



# Uganda's National 4IR Strategy

**A continental 4IR hub that enables a smart and connected Ugandan society**



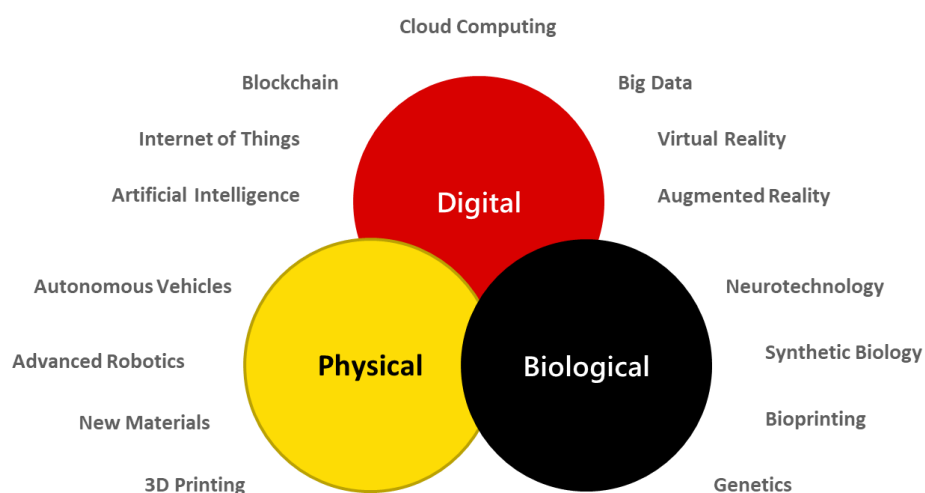
# Acronyms

Term	Definition
4IR	The Fourth Industrial Revolution
AI	Artificial intelligence
API	Application processing interface
AR	Augmented reality
AU	African Union
B2B	Business-to-business
BPO	Business process outsourcing
BTVET	Business, Technical, Vocational Education and Training
CBD	Central Business District
CCTV	Closed-circuit television
CFO	Chief Financial Officer
COO	Chief Operating Officer
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
DFI	Development Finance Institution
DPPA	Data Protection and Privacy Act
EMR	Electronic Medical Records
ESIPPS	Environment Surveys Information, Planning and Policy Systems
ESW	Electronic Single Window
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross domestic product
GDPR	General Data Protection Regulation
GIS	Geographic information system
GPS	Global Positioning System
GPU	Graphic processing unit
HEI	Higher education institution
HIS	health information system
HIV	human immunodeficiency virus
ICT	Information and communication technology
IP	Intellectual property
IT	Information technology
ITO	IT Outsourcing
IXP	Internet exchange point
KCCA	Kampala Capital City Authority
LMS	Learning Management Systems
M2M	Machine-to-machine
MDA	Ministries Department and Agencies
MNO	Mobile network operator
MoICT&NG	Ministry of ICT and National Guidance
MoFPED	Ministry of Finance, Planning and Economic Development

<b>NBI</b>	national Backbone Infrastructure
<b>NCDC</b>	National Curriculum Development Centre
<b>NDP</b>	National Development Plan
<b>NEMA</b>	National Environment Management Authority of Uganda
<b>NGO</b>	Non-Governmental Organisation
<b>NIISP</b>	National ICT Initiatives Support Programme
<b>NIRA</b>	National Identification and Registration Authority
<b>NITA-U</b>	National Information Technology Authority
<b>NPA</b>	National Planning Authority of Uganda
<b>NSSF</b>	National Social Security Fund
<b>OCR</b>	Optical Character Recognition
<b>PIA</b>	Privacy Impact Assessment
<b>PPP</b>	Public private partnership
<b>RCDF</b>	Rural Communications development Fund
<b>REA</b>	Rural Electrification Agency
<b>RECTS</b>	Regional Electronic Cargo Tracking System
<b>RPA</b>	Robotic Process Automation
<b>SDG</b>	Sustainable Development Goal
<b>SME</b>	Small or medium enterprise
<b>STEM</b>	Science, technology, engineering, and mathematics
<b>STI</b>	Science, technology and innovation
<b>SWG</b>	Sector Working Group
<b>UAV</b>	Unmanned aerial vehicles
<b>UBOS</b>	Uganda Bureau of Statistics
<b>UCC</b>	Uganda Communications Commission
<b>UDB</b>	Uganda Development Bank Limited
<b>UDC</b>	Uganda Development Corporation
<b>UDERB</b>	Uganda Digital Education Resource Bank
<b>UGGDS</b>	Uganda Green Growth Development Strategy
<b>UIA</b>	Uganda Investment Authority
<b>UIRI</b>	Uganda Industrial Research Institute
<b>UNBS</b>	Uganda National Bureau of Standards
<b>UNCCI</b>	Uganda National Chamber of Commerce & Industry
<b>UPE</b>	Universal Primary Education
<b>URA</b>	Uganda Revenue Authority
<b>URSB</b>	Uganda Registration Services Bureau
<b>VR</b>	Virtual Reality
<b>WEF</b>	World Economic Forum

# Executive Summary

The world in 2020 has changed fundamentally as technology integration becomes mainstream and key in the global response to the COVID-19 pandemic. The Fourth Industrial Revolution (4IR) relates to the combination of virtual, physical and biological interactions facilitated by technology.<sup>1</sup> This convergence is breaking down the siloes between the digital, physical and biological worlds. This relates to digital technologies such as cloud computing, AI and blockchain, physical technologies such as autonomous vehicles and 3D printing, and biological technologies such as bioprinting and neurotechnology. This convergence of technology is creating new opportunities by changing the way societies produce, distribute and consume goods and services. However, it also creates a range of risks that need to be monitored and managed.



