawed? Clearly, if the benefits of the "Digital Dividend" are bypassing 76% of the population, then the Human Capital of this 76% of the nation must be flawed.

WDR 2017: Governance and the Law: This World Bank Report is introduced via the link provided with the words: *"Why are carefully designed, sensible policies too often not adopted or implemented? When they are, why do they often fail to generate development outcomes such as security, growth, and equity? And why do some bad policies endure? This World Development Report 2017: Governance and the Law addresses these fundamental questions, which are at the heart of development*."

The above questions are particularly pertinent to South Africa – a fine constitution supported by an excellent Bill of Rights, well thought out justice systems with generally competent justices, but implementation is weak as discussed in Section 2.9.1 on page 97 of this document: The nexus of SDG16 and SDG8.

WDR 2017 focusses on the challenges of governance and law in this current era, with little or no reference to historical influences. The rich turbulent history of governance, law and order, is at least as old as post-neolithic human existence, some 12,000 years or so. The relevance of this history is that the questions posed by the World Bank in its introduction of this report have been, or must have been, asked numerous times throughout the relatively recent history of humankind (< 15 millennia). This turbulent history of "the good, the bad, and

the ugly" aspects of governance and application of its laws, which continues to impact and shape all countries today irrespective of their political or economic ideologies or processes, has many lessons for South Africa and other nations that need these lessons.

The ancient, recent, current, and future value systems that shaped the governance and justice systems used by humans up to today, and which still threaten human development with severe breaches of peace and stability of numerous countries and regions, have been continuous discussion points in all countries in all eras of development. The breakdown of "good governance" in much of Africa and the developing world, and the resurgence of nationalism and its extremist manifestations in a growing number of western countries, e.g., in present-day United States, are matters of deep immediate global concern, hence the relevance of this World Bank Report. But, the history of governance as a whole, the success of some countries, even on a temporary basis, and the failures of many, have too often unleashed the "four horsemen of the inequality apocalypse" described by historian Walter Scheidel. This suggests that the report and its context, with all its actual and perceived strengths and weaknesses, must be an integral part of South Africa's ICT4SDG initiatives.

WDR 2017 contains seven direct references to the "human capital" (HC) concept, e.g., (a) "*investments needed in HC so that individuals realize a return on the HC they acquired in adulthood*" (page 6 [30 of 307]), repeated verbatim on page 171); (b) Concerning social safety nets; "*Reforms* (in the designs of safety nets), *by improving the livelihoods of the poor and their investment in human capital, can ultimately help rebalance power in their favour*" (page 183 [207 of 307]); (c) "*investments in human capital present externalities: the benefits to society from educating or promoting the health of individuals can be larger than their private benefits"* (page 189 [213 of 307]); and a direct link between market failure and human capital is discussed on the same page, making the much-publicised ICT market failure perceptions in South Africa most pertinent.

WDR 2017 has great value for South Africa's ICT4SDG needs, many of which are discussed in Section 2.9 on page 97 of this document, which also raises the vital role of SDG17 – the cooperation, coordination, communication and collaboration that effective governance and the rule of law demands.

WDR 2018: Learning to realize education's promise: This World Bank Report, introduced via the link provided in the title, correctly identifies the immense human development and economic growth opportunities presented by the age-old education and learning functions, which sustained human development throughout its estimated 9-million-year evolutionary journey to today. This WDR is introduced by the World Bank as follows:

"*The World Development Report 2018 (WDR 2018)—LEARNING to Realize Education's Promise—is the first ever devoted entirely to education. And the timing is excellent: education has long been critical to human welfare, but it is even more so in a time of rapid economic and social change. The best way to equip children and youth for the future is to place their learning at the centre. The 2018 WDR explores four main themes: 1) education's promise; 2) the need to shine a light on learning; 3) how to make schools work for learners; and 4) how to make systems work for learning*"

This development report may be the World Bank's "*first ever devoted entirely to education*", however, the report proceeds in numerous paragraphs to identify a major distinction between the process of "education" and "learning" – the two are not synonymous, as the report states in its introduction and throughout the discussion, that "*providing education is not enough. What is important, and what generates a real return on investment, is learning and acquiring skills. This is what truly builds human capital. As this year's World Development Report documents, in many countries and communities learning isn't happening. Schooling without learning is a terrible waste of precious resources and of human potentia*l" (page xi [13 of 239]).

What can, perhaps must, be disputed in this statement is the stated purpose of education and learning - to realise "*a real return on investment*" from such education and learning. And the implied purpose of education with learning being "to build human capital" so that the "precious resources" (the money spent on education and learning), and the "human potential" (to raise profits for its owners?) is not wasted.

The questions that arise from this World Bank focus on the monetary value of being human are (a) "when did the genus Homo become a commercial or economic asset?" (b) Did the antecedents of modern humans

encourage the learning processes of their offspring to realize "returns on the investments" expended on such learning? (c) At what stage of its 400,000-year-long existence did Homo sapiens recognise that their offspring had a monetary value, for which returns on investments into their "learning" must be sought? (d) Could it be that "commercialisation" of humans began with slavery, prior to the Greek civilization, although the first known recorded reference to this de-humanizing practice is in ancient Greek literature in e.g., the Hammurabi Code of 1754 BCE? (references "Slavery in history", and its modernisation in USA described by the Smithsonian in 2017).

There are 46 references to "human capital" in the WDR 2018 Report, including: (a) page 44 (64 of 239), "*In general, reliable institutions that implement the rule of law, reduce corruption, and protect property rights are associated with higher returns to human capital*"; (b) page 44 (64 of 239), "*More generally, shifts from planned to market economies have increased the returns to human capital*" (contradicted by China in the previous sentence, where "*the returns to education rose from 4 percent a year of schooling in 1988 to 10 percent in 2001*"; (c) Figure 5.1 on page 114 (134 of 239) shows that investments in preschool results in far higher rates of brain development than all other school classifications.

Besides the monetization of humans implied by the human capital concept, the report contains valuable insights into improvements in the outcomes of education and learning, complementing the discussions in Section 2.5 of this discussion document - the Nexus of Education, Decent Work and Economic Growth.

WDR 2019: *The Changing Nature of Work.*:

Text Box 4.4.5: WDR 2019: The Changing Nature of Work: World Bank Introduction:

"The World Development Report (WDR) 2019: The Changing Nature of Work studies how the nature of work is changing as a result of advances in technology today. Fears that robots will take away jobs from people have dominated the discussion over the future of work, but the World Development Report 2019 finds that on balance this appears to be unfounded. Work is constantly reshaped by technological progress. Firms adopt new ways of production, markets expand, and societies evolve. Overall, technology brings opportunity, paving the way to create new jobs, increase productivity, and deliver effective public services. Firms can grow rapidly thanks to digital transformation, expanding their boundaries and reshaping traditional production patterns. The rise of the digital platform firm means that technological effects reach more people faster than ever before. Technology is changing the skills that employers seek. Workers need to be better at complex problem-solving, teamwork and adaptability. Digital technology is also changing how people work and the terms on which they work. Even in advanced economies, short-term work, often found through online platforms, is posing similar challenges to those faced by the world's informal workers. The Report analyses these changes and considers how governments can best respond. Investing in human capital must be a priority for governments in order for workers to build the skills in demand in the labour market. In addition, governments need to enhance social protection and extend it to all people in society, irrespective of the terms on which they work. To fund these investments in human capital and social protection, the Report offers some suggestions as to how governments can mobilize additional revenues by increasing the tax base"

This World Development Report is dominated by the concept of "human capital", there are 159 mentions of the term in the report, emphasised in the early paragraphs as "*this Report emphasizes the primacy of human capital in meeting a challenge that, by its very definition, resists simple and prescriptive solutions*" page vii (9 of 151).

The early drafts of the Report generated numerous criticisms, probably the result of the Report's emphasis of the primacy of the human capital concept – the commercialisation of all humans alive towards the achievement of economic returns from their existence, and the skills and physical fitness they acquired throughout their lives to increase their economic value. The Human Capital Index provided in Table 3.2 on page 62 (72 0f 151) of this WDR 2019 ranks South Africa's human values at 126 out of 157, with an HCI score of 0.41, alongside Benin, Malawi, eSwatini, Comoros, and Togo. The nationals of these countries are worth 47% of the human values in the highest ranked country, Singapore, with an HCI of 0.88. Clearly, the World Bank has, and states, a very different interpretation of the human capital index from the interpretation in the preceding sentence, but the perception remains a reality. A few selected criticisms and comments on WDR 2019 are:

