



2018 SKILLS BUILDING PROGRAM



BIG DATA, ARTIFICIAL INTELLIGENCE AND DECISION SCIENCE IN HEALTH AND NUTRITION

Développements et Futur de l'IA en Afrique

Dr Jacques Ludik

Fondateur & Président du MIIA (Machine Intelligence Institute of Africa)

In partnership with



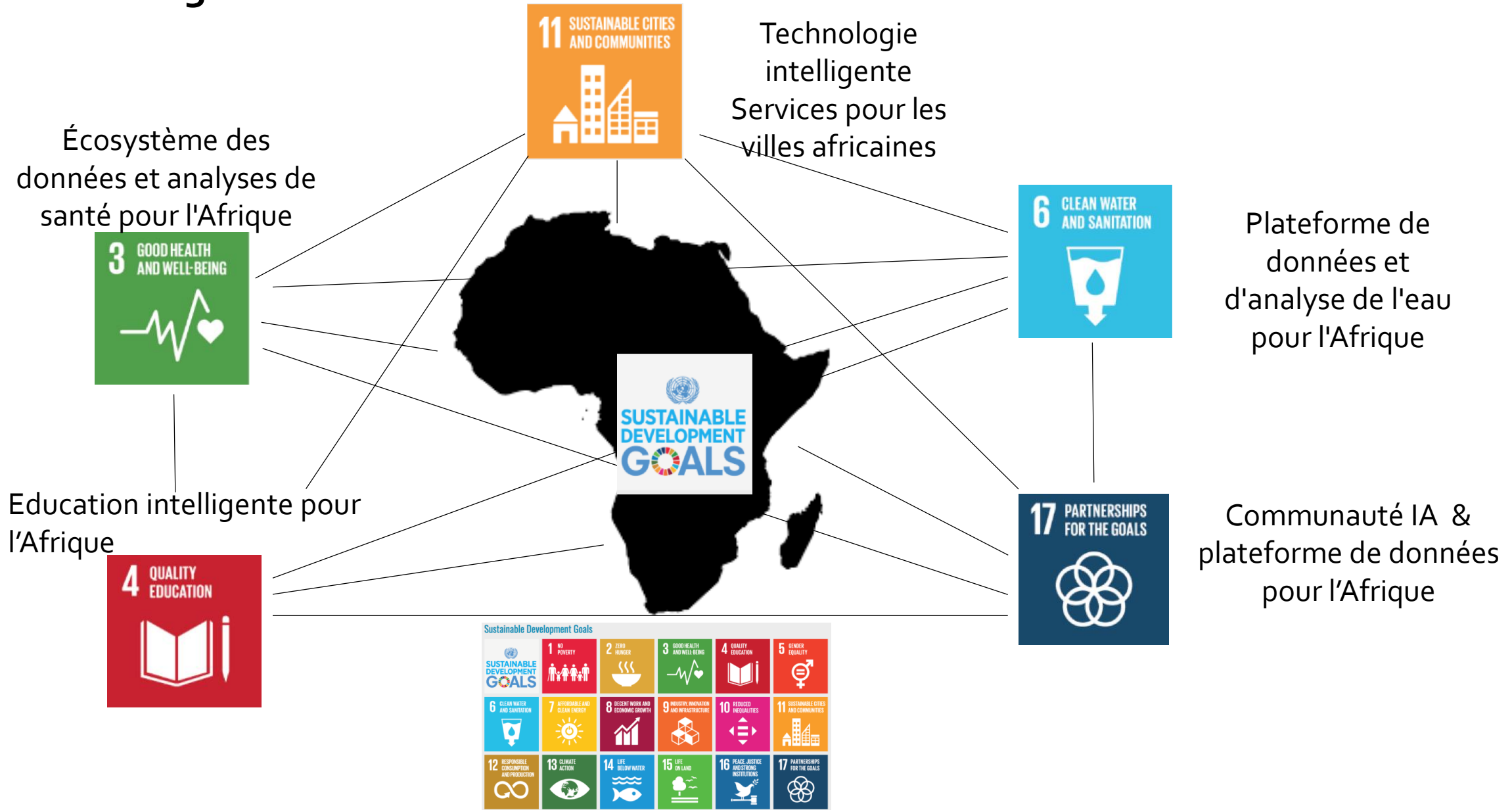
Services de santé, d'eau, d'éducation intelligente et de technologie intelligente pour les villes intelligentes africaines



- Résumé
- Ere de la Technologie intelligente
- Plateforme Communauté et données IA pour l'Afrique
- Écosystème des données et analyses de santé pour l'Afrique
- Plateformes de données et d'analyse de l'eau pour l'Afrique
- Education intelligente pour l'Afrique
- Services de technologie intelligente pour les villes intelligentes africaines
- Annexe
 - IA en Afrique - le présent
 - IA en Afrique - l'avenir



Services de santé, d'eau, d'éducation intelligente et de technologie intelligente pour les villes intelligentes africaines



Cartographie de l'IA pour le Sommet mondial, Pistes pour le projet de technologie intelligente africaine

IA pour le sommet mondial	Exemples d'utilisations	Projet de cartographie pour l'Afrique : Services de santé, d'eau, d'éducation intelligente et de technologie intelligente pour les villes intelligentes africaines	
IA & imagerie satellitaire	montrer le potentiel de l'IA pour cartographier la pauvreté et aider à faire face aux catastrophes naturelles grâce à l'imagerie satellitaire	Plateforme Communauté et données IA pour l'Afrique	Services de technologie intelligente pour les villes intelligentes africaines
IA & santé	de nouvelles opportunités pour l'IA pour aider à atteindre la couverture sanitaire universelle	Écosystème des données et analyses de santé pour l'Afrique	Plateforme communautaire et de données IA pour l'Afrique; Services de technologie intelligente pour les villes intelligentes africaines
Villes intelligentes et communauté IA	Comment l'IA pourrait-elle aider à fournir des services axés sur le citoyen dans les villes intelligentes?	Communauté IA et plateforme de données pour l'Afrique, Technologie intelligente pour villes africaines intelligentes	Plateforme de données et d'analyse de l'eau pour l'Afrique
Confiance en l'IA	contribuer à la transparence et à l'explication des algorithmes d'IA	AI Community & Data Platform for Africa	Smart Technology Services for African Smart Cities

L'Ere de la technologie intelligente



THE FOURTH INDUSTRIAL REVOLUTION

Shaping a Better Future in the Smart Technology Era

Nous sommes au bord d'une révolution technologique qui modifiera **fondamentalement** notre mode de vie, notre travail et nos relations mutuelles ...

THE FOURTH INDUSTRIAL REVOLUTION L'ère de la Technologie Intelligence est ici...

Elle s'appuie sur la révolution numérique et se caractérise par la **fusion de nouvelles technologies** qui brouillent les frontières entre les mondes physique, numérique et biologique, impactant toutes les disciplines, économies et industries, et même défiant les idées sur ce que signifie être humain

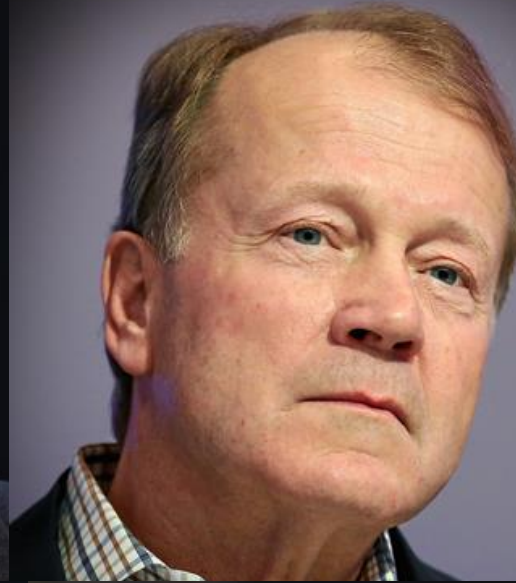
We cannot wait until there are massive dislocations in our society to prepare for the Fourth Industrial Revolution

Robert J. Shiller
Yale University



If you don't innovate fast, disrupt your industry, disrupt yourself, you'll be left behind.

John Chambers
Chairman and Chief Executive Officer, Cisco, USA



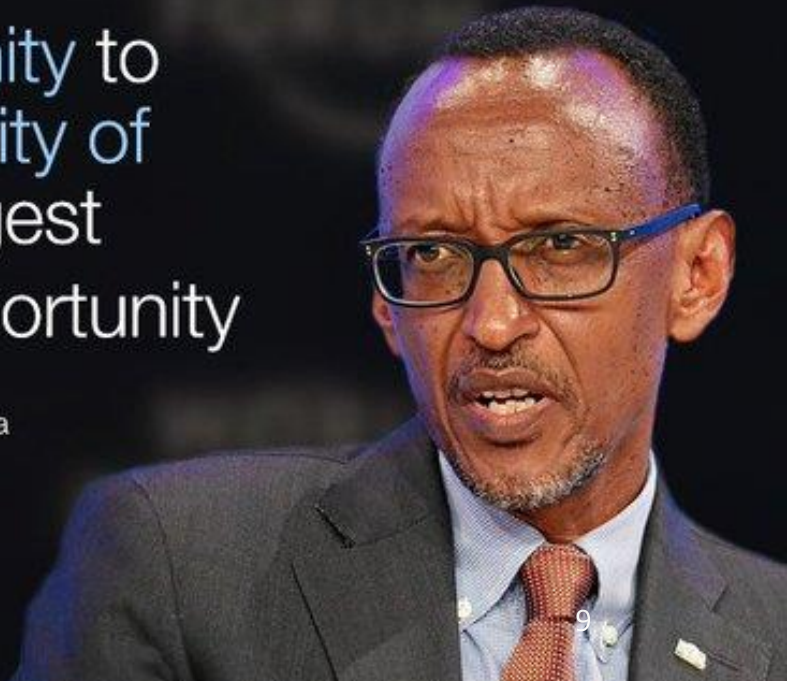
The Fourth Industrial Revolution should be a revolution of values

Amira Yahyaoui
Founder and Chair, AI Bawsala



The opportunity to raise the quality of life is the biggest business opportunity

Paul Kagame
President of the Republic of Rwanda





In the new world,
it is not the big fish
which eats the
small fish, it's the
fast fish which
eats the slow fish

Klaus Schwab

We need to start
sharing not the
burden, but the
responsibility

Federica Mogherini
Vice-President of the European Commission



A secular shift in
commerce is coming,
and for companies
ready to embrace it,
there's a \$14 trillion
opportunity at stake

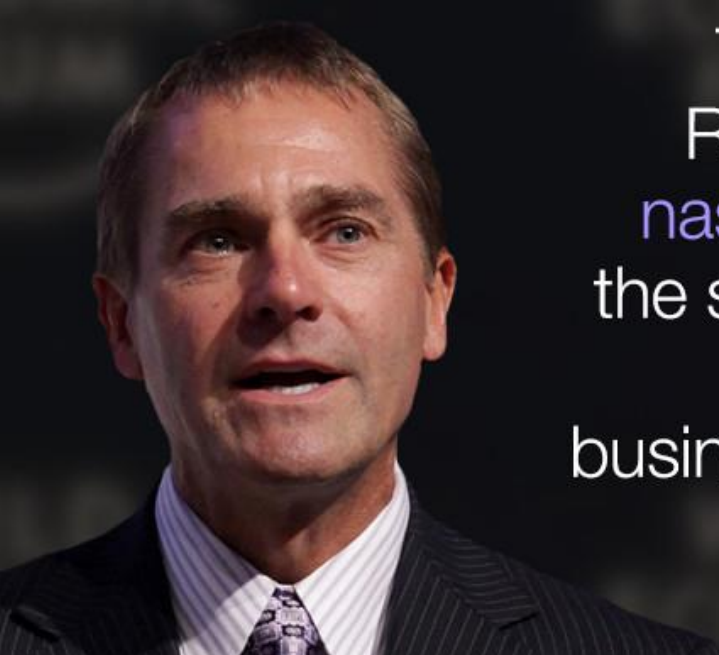
Devin Wenig
President and CEO of eBay



Africa is an article of
faith. I believe in this
continent

Sunil Bharti Mittal
Founder and Chairman, Bharti Enterprises
Co-Chair of the World Economic Forum on Africa





The Fourth Industrial Revolution is still in its nascent state. But with the swift pace of change and disruption to business and society, the time to join in is now

Mexico is one of the only nations whose constitution recognizes the right of its people to a broadband internet connection



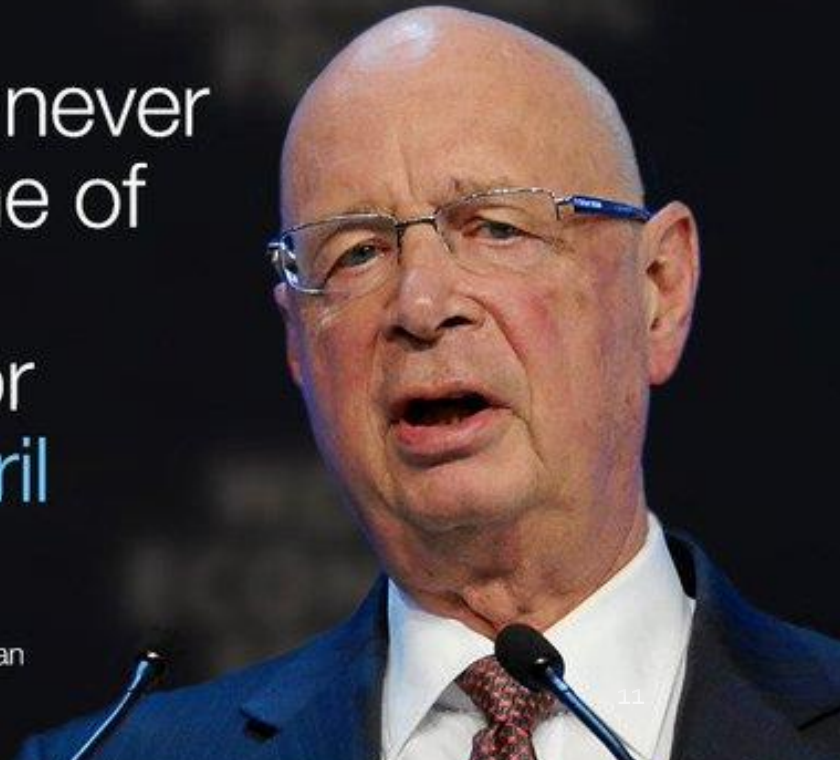
China is paying more attention to the quality, not the quantity, of economic growth

Jiang Jianqing
Chairman of the Board, Industrial and Commercial Bank of China Limited

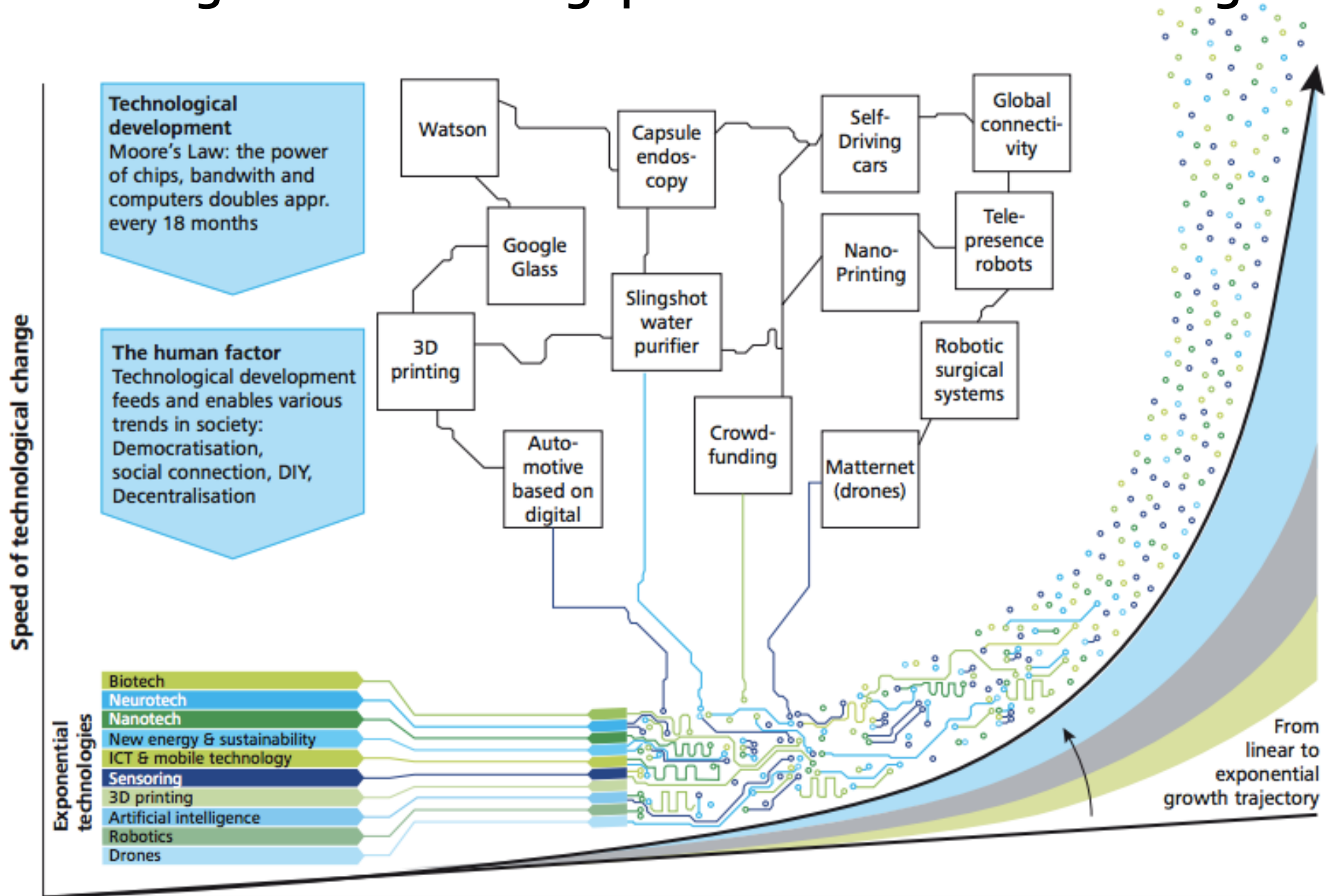


There has never been a time of greater promise, or greater peril

Professor Klaus Schwab
Founder and Executive Chairman
of the World Economic Forum



Vitesse de changement technologique dans l'ère de la technologie intelligente



Des opportunités illimités avec les mobiles et les technologies exponentielles

Les possibilités offertes à des milliards de personnes connectées par des appareils mobiles, avec une puissance de traitement, **une capacité de stockage et un accès au savoir sans précédent**, sont illimitées.



Et ces possibilités seront multipliées par des percées technologiques dans des domaines tels que: **l'intelligence artificielle, la robotique, l'Internet des objets, les véhicules autonomes, l'impression 3D, la nanotechnologie, la biotechnologie, la science des matériaux, le stockage d'énergie et l'informatique quantique.**



“ AI is the new
electricity.”

Andrew Ng, Baidu



WORLD
ECONOMIC
FORUM

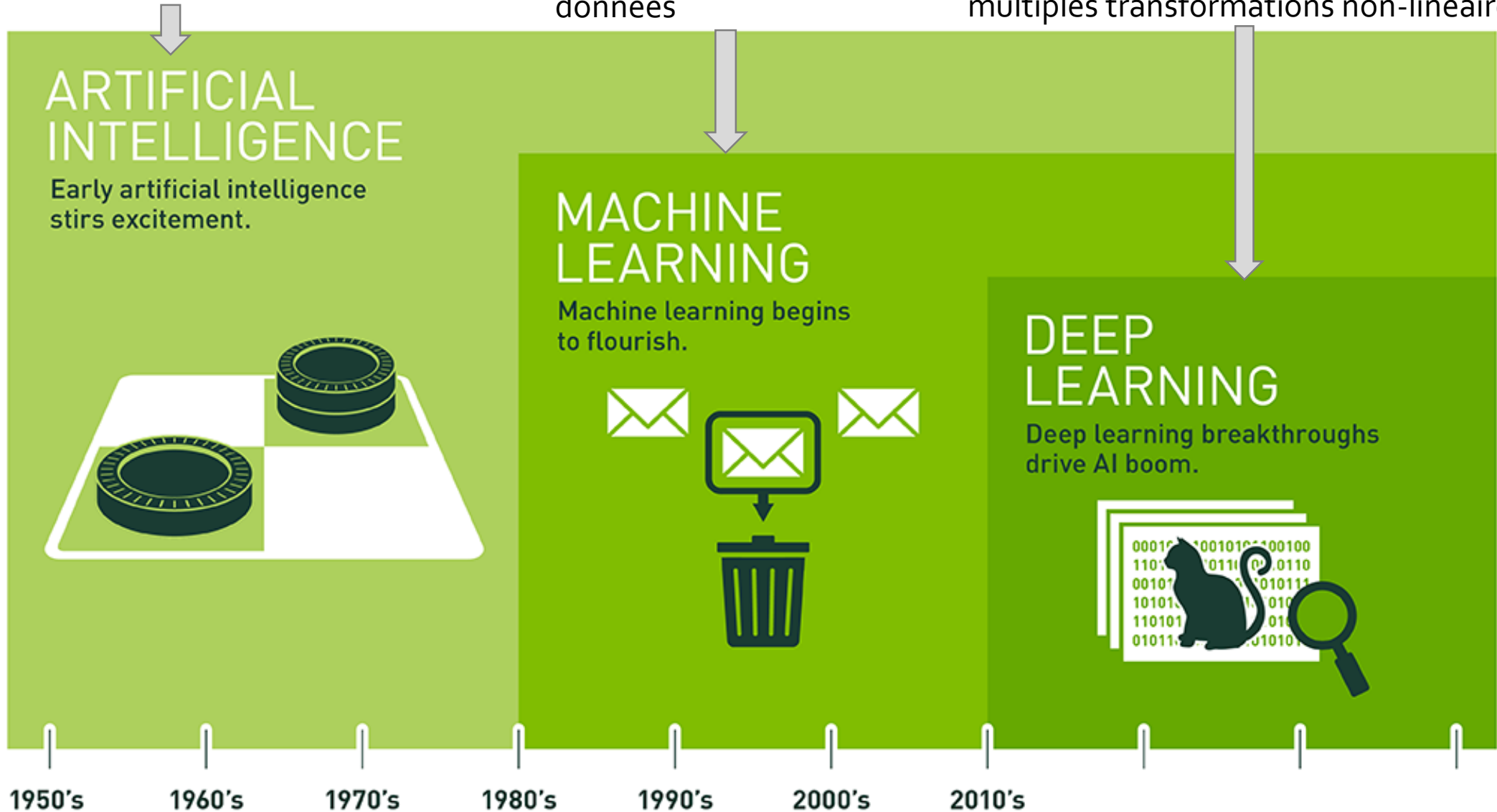
The **artificial
intelligence**
revolution
is here

Marc Benioff says
it will change your life

L'intelligence présentée par les machines ou les logiciels, et la branche informatique qui développe des machines et des logiciels avec **INTELLIGENCE**

Une branche de l'IA concerne la construction et l'étude des systèmes qui peuvent **APPRENDRE** des données

Un ensemble d'algorithmes dans ML qui tentent de **MODELISER DES ABSTRACTIONS DE HAUT NIVEAU** dans les données en utilisant des architectures de modèles composées de multiples transformations non-linéaires



The Deep Learning Recipe



How many shortest-length paths are there to get from your house to the doughnut shop?