Uganda has the opportunity to become a leading global player in harnessing 4IR applications to solve its development challenges with a concerted effort and a strategic focus on its areas of competitive advantage. This will require Uganda to take a proactive rather than reactive approach to creating opportunities and managing risks inherent in this new 4IR world. Harnessing 4IR opportunities for growth, competitiveness and human development will require a co-ordinated effort, not only among government but also the private sector and civil society. This effort includes targeted support for the process of local innovation, the localisation of 4IR technologies applied in specific domains, developing an agile governance framework, upskilling the population and ensuring 4IR connectivity so that all Ugandans can participate in and benefit from the 4IR economy.

President Museveni established a National Expert Taskforce on the 4IR in 2018 to advise the government on how to achieve these objectives<sup>2</sup>. The Taskforce subsequently identified the need for a national 4IR strategy to identify the key areas of opportunity for domesticating 4IR technologies, and the imperatives for realising and scaling these opportunities safely. An assessment of Uganda's 4IR opportunities and readiness was conducted to identify the areas that must be further developed to achieve these objectives. The approaches taken by comparator countries in the formulation of national 4IR technology strategies were also considered. Uganda's National 4IR strategy incorporates findings from the opportunities and readiness assessment, peer country assessment and a broad process of local stakeholder consultation to reflect the country's developmental objectives.

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<sup>1</sup> Klaus Schwab, 2015, The Fourth Industrial Revolution: What it Means and How to Respond, *Foreign Affairs*, Online, Available: <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution>

<sup>2</sup> The taskforce's specific objectives include: a national environmental scan and establishing the current status of 4IR initiatives in the country; to review existing national policies, legal and regulatory environment and standards; to recommend a comprehensive national ecosystem/strategy for the adoption and promotion of 4IR across a range of domains and activities; to identify national challenges and risks for the adoption of 4IR; To advise on an optimal national framework that will strengthen Uganda's position as a regional hub for the 4IR, and; to recommend a national institutional framework, regional and international partnerships and collaboration in 4IR as well as incentives for the adoption of 4IR technologies.

Achieving Uganda’s vision of becoming a 4IR hub and a competitive upper middle-income country by 2040 requires strategies that support wealth creation and the emergence of globally competitive industries. The enabling role 4IR can play in Uganda’s development is reflected in the vision, mission and objectives of this 4IR strategy.