- Public Services International 10 July 2018: "*Global unions and civil society call for the World Development Report to be rewritten to promote decent work and inequality reduction*"; "*As civil society organisations, social movements and trade unions advocating for workers' rights, we feel the recommendations of the WDR 2019 report – as they stand – will create harmful consequences for working people globally, with far-reaching damaging economic and social implications*"
- Oxfam criticises World Bank for backing deregulated labour markets: The Guardian report of Fri 12 Oct 2018: "*Its* (the World Bank) *core recommendation, the need to water down the rights of workers for the greater good of the economy, was discredited may years ago. It is completely at odds with the OECD and the International Monetary Fund, both of which are saying that we need more trade unions and higher minimum wages to counteract the growing power of extreme wealth in the world.*"
- Bretton Woods Project Opinion, 23 July 2018: "*Pro-business agenda drives World Bank's report on the future of work*"; Summary: ● World Bank's draft WDR embraces market flexibilization; ● Report sets Bank apart from recommendations of the ILO; ● Global trade unions express concern over dangerous labour market deregulation.
- Education International 16 October 2018: "*World Bank World Development Report 2019: Once again, the "cure" is worse than the disease*": "*On education, students are still considered as if they were factors of production to be churned out of schools to serve the global economy*"
- ILO 12 October 2018: "*International Labour Office expresses concern about World Bank report on future of work*": "*we remain concerned about the WDR's approach to labour market institutions, regulations, the informal economy and social protection, and its lack of consideration of the gender dynamics of the changing nature of work. In addition, where we may agree with certain observations in the WDR, we find that the analysis and policy solutions fall short of a comprehensive approach to reducing inequality*"
- World Bank Group, Malaysia Hub: 16 August 2018: "*The Future of Work: Race with—not against—the Machine*": "*Will the revolution in digital and information technologies make us obsolete? Will jobs be lost and never replaced? Will wages drop to intolerable levels? History and economic theory and evidence suggest that in the long term, such fears are misplaced. However, in the short and medium term, dislocation can be severe for certain types of work, places, and populations. In the transition period, policies are needed to facilitate labour market flexibility and mobility, introduce and strengthen safety nets and social protection, and improve education and training"*

  This excellent report and opinion from a developing country hub of the World Bank provides valuable food for thought, a vital reference for South Africa's ICT4SDG strategy. One overriding message in WDR 2019, is the report's emphasis that the world is dealing with a very long-term highly complex challenge. The impacts of irreversible changes in the world of work will be massive, perhaps even disastrous for some countries, yet the long-term impacts are very clear in vision, exceptionally cloudy in detail, but change will happen, welcome or not. All nations, and the whole world, must prepare for such changes. A useful vehicle is provided in the 4Cs recommendations for ICT4SDG17 discussed in this document.

The most profound, and challenging statement in this WDR 2019 appears in the World Bank's pre-launch PowerPoint presentation of October 2018 (click here to download the presentation). Slide 14 proposes to "*Protect People, Not Jobs"*, an exceptionally difficult but vital call in this age of human capital and Homo economicus. According to a growing number of human behavioural science researches and critical thinkers, this was the dominant mode of human existence for the greater part of humanity's estimated 400,000 years of existence – there were no jobs, there were tasks that needed to be done for whole communities, families and tribes - these were done with no expectation of rewards, no bosses, and with great pleasure by all who had the requisite capabilities and competencies. Today's "jobs", at all hierarchies from slave labourers to corporate giants, came with the post Neolithic materialism that began to assign a monetary value to humans from birth to grave, e.g., that which "*gave 9-month-old George Washington a value of $150",* according to Harvard University's research findings outlined in *Harvard Business School Research, 16 January 2013*. Homo sapiens became human capital – their capabilities and competencies acquired an economic value to feed sustainable economic growth – Adam Smith's "*vile maxim of the masters of mankind*".

Irrespective of all the criticisms, and praise, WDR 2019 remains a critical document as the world seeks long-term solutions that enable future generations to reshape their relationships with the changing nature of work. This changing nature of work is driven not only by technological changes that demand new skills and work formats, but also by environmental damage caused by traditional work methods and resource extraction, they too demand urgent changes to avoid catastrophic global environmental degradation. Major global conundrums can be expected - mitigation or reversal solutions designed for the future will most likely be incompatible with the present economic dependencies, and may therefore be resisted furiously, even violently, by both beneficiaries and victims of the challenges. Solutions to mitigate or reverse the known threats today and in the near future may also be incompatible with long-term future solutions, and may thus become significant setbacks for the desired future social, economic and world of work changes.

WDR 2020: *Trading for Development in the Age of Global Value Chains*:

Text Box 4.4.6: WDR 2020: *Trading for Development in the Age of Global Value Chains*: Introduction:

Global value chains (GVCs) powered the surge of international trade after 1990 and now account for almost half of all trade. This shift enabled an unprecedented economic convergence: poor countries grew rapidly and began to catch up with richer countries. Since the 2008 global financial crisis, however, the growth of trade has been sluggish and the expansion of GVCs has stalled. Meanwhile, serious threats have emerged to the model of trade-led growth. New technologies could draw production closer to the consumer and reduce the demand for labour. And conflicts among large countries could lead to a retrenchment or a segmentation of GVCs. The World Development Report (WDR) 2020: Trading for Development in the Age of Global Value Chains examines whether there is still a path to development through GVCs and trade. It concludes that technological change is at this stage more a boon than a curse. GVCs can continue to boost growth, create better jobs, and reduce poverty provided that developing countries implement deeper reforms to promote GVC participation, industrial countries pursue open, predictable policies, and all countries revive multilateral cooperation.

The concept of "Global Value Chains (GVC)" has been attributed by many to Harvard Business School economics professor Michael Porter (born 1947), derived from his 1985 book "Competitive Advantage", which focused on firms, companies and corporations, and which was followed closely by his 1989 masterpiece (author's opinion) "*The Competitive Advantage of Nations*"

The World Bank defines "global value chains (GVC)" in Box 1.1 on page 17 (41 of 239) of WDR 2020 as "*the series of stages in the production of a product or service for sale to consumers*". The example given in the definition is the humble bicycle, used by virtually all the world's people, from childhood (as tricycles) to racing bikes valued in multiples of the monthly income of many developing country inhabitants. The example given in the definition is a bike assembled in Finland from parts made in Italy, Japan, and Malaysia, which is then exported to the Arab Republic of Egypt "as a GVC" – not a bicycle?

"*Global value chains (GVCs) powered the surge of international trade after 1990 and now account for almost half of all trade*"

International trade began much earlier than 1990, possibly long before the evolutionary birth of Homo sapiens. Stone tool technologies originating in Africa around 2.6 million years ago as reported by the Smithsonian institution, were crafted in very specific ways, using very specific stone types selected for their desirable physical properties. The technological innovations, manufacturing processes, raw materials and finished products were "exported" to every inhabited country and region of the world, free of charge, zero evidence of any competitive advantage or profit motive, all in the interests of Homo survival and growth.

There is an abundance of fictional and factual literature above and beyond scientific research reports to support the above statement. The prolific writings of one Merchant of Venice, the international trader Marco Polo (1245-1324), were reinterpreted with artistic license by the literary genius Shakespear nearly 300 years later, to reflect today's commercially driven human frailty of bigotry and xenophobia in his classic "The Merchant of Venice". Antonio, the bigoted wealthier merchant, demanded a pound of Shylock's flesh in lieu of monies owed to him – Homo economicus in action even then. Marco Polo's travels for international trade, which we now refer to as GVC, were along the historically famous Silk Road, which is now being redefined and upgraded to China's US$ 900 billion Belt and Road – technological change is a human-driven certainty which no culture, nationality or border can prevent. These stories, and many more, inform us of what is now

popularly known as GVC. According to the World Bank definition, the surge in GVC began in 1990, alongside the exponentially rising technological progress, which heralded the defeat of manmade barriers to global information flows and human travel. The concept of GVC is as old as humanity itself, irrespective of the words and acronyms we now use to describe the process.

WDR 2020 traces a variety of both positive (beneficial) and negative (detrimental) links between "Human Capital (HC)" and "Global Value Chains" the central theme of this World Bank report. Box 3.6 on page 82 (106 of 293) poses the question "*Does GVC participation lead to human capital accumulation?*", and discusses how HC can reinforce and impede GVC, the conditions in which HC has both positive and negative effects on GVC progress. The discussion in Box 3.6 concludes with the statement that:

> *"On balance, participation in GVCs may still support human capital formation via income growth and the weaker financial constraints facing parents and governments. But these positive effects may be offset by reduced skill formation in areas in which participation in GVCs leads to an expansion of low-skill-intensive sectors and tedious tasks."*

The links between GVC and HC are especially important for South Africa – the recommendation on page 163 (187 of 293) that "*As countries look to upgrade in GVCs, policy priorities shift to the quality rather than the quantity of human capital*", could have hugely negative consequences on the nation's equitable growth with socio-political stability. With up to 76% of the population classified poor, hugely disappointing outcomes of education and learning (now human capital formation) as discussed in Sections 1.2.6 and 1.2.7 starting on page 17 of this discussion paper, and a low human capital index (HCI) of 0.4, which raises the uncomfortable perception that the World Bank thinks South African "humans" are inherently inferior to say Singaporean "humans". This priority policy focus on quality over quantity in human capital demands for GVC upgrades could have negative impacts on the nation's equitable growth with socio-political stability. The trickle-down flow of the priority focus of human capital from those who have much of it (the wealthy well-educated 24%) to those who have too little human capital, the 76% poor and ill-educated majority, will not happen under a shift in GVC requiring lower-level skills to increase its ROI. The national challenge lies at the base of the South Africa's development pyramid, not at its apex. Effective, high-quality learning to replace "*schooling without learning*" discussed in WDR 2018, and to replace also the "*human capital formation*" which seems fixated on "continuously sustained economic growth" in the World Bank's Human Capital Project, is what South Africa needs to bridge its inequality divides, and to begin to restore its humanity that shaped the evolution of our species.