4 up's
7 right's

$\binom{11}{7} = \binom{11}{4} = 330$ paths

$\binom{n}{k} = \frac{n!}{k!(n-k)!}$

$e^x + 1 = 0$

Find $7 + 12 + 17 + 22 + \dots + 343$

$7, 11, 15, 19, 23, \dots$

$\mu_1 - \mu_2 = 4$
 $\mu_2 - \mu_3 = 4$
 $\mu_3 - \mu_4 = 4$
 \vdots
 $\mu_n - \mu_{n+1} = 4$
 $\mu_n - \mu_1 = 4n$
 $\mu_n = \mu_1 + 4n$

$K_{2,3}$

Algorithms

There are six dogs to give 25 bones. Use a "stars and bars" diagram to illustrate the first and sixth dog get 3 bones, the second dog gets none, the third dog gets 5 and the fourth dog gets one.

||**||***

$A = \{2, 4, \oplus, \otimes\}$

$(A \cup B) \cup (A \cap B)$

$v = e + f = 2$

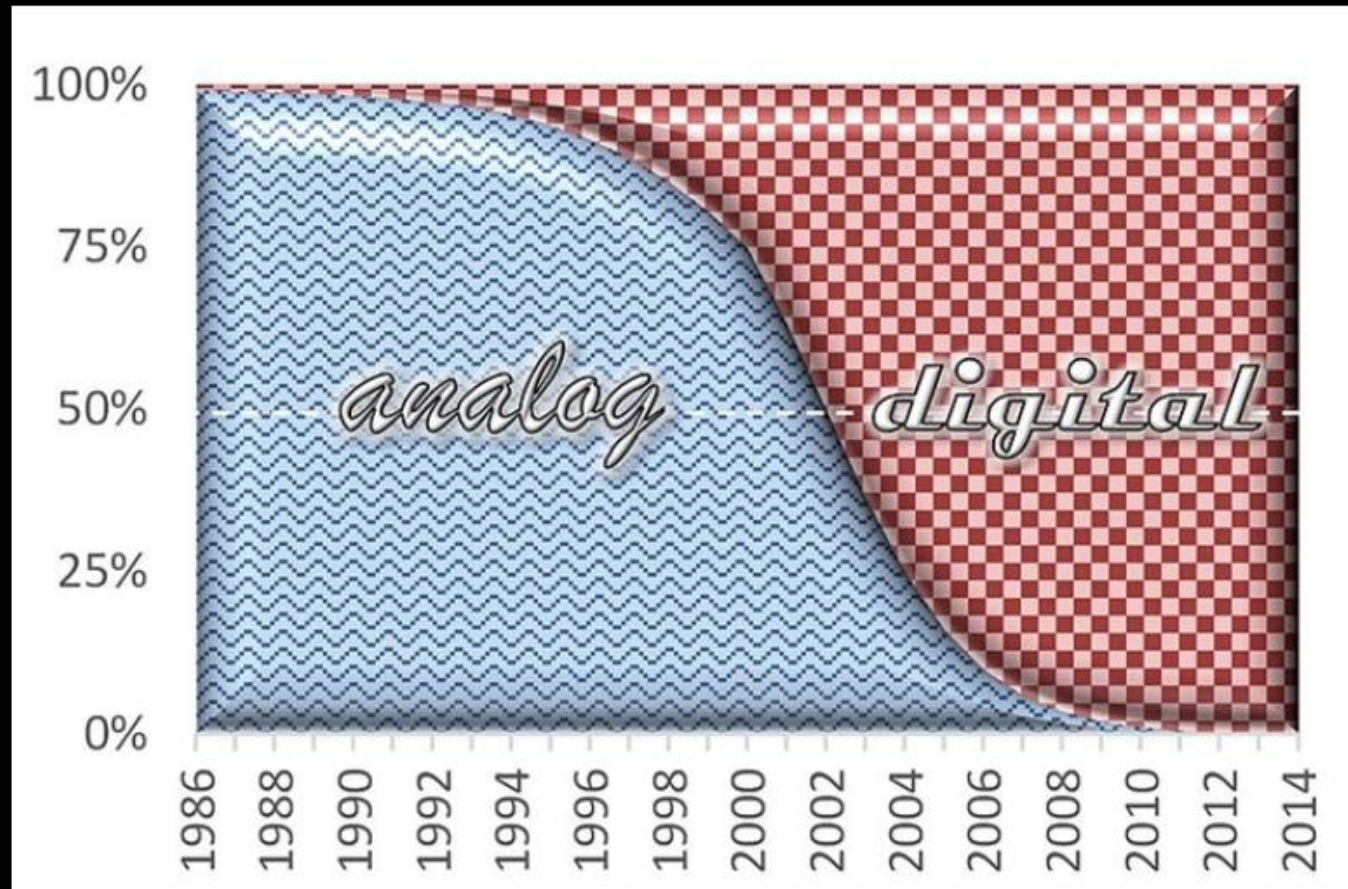
P.I.E. Example:

$\phi = \left[\binom{1}{1} - \binom{1}{2} + \binom{1}{3} - \binom{1}{4} + \binom{1}{5} - \binom{1}{6} + \binom{1}{7} - \binom{1}{8} \right]$

DRIVING FORCE #1

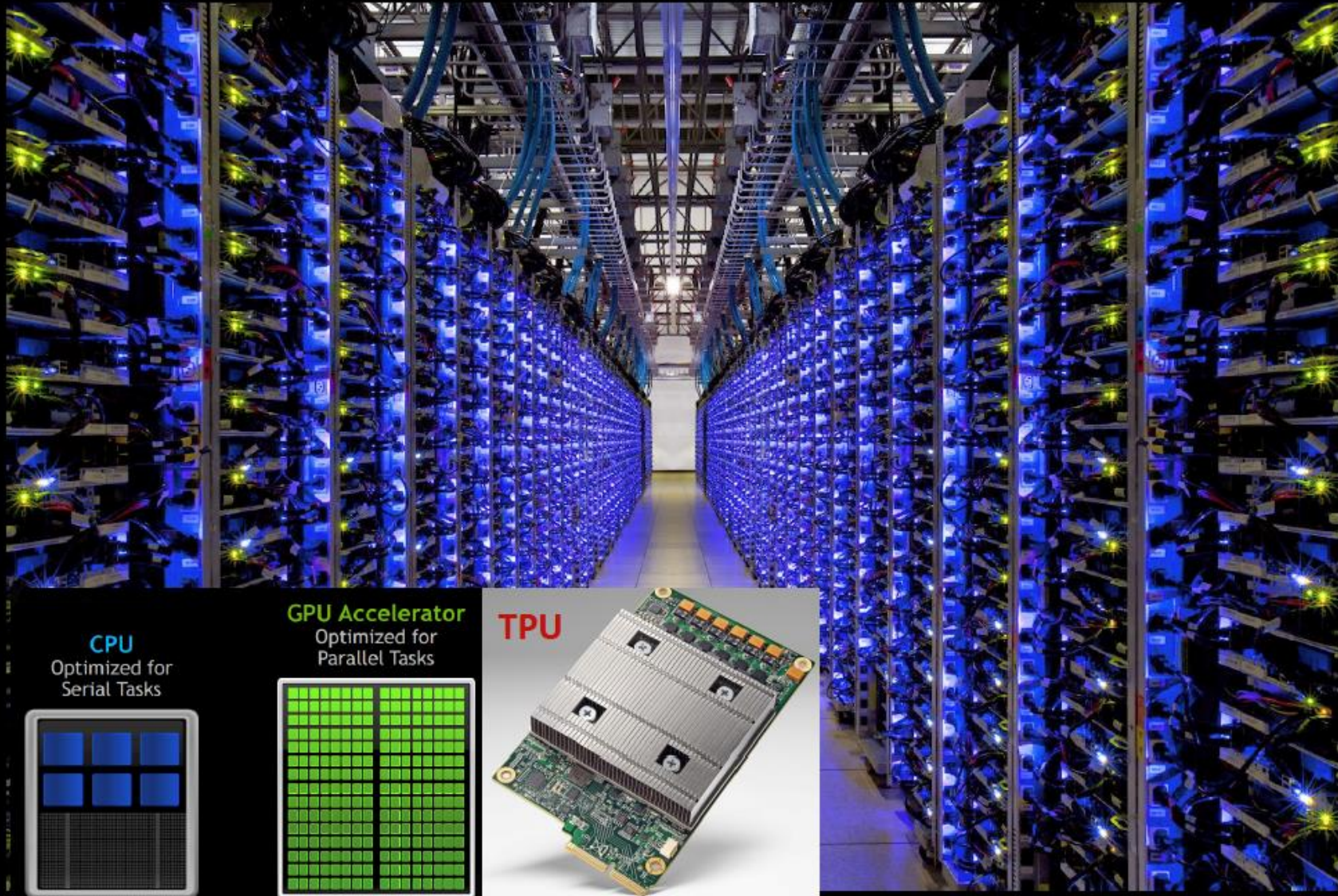
Big Data Availability

The World's Technological Capacity to Store, Communicate, and Compute Information



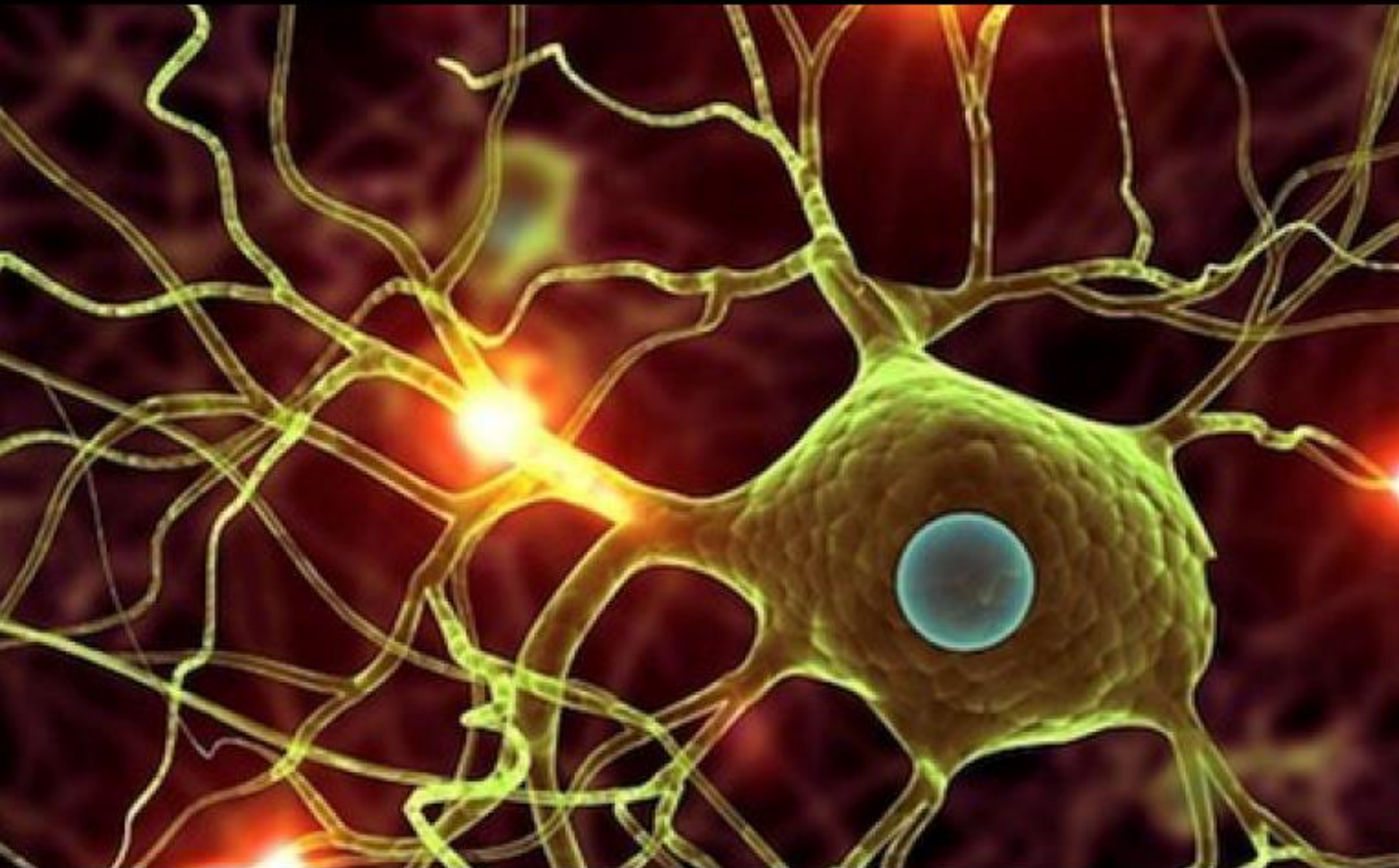
DRIVING FORCE #2

Computational Power



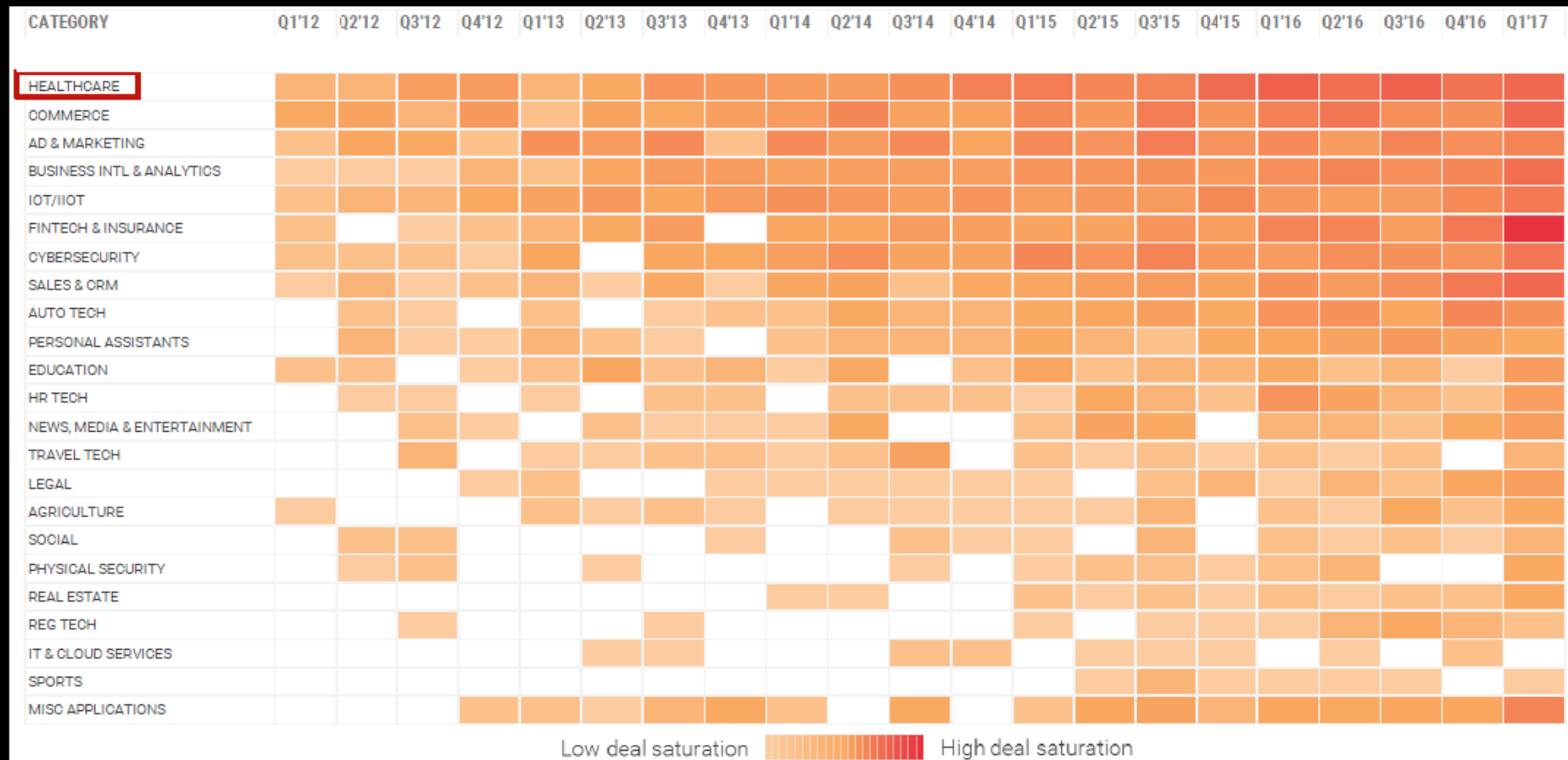
The Next Era:

Deep Learning for Biomedical Research



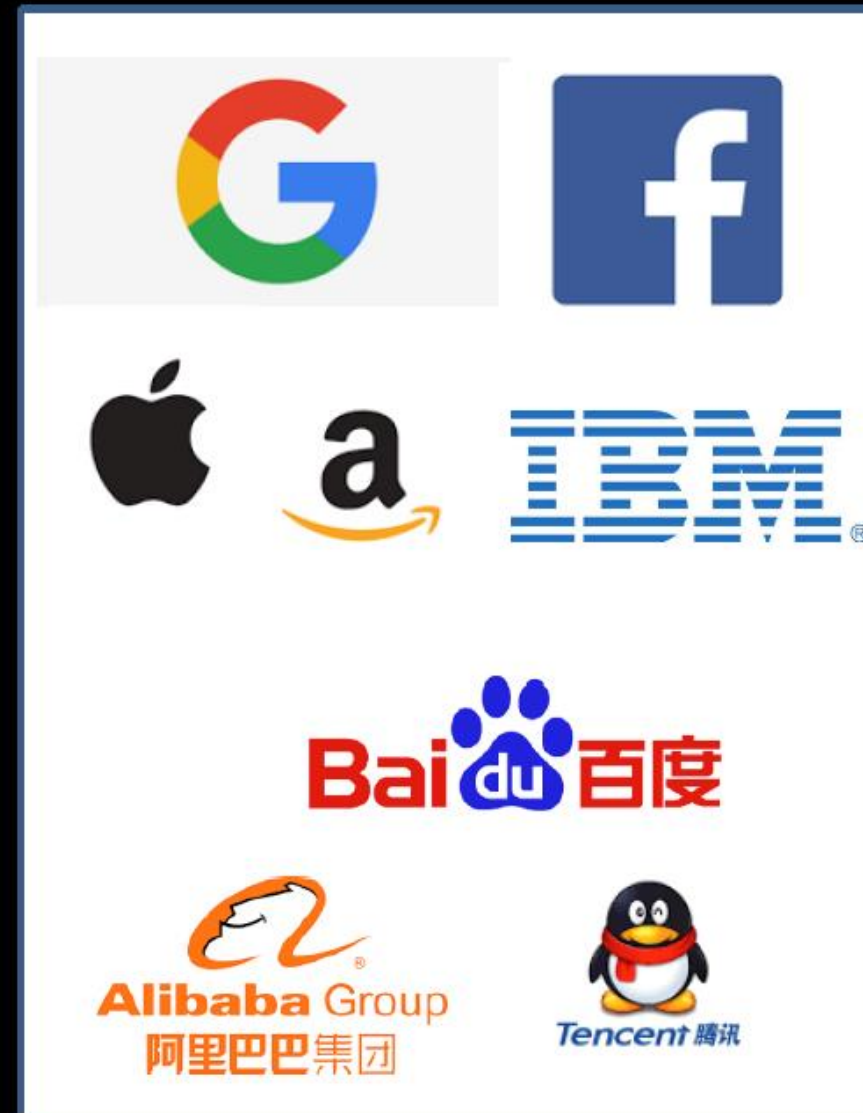
AI heatmap: Deals Distribution by Category