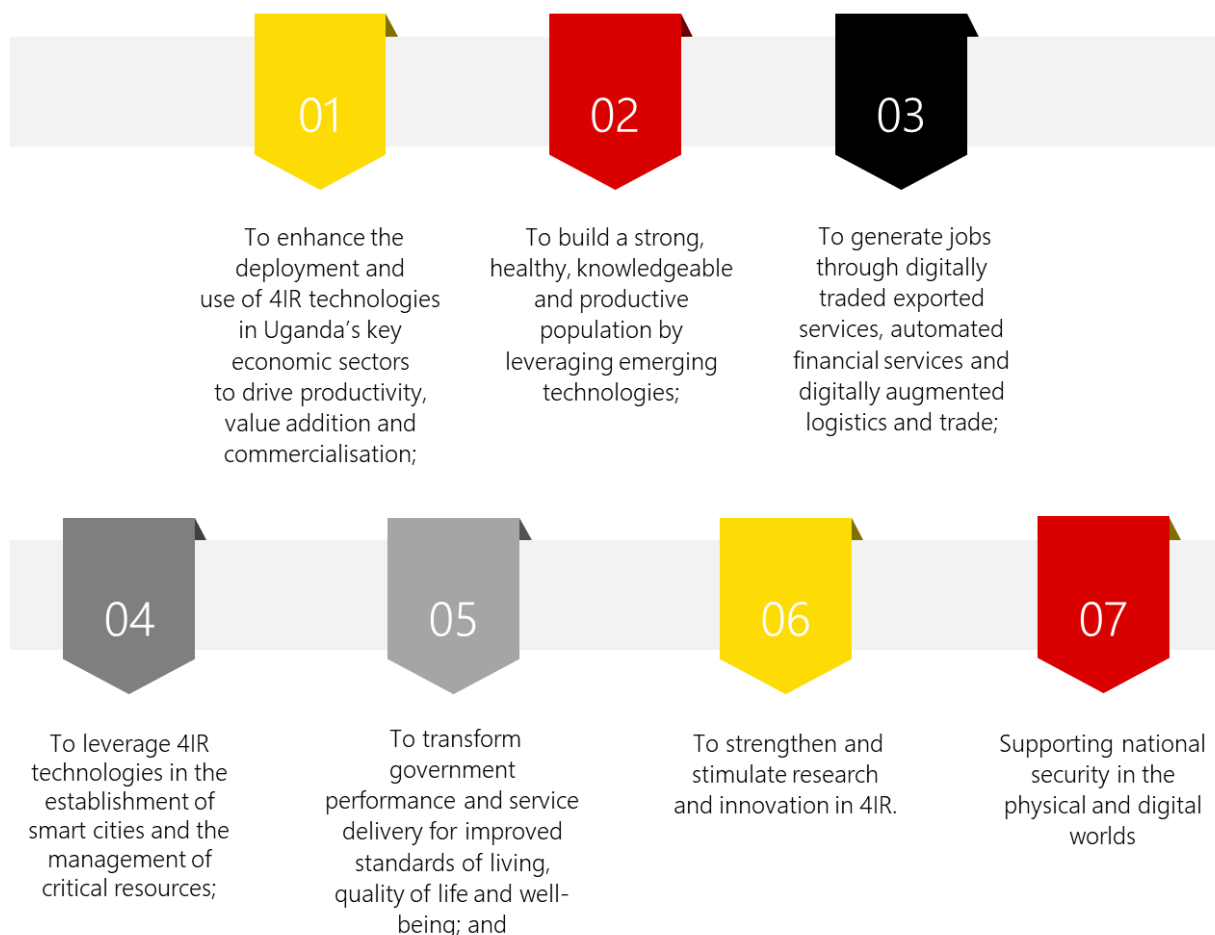
## Vision

*A continental 4IR hub that enables a smart and connected Ugandan society*

## Mission

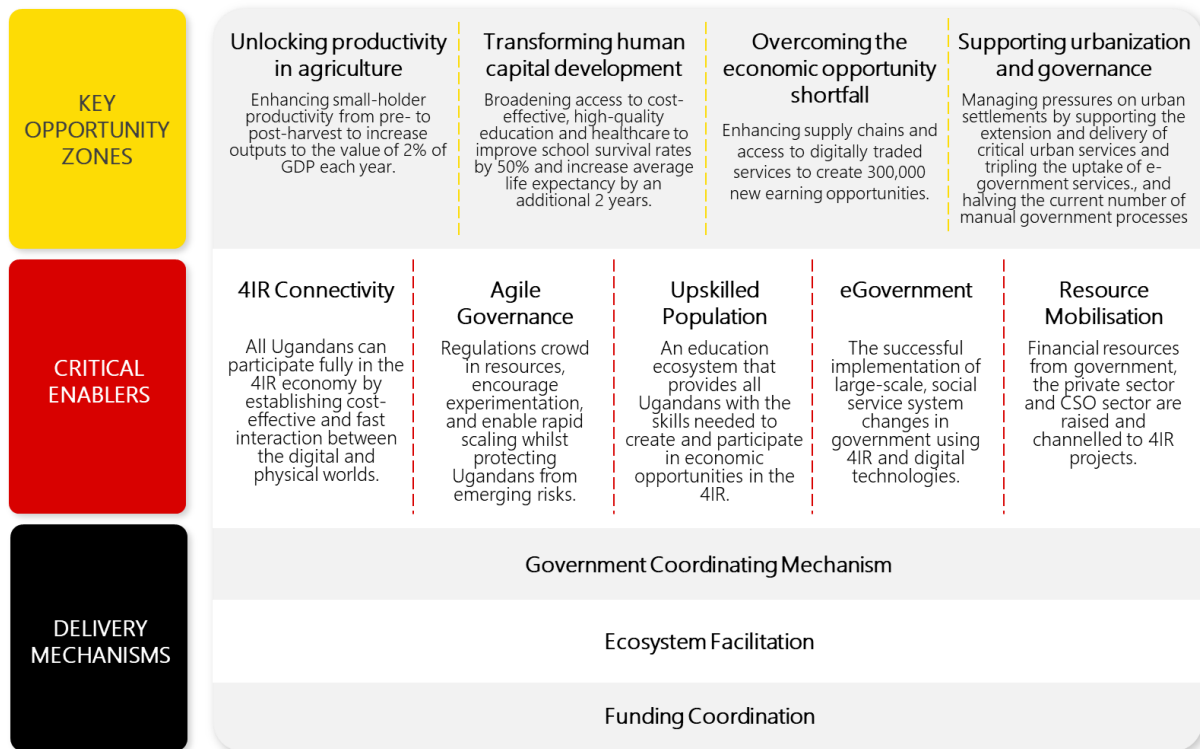
*To transform and accelerate Uganda’s development into an innovative, productive and competitive society using 4IR technologies by 2040*

## Strategic Objectives



This strategy document employs a three-part framework to set out Uganda’s key 4IR opportunities, enablers and delivery mechanisms. The key 4IR opportunities identify the areas where 4IR technology can contribute to concrete gains in Uganda’s development objectives. The critical enablers set out the actions that must be taken

for these gains to be realised. The delivery mechanisms provide practical implementation channels to ensure implementation of this strategy is effective and sustainable.



## 1. Opportunities in the 4IR

Since technology innovation can achieve a range of economic outcomes, it is critical that Uganda focuses its efforts on the domestication of those technologies with the greatest potential to solve Ugandan challenges. These development challenges are well documented, and a clear vision for the future has been identified in the country's development policies including Vision 2040, the third national development plan (NDPIII) and the Digital Uganda Vision.

The four priority areas of opportunity cover a variety of sectors and processes that will be critical to Uganda's ability to navigate powerful forces of change. These forces include climate change, rapid urbanisation, the youth wave<sup>3</sup>, and the global dispersion of production. Building and scaling the opportunities across these zones will be instrumental in Uganda's ability to realise structural transformation, harness the demographic transition, and mitigate the risks in the global economy.