WDR 2021: *Data for better lives:*

Text Box 4.4.7: WDR 2021: *Data for better lives:* Introduction:

Today's unprecedented growth of data and their ubiquity in our lives are signs that the data revolution is transforming the world. And yet much of the value of data remains untapped. Data collected for one purpose have the potential to generate economic and social value in applications far beyond those originally anticipated. But many barriers stand in the way, ranging from misaligned incentives and incompatible data systems to a fundamental lack of trust. World Development Report 2021: Data for Better Lives explores the tremendous potential of the changing data landscape to improve the lives of poor people, while also acknowledging its potential to open back doors that can harm individuals, businesses, and societies. To address this tension between the helpful and harmful potential of data, this Report calls for a new social contract that enables the use and reuse of data to create economic and social value, ensures equitable access to that value, and fosters trust that data will not be misused in harmful ways.

This World Bank Report is central to this ICT4SDG discussion document. The whole report needs careful perusal and scrutiny by all South Africa's multidisciplinary leaders engaged in national development, including the highly competent specialists in the ICT industry in their search for a fully participative holistic approach to ICT4SDG. The most important communities in this ICT4SDG initiative must be the population groups excluded from the full benefits of "data", the folks who reside at the base of South Africa's development pyramid. If this community, estimated to number 76% of the South African population, are to benefit fully from the ICT4SDG development programme, they must participate fully in the process, accessing and understanding all the

"data" that defines their circumstances, and opportunities. They must understand all relevant and irrelevant (for their unique circumstances) facts and nuances, and be able to choose how they and their children and youthful offspring will engage productively with these facts, irrelevancies and nuances. The whole complex ICT4SDG process must be demystified and translated into language, and learning processes, which the youngest members of these economically and socially excluded communities will begin to understand, and begin to participate in their own ways and timeframes. This must be a central objective of the ICTSDG process if it is to derive maximum value from this vital World Bank Report. The heading of the first chapter, "Harnessing the value of data for the poor", must be central to the ICT4SDG process.

A detailed analysis of this WDR 2021 will be deferred to the complex, necessarily lengthy timeframe needed for the virtuous circle approach recommended for project design, implementation, and management. The following brief review of the key concepts of this report are presented as a starting point for the proposed demystification and simplification process. The review is a continuation of the discussions concerning the actual meaning of popular terms, acronyms, and jargon used in the industry, starting in Section 1.0 on page 9 of this document.

- **Data,** the central them of WDR 2021:
  - WDR 2021: Box 1.1 on page 24 (44 of 349), states: "*The term data is difficult to define. It has meant different things at different times, and in different disciplines*"; and "*data can be quantitative or qualitative in nature, and may be stored on analogue (that is, paper, stone tablets) or digital media*." The discussion sets an excellent basis for demystifying "data" so that target populations can begin to understand its value, and remove it mentally from the deluge of distracting technocentric usage that dominates the ICT literature.
  - Merriam Webster Dictionary, data: (a) factual information (such as measurements or statistics) used as a basis for reasoning, discussion, or calculation; (b) information that is produced or stored by a computer; (c) information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful.
  - Cambridge Dictionary: (a) information, especially facts or numbers, collected to be examined and considered and used to help with making decisions; (b) information in an electronic form that can be stored and processed by a computer.
- **Digital**, as in "digital transformation', "digital divide" etc;
  - WDR 2021 does not define "digits" or "digital", but the whole report is awash with terms like "digital divide"; "digital democracy"; "digital literacy"; 'digital economy"; "digital government", etc., to the extent that the term becomes meaningless to most non-technocrats, and discerning technocrats too. This confused mess of "digital everything" is discussed in greater detail in Section 1.0 of this document, and must feature prominently in the ICT demystification process.
  - Merriam Webster Dictionary, digital: (a) of, relating to, or utilizing devices constructed or working by the methods or principles of electronics; (b) composed of data in the form of especially binary digits; (c) providing a readout in numerical digits; (d) relating to an audio recording method in which sound waves are represented digitally (as on magnetic tape) so that in the recording wow and flutter are eliminated and background noise is reduced; (e) of, relating to, or using calculation by numerical methods or by discrete units; (f) of or relating to the fingers or toes; (g) done with a finger (some medical procedures).
- **Cloud**, as in "cloud computing", "cloud platforms", "cloud infrastructure", "cloud storage", and many more meaningless jargon phrases that the ICT industry prefers.

> Microsoft CEO Nadella: Leaders Realized, 'I Won't Exist if I'm not in the Cloud' (report: Bob Evans, March 19, 2021)
> Besides the difficulty in visualizing Satya Narayana Nadella "existing in a cloud", the head of arguably the most successful technology company over the last half century or so, made this statement as he launched the company's "cloud computing" platform, appropriately, or inappropriately named *"Azure"* - bright blue in colour like a cloudless sky. Is Microsoft's product a cloud-based service in a cloudless sky? An oxymoron?
> "*Asked by Weiss* (interviewer) *to describe why the pandemic* (Covid-19) *has been such a powerful force in driving digital transformation, Nadella said leaders first realized that digital technology was the key to resilience, and that the cloud became quite literally an existential requirement*" Yes, clouds are definitely existential requirements – they bring rain, vital but incompatible with computers or internets. They also produce lightning, vital for nitrogen fixation, disastrous for computers.

Such language is far removed from nature's clouds, about which children from poor technologically illiterate families must learn in their science classes. They must learn about *cirrus*, *cumulus* and *stratus* cloud types, their rain and lightning capabilities and capacities, etc. These vital knowledge tools for

children have very different meanings in the knowledge-delivering industry which they must rely on, even to learn that science, and upon which they will depend for the rest of their lives. Is this fair on the young minds seeking to change their world through knowledge? The meaningless confusion extends deep into the ICT industry's formal descriptions of "cloud-based technologies": Difference Between The Internet And Cloud Computing (2021)? "*The major difference is that the internet is a network of networks that provides an infrastructure that creates and maintains the connectivity of computers worldwide while Cloud computing is an internet service that offers various kinds of resources over the internet*".

Of course! Fits in well with the alternative meaning of "cloud": "something that obscures, blemishes, e.g., "a cloud of ambiguity" (Merriam Webster Dictionary). Could this have been a deliberate marketing ploy to keep users partially in the "dark clouds of confusion and ignorance", e.g., children using social media to "unlearn" that clouds are rain and lightning storage natural phenomenon, that they have "evolved" to become computers, smartphones, and "cloud-based" social media services that children love? Clearly, this "cloudy mystification" of a vital natural phenomenon and equally vital mode of communication has been extremely profitable. The very high economic returns may be identified by some critics as conforming to Mirriam Webster's third dictionary meaning of "cloud", "*something that has a dark, lowering, or threatening aspect*", but which remains an immovable pillar of the Homo economicus concept, one which whole nations have warred over. There is much demystification of a vital human good that needs to be done if the children of the poor are to be fully "digitally savvy" in their adult lives, able to benefit from the technology whilst protecting themselves from its "dark, lowering, or threatening" cloudy aspect.

Besides the criticisms, this World Bank Development Report has the perfect focus for this pro-poor ICT4SDG proposal:

Overview: "*Data, which are growing at an unprecedented rate, are becoming an integral part of the daily lives of most people everywhere. But how does that matter for the more than 700 million people living in extreme poverty? Is the explosion in the new types and uses of data improving their lives? Or will poor people and poor countries be left behind, creating a widening gap between those who reap the benefits of this new data-driven world and those who do not?*"

The report, with all its perceived blemishes and criticism, must be an integral component of the bibliography used in ICT4SDG, a critical resource for the design, implementation, and continuous feedback loops that comprise the proposed virtuous circle control and management of the strategy.

Section 5.0: An overview of the proposed pro-poor ICT4SDG strategy for South Africa.

The following paragraphs suggest a starting point for an extremely complex process, one which will in time begin to reverse several hundred years of extreme inequalities based on age, access to information and knowledge, economic opportunities, gender, learning opportunities, social segmentation, racism, all exacerbated by environmental abuse and consequential environmental degradation, in South Africa and elsewhere. All SDG challenges combine to render their mitigation and eventual resolution extremely difficult and time sensitive – resolving one apparent challenge in the short term could have serious unexpected results in the long term, and planning for logically derived future predictions could have disastrous short-term impacts.

But, in the interests of long-term social stability and growth which includes but extends much further than economic growth, the holistic efforts of SDG challenge mitigation and ultimate solution must start now, irrespective of the complexity. SDG 17 must be expanded from its currently narrow definition to enable vital partnerships and the 4Cs of Collaboration, Communication, Cooperation and Coordination. And it must focus primarily on the base of South Africa's development pyramid without threatening or damaging the macro-development processes at the apex of this development pyramid.