Q1'12-Q'17 (as of 3/23/17)



Healthcare emerges as hottest area of investment

New Players are Entering the **Healthcare Space**



17 PARTNERSHIPS
FOR THE GOALS



Communauté IA et plateforme de données pour l'Afrique



Institut de l'intelligence industrielle de l'Afrique (MIIA)

*Transformer l'Afrique par
l'intelligence artificielle*



Accélérateur & Communauté innovante pour la
recherche et les applications de l'intelligence
artificielle et de la science des données
Pour aider à transformer l'Afrique



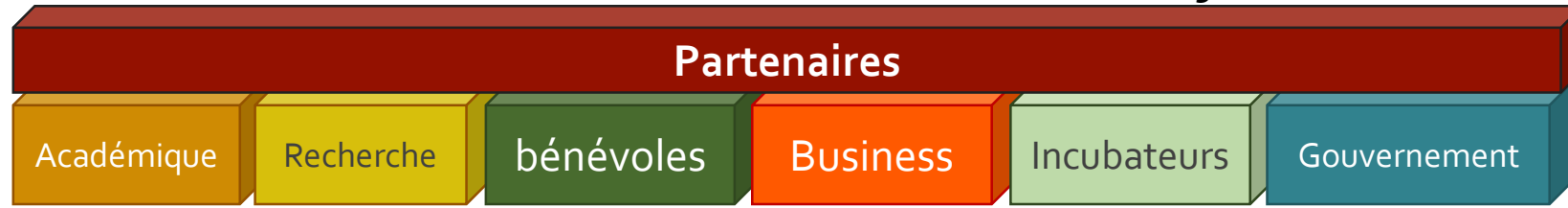
Machine Intelligence Institute of Africa

Transform Africa through Machine Intelligence

Accélérateur & Communauté innovante pour la recherche et les applications de l'intelligence artificielle et de la science des données pour aider à transformer l'Afrique

La communauté MIIA grandit! Environ 2320+ inscriptions sur les canaux MIIA

Une collaboration internationale and intra-africaine

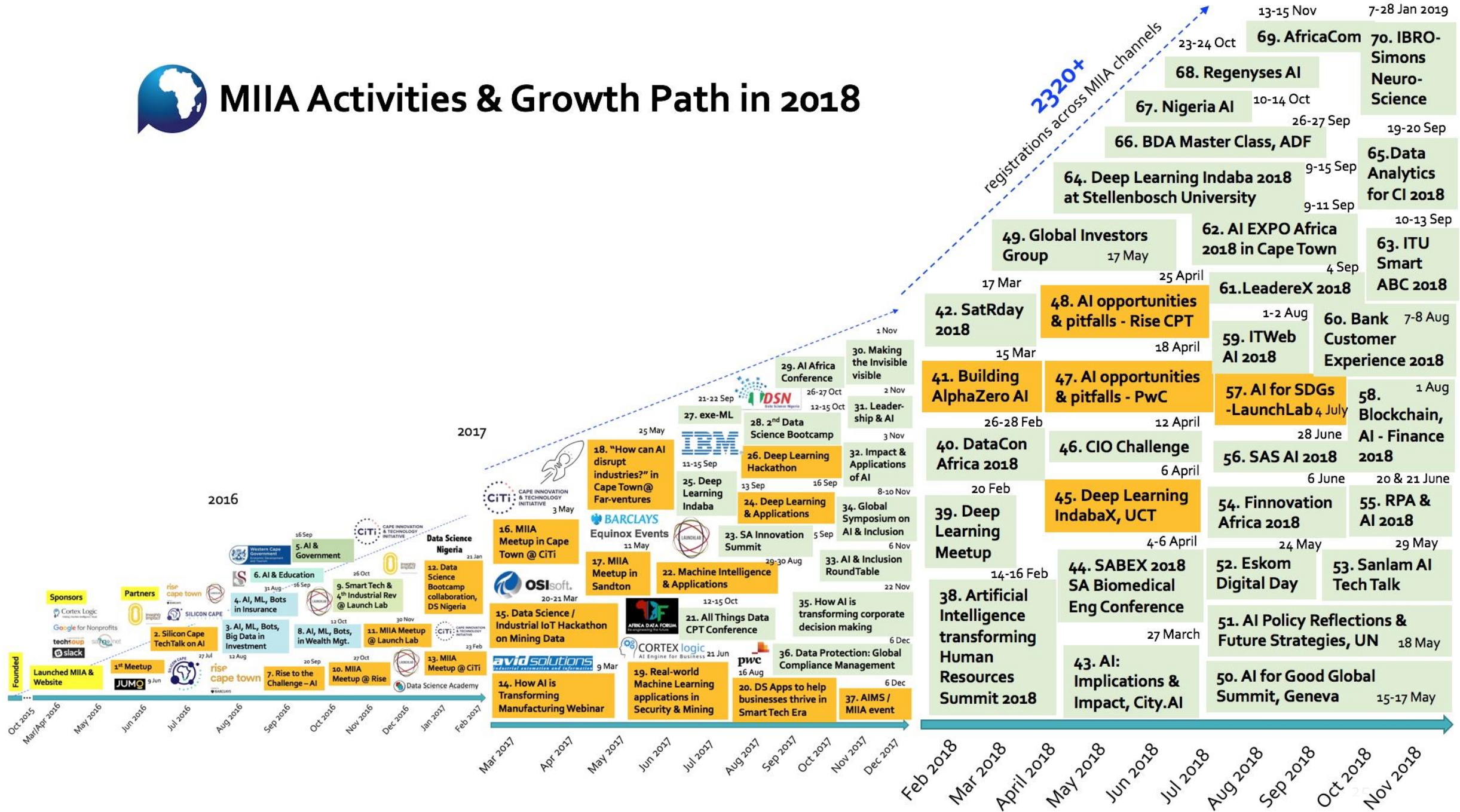


Microsoft
Corinium
exe ML
DSN Data Science Nigeria
Data Science Nigeria
techsoup
CORTEX logic
Google for Nonprofits
IBM
Deloitte
McKinsey & Company
rise cape town
Centre for HPC
INNOVUS
SILICON CAPE INITIATIVE
Citi
CAPE INNOVATION & TECHNOLOGY INITIATIVE
Web events
JUMO
Data Science Academy
Google for Nonprofits
slack
ACE-DS
ZA
KIDS CARE INTERNATIONAL
thestudent hub
eraonline
Western Cape Government
IXIO ANALYTICS





MIIA Activities & Growth Path in 2018





Machine Intelligence Institute of Africa

Transform Africa through Machine Intelligence



Data Science Nigeria



Bénéfices attendus

Aborder un problème ou une opportunité en Afrique

Soutien aux activités entrepreneuriales

Soutien au développement / apprentissage /
collaboration communautaire

Avancement la recherche et la
technologie

Aborder les problèmes africains

- Faible niveau d'éducation et développement des compétences
- Mauvaise qualité des soins de santé
- Manque d'emploi et accès aux ressources financières
- Absence de systèmes de gouvernance durables et de prévention du crime
- Infrastructures médiocres (transport) et pénuries d'énergie
- Pénurie alimentaire et agriculture inefficace
- Manque de compétitivité technologique et manufacturière
- Augmentation du stress hydrique (manque d'eau potable)
- Mauvais assainissement (manque d'accès à des toilettes propres)
- La pollution croissante dans les pays en développement
- Affaiblissement de la démocratie représentative

Industries pertinentes

Soins de santé

Education

Agribusiness
Forestières

Finance

Infrastructure
Utilitaires

Transport &
Logistique

Manufactures
& Services

Energie
Pétrole, Gaz, Mines

Tourisme, détail,
Propriété

Gouvernance
légale

Projets

Applications

Recherche

Technologie

Partenaires

Académiques

Recherche

Bénévoles

Business

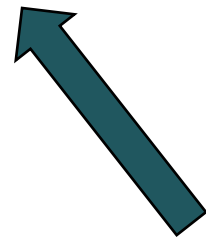
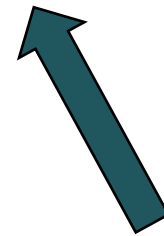
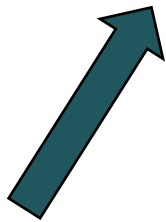
Gouvernement

Incubateurs

ZIND!



Zindi - "Kaggle" for Africa



 **Machine Intelligence Institute of Africa**
Transform Africa through Machine Intelligence

ixio
ANALYTICS

 **CORTEX logic**
AI Engine for Business

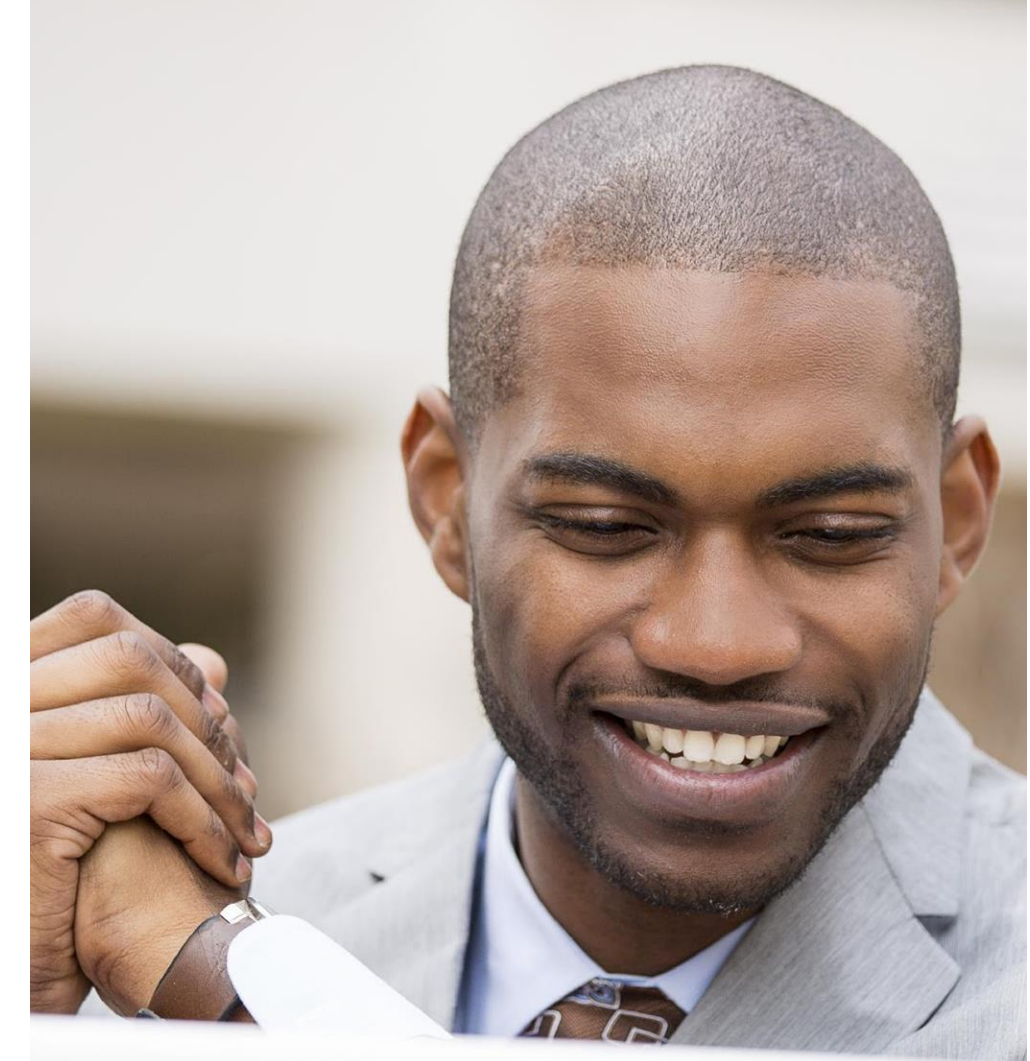
...

Qu'est-ce que Zindi?

Une entreprise sociale dont la mission est de renforcer les capacités de la science des données en Afrique. Notre vision est de mobiliser une communauté dynamique de scientifiques de l'information à travers l'Afrique afin de résoudre les problèmes les plus pressants de la région. Zindi est une plate-forme en ligne qui hébergera des concours, des jeux de données, des didacticiels, un tableau des tâches et des forums de discussion.

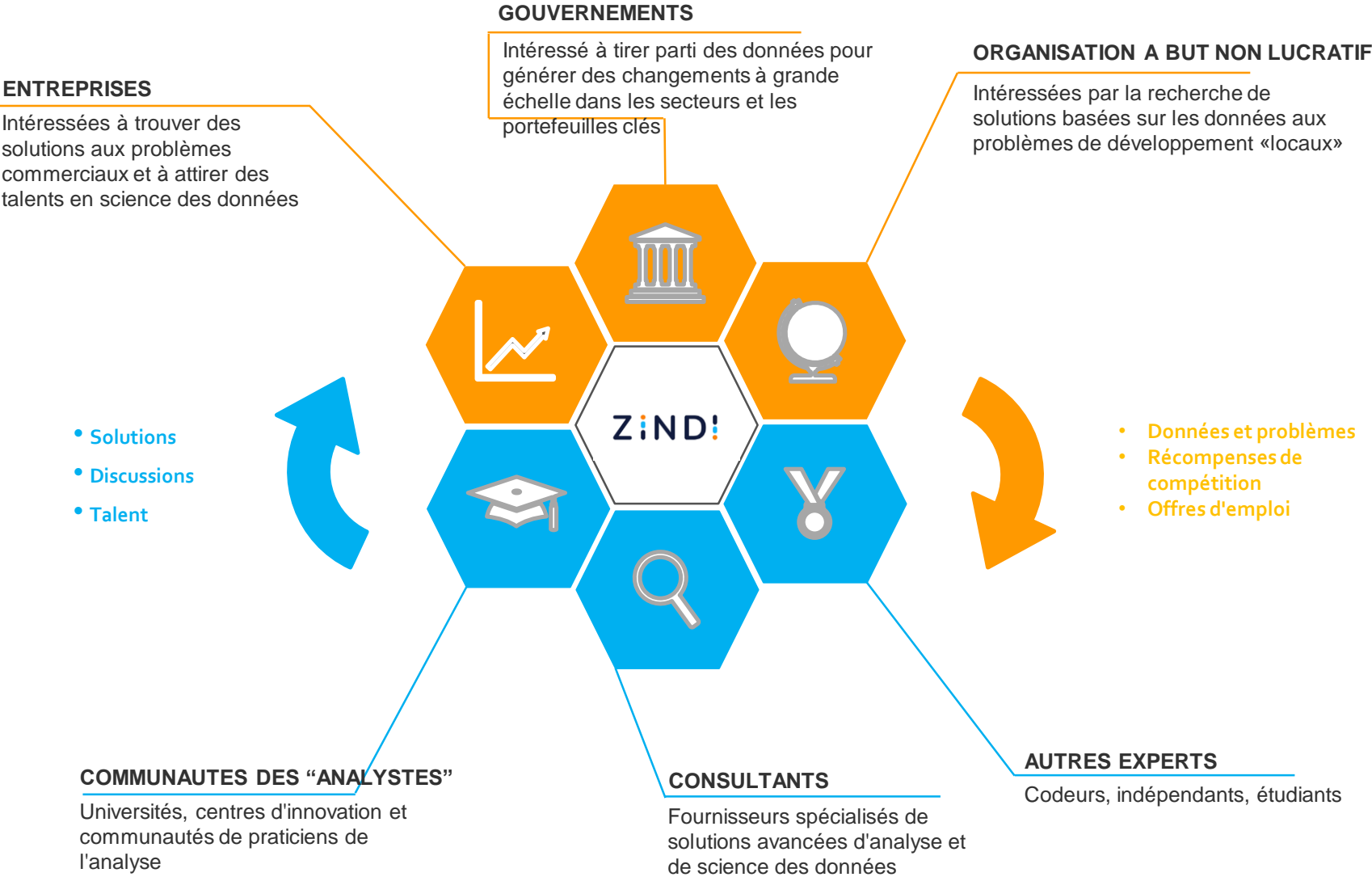
Zindi travaillera avec des entreprises pour développer, gérer et préparer des défis liés aux données. Les solutions sont classées automatiquement par précision de prédiction. La plate-forme Zindi offre aux scientifiques des données la possibilité d'accéder à des emplois et à des prix en espèces, de développer leur profil et leurs compétences et de se connecter avec leurs pairs dans toute la région.

Zindi permet aux entreprises, aux organisations et aux gouvernements d'organiser des concours pour résoudre leurs problèmes spécifiques et attirer les meilleurs talents en science des données en Afrique.



L'écosystème Zindi

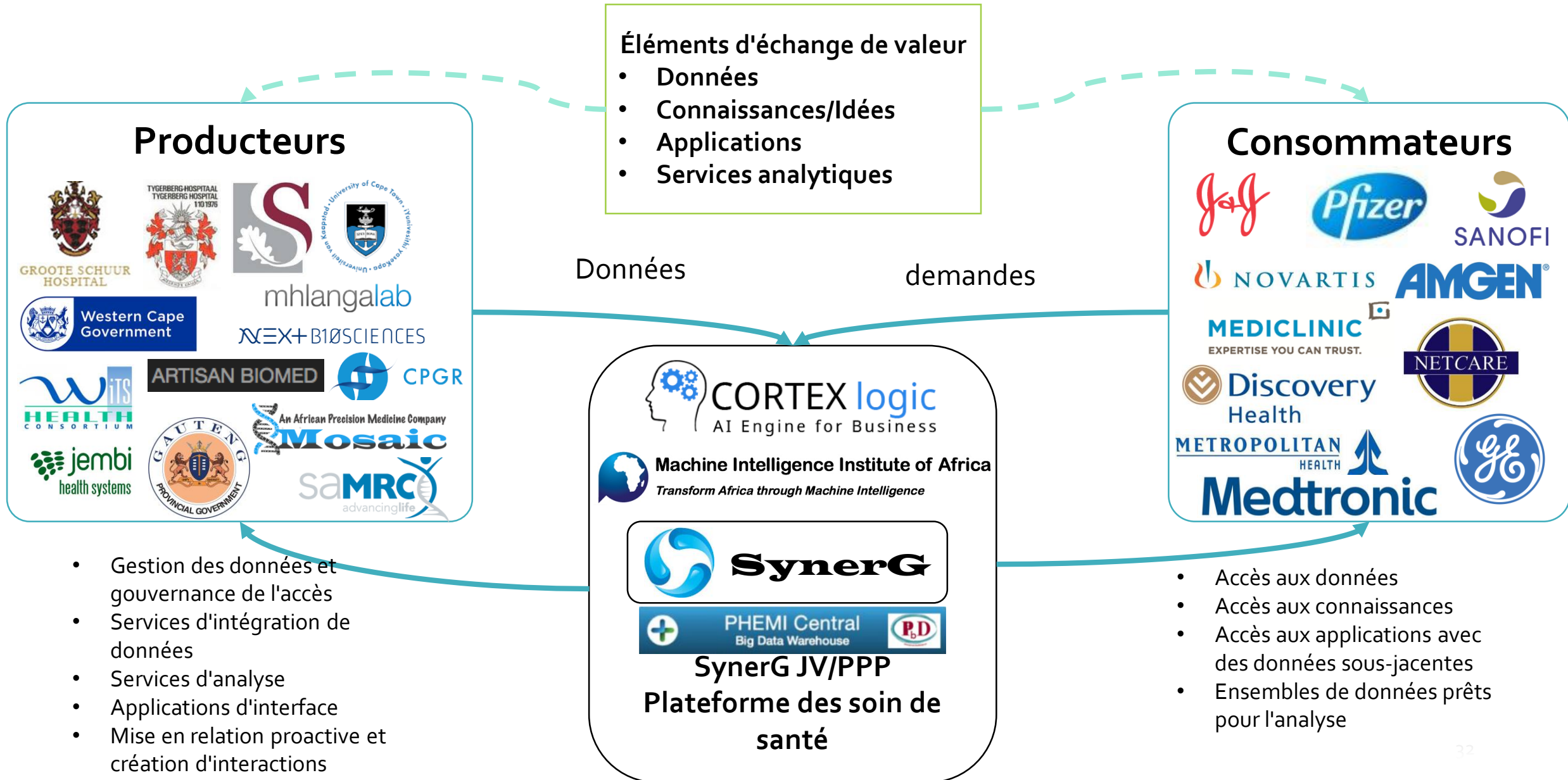
- Chercheurs de solutions
- Fournisseurs de solutions