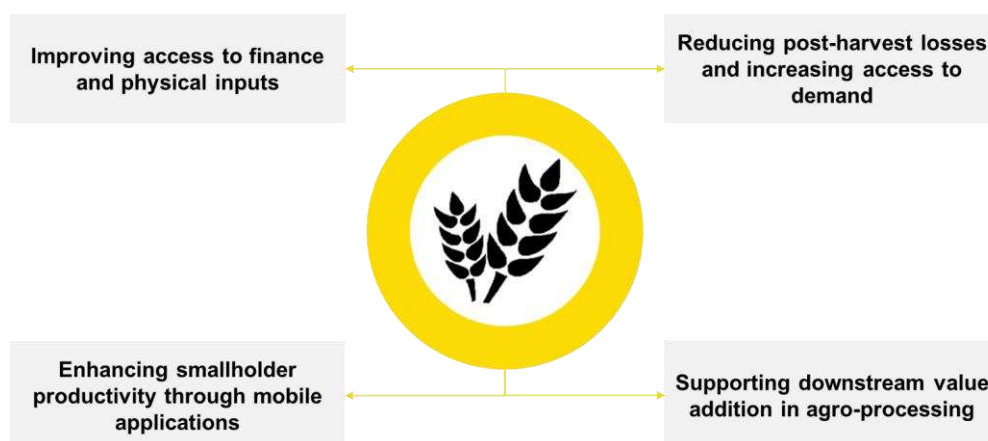
<sup>3</sup>Uganda's large youth population will be increasingly participant in the economic and political world. This 'youth-dividend' is a unique opportunity to leverage a vibrant and independent work-force to raise living standards and alter the course of the country.



## 1.1 Unlocking productivity in agriculture

*Enhancing small-holder productivity from pre- to post-harvest to increase outputs to the value of 2% of GDP each year.*

Commercialising Uganda’s agriculture sector by supporting smallholder farmers to become market-oriented is an imperative for Uganda. The deployment of 4IR technologies in Uganda’s agriculture sector can drive commercialisation and unlock value of approximately 2% of GDP each year<sup>4</sup>. The process of enhancing productivity in agriculture consists of four elements as shown in the diagram below.



**Improving access to finance and physical inputs:** smallholder farmers have historically struggled to gain access to sufficient finance and physical inputs, severely limiting their productivity and output. Remote sensing and weather analytics tools can be used to assess weather patterns to predict the impact of adverse weather conditions on future yield. Smart credit risk assessments can be used to provide financial institutions with agriculturally-relevant and data-driven models to assess risk and develop credit scoring models that fit the needs of smallholder farmers. Shared economy platforms will enable smallholder farmers to leverage the latest farming machinery and equipment at a lower cost. Bio-informatics, genetics and microbial technologies will substantially increase crop yield by creating pest resistant seeds that protect crops from the extreme conditions resulting from climate change.

**Enhancing smallholder productivity through mobile applications:** in the 4IR powerful analytics and diagnostic capabilities can be delivered through mobile phones to transform smallholder productivity. Smart irrigation will

<sup>4</sup> The estimate combines high level assumptions around uptake, data on the agriculture sector, and sources that detail the impact of interventions similar to those identified in the opportunity. This relates to improving access and disbursement of insurance; improving farmer ability to mitigate losses; providing farmers with smartly developed information services, and; increasing access to improved seeds.

enable smallholder farmers to improve irrigation management practices. AI diagnostics delivered through mobile applications provide the opportunity for smallholder farmers to improve soil management practices and maintain healthy crops. Mobile delivered digital extension services can upskill farmers' knowledge and capabilities to increase their productivity. Technologies that provide yield prediction and pricing analytics will enable smallholder farmers to adequately conduct farm management.

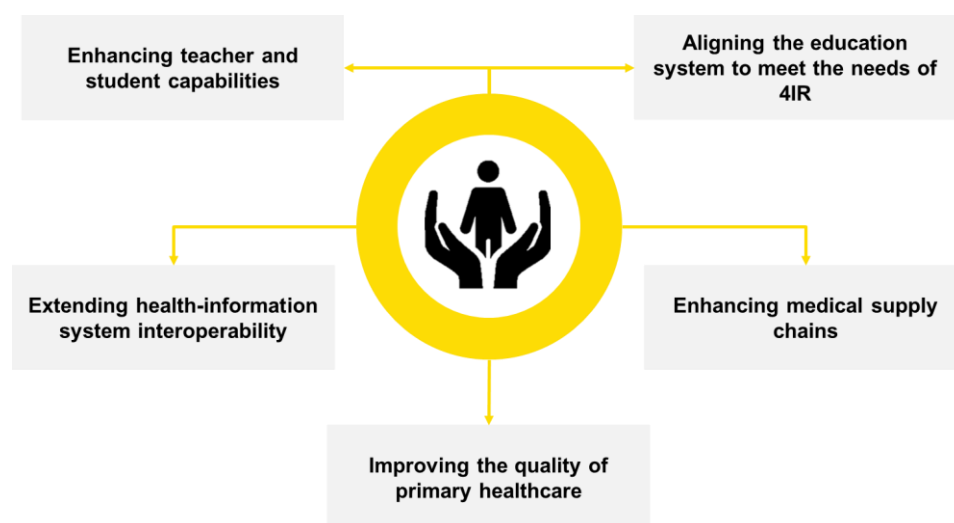
**Reducing post-harvest losses and increasing access to demand:** Poor post-harvesting techniques have resulted in post-harvest losses of over 30%<sup>5</sup>. Technologies that enable the monitoring of temperature and humidity will improve the quality of post-harvest storage facilities. In addition, technologies that connect farmers and traders via mobile phones will ensure competitive prices in the market, by eliminating price distortions brought about by middle-men, and unlock new business opportunities for farmers.

**Supporting downstream value addition in agro-processing:** increased output of smallholder farms provides the opportunity for downstream value addition when combined with improved competitiveness of the agro-processing industry. Mechanisation in the agro-processing industry will improve and enhance the value and quality of processed agricultural products. Low-cost flexible robotics can unlock the opportunity of increased value addition in agro-processing. Biotechnology in agro-processing can use micro-organisms for the preservation of food and for the production of a range of value-added products such as enzymes, flavour compounds, vitamins, microbial cultures and food ingredients.