The above may be a seemingly impossible task, but it can, and must be done. It is imperative to reposition ICT as an enabling developmental tool in addition to the usual economic driver that the industry has become. ICTs must be positioned as platforms for development across all growth segments and all SDG challenges discussed and quantified wherever possible in all preceding sections of this discussion document. The starting points

and structures of such platforms are presented below, but the end results cannot be specifically defined or predicted at this stage. All that can be defined for the very long term is a vague vision of final resolution of all SDG challenges. There will be numerous, often very serious setbacks resulting from conflicts between short-term imperatives and long-term demands. These conflicts must first be recognised and understood, followed by mass acknowledgement of their existence and range of required interventions, all followed by readiness for the mitigation of all unexpected short-term reversals in clearly understood and shared virtuous circle modes of long-term programme implementation.

5.1: Setting the pro-poor ICT4SDG platform for South Africa.

South Africans from all walks of life have known about the national inequalities in access to information and knowledge via ICTs, many have lived it. It is not the "digital divide" that defines these inequalities – it is the whole integrated and interdependent impact of the triple threats of economic and social inequality, the resulting poverty, and world record unemployment levels which will determine the nation's future sustainability and growth. The impact of broadband deficiencies during the current Coronavirus pandemic has dramatically raised the national recognition of these deficiencies – children from the 24% wealthy segments of society have mitigated this "challenging time" through the broadband connectivity they have at home and in their pockets – the children of the estimated 76% of poor South Africans struggle even with the estimated high levels of mobile broadband coverage and access to smart phones. This must be the starting point for the ICT4SDG platforms – broadband access and use capabilities and capacities for the poor. Section 3.0 starting on page 106 of this document discusses South Africa's numerous efforts aimed at dealing with this challenge, the successes and failures of each model, and the mixed experiences of South Africa's developing nation peers.

The numerous pro-poor ICT4D models that South Africa has tried, and the experiences of its more progressive developing nation peers, suggests that the Internet Café, a.k.a. Cyber Café, a.k.a. LAN House in Brazil, a.k.a. PC Bang in South Korea, holds the most promise for South Africa's poorest citizens. The best ICT infrastructure model, individual home and personal connectivity, cannot be extended to the nation's poor unless and until major changes in how the nation builds and prices its broadband ICT infrastructures takes place. It is most unlikely that some of the national broadband growth models adopted by countries like China, South Korea and Vietnam can be emulated in South Africa over the short and medium terms, South Africa's chosen market-driven ICT growth model does not allow such models to resolve the nation's extreme inequalities.

South Africa is fully familiar with the Internet Café model, but only as a private sector commercial model functioning in a competitive free market economy. This model is neither scalable to the level needed, nor can it sustain user prices that match the needs of the poor. The Brazilian LAN House model has most of the characteristics need by South Africa today, and with a few changes to accommodate technological advances, usage and sociocultural preferences, this model can be made to fit South Africa's needs. The following prerequisites are necessary for this model, and any other that may be conceived in the future, to bridge South Africa's massive ICT affordability divides. The R 15.40 per month price target for 1GB of data usage discussed in Section 2.11 on page 105 of this document will be difficult to achieve in a competitive free market economic model that can scale to meet the needs of the estimated 76% South Africans who are poor:

5.1.1: Success criteria for pro-poor public broadband access platforms in South Africa.

What is a pro-po public broadband access platform? It is a place where poor people of all ages and education levels can access the fastest, highest capacity and quality broadband services possible, at prices that they can afford – the internationally recommended price guideline of 2% of their monthly income for a minimum of 1GB per month. For effective ICT4SDG, they need much more than 1GB per month. The bandwidth usage must become a moving target, driven also by Nielsen's Law - content quality and quantity for learning increases in line with network capabilities. These public platforms must be fully flexible, ranging in format, style and usage from simple broadband hotspots to fully fledged but locally owned and operated academia supported living labs, with all possibilities including MIT's FAB LAB innovations.

The public broadband platforms can/must also be positioned as invaluable communications platforms for the vital 4Cs needed for effective response to all SDG challenges, through a refined and remodelled SDG17. The

primary target of all this attention must zero in on the plight of the estimated 76% of the population that is currently fully or partially excluded from the benefits and opportunities of national development.

Every branch of government which is needed to support or implement programs for alleviation, mitigation, and ultimate elimination of each SDG challenge needs to be engaged in SDG17 type partnerships. The starting challenges which need further elaboration are listed in Section 2.0 of this discussion document, from page 23 through to page 106. The discussions in this document are centred around SDG8 for convenience only, each specialist agency and its development partners should develop full details for their specific disciplines, e.g., health specialists dealing with the full range of health issues, including expected future global health pandemics, the imagery of Walter Scheidel's apocalyptical second horseman. And the immense challenges of learning and skills acquisition through education and schooling, the disconnections of which are well described by the World Bank in WDR 2018: "*Schooling without learning is a terrible waste of precious resources and of human potential*".

Platforms must be suitable for vital research and development by all competent agencies, institutions and organizations engaged in, or just interested in, the full range of SDG challenges. These challenges range from SDG1 all the way through SDG17, all must translate the quest for knowledge and production of research papers to practical application in virtuous circle models to overcome the known complexities of the processes. SDG16, Peace, Justice and Strong Institutions must feature prominently on this platform usage, given the dehumanizing extremes of all SDG challenges, especially the child and gender related abuse in SDG5 that has risen to the highest levels of national concern. The platforms must also address the dangers posed by insidious use of the invaluable information and knowledge access technologies by global and local criminals and their syndicates – all variants of Cybercrime.

Platforms to ease data collection, management and processing, a major challenge in fully understanding and responding to the plight of the 76% socioeconomically marginalized population, followed by the development of appropriate responses based on measurable performance indicators. Selected ICT4SDG platforms in all communities can be strengthened through highly focused training and provision of resources to assist Statistics South Africa to fully meet its mandates in these exceptionally complex highly mobile marginalized communities in rural and urban South Africa.

Platforms for early childhood development with specific focus on the children of the poorest communities. There is a wealth of vital knowledge and information of how this immensely valuable future-proofing of South Africa's long-term prospects can be delivered, through ECD and avoidance of the cognitive damage to the brain development of children living in poverty, as discussed in this document, and in WDR 2018. The World Bank and many other institutions have amassed large knowledge libraries of the ICT tools and processes needed, all that is needed in South Africa is for a critical mass of concerned citizens and institutions to access, understand, and use this knowledge, creating new variants aligned with the needs of South Africa's poor. There are amazing related interventions by philanthropic individuals like Will.i.am., and his insightful discussions at most WEF conferences from 2015 onwards, e.g., *"Davos 2015 - Press Conference with Will.i.am*", about ICT formation in ghetto communities in US and elsewhere.

How should they work and what must they look like? The broadband connectivity must be technologically neutral, ranging from simple broadband hotspots with Wi-Fi, 3G, 4G/LTE, 5G, ADSL, optical fibre, any connectivity that local entrepreneurs can acquire and afford. Office furniture and equipment layouts can be simple yet expandable: chairs, tables, benches, stools, unfurnished shady spaces, shopping complex corridors, Spaza shops, any space from which poor people can access and use broadband, for whatever (legal) purpose they choose.

The humble start-up beginnings must be allowed, and encouraged with full national support, to expand to the more sophisticated fully equipped multiservice businesses – the high value online gaming facilities of South Korea's PC Bangs; the Chinese Wangba (excellent 2021 research publication of youth usage here); the Japanese Manga Kissa facilities which also offer low cost food and overnight accommodation with fast broadband to Japan's homeless insomniacs; to Russia's *Ziferblat* anti-cafés which travelled well to many developed cities of the world; and Brazil's wide varieties of LAN Houses which supported the nation's

migration to individual home connections, even for the poor (reference Section 3.1.5 starting on page 120 of this document).

Who must own them? Poor people, without discrimination of any sort.

a. **Women** - preference must be given to mature women from poor communities, those who have the capacities, capabilities and willingness to learn how to own and operate progressively growing ranges of ICT equipment, or merely to use the equipment owned by other entrepreneurs within reach. The intent and purpose of this focus on mature women is to enable ECD of the technological kind – child-friendly online learning games supervised by adults with knowledge, experience, and desire to nurture groups of young children from poor communities, while generating additional income streams for themselves in the process (read e.g., "Fun and games - Finnish children's ideas for the use of digital media in preschool";
b. **Youth** from poor communities who show aptitude and interest towards self-learning, as the Brazilians did in their Computer Reconditioning Centres (CRC) described in slides 22 to 29 of the Brazilian/Johannesburg 2010 Multistakeholder Forum presentation. These were set up specifically to enable youth, and interested adults from Brazil's favelas to prepare donated second-hand ICT equipment for their own use in LAN Houses;
c. **Unemployed graduates** – invaluable for the support they can give to the communities and themselves, but dependence on this group must be limited – their education and training will/must drive most of them to higher level ambitions in formal non-poor occupations outside the socioeconomically disadvantaged communities;
d. **Community based adult** entrepreneurs who need primary or secondary income streams. An excellent fully illustrated example of this group is provided by Brazilian Dr David Nemer's continuing ethnographic studies, in "*Digital Favelas: What Cities of Tomorrow Can Learn from the Slums of Today, 2015*";
e. Ambitious **big business entrepreneurs**, those willing to invest in pro-poor public access facilities must be welcomed, enabling the expansion of these facilities through e.g., nation-wide franchises. Some regulatory caution for this group will be essential – they must not compete with the poor community-based SMMEs in ways that will destroy the latter, as big supermarket chains did to community based "Mom and Pop" stores in this age of neo-liberal free market economics;
f. **The national ICT industry**. The initiatives by most big ICT companies discussed on pages 122 and 123 of Section 3.1.5 of this report, are invaluable, but if they are to succeed, their relationships with the communities they wish to serve must be fully arm's length and hands free – ownership must be in the hands of members of the community. The community-based SMMEs must be free to develop at their own pace and in their own ways, growing with the experience they gain, and learning from the many failures they will experience. Big ICT companies in South Africa and everywhere else have images and reputations to protect, and corporate cultures that are generally incompatible with the folks who live at the bases of national development pyramids. But they have the expertise and financial capacities to make a difference in those communities. The nation as a whole, and the national ICT industry, needs to learn how to collaborate with poor community-based SMMEs in the latter's own terms, without destroying them through their dominance in financial, intellectual, and knowledge capacities.