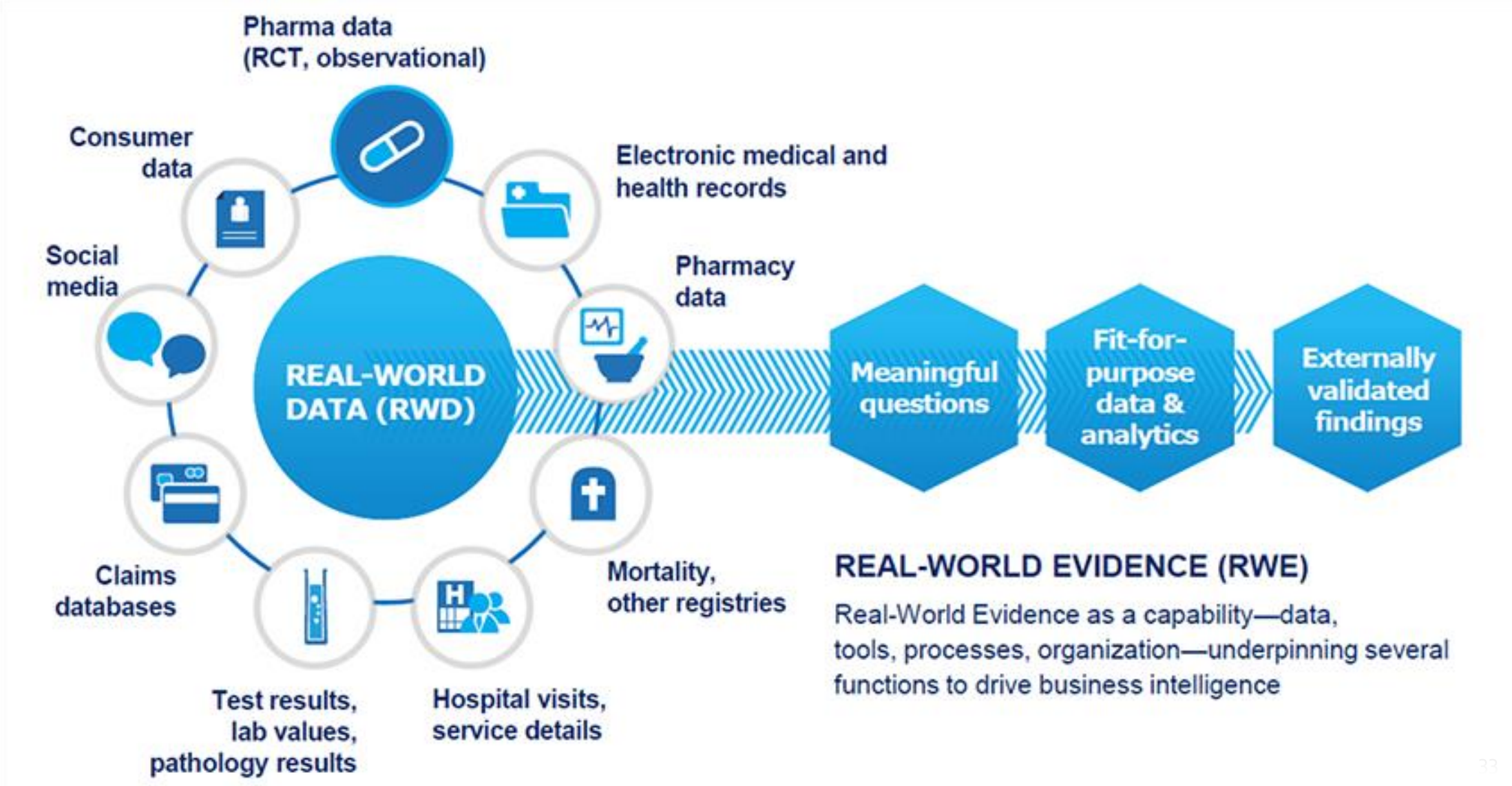


Écosystème des données et analyses de santé pour l'Afrique

Écosystème des données et analyses de santé pour l'Afrique



Données du monde réel et données factuelles sur la découverte et le développement de médicaments



Precision Oncology enabled by Data

Pharma Industry

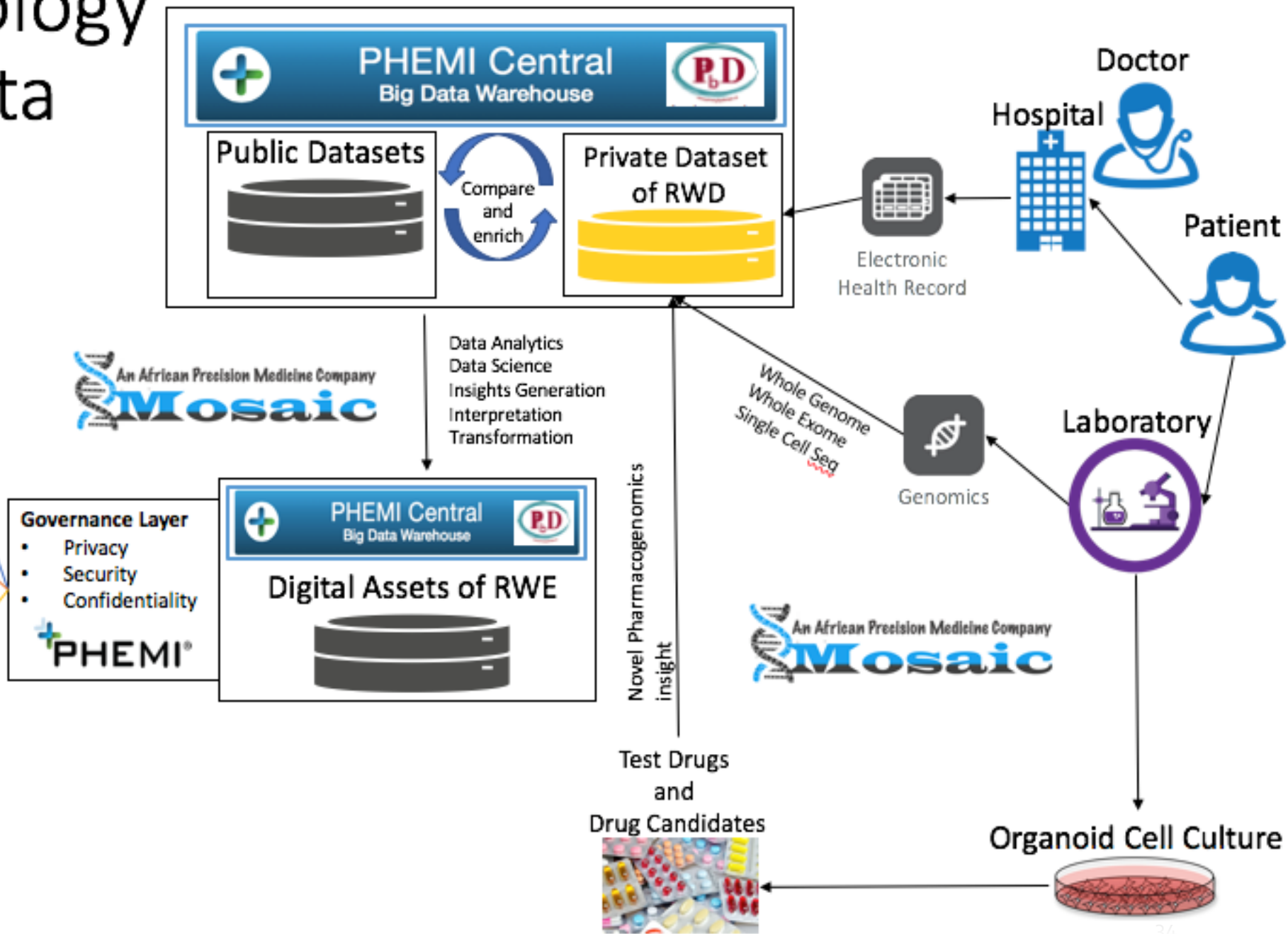
- Identify clinical trial patients
- Identify candidates for treatments
- Pharmacovigilance information
- Novel targets or applications
- Patient feedback on experimental treatment
- RWE for quicker FDA approvals

Health Insurance Industry

- Identify possible treatments with high probability of success
- Evidence for value-based reimbursement
- Increased confidence for experimental treatments

Public Sector Payors

- Increased confidence following public procurements of drugs
- Negotiation power with producers based on evidence
- Precision medicine approach with improved outcomes
- RWE on populations → better planning

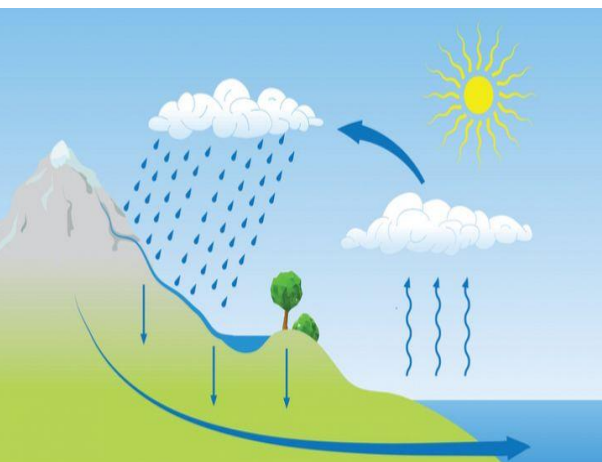




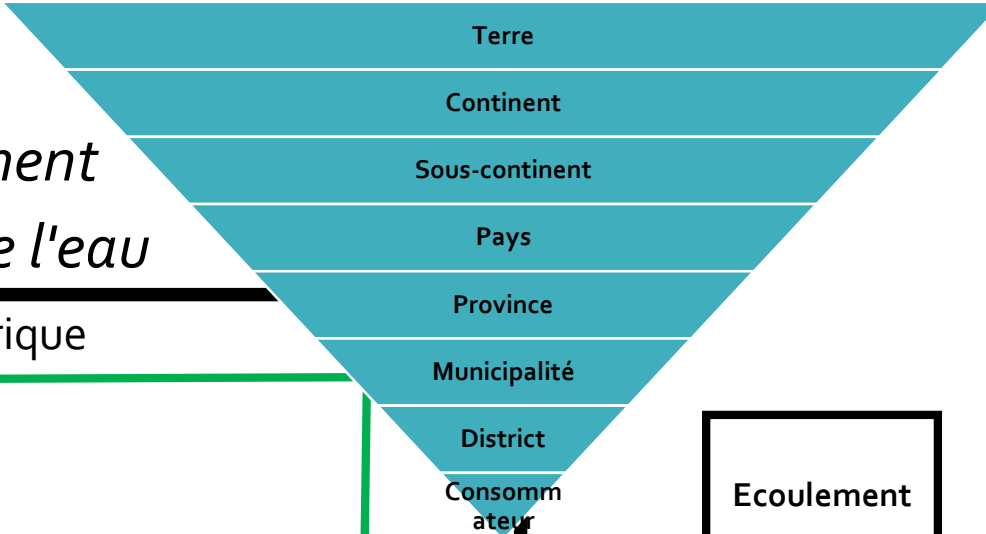
Plateforme de données et d'analyse de l'eau pour l'Afrique

Plateforme de données et d'analyse de l'eau pour l'Afrique

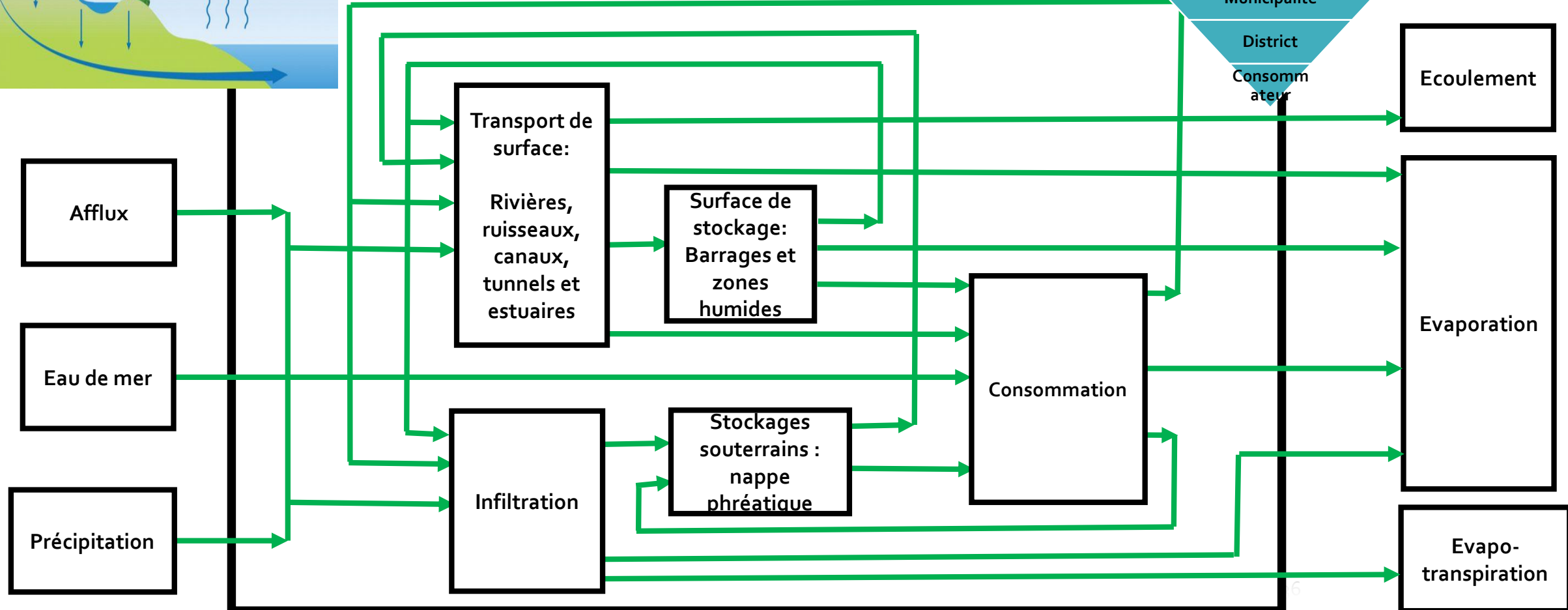
Niveaux des zones de contrôle de l'eau



Cycle de l'eau
Défis de l'eau et de l'assainissement
chaînes de valeur de l'eau



Zone de contrôle de l'eau générique





Education intelligente pour l'Afrique

La technologie intelligente a permis à l'écosystème éducation-entrepreneuriat de transformer l'Afrique

Tout le monde devrait avoir un accès abordable au monde numérique!



Accélération extrême des compétences du 21ème siècle



Utilisez la technologie de la 4ème révolution industrielle pour aider l'Afrique à franchir le pas? éducation, santé, énergie, agriculture, finance, emploi et compétitivité



Technologie Intelligente COE

Accélérateur de l'entrepreneuriat technologique

4IR Apprentissage et recherche interdisciplinaires

Technologie Entrepreneuriat

Incubation de start-up d'entreprises 4IR high-tech de classe mondiale



Plateforme collaborative
Certification numérique sécurisée
Partenariats



Machine Intelligence Institute of Africa

Transform Africa through Machine Intelligence

Communauté innovante pour l'intelligence mécanique Recherche et applications en science des données pour aider à transformer l'Afrique



Data Science Academy

Formation et perfectionnement pertinents pour les scientifiques des données modernes

Education intelligente

Certification numérique sécurisée (identifiant global) avec Blockchain
Plate-forme de collaboration sécurisée
Apprentissage personnalisé en utilisant l'informatique cognitive, les données intelligentes, l'apprentissage analytique
Recherche interdisciplinaire
révolutionnaire



Des MOOC certifiés de classe mondiale avec des programmes pratiques pertinents

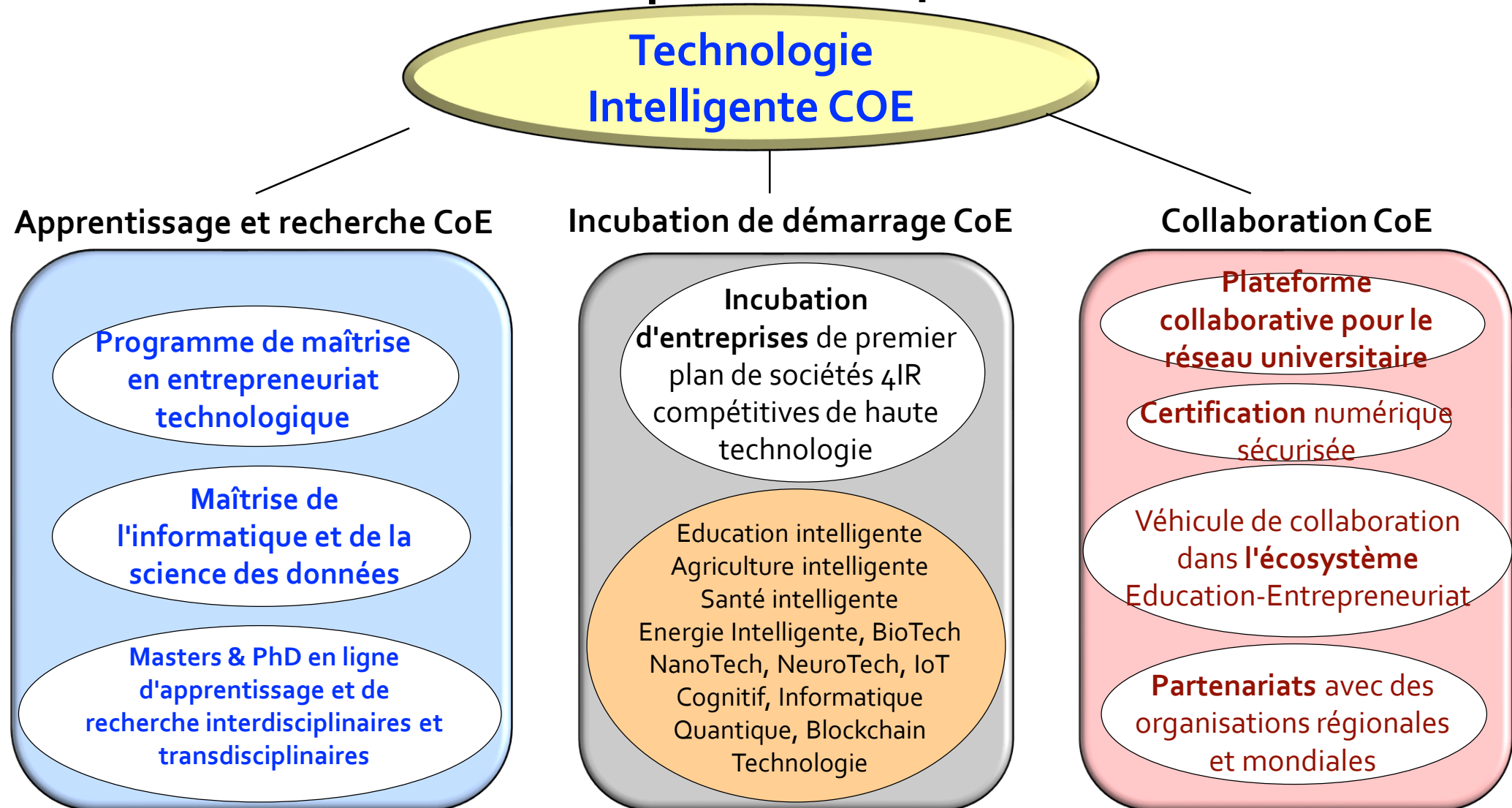


Un gouvernement et un secteur public efficaces, transparents et agiles; utilisation décentralisée des services de gouvernance et de réglementation de la technologie Blockchain



Système de support eLearning et étude nouvelle génération

Technologie Intelligente CoE (Centre d'excellence) - Accélérateur d'entreprenariat technologique pour l'écosystème éducation-entrepreneuriat 4IR



Technologie Intelligente COE

Apprentissage et recherche

- (1) Programme de maîtrise en entrepreneuriat technologique visant à développer l'innovation et l'application technologiques, les compétences en leadership et la capacité d'entreprendre
 - Offrir aux étudiants des opportunités interdisciplinaires pour appliquer les compétences du 21^{ème} siècle
 - Instruire les étudiants pour qu'ils deviennent les meilleurs ingénieurs, gestionnaires, entrepreneurs ou fondateurs d'entreprises à la pointe de la technologie innovante
 - Offrir des possibilités de formation aux étudiants intéressés à travailler dans le secteur industriel / commercial, aux entreprises du CdE ou à créer leur propre entreprise avec des technologies haut de gamme
- (2) Maîtrise de l'intelligence artificielle et de la science des données avec programme d'études interdisciplinaire et applications dans de multiples secteurs
- (3) Faciliter l'apprentissage et la recherche en ligne interdisciplinaires et transdisciplinaires - Masters & PhD (les innovations se produisent là où les disciplines se rencontrent)
 - Mélangez des MOOC certifiés de classe mondiale avec des programmes d'apprentissage personnalisés et pratiques (dans une «salle de classe inversée»)
 - Par exemple, de multiples opportunités de percées dans la recherche sur l'intelligence mécanique et ses applications pratiques