## 1.2 Transforming human capital development

*Broadening access to cost-effective, high-quality education and healthcare to improve school survival rates by 50% and increase average life expectancy by an additional 2 years.*

Uganda is tasked with building a strong, healthy, knowledgeable, and productive human resources base as a key component of its Vision 2040. 4IR technologies can create tremendous gains in human capital development by rapidly assessing and responding to the weak links in both education and the health care system. While 4IR technologies can be leveraged to enhance socio-economic transformation, several challenges continue to impede the potential and reach of healthcare and education across Uganda. 4IR technologies present new ways to enhance human development outcomes and stretch what might otherwise be finite resources in the delivery of education and healthcare services. Five processes across the education and healthcare sector have been identified as the key areas for harnessing 4IR technology to build Uganda's human capital.



<sup>5</sup> World Bank. 2018. Uganda Economic Update, 11<sup>th</sup> Edition.



**Enhancing teacher and student capabilities:** access to quality schooling and tertiary education in Uganda remains low, despite significant gains due to universal education policies, with significant challenges in school management systems, teacher capacity and assessment methods. Biometric systems can be used to monitor teacher absenteeism and schools can put measures in place to increase teacher attendance. Digital tutoring & ICT in education can be used as channels to deliver quality education to populations who remain hard to reach. Improved visibility of, and data on, student performance and presence can improve the performance of the sector.

**Aligning the education system to meet the needs of the 4IR:** tertiary education is not sufficiently equipping Ugandans with the relevant knowledge, skills, and capabilities needed to participate in the transformation of the economy. Micro-credentialing and online courses can be used to acquire specific skills needed to meet the emergent needs of the 4IR. Incorporating ICT skills into school education is essential in developing a population that is digitally literate and skilled. NGOs currently operating in Uganda are delivering digital literacy and digital skills programs which provide the opportunity for scaling.

**Extending health information system interoperability:** current health information systems in Uganda do not create a single, accurate view of the performance and challenges of the healthcare system and provide a poor foundation upon which further innovations can be developed. The integration of healthcare information systems will assist in planning and facilitate innovation by providing a single view of the healthcare system. This digitised foundation could be leveraged for the deployment of new services and activities while additional 4IR technologies can broaden the availability and integrity of healthcare data.

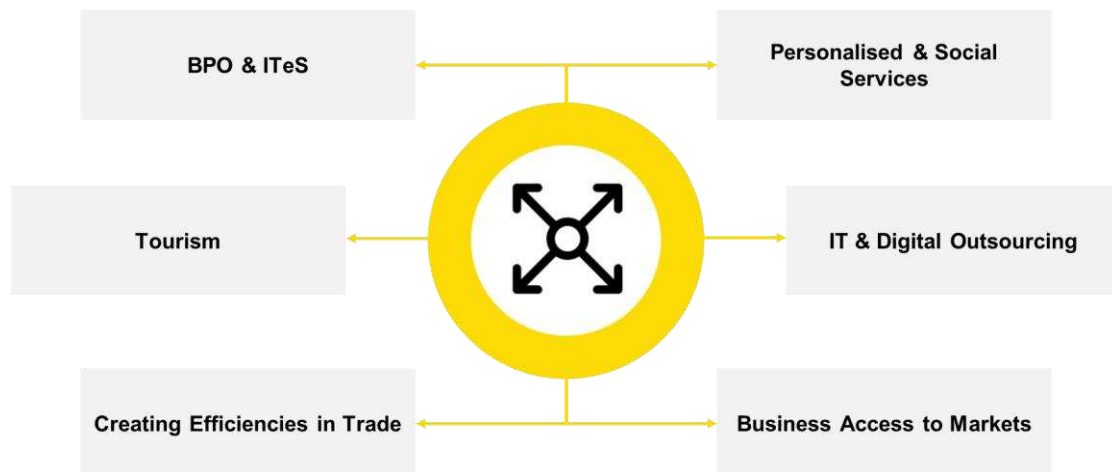
**Enhancing medical supply chains:** meeting the healthcare service needs of remote communities requires the efficient and effective operation of medical supply chains while maintaining supply-chain integrity. Unmanned aerial vehicles (UAVs), or drones, can carry small payloads of critical supplies rapidly and at low cost. Data on institution level inventories can be overlaid with institution level demand forecasts to assist in the dynamic short-term management of inventories and guide long term, sub-national planning. Furthermore, block chain can enhance the integrity of medical supply chains and overcome current challenges of counterfeit medicines by facilitating proof of authenticity.

**Improving the quality of primary healthcare:** emerging technologies can extend the reach of scarce expertise to enhance primary healthcare staff capabilities. These technologies can place deep expertise in the hands of primary healthcare staff. For example, telemedicine and remote diagnostics allows healthcare practitioners to diagnose and treat illnesses and other problems outside conventional healthcare settings. Furthermore, improving the way expert medical staff are trained using remote learning and AR and VR technology can overcome resource constraints.

### 1.3 Overcoming the economic opportunity shortfall

*Enhancing supply chains and access to digitally traded services to create 300,000 new earning opportunities*

Key to accelerating Uganda's growth is enabling access to foreign markets for emerging and established industries. Local, regional and international linkages can improve competitiveness and create growth opportunities for emerging businesses in both established and new industries. In addition, improvements in the affordability and functionality of information and communication technology (ICT) are supporting an enormous expansion in the global trade of services digitally. Global evidence suggests that Uganda can generate significant growth in jobs and export earnings by capturing a share of this demand for digitally-traded services. The process of harnessing technology to overcome the economic opportunities shortfall consists of six elements, as shown in the diagram below.