- **What they must not be**:

a. **Technocentric solutions for human challenges**. Technocentric solutions must be avoided, most have been tried, and failed. Technology must remain a vital tool for the achievement of the human development objective, it must not become the objective itself, as it seems to have done.
b. **Components of the National Education Systems.** The informal nature of all public access systems has been found by researchers to be their most important attribute. They must not become institutional components of the national educational systems, public or private, but they must be strongly supported by the whole national education ecosystems, as key complementary facilities providing vital learning without the inhibitions of formal education and the national school systems. They must enable the invaluable ethnographic and related research by academics, human development professionals, and individuals with an interest in any of the SDGs that impact the poor. The value of peer-driven learning free of the inhibitions of the formal education systems and schools, has been researched and documented by

many, e.g., Brazilian researcher Dr David Nemer in his 2015 doctoral dissertation "*Rethinking Digital Inequalities: The Experience of the Marginalized in Community Technology Centers*".

But, educational establishments must be encouraged to set up their own platforms, for their own learners, or for their local communities. These can become potent centres of learning, for the learner and educator participants, and for researchers developing or refining all elements of the concept, including and especially the pedagogical components.

This separation from the formal educational systems can also help to bridge South Africa's massive learning inequalities, best expressed by South Africa's Professor Naledi Nomalanga Mkhize, quoted from the documentary video "*Some Children are More Equal than Others*". On page 3 of the support document ICT4SDG4, Professor Mkhize is quoted as saying "*Black schools are schools of poverty and impoverishment, both intellectually and financially. What should have happened is that we should have gone to the black schools first and turned them into beacons of hope*".

The emphasis of learning over education and schooling is also expressed in the World Bank document WDR 2018 discussed on page 152: "*providing education is not enough. What is important, and what generates a real return on investment, is learning and acquiring skills. This is what truly builds human capital. As this year's World Development Report documents, in many countries and communities learning isn't happening. Schooling without learning is a terrible waste of precious resources and of human potential*" (page xi [13 of 239]);

c. The public broadband access platforms must remain in private hands, preferably SMME ownership and operation, but with maximum support from all government institutions, competent private sector organizations and NGOs. Their capacity to generate income for their owners is vital in South Africa, given the country's high poverty and unemployment levels, and inadequate educational outcomes for the poor. This has been the preferred organizational arrangements of Brazil's LAN Houses, and Internet Cafés in most other developing nations who used them to raise ICT access and usage levels;
d. The support received from all segments of the nation must be fully flexible, allowing and enabling informality whenever or wherever necessary, with the proviso that law enforcement must be protective, supportive and firm, suppressing delinquent and unlawful behaviour, and encouraging community support as far as possible. The well-documented social contracts that Brazilian LAN Houses established with both communities and crime syndicates have been invaluable; the latter provided arm's length protection without operational interference, viewing LAN Houses as common goods that even criminal syndicates must appreciate and respect.
e. There are many more critical organizational and operational arrangements that have yet to be developed for South Africa's specific social-economic-political-cultural heritages and norms, and other traditional practices that need to be suppressed or eroded over time. Some of these discussions may be emotionally uncomfortable for some segments of South Africa's multicultural realities, but they must nevertheless be held as part of the ICT4SDG development process.

Additional information providing a global survey of Internet Cafés prepared by the author in 2017 is available for download at https://www.sakan.org.za/Docs/SA-LAN.pptx.

Section 6.0: The proposed pro-poor ICT4SDG strategy for South Africa.

After approximately 160 years from the introduction of ICTs, 27 years of democracy, and 25 years after the promulgation of the first democratic national ICT policy, South Africa still struggles to productively connect all its inhabitants to the most effective technological driver of development – the ICTs, a.k.a. telecommunications, a.k.a. the Internet, a.k.a. all names and acronyms given to the changing world of the key technological enabler of human development, now popularly known as ICT. The analyses and discussions of the nation's numerous attempts to enable ICT access and effective use for all who reside in the country are briefly outlined in Section 3.0: *ICT4SDG: Positioning ICT for delivery against all SDGs*, starting on page 107 of this document. All actual or perceived failures of any and all these historical attempts must be systematically corrected, slowly but steadily over time, if necessary, to overcome deeply entrenched beliefs and practices.

Obviously, the best form of connecting whole populations to this modern information age is to build nationwide ICT networks with services that reach, and are affordable by, all persons who reside in the country. This has been the primary ICT sector objective for the full 160-years or so that ICTS have been available in the country, but this objective has been obfuscated by illogical social-economic-political factors. This must change, but during the lengthy processes of change, effective interim solutions must be implemented. The most effective interim solutions used by every nation on earth has been the provision of public access facilities, which must ultimately render themselves obsolete after they achieve the nation's growth objectives of ICT4ALL - 100% households, and therefore businesses and other places of human activity, fully connected 24/7 to the full range of "transformative" modern ICTs.

Section 3.0 suggests that South Africa has tried all modes of mass public access to ICTs, yet effective solutions remain elusive. The most productive model used by virtually all nations recently, and in the early stages of integrated ICT development, has been the Cybercafé model. This model has the flexibility to grow to provide any and all conceivable information and knowledge access services to all segments of the nation who need them, and to render itself obsolete when its job is done. The preceding Section 5.0 discusses a few key elements of the scope, merits, and structures of such a model. The following discussions suggests how South Africa can refine and reposition this well-known model to help meet the nation's multifaceted SDG challenges.

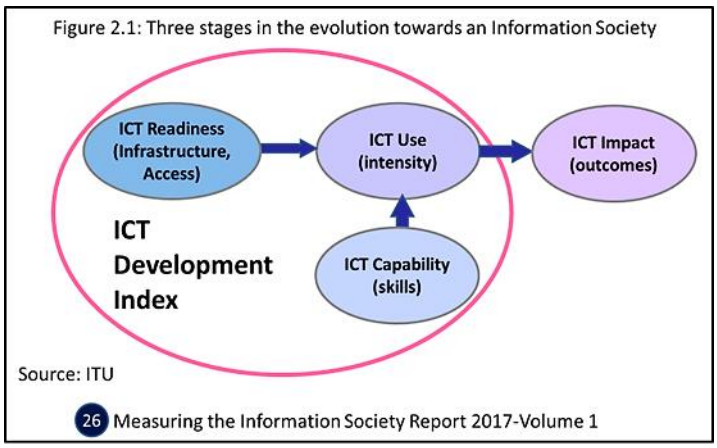
6.1: The International ICT growth model: the ITU IDI process with proposed revisions:

Approximately eighteen years ago in December 2003, the world of nations came together to conceive the World Summit on the Information Society, WSIS, in which the world's oldest ICT representative body, the International Telecommunication Union (ITU), was tasked with the implementation of the global WSIS declaration:

WSIS Declaration December 2003

"We, the representatives of the peoples of the world, assembled in Geneva from 10-12 December 2003 for the first phase of the World Summit on the Information Society, *declare our common desire and commitment to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life, premised on the purposes and principles of the Charter of the United Nations and respecting fully and upholding the Universal Declaration of Human Rights."*

The world, through the ITU, adopted the following model of ICT development to meet that objective:



https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume1.pdf

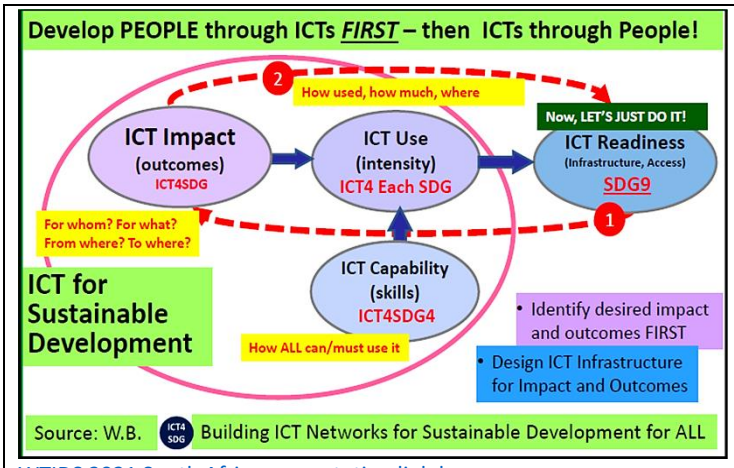
Relevant ITU Definitions:

- **Stage 1:** ***ICT readiness*** – reflecting the level of networked infrastructure and ***access*** to ICTs;
- **Stage 2:** ***ICT use*** – reflecting the level of ***intensity*** of ICT use in the society;
- **Stage 3:** ***ICT impact*** – reflecting the ***results/outcomes*** of more efficient and effective ICT use.
- ***Skills sub-index*:** This sub-index seeks to capture capabilities or skills that are important for ICTs. It includes three proxy indicators (mean years of schooling, gross secondary enrolment, and gross tertiary enrolment).