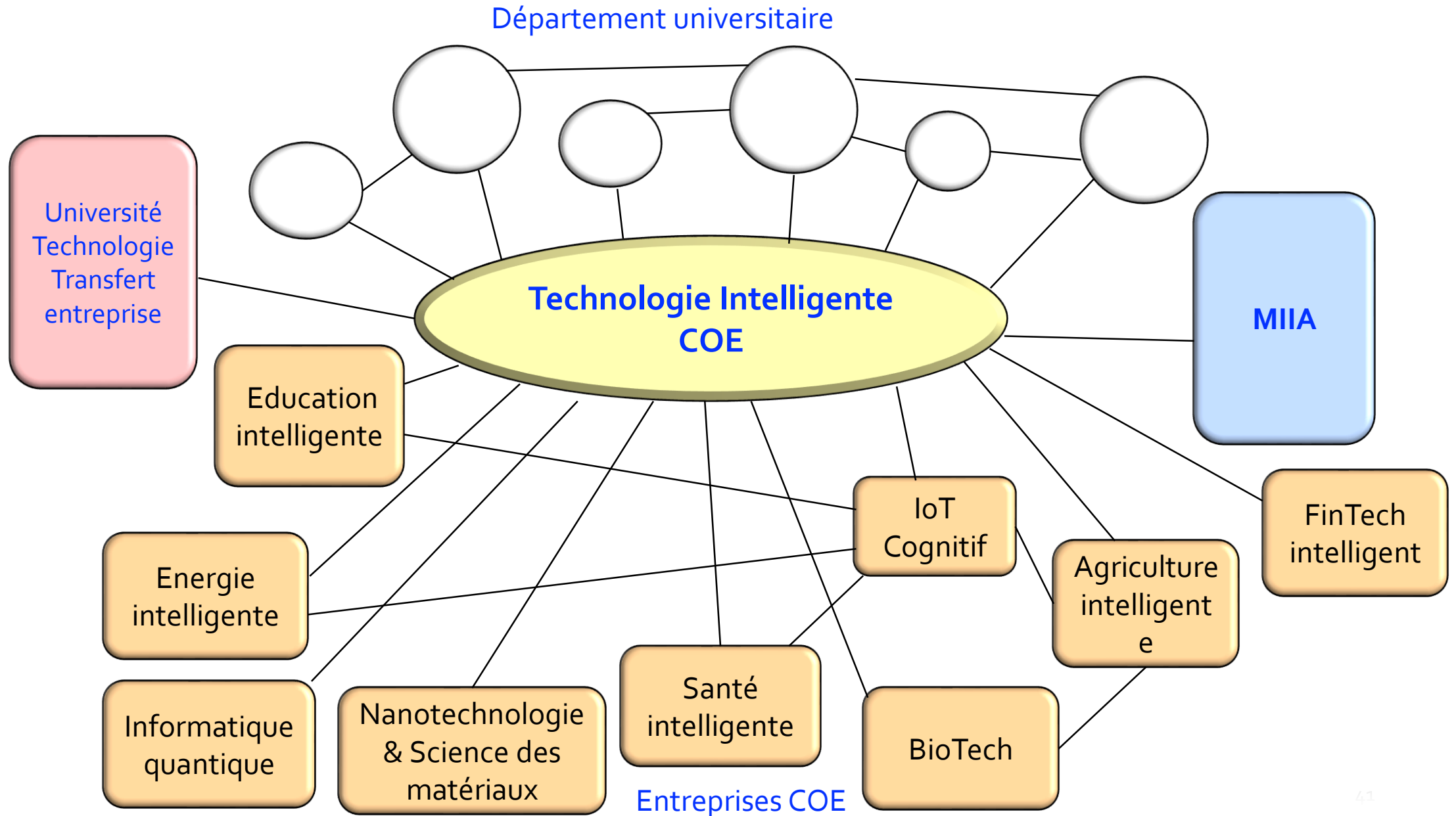
Incubation d'entreprise

- **Incubation d'entreprises de sociétés 4IR compétitives de classe mondiale** dans des domaines d'activité prédéfinis, qui répondent aux problèmes de l'Afrique et des marchés émergents grâce à la fusion de technologies de pointe (par exemple, définir et aider à développer des plans d'affaires pour les sociétés incubées du COE)
- L'une d'entre elles est une entreprise d'éducation intelligente destinée à révolutionner l'éducation au sein des universités locales AS en tant que référence et rôle auprès d'autres établissements d'enseignement supérieur en Afrique.
- Autres: **Agriculture intelligente; soin de santé intelligent; Energie intelligente Biotechnologies; Nanotechnologie ; Neurotechnologie; IoT cognitif, informatique quantique, technologie des blockchains**

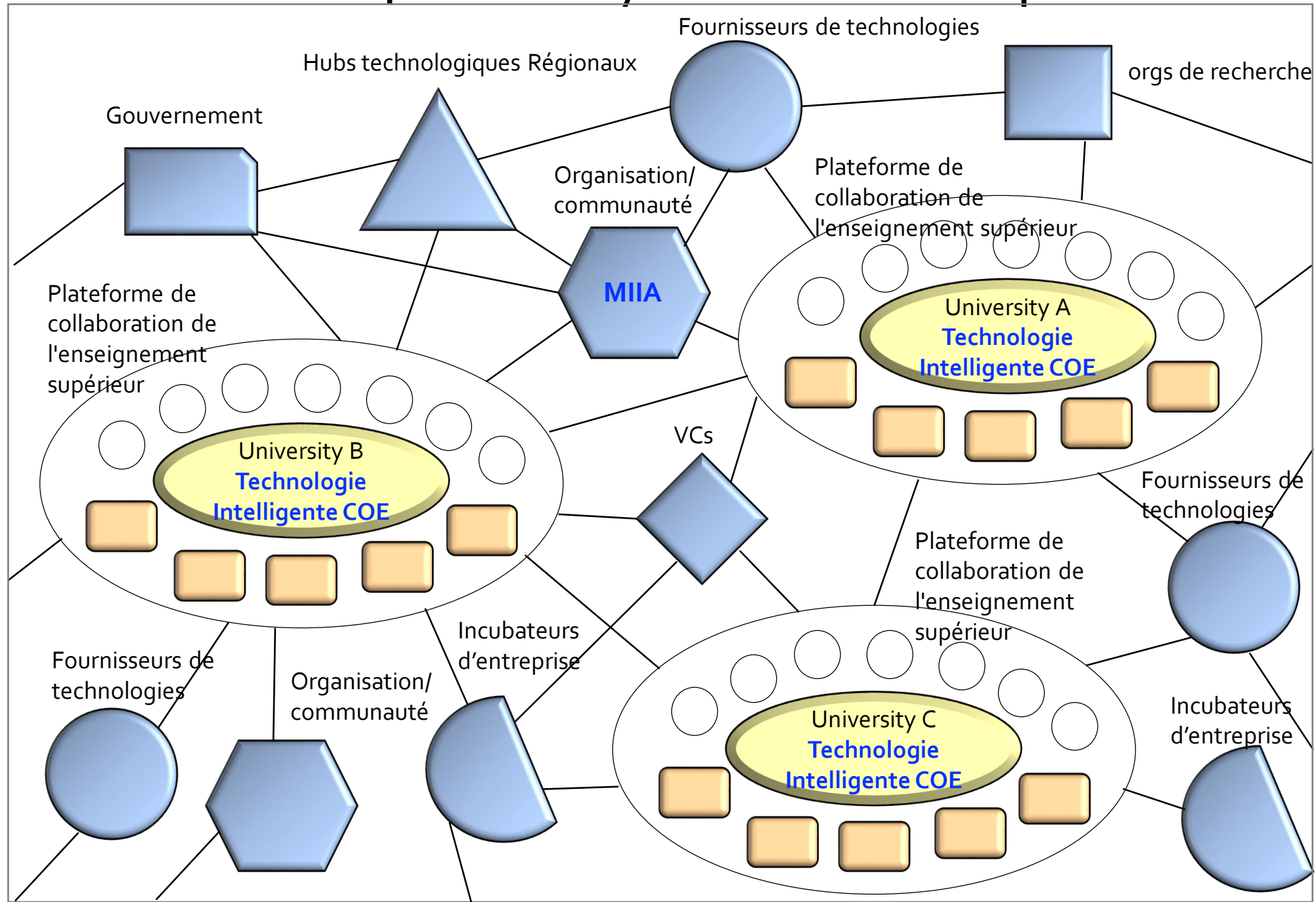
Collaboration COE

- Créer une plate-forme de collaboration sécurisée structurée en maillage pour les étudiants / clients / réseau des anciens
- **Certifications d'éducation pionnières basée sur les Blockchains**
- Véhicule de collaboration avec les parties prenantes du secteur des affaires et de l'industrie, des organisations communautaires telles que MIIA et d'autres sociétés de technologie Smart Tech dans l'écosystème de l'éducation et de l'entrepreneuriat
- Partenariat avec le WEF, la Banque mondiale, le FMI, la BAD, l'UNESCO, etc. (Mesure et suivi des nouveaux objectifs de développement durable de l'ONU, des aspirations africaines, etc.)

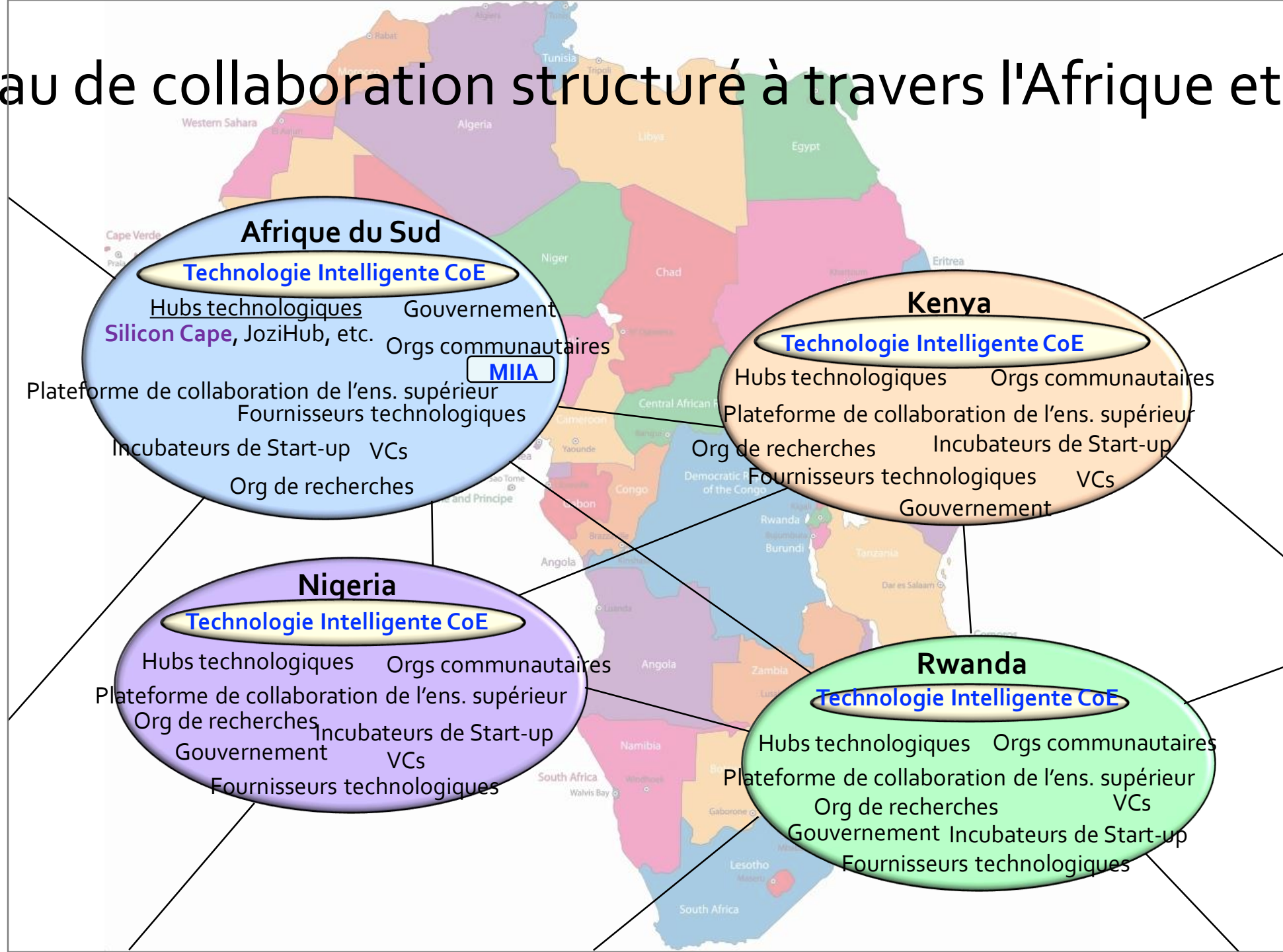
Technologie Intelligente COE à l'université



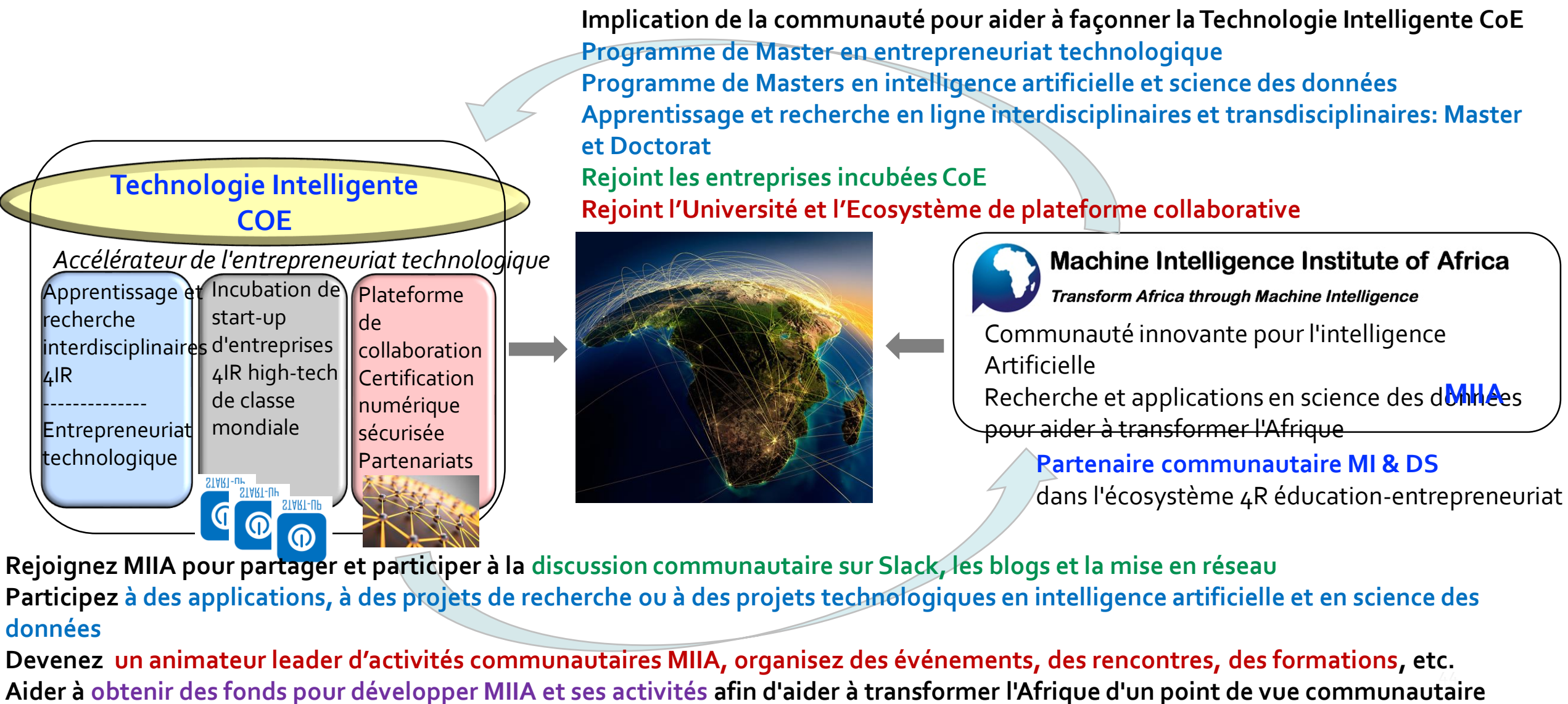
Education 4 IR-Ecosystème d'entrepreneuriat



Réseau de collaboration structuré à travers l'Afrique et ailleurs



MIIA et Technologie Intelligente CoE dans l'écosystème de l'éducation entrepreneuriale 4IR



Value Drivers of a Thriving Business in the Smart Technology Era

Increase Operational Efficiency, Effectiveness and Revenue

Increasing Automation
Improving Processes
Equipment Availability

Increase Throughput
Increase Yield, Quality,
Cross-sell, Up-sell,
Recommend

 **Productivity**

 **Revenue**

 **Reduce Risk**

 **Lower Costs**

Process and
Equipment Failure
Customer Churn
Fraud, Waste & Abuse
Cyber Security

Eliminate Redundancy
Energy & Raw Material
Usage, Operations &
Maintenance

Create Strategic Value

Acceleration



Faster, Better &
more Proactive
Decisions

Smarter R&D, Forecasting
Innovation
Collaboration
Enhance Scalability
New Business Models
New Revenue Growth
Opportunities

Enhance Customer Experience Targeted Sales & Marketing

- ▶ Realtime, on demand, digital, personalized service delivery, assistance & advice
- ▶ Improve Risk selection & assessment
- ▶ Enhancing efficiencies (e.g. automated & augmented underwriting)
- ▶ Reducing process times and costs (e.g. robo-claims adjuster)
- ▶ Targeted Sales & Marketing



Deep 360 degree insights
about the customer



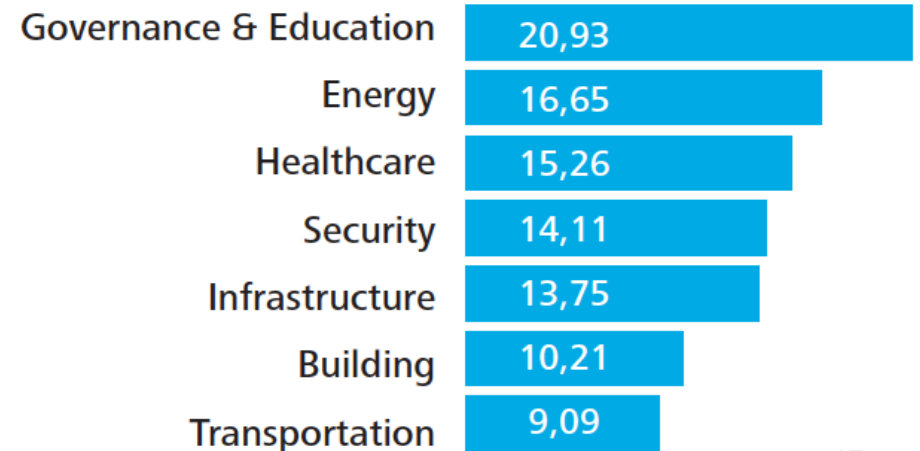
Services de technologie intelligente pour les villes intelligentes africaines

Recent smart city trends: empowered citizens on the rise

Tailored public services to increase resource efficiency

80 percent of the population currently lives in cities. Population growth and aging, climate change and pollution—all these are the de facto trending topics in our current societies and all of them contribute to the pressure on public resources availability¹. Faced with the challenge of maintaining citizens' quality of life and living, the smarter move for governments was to combine and use the increasing availability of data and advances in research on the technology of things, and this way optimize the delivery of services. How is it called? Smart city. What is the goal? To tailor public services to increase resource efficiency.

Deloitte.



Villes Intelligentes / Smart Cities 3.0

Conclusion: is third time always a charm?

Smart cities are a constant data flow. However, we have learnt that data gathering is not the problem, rather its **digestion is the challenge**. While technology is crucial, it has a use-it-or-lose-it dimension and requires well-spread digital and analytical skills among the agents delivering the change. We need indeed fully prepared and properly trained professionals to ensure that the information is effectively managed, because the terabytes have to be converted into effective and efficient public policies. Furthermore, **data privacy and data transparency** are a “must” to ensure both innovations and the proper utilization of the projects being deployed. Data privacy will establish trust, and data transparency will give rise to government control and accountability.

Smart cities 3.0 build on the heritage of version 2.0. The final stage of this concept actively seeks to **engage citizens to work in collaboration with private corporations and the public sector** to build better cities in which to live. Citizens are not only expected to increase their use of applications to contribute to the decision-making process, but also to be part of the development of such innovative gadgets²⁸. Although citizens are already becoming increasingly aware of all the potentials of living in a smart world, they should be fully integrated in the dynamics which are already in place between private and public sectors. If the aim is to design tailored solutions for day-to-day problems, and to work for a sustainable city life unhindered by a scarcity of resources, all members of society need to work **collaboratively**. Smart cities shall be therefore inherently linked to the efforts of citizens, businesses and governments, and their interconnections through devices, sensors, and applications.