**BPO and ITeS:** although Uganda has an established BPO and ITeS sector, it remains nascent and has yet to scale significantly. The sector has received government prioritisation and support but has failed to convene and coordinate the players needed to significantly grow. In addition to convening and coordinating better, the BPO and ITeS sector can benefit from technologies which improve quality and cost margins. Investment in this technology can be costly, so the sector can grow organically by exploiting domestic opportunities to develop export capabilities.

**IT and digital outsourcing:** in addition to BPO services, the need for digital transformation across all industries and organisations has given rise to the next wave of outsourcing in ICT and digital services. Uganda’s IT sector has strong capabilities in foundational IT services but has not developed scale in higher-value services related to 4IR technologies. The domestic demand for IT development and deployment is a valuable opportunity for scaling the IT sector, deepening and broadening capabilities and establishing a standard of quality that is exportable. Uganda has the opportunity to move up the IT value chain by developing exportable capabilities in advanced tech services.

**Personalised and social services:** In addition to the business services discussed above, there are also an expanding set of personalised and social services being traded digitally which offer additional opportunity. Although these forms of virtual services are not well developed in Uganda, there are significant opportunities to capture demand for these services domestically and in the global market. The agriculture, healthcare and education sectors provide a real opportunity for Uganda to make use of digitally-traded services to create jobs and improve development outcomes. Mobile and digital platforms can be utilised to provide agriculture and tele-farming services including know-how advice and information about markets and prices, prevention of pests and diseases and the location of veterinarians.

**Tourism:** the tourism sector is a fundamental component of the Ugandan economy and provides a real opportunity for scaling job creation. The deployment of digital technologies can improve customer experience as well as ensure the sustainability and quality of the sector. Emerging technologies are furthermore critical to ensuring the sustainability of the industry by improving conservation capabilities such as the use of IoT for monitoring poaching, predictive modelling of poacher activity and drone monitoring and response.

**Improving business access to markets:** Uganda hosts a small domestic market where there is limited access for remote communities to domestic supply chains, and consumers have low buying power. Ugandan businesses can scale through access to e-commerce channels which reduce barriers to entry by providing a low cost means of accessing non-localised markets. In addition, the use of frontier technologies can enhance SME access to online sales, overcome challenges in delivering to hard-to-reach communities, and be used to improve customer experience.

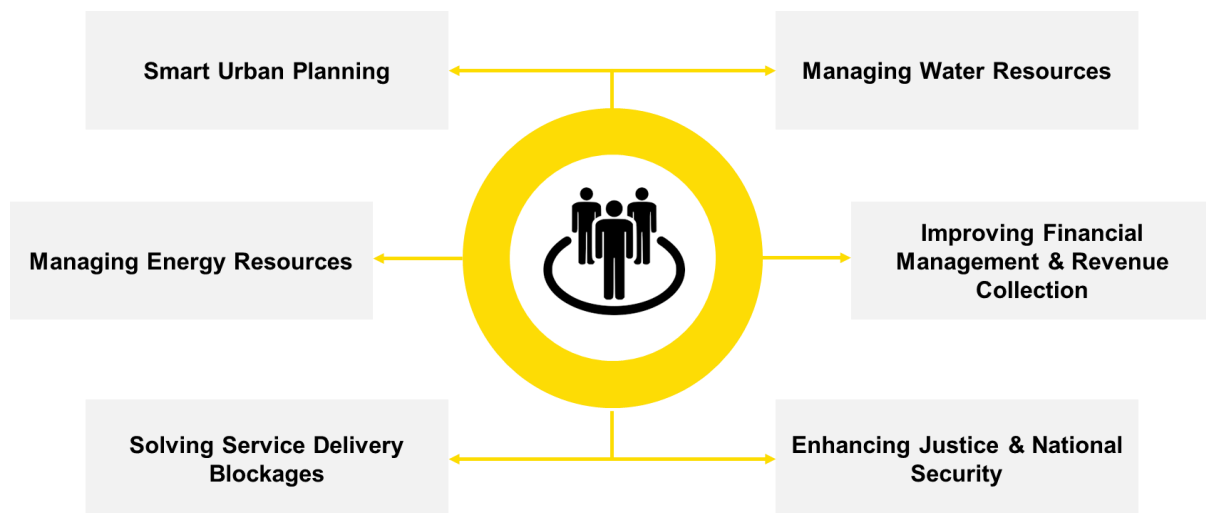
**Creating efficiencies in trade:** Uganda’s landlocked status incurs significant additional costs and time for trade relative to its peers. Uganda has made significant progress in reducing the time and cost of cross-border trade,

however there remains room for improvement. Emerging technologies can increase efficiency and reduce the costs of cross-border trade processing. Technologies that facilitate the real-time tracking of cargo have had substantial successes in Uganda. The Uganda Revenue Authority (URA) deployed a real-time electronic cargo tracking system (RECTS) which has been pivotal in improving supply chain visibility and trade efficiency of high risk and sensitive cargo. The success of the RECTS system illustrates how emerging technologies can be replicated by the private sector, however there is further opportunity in VR, AR and block chain.

## 1.4 Supporting urbanisation and governance

*Managing rising pressures on urban settlements by supporting the extension and delivery of critical urban services, tripling the uptake of e-government services and halving the current number of manual government processes*

Uganda has a set of ambitious Vision 2040 targets related to rapid urbanisation which necessitate the efficient planning and management of critical resources. 4IR technologies can be leveraged to modernise planning and resource management in the key areas of transportation, water and energy. As the government modernises its approach to managing urbanisation, it is also critical that the public sector leverages 4IR technologies to deliver on the goals of productivity, growth and wealth creation. The opportunities for harnessing technology to improve human settlements and governance consists of six elements, shown in the diagram below.