Since publication of MISR 2017, driven by the exponential technological and use changes in the global ICT industry, the MISR process is being revised. The ITU-driven revision process is captured in the ITU site ITU Academy – Empowering Minds

The above model, and all revisions of it under active consideration since the 2017 publication, are aimed at all countries, according to the mandate given to the ITU for implementation. The specifics relevant to each member state of the ITU will of necessity be different. The differences relevant to South Africa were captured

in a presentation by the author of this document on the occasion of the World Telecommunication and Information Society 2021 (WTISD 2021), celebrated on 17 May 2021:



WTIDS 2021 South Africa presentation link here

Suggested changes for South Africa:

- Transpose ICT Readiness (Infrastructure, Access) and ICT Impact (outcomes). Determine ICT needs and outcomes for South Africa's 76% poorest, design ICT Readiness for those desired outcomes;
- Design ICT Use (intensity) specifically for the information and knowledge needs of the poor - the ICT qualities, quantities and content that enables intensive ICT use to protect themselves and eventually overcome all SDG challenges;
- Design ICT Capability (skills) that transcend "digital transformation", target all skills needed to survive this changing, challenging world, defined by all SDG challenges.

These suggested changes may not suit all ITU member states, they are specific to most African countries, especially inequality-challenged South Africa

The key suggestions in that presentation included, for South Africa if they are not relevant to other countries, the suggested changes in the model to reflect the extreme inequalities that prevail in South Africa today. Details of exactly how the above changes must be implemented is beyond the scope of this discussion document; the specific implementation details cannot, and should not, be developed in isolation, by the author of this discussion document or by anyone else. The process must be fully inclusive, developed in full partnership with all oversight agencies and partners, and with representatives of the target communities, within the spirit of SDG 17.

The broad requirements for effectiveness and success discussed in the whole of section 5.0 in the preceding paragraphs are central, they present a logical path towards the desired implementation strategy that should be understood and supported by all stakeholders.

The last point concerning implementation is that this proposed process must not compete with the standard model of macroeconomic development via ICTs, which is so deeply entrenched in South Africa's national ICT growth model. Any attempt to set the model up to compete with the prevailing growth model will doom it to certain failure. The proposed model must coexist with the national macro model, but its importance, and direct and specific focus on South Africa's marginalized population, estimated at 76% of the population by competent local authorities, must be paramount. The long-term growth of the country with socio-political stability demands that the parallel pro-poor growth strategy is escalated to the national level, with full inclusion of all sectors of the nation.

Section 7.0: Concluding comments, observations and recommendations.

The secret of Homo sapiens' success, its dominance over nature and all other earthly life species, has been its ability to share ideas, information and knowledge, which in turn led to the development of the information and knowledge-delivering technological tools we now take for granted. When viewed from the perspective of the challenges defined by the Sustainable Development Goals, some well-known global scale elements of this success must be regarded as a pyrrhic victory, a kamikaze race towards extinction of the world as we know it.

The ICTs and related technologies were/are able to support both aspects of human evolution – its progress towards a better future for all, and its kamikaze-like race towards the next mass extinction. ICT, as a tool for the creation and dissemination of information and knowledge, evolving as it did from the dawn of human cognition in Africa several hundreds of millennia ago, has been used by humans for both supportive and nefarious purposes. Both purposes are reinforced by technological advances; both have shaped the trajectory of human progress since its evolutionary separation from its ancestors some 400,000 years ago. This disturbing imagery of the bi-directional role of technology is captured well by a growing number of creative critical thinkers worldwide, like the Israeli Historian Yuval Noah Harari in his trilogy "Sapiens: A Brief History of

Humankind" 2011; "Homo Deus: A Brief History of Tomorrow" 2015; and "21 Lessons for the 21st Century" 2018. Professor Harari paints a disturbing and redeeming imagery of Homo sapiens' past, future, and present, in that order. His insights are shared by numerous compatriots in his profession, ranging from ancient Chinese and Greek philosophers all the way to Professor Walter Scheidel, quoted liberally in this document through his classic "*The Great Leveler: Violence and the History of Inequality from the Stone Age to the Twenty-First Century*". Historians report on the works of dedicated researchers, many of whom publish their own highly readable research results. Amongst this extensive list are the South African scientists Christopher Henshilwood and James Suzman, both directly focussed on the immensity of South Africa's human history, which this document uses liberally.

Why is this ancient history of human evolution important? If, as virtually all modern scientific evidence suggests, Southern Africa was one of the key places of origin of the human species and its predecessors, then all humans alive everywhere have a close genetic, therefore ancestral, affinity to Africans in general, and to Southern Africans in particular. How, when and why did these humans, who according to scientific research evidence lived fairly peaceful lives, at balance within themselves and their environments for more than 400,000 years, change to become modern humans who are both caring and dangerously self and environmentally destructive?

The answers to these critical questions are available in the vast well-documented histories of humankind, to those who wish to know, via global ICT infrastructure. The solutions for further upliftment of humanity's survivability, and the reduction of its more destructive instincts and activities, are also equally available to those who wish to know, also via the global ICT infrastructure. The tools crafted from the world of Science, Technology, Engineering, and Mathematics (STEM) were "discovered" from nature, and are/were updated continuously by humanity to improve its survivability and that of its living environment, and also to threaten that very same survivability and environment. As numerous researchers across all scientific disciplines have "discovered" from their researches, all human societies can choose to use technology productively for their own and collective wellbeing, and the survival of their living environment, or to destroy it all through self-interest, greed, and stupidity. One such scientist is Jared Diamond, who describes these stark choices available to humanity in his best-selling 2005 book "Collapse – how societies choose to fail or survive".

In this discussion document, the history of Homo evolution is heavily summarised, as are the STEM-derived tools like ICTs. The summaries are supported by numerous references, which themselves are far too long and detailed to list and discuss fully in this document, hence their presentation as hyperlinks within the text and in footnotes. The use of hyperlinks to access vital reference sources is a further testimony of the power of the STEM knowledge outcomes, like ICTs, to foster understanding of the underlying history and knowledge, and to create and shape new histories and knowledge. The intent and purpose of the use of technology, discussed liberally throughout this document, must be to migrate from the dominant post-Neolithic Homo economicus model of development, driven by *"the vile maxim of the masters of mankind"* as stated by the so-called "father of capitalism", towards a kinder, gentler, caring humanity as suggested by yet another eminent South African scientist, the late globally celebrated scientific guru Phillip Valentine Tobias, whose lifelong achievements include:

- "Unearthing" the scientific evidence that all humans originate from common African ancestors, many of them originating in South Africa itself – the Cradle of Humankind World Heritage Site located at Sterkfontein and environs. Professor Tobias must have turned in his grave, in absolute glee and celebration over the discovery of Homo naledi in 2013 by his scientific successors, and in deep disappointment and sadness on hearing the gross misunderstanding rooted in national scientific illiteracy, clearly inherited from South Africa's brutal apartheid past:
  - **Celebration**: Professor Lee Berger, Homo naledi project leader: "*For our scientists the search for human origins is one that celebrates all of humankind's common origins on the continent of Africa. The science is not asking questions of religion nor challenging anyone's belief systems, it is simply exploring the fossil evidence for the origins of our species*"
  - **Disappointment**: Dr Matole Motshekga, Kara Heritage Institute: Dr Motshekga dismissed the Homo naledi discovery, saying it was "*an attempt by Europeans to reinforce racial stereotypes and extend*

the narrative of Africans being sub-human. Africa has a picture of the oldest, most ancient human beings that originated on this continent – and that human being is claimed to have been in the image of God, and he's not a chimpanzee. Europeans don't have a record of their history and their ancestors – they're looking for their next ancestor, and they found their ancestor in the baboon". Media coverage from BUSINESSTECH, September 2015, and several other local and international sources.