Smart Citizens

- Will take responsibility for the place they live, work and love in
- Value access over ownership, contribution over power
- Will ask forgiveness, not permission
- Know where they can get the tools, knowledge and support
- Value empathy, dialogue and trust
- Appropriate technology, rather than accept it as is
- Will help the people that struggle with smart stuff
- Ask questions, before they come up with answers
- Take part in design efforts to come up with better solutions
- Work agile, prototype early, test quickly, start all over
- Will not stop in the face of huge barriers
- Continuously share their knowledge and their learning



waag society

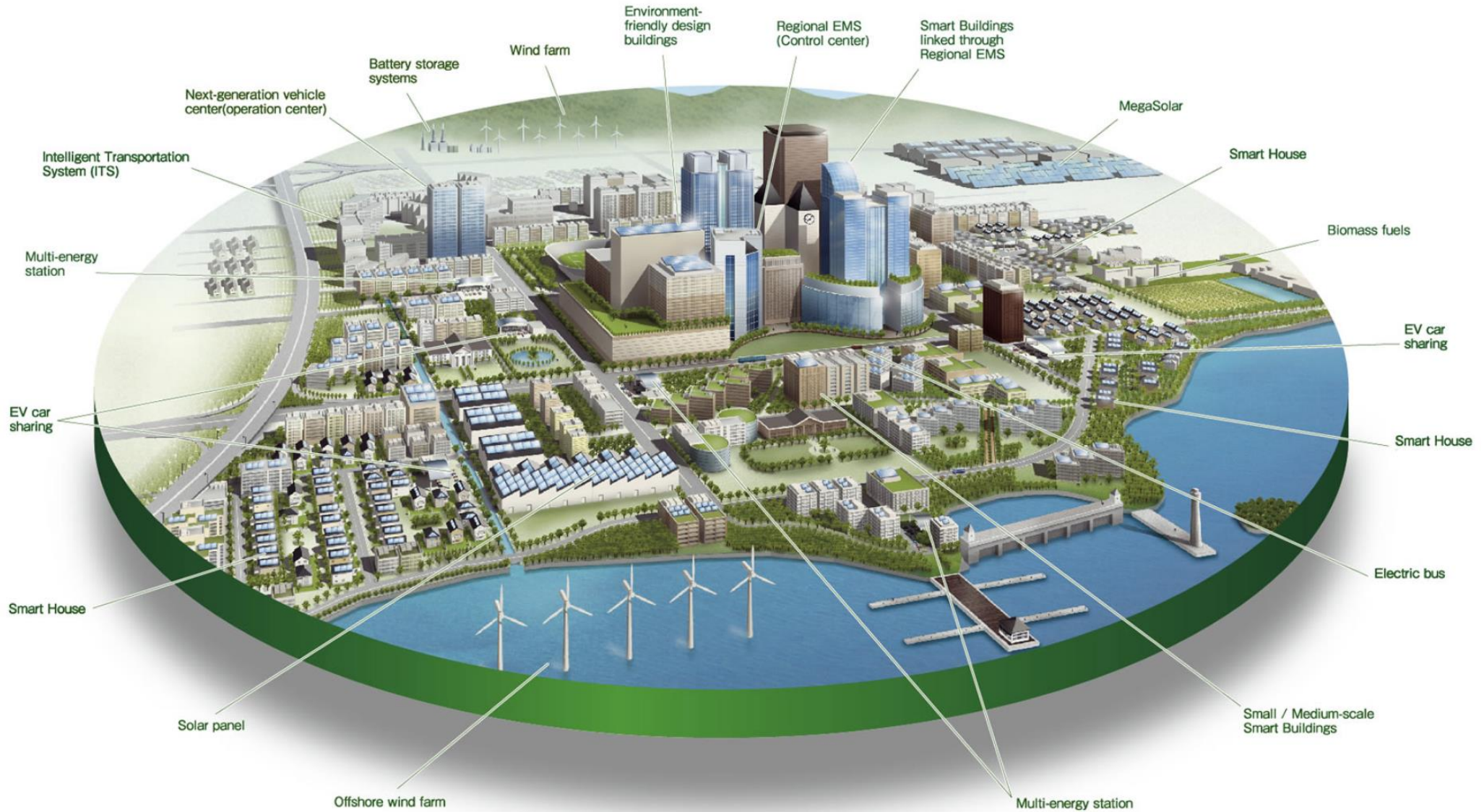
institute for art, science and technology

we code for amsterdam

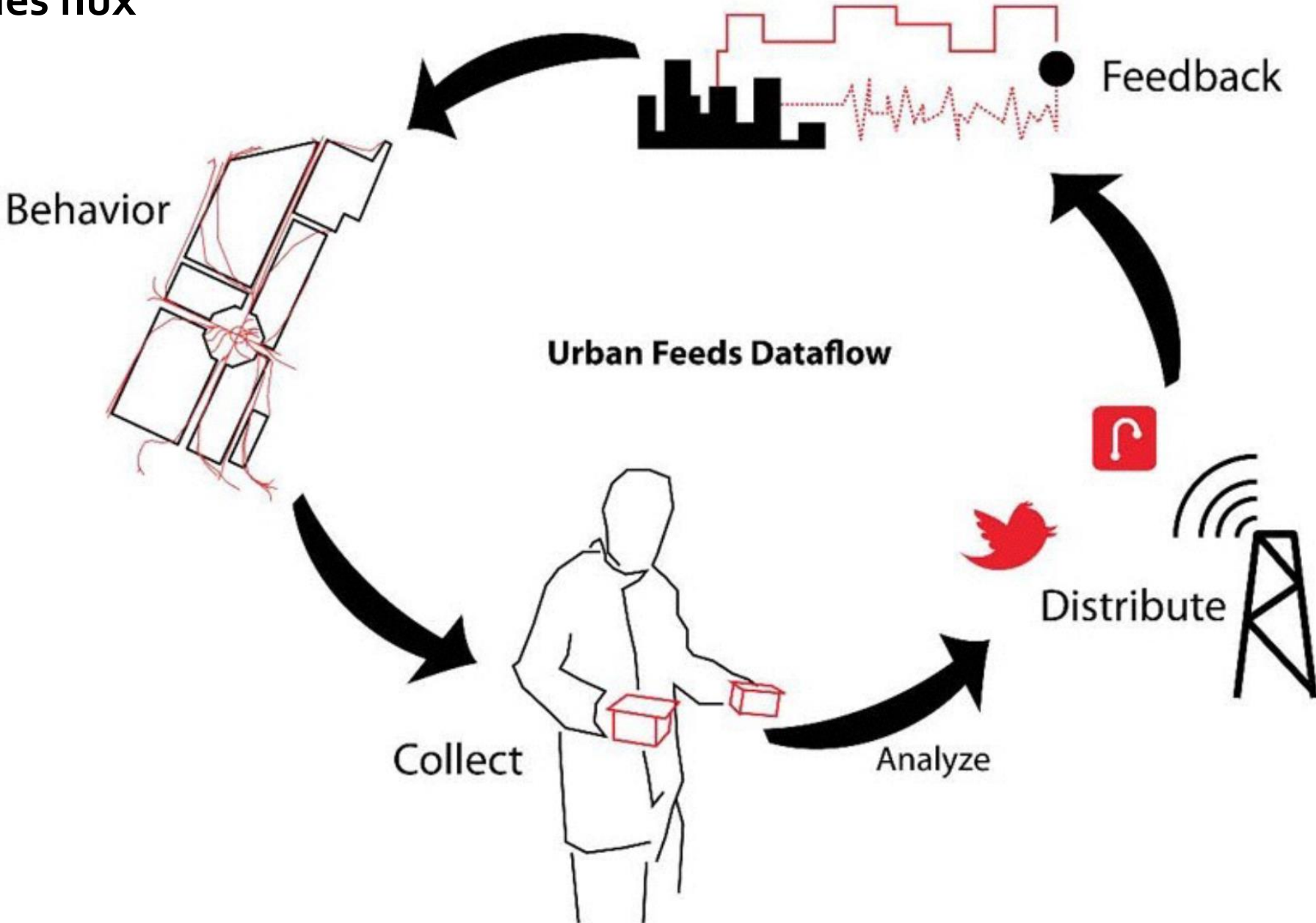
Amsterdam Smart Citizens Lab



Smart Cities



Flux de données des flux urbains



Une approche citoyenne intelligente

1 MEET

First, after an open invitation in the local newspaper and online via newsletters of partner institutes, people sign up and meet at a space in town center that is perceived to be safe (to speak up) and neutral (without its own hidden agenda). A collection of presentations and exercises is used to introduce the participants to each-other and sensitize them to possible questions, approaches and outcomes, as well as on the roles they will have to take to turn it into a success.

3 MAP

The next step is helping the groups to understand and map in more detail both the problems and/or opportunities, and possible approaches to solve them. The help of experts is sought and valued because problems related to the environment are complex in nature, and much is already known. This step ends with developing a sensing strategy: what is to be measured, in which quantities, and which kind of technologies are used to get there.

2 MATCH

Step two consists of encouraging people to form groups based on shared interests, experience and/or levels of commitment. To make the resulting groups more effective (and possibly self-sufficient, care should be taken to mix people), with different (levels of) expertise and background. It was made clear that the groups themselves will be responsible to get to the desired results, so they should self-organize as much as possible, for example by using on-line tools for sharing calendars and progress.

4 MAKE

The fourth step consists of making the hard- and software to be able to measure the desired variables. This typically means putting together one or more existing, low-cost sensors with a circuit to (pre-)process and store or send the resulting data to a server that will collect it for further analysis and visualisation. It typically entails devising and building a specialised casing that will help the electronics to withstand the conditions that the sensor will be put in (rain, cold, warmth or even submerged). The Amsterdam Smart Citizens Lab strongly encourages the use of open source software and hardware for reasons of bootstrapping the development process, adaptability and flexibility in application and development, typically lower cost, availability of development expertise and the sharing and further development of the outcomes.

5 MEASURE

The fifth step consists of carrying out the measuring strategy from step three with the hardware and software developed in step four. It starts with calibrating the hardware, and then deploying the sensor(s) in one or more locations, during a specific amount of time as prescribed in the strategy. Typically, things turn out different than expected in terms of actual data collected, which gives rise to ad-hoc changes in the measuring strategy and sometimes to changes in hard- and software. The data are collected for further analysis.

6 MASTER

Step six consists of mastering the data: analysing and possibly visualising them to understand what they mean. Typically, existing software is used to perform this step. Depending on the complexity, the help of external experts is sought, that help in technical procedures for cleaning and analysing data, as well as interpreting and giving credibility to the results.

7 MOBILIZE

The final step entails mobilizing either citizens, public authorities, or both, to take action on the findings. This is potentially a huge step, involving (mass) media, spokespersons, ambassadors, political parties and spin doctors. Depending on the desired results and the vested interests, this is also the hardest step that might take years to get to. Small-scale mobilization, however, is also possible, which would consist of one's behaviour or convincing neighbors to do so.

Empower Smart Citizens

Lessons Learned

- Thorough issue mapping is needed
- From sensing to action is challenging
- Sensors need improvement
- However, this is **not** about accuracy
- Citizens **love it**

Empower people to:

- Acquire, Read & Manipulate Data
- Understand their environment
- Turn data and insight into action
- Using public networks of low cost, open source sensors

Resulting in:

- Better informed, more engaged citizens
- Impactful dialogues between citizens and governments
- More data, more insight, better policies
- More enjoyable, social, inclusive, healthy & livable cities

Empower Smart Citizens

THE OLD WAY

TOP DOWN DECISION MAKING

LINEAR APPROACH

REDUCING COMPLEXITY

MINIMIZING UNCERTAINTY

STIFLING INNOVATION



THE NEW WAY

BOTTOM UP DECISION MAKING

NON-LINEAR APPROACH

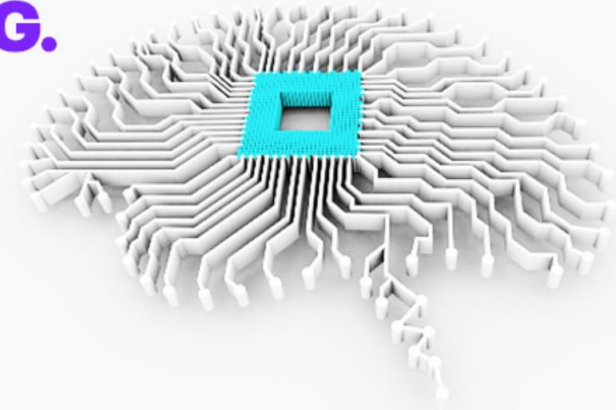
ENCOURAGING COMPLEXITY

EMBRACING UNCERTAINTY

ENABLE & BOOST CREATIVITY

What, exactly, makes AI “responsible”?

**TRANSPARENCY.
TRAINING.
TUNING.**



START THE JOURNEY

Ready to use AI to enhance citizen experience?
Start with five steps for achieving sustainable success:

1

Put humans at the center

Start with a design that is ethical, compliant, and responsible and that centers around people: citizens/customers and workers.

2

Develop an enterprise AI strategy

Develop an enterprise AI strategy that defines your long-term vision, roadmap, and governance while delivering near-term value.

3

Map user journeys and prioritize

Use service design to map user journeys into service blueprints that can help identify and prioritize AI opportunities.

4

Keep goals in sight

Implement targeted solutions to help achieve your goals through intelligent automation, superior judgment, and enhanced interaction.

5

Never stop improving

Keep assessing strengths and weaknesses and continually address what you learn.



Safer Cities

Public Safety & Justice

- Call Center & Dispatch
- Catastrophe Modeling
- Community Policing
- Courts Management
- Digital Patrol
- Operational Intelligence
- Prison Management
- Video Management



Healthier Cities

Health & Social Services

- Population Health Management
- Remote Patient Monitoring
- Social Programs
- Virtual Health



Educated Cities

Education

- Classroom Devices for Learning
- Facilities Management
- Future-Ready Skills
- Learning Management Systems
- Physical Safety
- Predictive Analytics for Education



Sustainable Cities

Urban Mobility

- Connected Vehicle Analytics
- Disruption Management
- Fare & Toll Management
- Fleet & Asset Management
- Parking Management
- Traffic & Transit Optimization

Energy & Water

- Atmospheric Air Quality Management
- Carbon Management
- Energy Distribution Management
- Water & Sewer

Buildings, Infrastructure, Planning

- Land Management
- Sanitation
- Smart Buildings
- Street Lights



Digital Cities

Government Admin

- Citizen Services
- Connected Field Services
- Decision Management & Support
- Personalization
- Regulations, Licensing & Permitting
- Virtual Town Hall

Government Finance

- Financial Management
- Fraud Detection & Prevention
- Grants Management
- Tax

Tourism, Recreation, Culture

- Destination Management
- Sports & Events
- Tourism portals



Building Blocks of Citizen-driven Smart Cities: Connectivity, Convenience, Commute

Through our primary research, we determined that a smart citizen has three quintessential needs: *higher levels of connectivity, greater convenience, and better modes of daily commute.*

Annexe I

IA en Afrique – Le Présent

THE AFRICA REPORT



NEWS

IN DEPTH

BUSINESS

POLITICS

ART & LIFE

RANKINGS

COUNTRY FILES

SERVICES

BUSINESS > TECHNOLOGY > ARTIFICIAL INTELLIGENCE HITS AFRICAN COMPANIES



Posted on Thursday, 16 March 2017 17:46

Artificial Intelligence hits African companies

By **Bright Simons**

Recommend 343 Tweet

ALT

Fear not, robots will not be stealing Africa's jobs any time soon. It has been a mantra of capitalism since the beginning: using a tractor boosts your yield compared to using a spade.

Your factory can multiply your output. Technology boosts productivity.

The rise of artificial intelligence in Africa

by Nouha Abardazzou on '16 September 2017'



ECX e-Trade platform: In 2015, The [Ethiopia](#) Commodity Exchange (ECX) has teamed up with IBM and IBM Business Partner Wavetec, to build a coffee-traceability solution based on state-of-the-art analytic, mobile and internet of things (IoT) technology. Today, the IoT solution tracks coffee through all stages of the supply chain.



Aeroview platform: Aeroview is a platform developed by the Cape Town based start-up Aerobotics. It uses AI, satellites and drones to assist farmers and help them optimise the yield through analysing processed maps to identify problem areas in crops. Aeroview is available worldwide and has users in South Africa, Australia, New Zealand, Australia, Malawi, Zimbabwe and Mozambique.

The rise of artificial intelligence in Africa

Healthcare

SOPHiA: Medical institutions in Morocco, Cameroon and South Africa have integrated SOPHiA artificial intelligence for clinical genomics into their clinical workflow to improve patients' care.

Drones: [Rwanda](#) has adopted the world's first national drone delivery network for medical aid, which is used to deliver blood to patients in remote areas. The California based Robotics company "Zipline" is working directly with Rwanda's National Centre for Blood Transfusion to make 50 to 150 deliveries a day of blood to 21 transfusing facilities

Scanning platform: An optical accessory that fits onto Android smartphones is now used by healthcare professional, in six African countries, to examine women for early signs of cervical cancer.

by Nouha Abardazzou on '16 September 2017'



Neurala fights poaching in Africa with AI-powered drones



BY MIKE WHEATLEY

UPDATED 00:31 EST .
19 MAY 2017



Deep learning startup [Neurala Inc.](#) is applying its technology to a partnership with the Lindbergh Foundation that aims to combat illegal elephant poaching in Africa with artificial intelligence-powered drones.

Despite increased efforts to combat poaching in several African countries, the statistics remain rather grim. The Lindbergh Foundation says more than 100,000 elephants were killed in Africa from 2010 to 2012, with a further 40,000 killed in 2013. It reckons an elephant is killed once every 14 minutes in Africa – a rate that will see the animals extinct in just 10 years. Rhino poaching, meanwhile, has increased by

9,000 percent in South Africa since 2007, with one slaughtered every nine to 11 hours, the foundation said.

AI helps answer thousands of health queries in Zambia via SMS



SMS has proven an exceptionally useful technology in parts of Africa
GIANLUIGI GUERCIA/AFP/Getty Images

By Anna Nowogrodzki

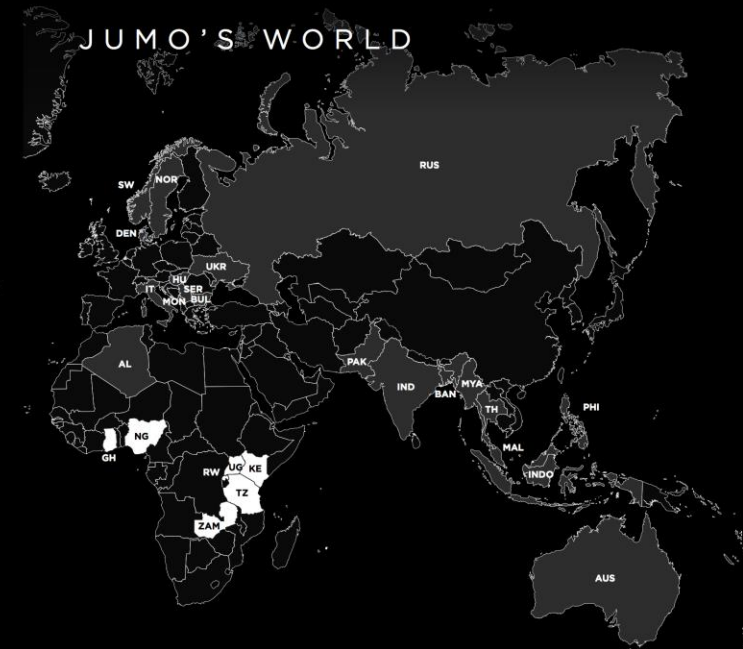
For many people in Zambia with health queries, sending a text message is the best way to get it answered. U-report, a free SMS-based service set up by UNICEF and run by volunteers, receives many thousands of questions a month, many specifically about [HIV and AIDS](#).

Also popular in Uganda, U-report has seen usage triple in the last three years, and about a thousand new users register every day. The volume of messages is growing so fast that the volunteers can't keep up, so UNICEF is testing software that reads and responds to many of the messages automatically.

In Zambia, there are roughly 27,000 new HIV infections a year, according to UNICEF, and 40 per cent of these are in those aged 15 to 24. With people constantly texting U-report for all kinds of HIV information and advice, the automated version [uses machine learning algorithms](#) to sort messages into eight categories: symptoms, HIV testing, treatment, pregnancy, transmission, prevention, definition, and male circumcision.