**Smart urban planning:** it is estimated that 24,000 person-hours are lost to traffic congestion every day in Kampala, the heart of Uganda’s commerce.<sup>6</sup> Slow progress in paving the road network, a lack of integrated planning and insufficient data are among the key reasons for continued congestion cited in NDPIII. Analysing big data from cell phone towers and geographic information systems will reveal trends and patterns of mobility and inform the intelligent design of public transport routes. Additionally, it will direct the cash-strapped public works department to the priority routes for upgrades and more frequent maintenance.

**Managing water resources:** despite high safe water coverage, Uganda’s poorly maintained network of boreholes results in a low real access to safe drinking water. Little regulation on the digging of boreholes and out-dated methods for monitoring the boreholes across the country are drivers of this problem. The fusion of IoT sensors, cloud-based water management systems and a ‘user pays’ principle can provide real time data and funding for a sustainable borehole management programme in Uganda.

**Managing energy resources:** Only 10% of rural households are able to access electricity through the national main grid, or mini grids. The tariffs on the national grid, although cost reflective, leave many rural consumers in the

<sup>6</sup> Wee Tracker. 2019. *Kampala Faces 24000 Man-hour Loss Everyday Due To Traffic Jam*

dark. Smart micro and nano renewable energy grids are a promising solution to electrifying rural or otherwise remote communities. The government's recognition of the value of small-scale renewable off grid solutions and their existing roll out plan shows that this is an avenue the country is already pursuing.

**Improving financial management and revenue collection:** Uganda struggles to independently finance developmental projects through domestic revenues. Development financing challenges are noted in NDP III where a renewed focus is to be placed on revenue collection and fiscal management. Emerging technologies can help Ugandan tax authorities improve revenue collection and manage the current fiscal gap by predicting risks of non-compliance and tax avoidance. Artificial intelligence can combine and digest enormous volumes of numerical and natural language data to derive insights, identify anomalies and predict behaviour. Tax authorities in markets such as South Africa, India and Canada are investigating how big data can be used to understand taxpayer behaviour and identify current and future risks of tax evasion. Artificial intelligence can also reduce the complexities of filling out tax returns.

**Solving service delivery blockages:** unlocking latent government efficiencies can improve service delivery and reduce the fiscal burden of government operations. This relies on the integration of government systems, and the intelligent automation and targeted streamlining of government processes. Robotic process automation can increase how efficiently and accurately government processes and workflows are performed. By integrating government services into a single point of access, citizen uptake of services and cross-departmental coordination can be improved. This is evidenced by the success of Estonia's eGovernment program where 99% of government services are online and 844 years of national working time is saved annually<sup>7</sup>.

**Enhancing justice and national security:** although Ugandan citizens have improving access to justice services, the judicial system continues to suffer from inefficiencies. Emerging technologies can improve citizen access to judicial services, increase the judicial system's efficiency, and enhance corruption detection. Border patrolling and security is a government function that has historically been resource intensive, but using drones can significantly reduce these costs. 4IR technologies can also be deployed to both ease the burden on civil security personnel such as police officers and firefighters, and inform their response to emergencies. Emerging technologies are not only detecting threats and emergencies in the physical world but also enhancing national security in the digital world.

## 2. Critical Enablers

Executing on the opportunities that the 4IR presents requires a consolidated approach that unlocks resources and coordinates efforts. Realising the 4IR opportunities identified in this strategy will require a concerted effort to put five critical enablers into place: 4IR connectivity, agile governance, upskilled population, eGovernment, and resource mobilisation and investment promotion.

### 2.1 4IR connectivity

This critical enabler aims to ensure that **all Ugandans can participate fully in the 4IR economy by establishing cost-effective and fast interaction between the digital and physical worlds**. There are three areas for strategic action to achieve this objective: network access, physical technology access and cloud computing. The priority actions are in network access given the foundational importance of high-speed affordable networks in the 4IR. The network access actions identified in the strategy aim to achieve national broadband at 100% geographical coverage of a minimum speed of 4Mbps, and 80% population coverage of a minimum speed of 8Mbp by 2025. The other objectives of this strategy are firstly ensuring ubiquitous use of the highest quality, lowest cost physical technology, and secondly access to competitive, agile, and lowest-cost cloud services from multiple providers.

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<sup>7</sup> Estonia XRoad. 2019. Online

## 2.2 Regulatory agility

This critical enabler aims to ensure that **regulations crowd in resources, encourage experimentation, and enable rapid scaling whilst protecting Ugandans from emerging risks**. There are three areas for strategic action to achieve this objective: agile governance, closing regulatory, legislative and strategic gaps, and data legislation and regulation. The priority actions are in data legislation and regulation given the foundational importance of data sharing in the 4IR. The actions identified in this strategy aim for Uganda's data protection regulation and legislation frameworks to enable data sharing, meet global standards for data protection and harmonise with emerging technologies. The other objectives of this strategy are firstly equipping regulators to be able to quickly respond to changing conditions, adjust regulation accordingly and enable business experimentation with new technologies, and secondly closing the legislative, regulatory and strategic gaps created by 4IR technologies.

## 2.3 Upskilled population

This critical enabler seeks to establish **an education ecosystem that provides all Ugandans with the skills needed to create and participate in economic opportunities in the 4IR**. There are three areas for critical action identified in this strategy: foundational skills, micro-credentialing and flexible accreditation, and higher education. The priority actions are in higher education given the critical need to quickly scale a pipeline of skills needed to support the growth of the 4IR economy. The actions identified in this strategy aim to position HEIs to provide the technical and practical 4IR expertise needed in the local market. The other objectives of this strategy are firstly ensuring that Ugandans coming out of basic and secondary schools are equipped to engage in the 4IR economy or take up tertiary training in 4IR-related skills, and secondly that Uganda's accreditation and credentialing framework recognises and encourages new approaches to learning that make use of digital and other technologies.