- In 2002, Professor Tobias launched his own very popular TV series, "Tobias's Bodies", with a highly relevant short video extract covering the tragedy of race, racial intolerance, and its wholly unscientific basis. The short video aptly titled "Tobias's Bodies – race", is available to view at https://vimeo.com/33672232. This video, and the concepts it captures, must be taught to all representatives of South Africa's future, the rich, poor, multi-coloured and multi-cultural children of the nation. They must be equipped to reverse this ugly element of human history.
- Within the six-part video documentary "Tobias' Bodies", which was broadcast by the state public broadcaster SABC, Professor Tobias made the following profound statement, directly related to most of the SDG challenges that this discussion document seeks to address:

> **I am an African: Phillip Tobias:**
> *"The human species has a genetic pre-disposition of being extremely violent, and very caring. Culture and environment determine where we are between these extremes. Must we wait 1000 years for genetic evolution to breed out our propensity for violence? If we are helpless products of our genes, then we must. But if we accept that we are a product of our society and our genes, we can change society to reduce our propensity for violence. Society creates us and our behaviour, but we create society, therefore, we are in a position to re-create ourselves and to master our genetic propensity for violence"*

This opinion expressed by Professor Tobias lies at the core of this discussion on ICT4SDG – recent changes in the preferred lifestyle of Homo sapiens has favoured our propensity for violence over caring, e.g., the extremes of gender-based violence, GBV, and the imagery of Walter Scheidel's four apocalyptical horsemen that diffuse extreme inequality, as documented in this and other related ICT4SDG documents.

- **The return of Sarah (Saartjie) Baartman**: The brutal dehumanizing history of Sarah Baartman, a.k.a. the "Hottentot Venus", born circa 1789 in the Eastern Cape province of South Africa, who died in France on 29 December 1815, was well-known to Professor Phillip Tobias. The story was also well-known to most informed South Africans, and led to the newly elected president of the new Democratic South Africa, Nelson Mandela, calling on Professor Tobias in 1996 to lead the struggle for the repatriation of her remains from the museum in Paris, France, where her dissected body had been exhibited as an example of a sub-human female. Professor Tobias and his team succeeded in negotiating the release of Sarah Baartman's remains by the French Government, and her remains were repatriated to her homeland for official burial in 2002. The extremely disturbing historical record of Sarah Baartman's dehumanization has been captured on film; the 1998 Zola Maseko documentary "The Life and Times of Sarah Baartman"; the 2010 French drama movie "*Vénus noire*" (Black Venus); and a short YouTube documentary at https://www.youtube.com/watch?v=z7NZmvF6Bzs which features vital commentary by Professor Tobias.

  The racism that dehumanized Sarah Baartman continues to haunt her memory 200 years after her death. Nearly all South African newspapers, and several international media giants (e.g., BBC 28 April 2015) reported the vandalism at her burial site by remnants of South Africa's racial supremacist history.

Could the history of Sarah Baartman, and many others like it, have influenced the opinions of many South Africans, as they clearly influenced Dr Matole Motshekga in his statements concerning the discovery of Homo naledi? Could the knowledge of our common human ancestry have prevented, or reduced the extremes of race-based brutality which shaped the nation, yet remains so harmful to both perpetrators and victims alike?

The history of human origins, their migration out of Africa, first by mankind's common ancient ancestor Homo erectus about 2 million years ago, followed much later by several waves of modern humans, starting about 220,000 years ago to finally "people" the whole world, is vital knowledge for future generations. The children of today, adults of tomorrow, must face increasingly dangerous challenges emanating from, and thriving on

human ignorance. The current educational systems they must use, discussed in Section 1.2.6. on page 17, and Section 2.5 on page 39 of this document, must change to a potent learning process that equips them to use their natural capabilities for critical and creative thinking to mitigate and resolve all future challenges. The local controversies surrounding the unveiling of the Homo naledi ancestral human fossil provided stark reminders of the challenges that future generations must confront.

7.1: Concluding recommendation.

This discussion document is about ICT4SDG, the role of all technologies, especially the ICTs, in the mitigation and eventual resolution of all SDG challenges. The single, and simple recommendation to conclude the extremely complex challenges of a holistic approach to ICT4SDG must therefore be a single-minded focus on the information and knowledge needs of the nation's estimated 76% population who live in poverty, unable to afford, and therefore unable to know, understand, and use the technologies of the past, present and future to secure wellbeing for themselves, their families, and their communities. There are no economic or technological solutions known today to overcome these challenges, these must be developed as part of the ICT4SDG process itself, through trial and error, in a strongly adhered to virtuous circle mode as strongly recommended by South Africa's own National Development Plan 2030 (NDP).

This recommended ICT4SDG process of focussing on the poor, and their children, has long been known as an effective tool for development, e.g., UN Habitat 2010 Recommendation that: "*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*" (page 25 of 279 in *The State of African Cities 2010*)

But, knowing has not been enough. Well-intentioned and well-crafted policies have been poorly executed, due, in the opinion of this author, to the distractions of wealth accumulation in the Homo economic model favoured in this age of Homo technologicus (link to Stanford Daily 2015 opinion by Mindy Perkins). Is this Homo technologicus trend, driving and driven by the not-so-obsolete Homo economicus model, heralding a post human evolutionary era (read South African academic opinion by *Malesela John Lamola* here)? The answer to this provocative high-level top-down question is well beyond the understanding, and interest, of South Africa's 76% poor majority, but it will have direct impact on their future wellbeing, whatever the answer may be. It will also impact their collective responses to the answer, whatever it is, possibly unleashing the anger of Walter Schiedel's imagery of the four horsemen of the inequality apocalypse.

The final recommendation: Build pro-poor broadband access and use models for the poor, starting with the well-known model of Cyber Cafés, updating the model to suit current technological availabilities and preferences, and appropriate business models that focus on affordability first, a target price of R 15.40 per month for a minimum usage of 1 GB per month (Section 2.11 on page 106), and the development of creative, innovative ICT applications to ensure their use by the youngest group of children, from 3-to-5 years of age, so that they can develop critical thinking skills directed at all SDG challenges through child-friendly online entertainment with learning electronic games. Such online learning games are available, but they need to be redeveloped for South Africa's multicultural, multilingual, and mainly illiterate children of the 76% South Africans who live at the base of the nation's development pyramid.

This will demand wide-scale multistakeholder support, starting with the most relevant government departments responsible for ICT first, closely followed by all government departments and subordinate institutions set up to deliver more than "check-list" success of all SDG challenges. Such multistakeholder support is easier said than done. A massive marketing campaign is necessary, preferably within an expanded SDG17 process, from which the recommended strategies can be developed and implemented in virtuous circle feedback control and management modes.

7.2: Annexures. This discussion document concludes with two annexures;

Annex 2.6.1: SDG 6 Sanitation:
Impact on South African Citizens, presented as a response to a particularly challenging problem that impacts the poor. Numerous programmes for alleviation and reversal are in progress, but the nation's developmental

history suggests that even these well-intentioned programmes are in need of additional support. This additional support can be provided through ICT4SDG – participation by key multistakeholders, especially the victims of system failures that reside at the base of the nation's developmental pyramids, and participation by most top-down multistakeholders that depend on effective sanitation for the successes of their SDG challenges;

Annex 2.7.3.2: Smart Cities:

All smart city projects in South Africa have strong broadband infrastructure components, but these components tend to prioritise the needs of those South Africans who already have much, bypassing the critical, and urgent needs of those South Africans who desperately need more. Prioritising the broadband needs of the poor is strongly recommended by virtually all development authorities and agencies, local and international, who recognise the role of ICTs in development. The smart city projects that focus on the rich, or the technologies themselves, are also extremely wasteful of the scarce resources available for true national development through broadband delivery for all.

The Cape Town Smart City project has been selected for this annex, simply because it had less of the self-interest distractions that have derailed most other smart city projects, but it too was hampered by the failure to conceive truly inclusive smart city strategies that focus on the poor: the knowledge that smart cities are built by, and made of, smart people; and that smart people must be developed as a priority prelude to smart cities. History is awash with evidence of smart cities destroyed by the victims of exclusion – they have a penchant to call for help from the destructive forces of professor Walter Scheidel's imaginary horsemen of the inequality apocalypse.

SABC NEWS

INDEPENDENT. IMPARTIAL.

Search

Parents, teachers, SGB up in arms over EC open pit toilets

12 September 2019, 7:01 AM | Fundiswa Mhlekude|@SABCNews

The Grade One learner injured when he fell into open pit toilet in Lutholi Junior Secondary in uMthatha.

Parents and teachers of Lutholi Junior Secondary school at Sibangweni near Mthatha in the Eastern Cape are up in arms after one of the learners got injured when he fell into a pit toilet at the school. Read more here.

A NATIONAL TRAGEDY THAT NEEDS TOP PRIORITY RESOLUTION

Key references to school latrine child deaths and injuries:

1. Statement by President Cyril Ramaphosa on 14 Aug 2018: https://www.gov.za/speeches/president-cyril-ramaphosa-sanitation-appropriate-education-initiative-14-aug-2018-0000#
2. Africa Check: Fact check published 25 January 2019: https://africacheck.org/fact-checks/reports/have-hundreds-kids-drowned-school-pit-latrines-south-africa

Brief visual review of South Africa's national sanitation challenge.