Next generation mobile money marketplace for emerging markets



Drive largest scale, lowest cost financial marketplace for emerging markets

Vision Maximise usable information by productising intelligence in a scalable way

Mission Understand customers and automate prediction and analytics to empower users and drive highest business, partner and ecosystem value

Predictive Models

- Credit Risk
- Affordability
- Fraud detection
- Anomaly detection
- Response modelling
- Segmentation
- Churn prediction
- Reject Inference

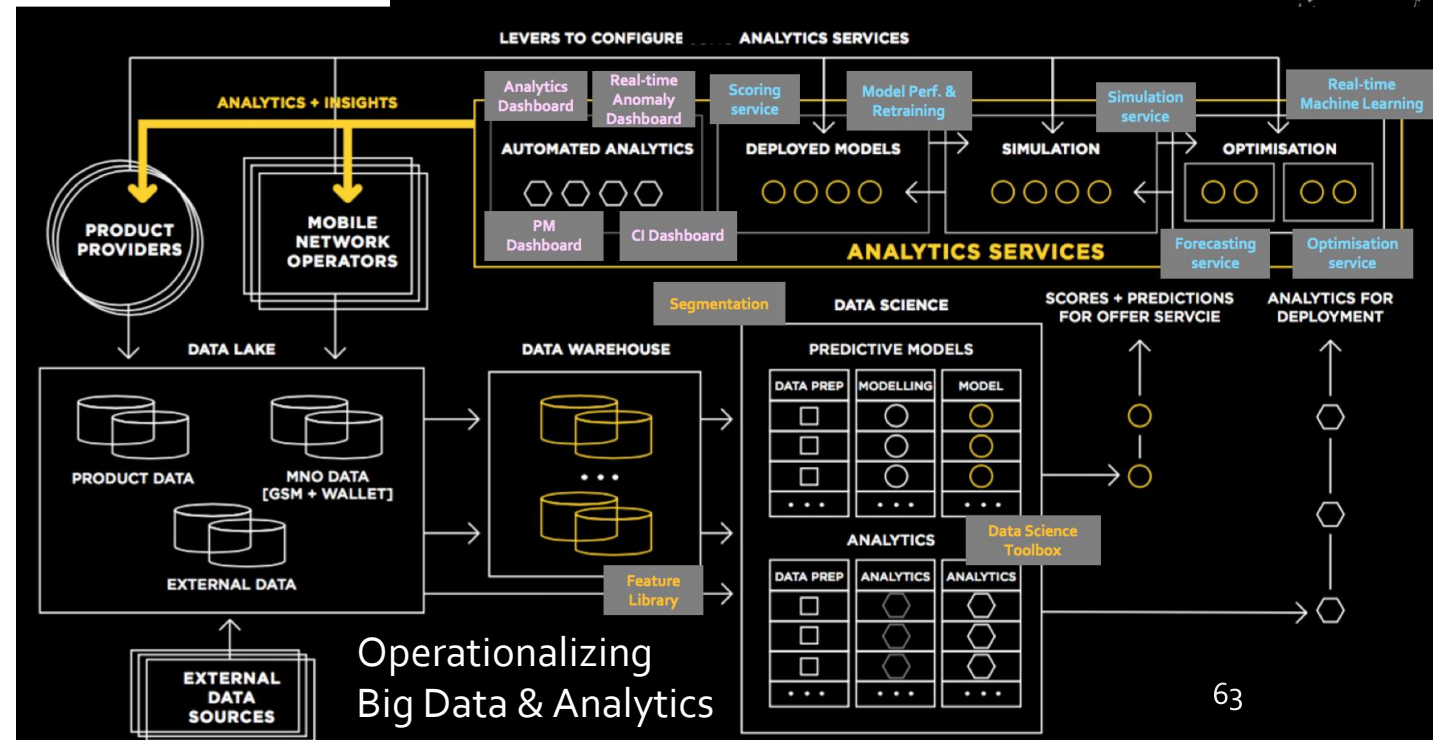
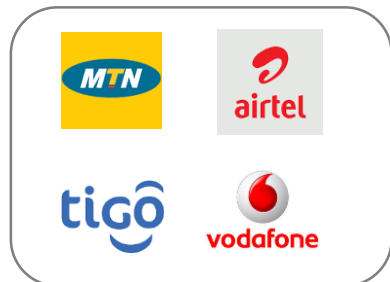
Analysis in Support of Business

- Automated & scalable Analytics Dashboard
- Customer Segmentation Analysis
- Social Network Analysis
- Feature Generation
- Problem-solving Analysis
- Product innovation
- Machine Learning based decisioning;
- Forecasting & Simulation
- What If Scenario Analysis
- Optimisation

Product Providers

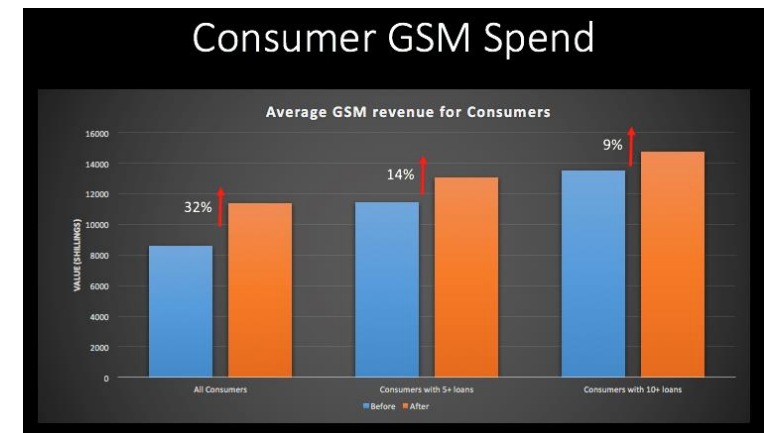
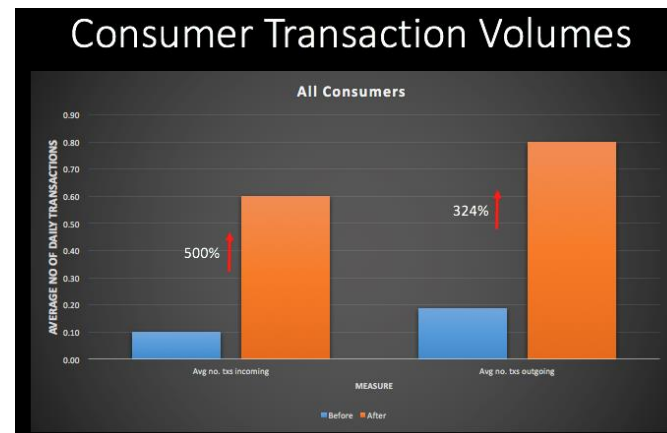
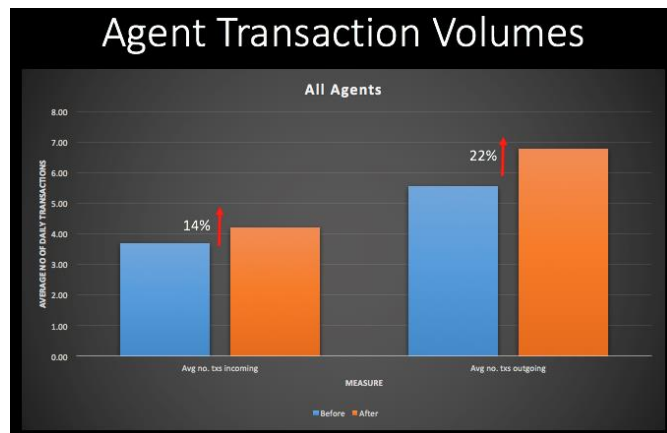


Mobile Network Operators

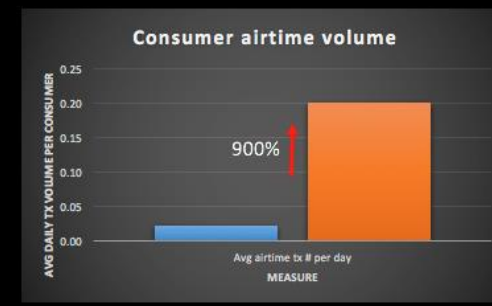
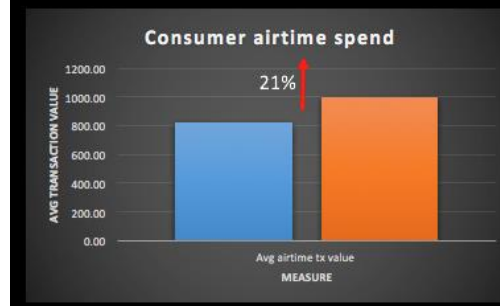


Growth and Churn prevention in Mobile Money Ecosystem

- **Transaction Growth:** Agent average number of *wallet incoming transactions* increased by 14%, and outgoing transactions increased by 22%. *Customers incoming wallet transaction volume* increased by 500%, and outgoing transaction volumes by 324%.
- **Revenue Growth:** GSM data showed similar trends. *Agent GSM revenue* went up by 41% overall, by 54% for agents with 5+ loans, and by 100% for agents with 10+ loans. *Consumer GSM revenue* went up by 32% overall, by 14% for consumers with 5+ loans, and by 9% for consumers with 10+ loans.
- **Ensuring Customer Loyalty/Product Gravity:** For agents, our customers displayed monthly churn ranging between 0-1%, while other customers displayed churn ranging between 1-17%, with other agents displaying an average of 4.5% higher churn / month.



Consumer Airtime



Predictive Modelling & Analysis: Lapse & Non-Active Members

104,512 main member policies
(raw: 160,695)
372,545 member & dependents
(raw: 572,161)

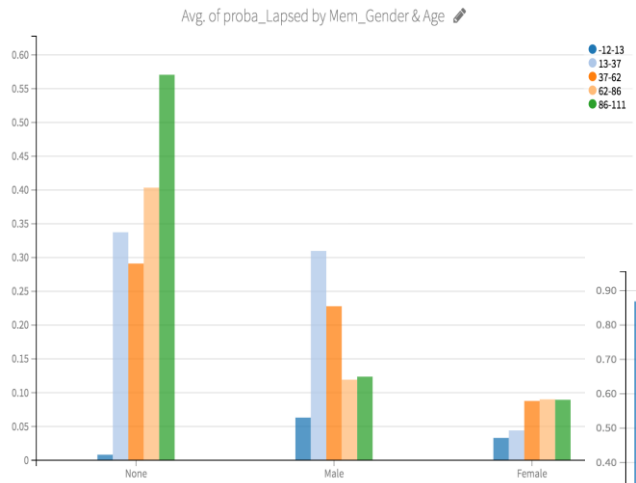


90,877 payment transactions
from Jan 2016 - May 2017

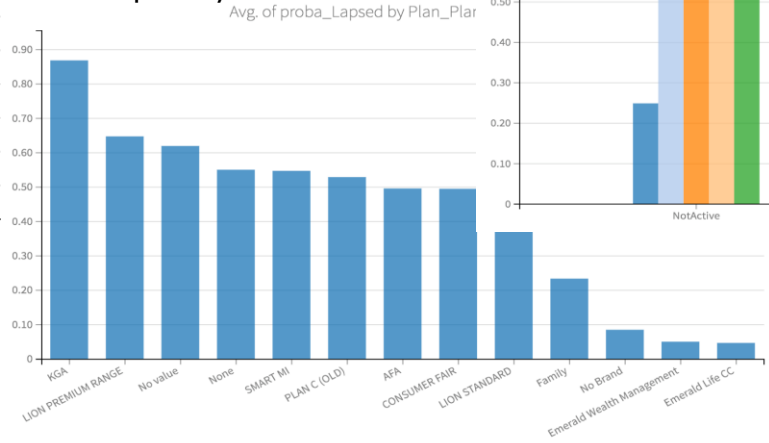


Predicting Lapse Propensity

Predictive Model accuracy of 94% (test data)



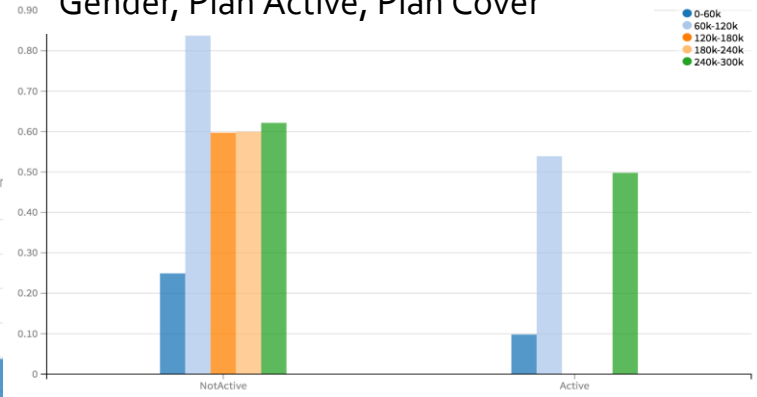
Average probability to Lapse by Plan Brand



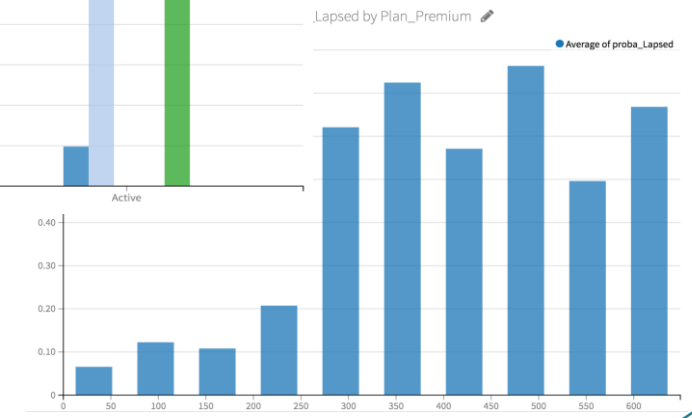
Predicting Non-Active Members

Predictive Model accuracy of 95% (test data)

Average probability to Lapse by Age, Gender, Plan Active, Plan Cover



Average probability to Lapse by Plan Premium



Churning in Insurance Industry

- **Problem:** The leading insurance brand in the “call center” market experienced a 40% cancellation rate of all there policies issued within 90 days after the sale.
- **Data Science solution:** A solution was developed using a variety of customer data sources such *email correspondence, voice recordings, text interactions* and *demographics*. The “proposed sale” is then analyzed overnight by the system and the **price adjusted** to *reflect the risk* and or *reject the sale the next day before the bulk of the costs relating to the issue of a policy is incurred.*
- **Cost Savings:** The estimated cost saving is between R100m and R120m per annum.



Medical Scheme Fraud Detection

- **Problem:** A major medical scheme administrator realized that they had a significant problem in terms of fraud amongst their schemes. It was estimated that around 10% of all contributions were lost due to fraudulent activity by service providers and members.
- **Results:** Some data mining highlighted R70m worth of “fraud/abuse” across the three schemes. This was after the existing fraud detection has been “passed”. The 3 schemes represent approximately 15% of the total members of this administrator. If the results are extrapolated the outcome is clearly much more significant.





AN AFRICAN AI EVENT FOR AFRICAN INNOVATIVE SOLUTIONS

1st ARTIFICIAL INTELLIGENCE CONFERENCE

26 & 27 October 2017

Sandton Convention Centre, Johannesburg, SA

Organised by
The CIRCUIT
Innovation | Knowledge | Intelligence

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BRAINCREATORS

NETWORK

Cortex Logic
Making Machine Intelligence Work

Machine Intelligence Institute of Africa
Transform Africa through Machine Intelligence

TOWARDS AI



DEEP LEARNING INDABA 2017

10-15 SEPTEMBER, JOHANNESBURG, SOUTH AFRICA



Machine Intelligence Institute of Africa

Transform Africa through Machine Intelligence

Deep Learning Hackathon



Machine Intelligence Institute of Africa

Transform Africa through Machine Intelligence

Deep Learning Hackathon



Cortex Logic

Making Machine Intelligence Work



Deep Learning Indaba

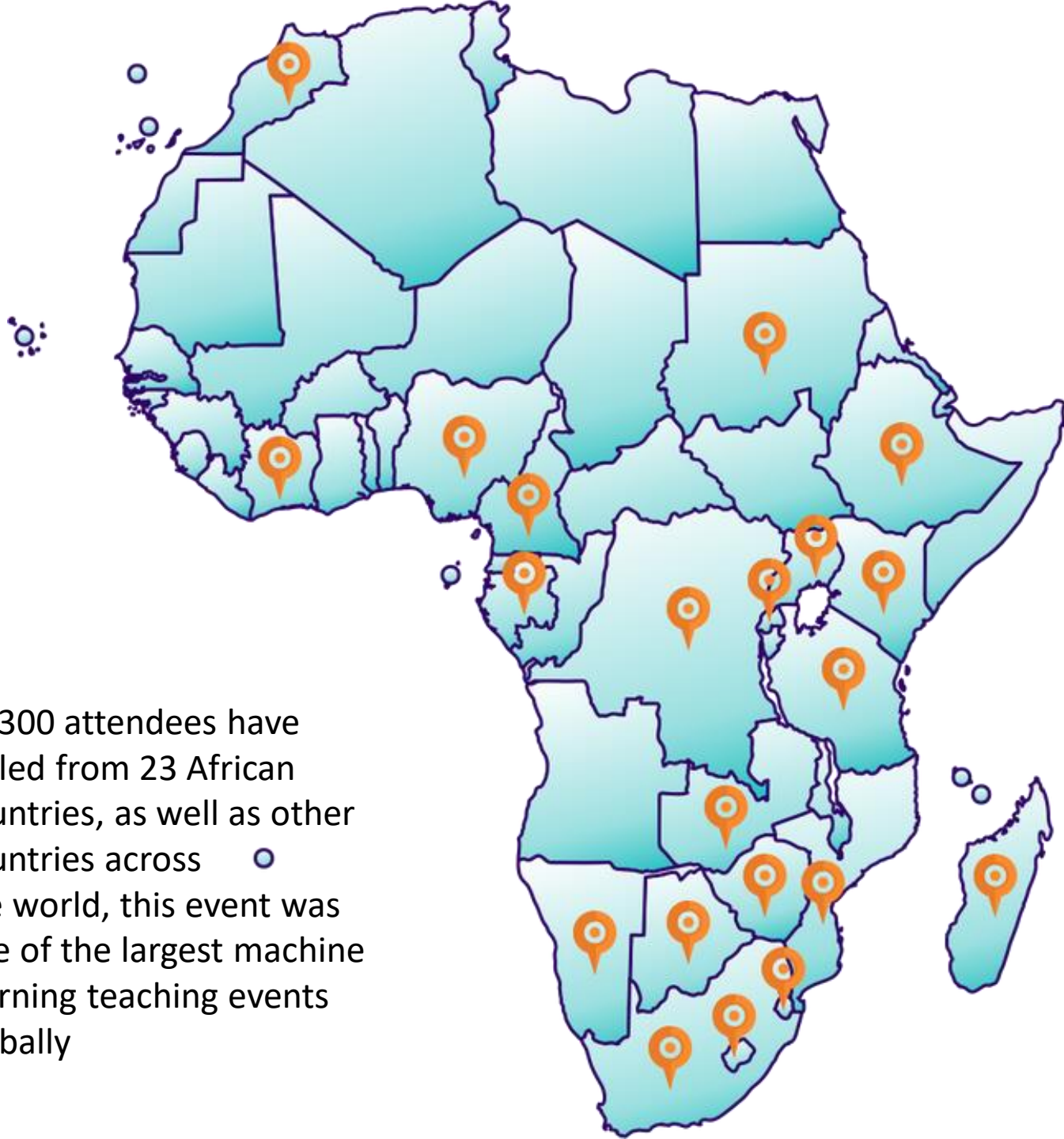
11-15 September

2017, Johannesburg, South

Africa



As 300 attendees have hailed from 23 African countries, as well as other countries across the world, this event was one of the largest machine learning teaching events globally





1ST NATIONAL SUMMIT ON THE BIG DATA ECONOMY: DRIVING THE ECONOMY THROUGH DATA SCIENCE

Thursday, 12th October, 2017
Eko Hotel, Victoria Island, Lagos




1st National Summit on Big Data Economy

New frontiers in Data Science, Machine Learning and Artificial Intelligence for Nigeria's development
Sky Pavilion, Oriental Hotel, Victoria Island, Lagos | Thursday 12 October, 2017, 9am

Ngosi Dada (Director, Onufi)	James Agada (CEO SWG)	Babajide Ogunbanjo (CEO, Interswitch)	Olufemi Awoyemi (CEO Proshare Nigeria)	Ayomide Olorun (CEO Rock Centre)	Babajide Ogunsanwo (Founder, Leadership by Status)	Emeka Okoye (CEO, Cymantika)
Oniscun Ogunbade (Co-Founder, Budget)	Uzoma Dooze (CEO Diamond Bank)	Steve Babaeke (CEO X3M Ideas)	Dr Yemi Kale (Statistician General of the Federation, Keynote Speaker)	Dr Nihaludh Shalwa (Data Science Scholar and Entrepreneur)	Adetayo Bamiduro (Co-founder, MAX.ng)	
Dr Tunji Adegbesan (Founder, Gidma)	Chika Nwachi (Founder, COO, IZAK)	Nadaya Enageli (Director at Andela)	Dale Tijunro (CEO WIR Combat Academy)	Olumide Olayinka (Partner, KPMG)	Dipo Fasina (Country Manager IBM)	Dr Sulaimon Afolabi (Data Scientist and Researcher, South Africa)

For more Information on registration and participation
Please visit: www.datasciencenigeria.org

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PARTNERS

2ND DATA SCIENCE NIGERIA BOOTCAMP

12th - 15th October, 2017
Lekki Peninsula Resort, Ajah, Lagos

(A world-class, all-expense-paid, residential bootcamp with global experts in Data Science/Machine learning and series of hackathon focussed on applying data science on Nigerian-centric data to answer fundamental socio-economic questions.)