## 2.4 eGovernment

This critical enabler aims to ensure **the successful implementation of large-scale, social service system changes in government using 4IR and digital technologies**. There are three areas for strategic action identified in this strategy: NITA-U, MDA and sector capacity deepening, government prioritisation and government procurement. The priority actions are in government prioritisation given the need to demonstrate and deliver some quick wins in improving public service delivery through 4IR technology applications. The actions identified in this strategy aim for prioritised, 4IR enabled e-government initiatives to be rapidly executed in high impact areas. The other objectives identified in this strategy are firstly for NITA-U, critical sectors and critical MDAs to be capacitated to deliver on key 4IR projects in government, and secondly to introduce a range of procurement tools to promote the emergence and scaling of 4IR businesses locally.

## 2.5 Resource Mobilisation & Investment Promotion

This critical enabler seeks to ensure that **financial resources from government, the private sector and CSO sector are raised and channelled to 4IR projects**. There are three areas for strategic action identified in this strategy: R&D spend, early stage financing, and attracting global tech. The priority actions are in attracting global tech given the importance of integration with the global tech economy for countries like Uganda to be able to access global demand to scale its 4IR economy significantly. The actions identified in this strategy aim to establish a clear 4IR value proposition for Uganda to attract global technology investment and execute an investment promotion action plan to win Tier 1 and 2 global tech companies, their partner and investors to set up in Uganda. The other objectives identified in this strategy are firstly for public and private research and development spending to constitute the AU's recommended level of 1% of GDP, and secondly for local and foreign capital to be channelled into early-stage and growth funding for firms using 4IR technologies.

## 3. Delivery mechanisms

Harnessing the opportunities the 4IR offers will require a coordinated effort, not only among government but also the private sector and civil society. Three delivery mechanisms are required to overcome challenges in collective

decision making, align the interests of multiple stakeholders and ensure there is effective coordination for execution on the strategy. The first delivery mechanism - *Coordinating 4IR through government* - details the design of a permanent coordinating body within the office of the Prime Minister to ensure that 4IR interventions and strategies are effectively and efficiently executed by government. The second delivery mechanism - *Ecosystem Facilitation* - aims to ensure that stakeholders and resources from many different parts of society are convened around specific opportunities and coordinated to action. The third delivery mechanism - *Funding Coordination* - aims to ensure that government, development partner and CSO funding is funnelled into high impact 4IR interventions that support government objectives.

### 3.1 Coordinating 4IR through government

The strategy presents a government led coordinating mechanism that prioritizes, allocates responsibilities and executes on nationally relevant 4IR strategies and interventions. This mechanism will ensure continuity and evolution of Uganda's National 4IR strategy while creating the means for efficient and effective execution. The proposed mechanism has been designed to overcome common collective decisioning complexities that coordinating entities in government face. To achieve this a permanent coordinating mechanism located in the office of the Prime Minister is recommended. This mechanism should be formally institutionalised through legislation to strengthen its capacity. This mechanism shall be a project in the office of the Prime Minister composed of a coordinating committee, a technical committee, a range of technical working groups as well as a range of opportunity working groups.

### 3.2 Ecosystem Facilitation

This strategy has identified four zones of opportunity where the application of 4IR technology can unlock significant value for Ugandan society. Within each opportunity zone, however, there are many different stakeholders that need to come together for these opportunities to be realised and scaled significantly. In other countries that have successfully pulled this kind of coordination off, there are specific institutions that play this coordinating role. Two examples are the centres of excellence (CoE) run by the National Association of Software and Service Companies (NASSCOM) in India – one on [AI and Data Science](#) and the other on [IoT and AI](#). What makes these CoEs special is the facilitating role they play in connecting stakeholders together for particular technology applications in specific domains. Uganda will establish a centre of excellence for 4IR applications in agriculture. The CoE should be established through a PPP model where government can provide the physical infrastructure and some funding, and corporate or development partner sponsorships (among the large global tech companies or development partner agencies) can provide the rest of the budget.

In addition, all of the identified opportunities require data as one of the core elements of the 4IR. Data is increasingly recognised as a critical national and business asset. Deepening the stock of available data and unlocking its flows can help to transform Uganda into a regional and global leader in 4IR. Open government data provides citizens and businesses with the opportunity to use government data for innovation and monitoring government performance. While promoting efficient citizen and business access to machine readable data is crucial in supporting innovation and the performance of the state, data sharing and collaboration within and between government departments can increase the value created by government data sources. Data sharing within the private sector and between the private and public sector is equally critical in supporting innovation. Data institutions should therefore be set up to steward pools of data on behalf of the public and private sector by controlling who has access and for what purposes. If well positioned and appropriately designed, these institutions can support the collaborative and safe use of public sector, private sector and development partner data to solve national developmental challenges.

### 3.3 Funding coordination

Funding the implementation of Uganda's national 4IR strategy will require coordination between the Ugandan government and the rich development partner and civil society community that support Uganda's development. A mechanisms is needed to convene the key government and development partner/CSO actors with a stake in Uganda's 4IR strategy and align these actors with the priorities identified in the strategy. Fortunately, there is

already an ICT Sector Working Group (SWG) convened with the purpose of collective planning, budgeting, resource allocation and performance review in the ICT sector. The SWG will have to deliver on identifying and channelling resources to high-impact 4IR interventions among its members. This includes identifying and supporting relevant projects that support the priority areas identified in this strategy.