Photo: Mkhuseli Sizan

Eastern Cape*: For three months, raw sewage overflowed into a street in Soweto-on-Sea in **Port Elizabeth**, with municipal workers reluctant to come and fix the drains because of attacks by robbers. Oct. 2019:* https://www.groundup.org.za/article/thugs-scare-municipal-workers-away-broken-township-drains/

Credits: csimpson80.com

KZN: S'bu Zikode: Jul 14, 2016: *Started 10 years ago, South Africa's shack dwellers movement Abahlali baseMjondolo has mounted a remarkable struggle – often at a terrible cost - to protect and promote the rights of impoverished people in the towns. This inspirational story shows what poor people can achieve when they organize themselves outside the state, political parties and NGOs*: https://www.pambazuka.org/human-security/political-and-economic-challenges-facing-provision-municipal-infrastructure-durban

Gauteng*: A manhole spills sewage onto a polluted field where children are playing soccer in Snake Park, Soweto township in South Africa. September 30, 2020.*

Thomson Reuters Foundation

Thomson Reuters Foundation/Kim Harrisberg : https://news.trust.org/item/20201026040638-f0gsd/

Koster, North West Province: July 2018

BBC NEWS

Koster - the South African town where residents took back control: July 2018

https://www.bbc.com/news/world-africa-44633331

In one part of this township the only source of running water is inside this broken sewage pump station - residents need to wade through faeces to get to it. The residents demanded change, with violence!

Emfuleni 13 Feb. 2021
The Vaal River Sewer – in their streets, yards, and homes

https://www.thesouthafrican.com/news/no-respite-for-sewage-saddled-in-the-dark-water-starved-emfuleni-residents/

Selected key references related to SDG6 – Sanitation

1. Seasonal Rainfall Influences on Main Pollutants in the Vaal River Barrage Reservoir: A Temporal Spatial Perspective: University of Johannesburg; a 2007 Dissertation by ESTIE OCHSE:

   In her Dissertation, Estie Oche lists references to the Vaal River pollution going back to 1987 – more than thirty years prior to the current (2021) outcry, and observes that:

   "Chemical pollutants which currently pose the biggest threat in terms of water quality for the Vaal Barrage Reservoir are Phosphates, Electrical Conductivity and Sulphates" …. "The occurrence of these pollutants in the Vaal River can be explained by the vast inputs of return flow water from sewage treatment plants, underground mine water and discharge from industries"

2. SAHRC 28 August 2012: Water is Life; Sanitation is Dignity: Launch of the Water and Sanitation Provincial Hearings: https://www.sahrc.org.za/index.php/sahrc-media/speeches/item/84-water-is-life-sanitation-is-dignity-launch-of-the-water-and-sanitation-provincial-hearings:

   (a) *"The Commission's findings also recognised that this was part of a bigger problem facing millions of people who are poor – a lack of access to sanitation and a lack of a right-based approach to service delivery";* (b) *"16 million people do not enjoy the right to sanitation"; (c) "R50 billion is needed to address the backlog and upgrade infrastructure"; (d) "In addressing the problems identified in the DPME report on sanitation, there should be no trade-off with other socio-economic rights in national, provincial or local budgets, as all rights are equal and dependent on each other"*

3. Polity.org.za, 13th June 2013: Statement by the SAHRC and Government Departments on 2012 Report: Against the background of serious service delivery breakdown in several parts of SA and a perceived lack of government accountability, a defining meeting took place today at the South African Human Rights Commission (SAHRC).

   March 2013 National Hearing on Water and Sanitation: *"Under oath, Director Generals, Special Advisers to Ministers and Directors responded to and agreed with the Commission's key findings and recommendations from 2012 hearings. These findings included the lack of access to water for the poorest communities in the country; the poor quality of water; the lack of sanitation services in informal settlements, poor maintenance of existing facilities, lack of effective monitoring of private companies contracted to provide services and the effect of mining and agri-business activities on water supply"*

4. SAHRC Water and Sanitation Research Brief, March 2018: Monitoring the Implementation of the Commission's Recommendations from its 2014 Report on Access to Water and Sanitation:

   South Africa has made notable progress towards water and sanitation for all, but: *"The progress is not enjoyed in an equitable manner by different members of society and in different geographical areas of the country"*. Rural areas and urban informal settlements are severely underserved. Vulnerable groups, learners, women and girls who do not have equitable access to water and sanitation, remain disproportionately affected, exposed to threats like sexual assault and other forms of violence against women and girls resulting from shared community toilets.

5. SAHCR, 15 August 2018: Water Wednesday: Rand Water responds to Vaal Dam sewage reports: https://www.sahrc.org.za/index.php/sahrc-media/news/item/1496-water-wednesday-rand-water-responds-to-vaal-dam-sewage-reports:

   (a) "*Reports around the Vaal dam sewage disaster escalated in the past week after thousands of fish were reportedly found dead as a result of raw sewage flowing into the river from pump stations in the Emfuleni Municipality*"; (b) "*In 2015, Water and Sanitation Minister Nomvula Mokonyane announced the ambitious R1bn Sedibeng Regional Sewer Scheme. One of the Scheme's objectives was to address the 'spillage of raw sewage into the Vaal River" and "deliver effective solutions to prevent pollution of strategic national water resources'"*; (c) "*Rand Water came under fire after Chief Executive Percy Sechemane received incentive bonuses for the past three years of up to 71%. The Department of Water and Sanitation's remuneration policy limits bonuses to 45%.*"

6. SAHCR, 17 February 2021: Final Report of the Gauteng Provincial Inquiry into the Sewage Problem of the Vaal River:

   (a) "Numerous reports of raw sewage, from the Emfuleni Local Municipality's Rietspruit Waste Water Care and Management Works situated in Vanderbijlpark, the Leewkuil Waste Water Care and Management Works situated in Vereeniging and other areas within the Municipality, had for weeks and months been leaking into and polluting the Vaal River and the Rietspruit"; (b) "The main sewers in Vanderbijlpark were blocked and that raw sewerage was flowing into people's yards and properties"; (c) 19 million people depend on the Vaal for water, for drinking and for domestic and commercial use, but the Vaal is now polluted beyond acceptable standards. The cause is the kilolitres of untreated sewage entering the reservoirs and rivers because of failed, badly operated and maintained wastewater treatment plants.

7. **Public Outcry and Highly Critical Media Coverage** – selected examples:

   - Times Live 18 Feb. 2021: "Gauteng says it is working to fix Vaal River ecosystem, amid scathing report"
   - Daily Maverick 17 Feb. 21: Vaal River sewage contamination a crisis, human rights violation and liability…."
   - SAHRC 19 Feb. 2021: "*Government passed the buck on Vaal pollution for too long —panel*"
   - Engineering News 17 Feb 21: "*SAHRC recommends Emfuleni municipality be placed under administration*…."
   - SABC News Video: The national public broadcaster produced and broadcast a particularly disturbing and scathing video narrated by Gillian Pillay in September 2018, available at: https://www.youtube.com/watch?v=uYRhNDzTrYk

Annex 2.7.3.2: From Smart Cities to Smart People

Visible Inequality along the N2 - Cape Town International Airport to City Centre

Cape Town's Smart City Challenges, visible as you fly in… and as you drive to the city centre……and to the pristine beaches….

What South Africa Can Teach Us as Worldwide Inequality Grows

"*Nowhere is this* (inequality) *more obvious than in Cape Town, where 60% of the population, almost all black, lives in townships and informal settlements far from the city centre. There, government services are limited, schools and health care are underfunded, insecurity is rife, and jobs almost non-existent. Transport into the centre is expensive, dangerous and unreliable*": TIME, article by Aryn Baker, May 2, 2019.

Population Indicators: estimates based on 2011 census and multiple sources with recent data.

City/Suburb/Township*	Population	Area (km^2)	Average Density (per km^2)
Cape Town	443,0000	400	1530
Blue Downs + Delft + Eerster River	284,000	42	6800
Gugulethu	98500	6.5	15150
Khayelitsha	391800	39	1,0000
Langa	52400	3.1	16900
Manenburg	52900	3.4	15600
Mitchells Plain	310500	43.8	7100
Nyanga	58,000	3.1	18800
Philippi	200600	34.2	5900
Total for above townships	1448700	175	8274
Other townships	1209300	146	8274
Total Township Population	**2658,000**	**321**	**8274**
Non township population	**1772,000**	**2574**	**688**

* *Township:* Urban ghetto reserved for black and coloured South Africans during apartheid, still dominated by black and coloured South Africans in this democratic twenty-first century. Rapid urbanization by poor formerly rural dwellers maintains the apartheid-era racial characteristics of townships – predominantly black, young and poor: see charts 1.3a and 1.3b in Section 2.2.3 of this document, and the relevant rural/urban migratory patterns illustrated in slide 13 of https://www.sakan.org.za/Docs/Department%20of%20Human%20Settlements%20June%202016.pdf.

Sixty percent of Cape Town's residents (2.7 million) are packed into 321 square kilometres of townships, averaging 8274 persons per square kilometre. The remaining 40% of Cape Town's non-township dwelling citizens share much larger residential areas estimated at 2574km^2, giving a population density 12 times lower at 688/km^2. This must be the primary focus of Cape Town's urban development, smart or otherwise, if future civilian unrest and massive crime statistics are to be avoided.