PLUS PRE-BOOTCAMP QUALIFICATION ACTIVITIES

- 3-month Microsoft Professional Certificate Track in Data Science for bootcamp qualification
- 3-levels Hackathon on Kaggle for skill development
- Post-event mentoring for best 20 participants by Microsoft 4Afrika

PARTNERS





Machine Intelligence Institute of Africa
Transform Africa through Machine Intelligence



Cortex Logic
Making Machine Intelligence Work



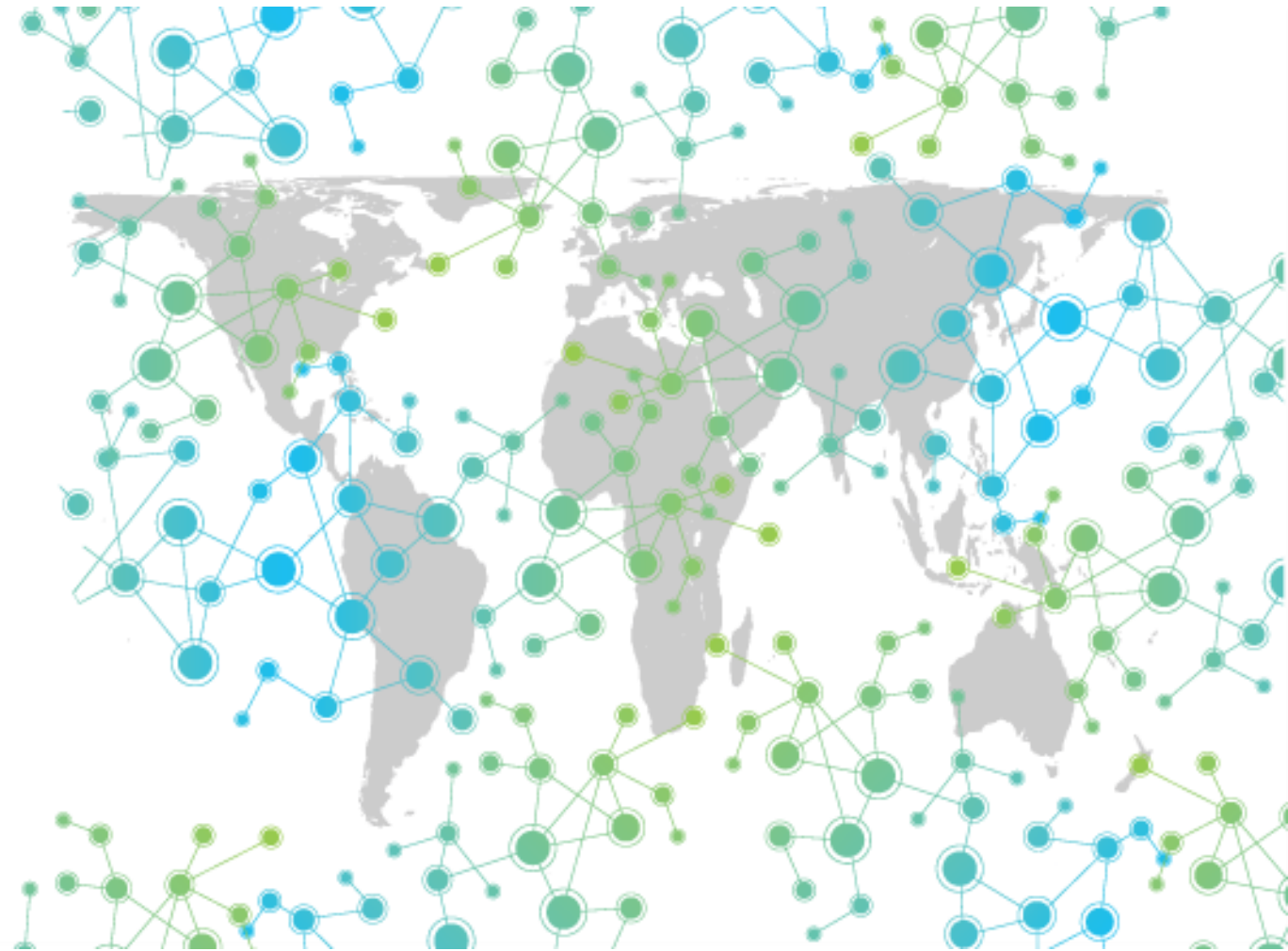
Deep Learning Hackathon



GLOBAL SYMPOSIUM

ARTIFICIAL INTELLIGENCE & INCLUSION

November 8-10, 2017



The Global Network of Internet and Society Research Centers (NoC) has organized the event which are co-hosted, on behalf of the NoC, by the Institute for Technology and Society of Rio de Janeiro and the Berkman Klein Center for Internet & Society at Harvard University, with support from the Ethics and Governance of Artificial Intelligence Fund. The aim of the Symposium is to deepen participants's understanding of Artificial Intelligence inclusion challenges and opportunities, to identify and discuss areas for research, education, or action, and inform and incubate new projects and other collaborative efforts among participants.



MIIA Activities & Growth Path in 2018





SKA TELESCOPE SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

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Dr. Catherine Cesarsky elected Chair of the SKA Board of Directors

The Board of Directors of the Square Kilometre Array (SKA) Organisation has approved the appointment, with immediate effect, of its new Chair, Dr. Catherine Cesarsky, following the recommendation from its Search Committee.

Dr. Catherine Cesarsky elected Chair of the SKA Board of Directors

Synchronisation System Designs Chosen for SKA telescopes

Molecule detection in young star system challenges search for Life assumptions

Website Latest

In the press



New issue of the 24th SKAO Bulletin available



35th edition of the SKA eNewsletter is now available



New issue of the 23rd SKAO Bulletin available



SKA People - Meet British radio



Explore the SKA

The SKA Headquarters



SKA Virtual Reality Experience



Taming the Data Deluge to Unravel the Mysteries of the Universe

Melanie Johnston-Hollitt
School of Chemical & Physical Sciences, Victoria
University of Wellington & Peripety Scientific Ltd.
Wellington, New Zealand
Melanie@PeripetySci.com

SKA IN AFRICA

Thousands of SKA antenna dishes will be built in South Africa (in the Karoo, not far from the Northern Cape town of Carnarvon), with outstations in other parts of South Africa, as well as in eight African partner countries.



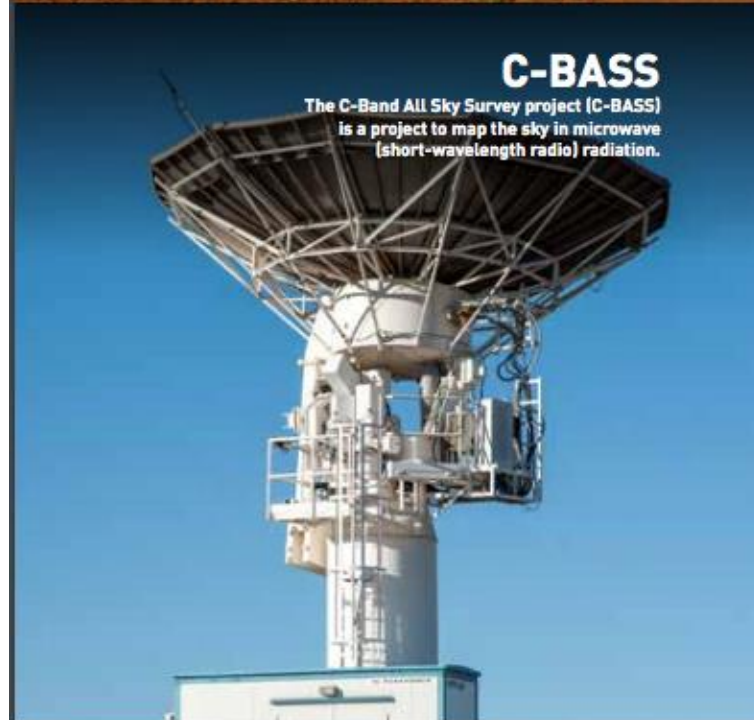
HERA

The HERA (Hydrogen Epoch of Reionisation Array) radio telescope will be instrumental in detecting the distinctive signature that would allow astronomers to understand the formation and evolution of the very first luminous sources: the first stars and galaxies in the Universe.



C-BASS

The C-Band All Sky Survey project (C-BASS) is a project to map the sky in microwave (short-wavelength radio) radiation.



KAT-7

The seven-dish MeerKAT precursor array, KAT-7, is the world's first radio telescope array consisting of composite antenna structures.



Where will the SKA be? In Africa.

SKA Stations in Africa - Phase II



Phased roll-out of the AVN

Fast-track of Namibia and Botswana to ensure readiness for SKA Phase 2



Modeling and Monitoring Crop Disease in Developing Countries

John A. Quinn

Department of Computer Science,
Makerere University, Uganda
jqinn@cit.mak.ac.ug

Kevin Leyton-Brown

Department of Computer Science,
University of British Columbia, Canada
kevinlb@cs.ubc.ca

Ernest Mwebaze

Department of Computer Science,
Makerere University, Uganda
emwebaze@cit.mak.ac.ug



Figure 4: Examples of healthy leaves (left) and those infected with cassava mosaic disease (right).

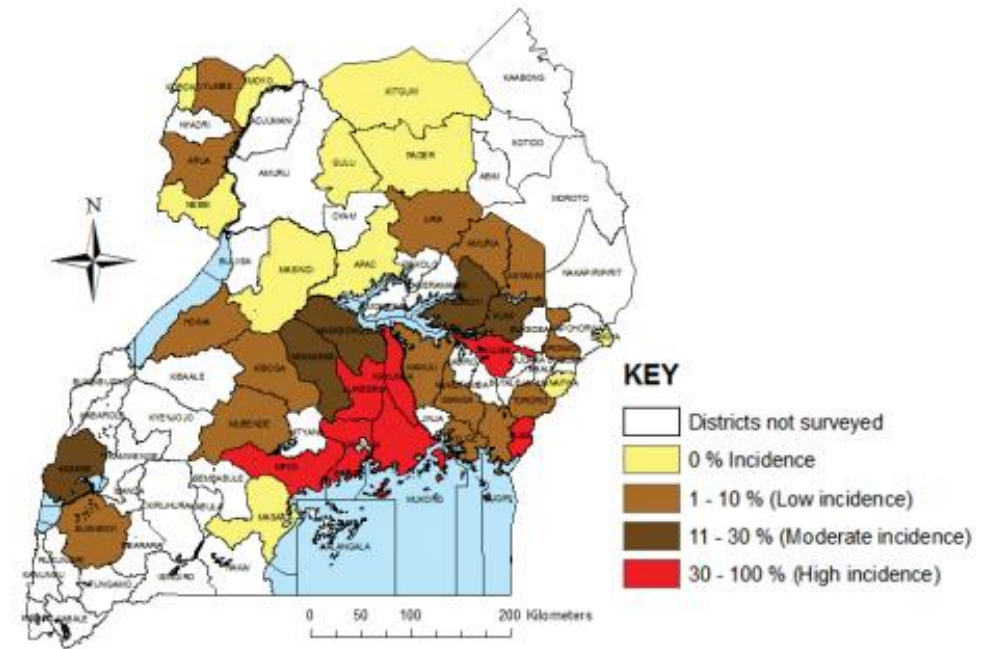
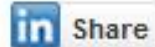


Figure 1: Incidence map of cassava brown streak disease in Uganda, 2009 (NACCRI).

Artificial Intelligence: The new technologies powering South African business

October 6, 2017 • General, Southern Africa, Top Stories

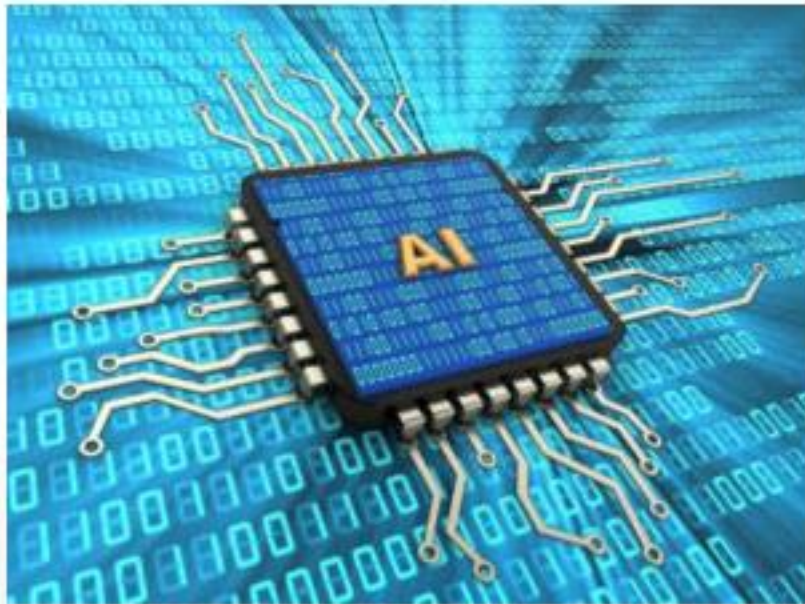


Artificial Intelligence: The new technologies powering South African business.

By next year, the number of businesses around the world using artificial intelligence (AI) in some aspect of their operations is expected to increase to 62 percent. Leading this trend are the South African organisations which are adopting smart technologies to not only make their procedures more efficient, but to adapt to the changing landscape of modern business.

Top 5 ways artificial intelligence can support your business

September 28, 2017 • East Africa, General, Lists, North Africa, Southern Africa, Top Stories, West Africa



5 ways artificial intelligence can support your business

Artificial Intelligence (A.I.) has for decades been the subject of science fiction and fantasy films. But we've come a long way since 'Skynet'. Only a few months ago, [Facebook deactivated a chatbot project](#), as the bots had developed their own language to communicate with each other, making them redundant to the human

employees 'in charge'.

- 1) Facebook for Business
- 2) Intelligent Candidate Matching for Recruitment
- 3) Chatbots
- 4) Cognitive Technology for Asset Management
- 5) A.I. Writers

Here's how companies can benefit from machine learning

September 7, 2017 • Opinion, Top Stories

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Here's how companies can benefit from machine learning.

When a technology has its breakthrough, can often only be determined in hindsight. In the case of artificial intelligence (AI) and machine learning (ML), this is different. ML is that part of AI that describes rules and recognizes patterns from large amounts of data in order to predict future data. Both concepts are virtually

omnipresent and at the top of most buzzword rankings.

Progress through machine learning

Artificial intelligence helps to satisfy the customer

If you can predict demand, you can plan more efficiently

New division of labor

Machine learning in education, medicine and development aid

Appendix II

AI in Africa - The Future

The AI Revolution could either

**pull the “bottom billion” out of poverty and transform
dysfunctional institutions**

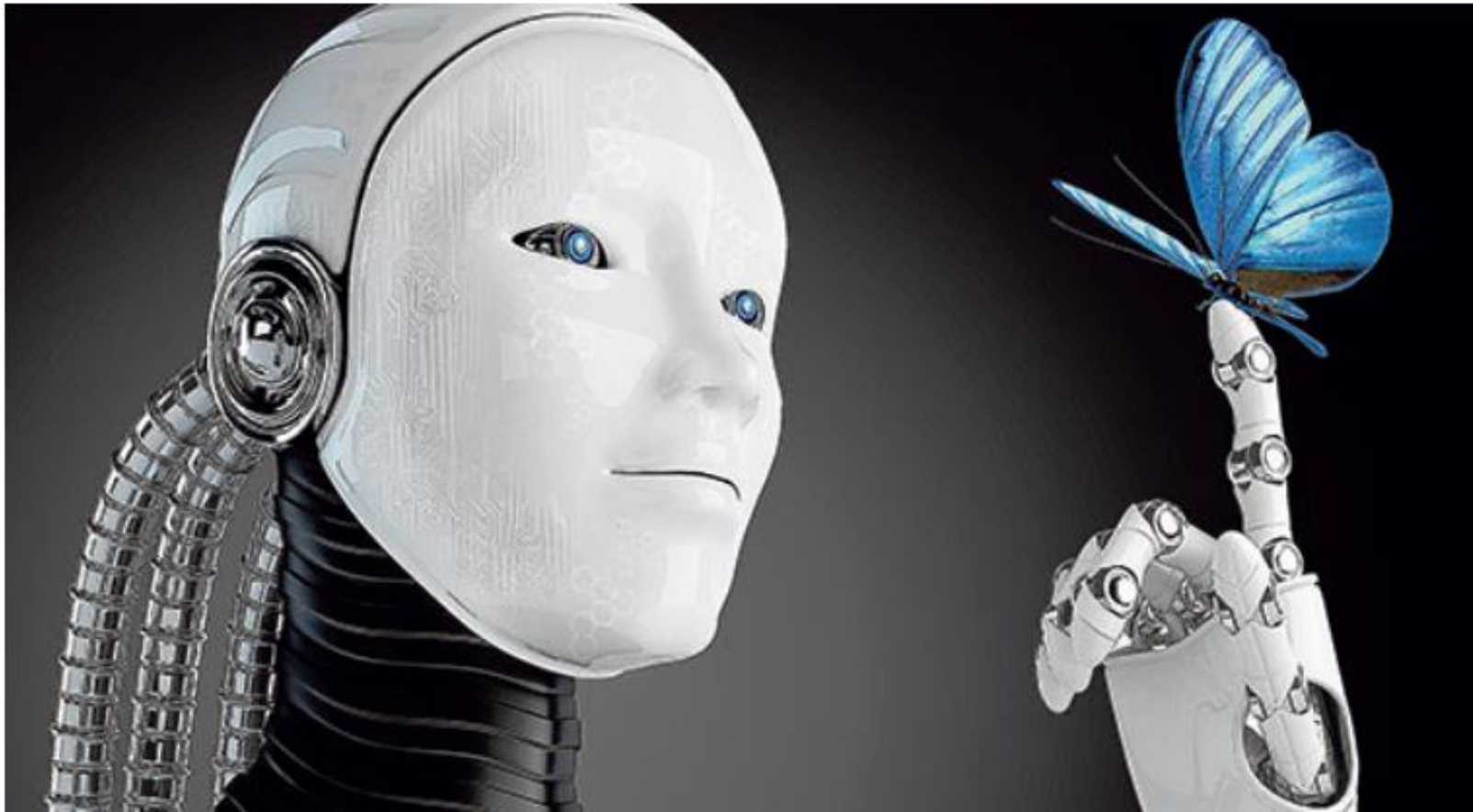
or

entrench injustice and increase inequality

The outcome will depend on how we manage the coming changes

Africa warned of Artificial intelligence impact on economies

SUNDAY JULY 30 2017

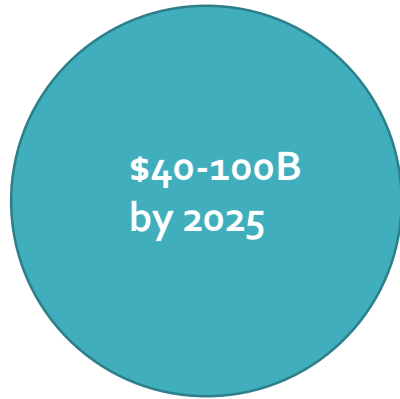


In Summary

- Economists say governments needed to [create access to affordable IT infrastructure for their youth](#), to prepare them for a future where economies will be driven by artificial intelligence.
- While many believe robots will mainly affect demand for [labour](#) by the industrial and service sectors, other professions like [accountancy, law and medicine](#) will also be heavily affected.
- According to Dr Donald Kaberuka recent history suggests that it is [not too late for Africa to adapt to the future](#).

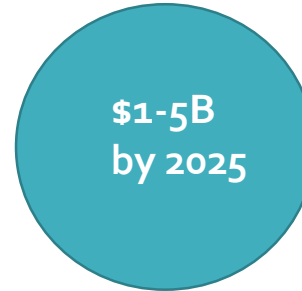
Market Size Opportunity

TAM Total Available Market



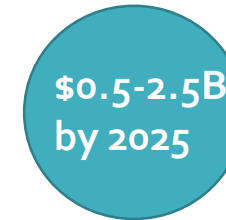
Worldwide Cognitive Systems and Artificial Intelligence Revenues Forecast to Surge Past \$47 Billion in 2020, According to New IDC Spending Guide

SAM Serviceable Available Market

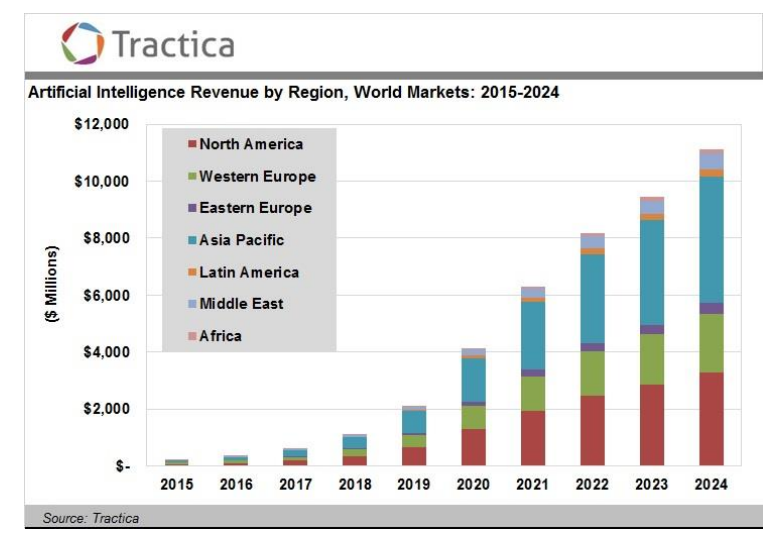
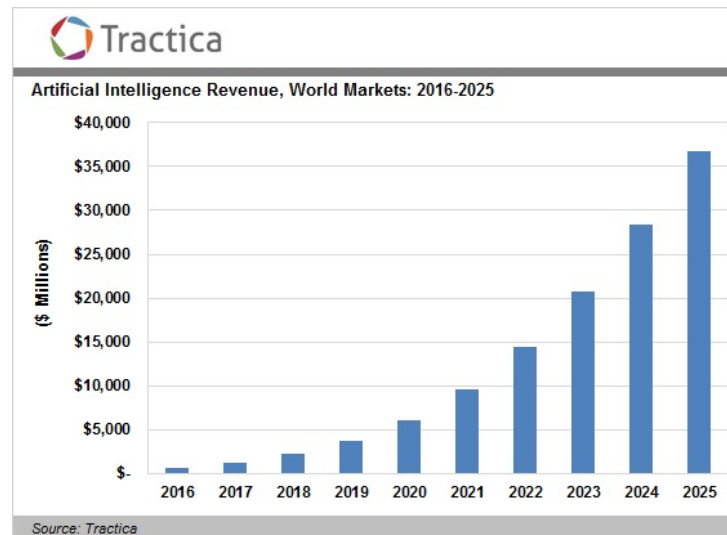
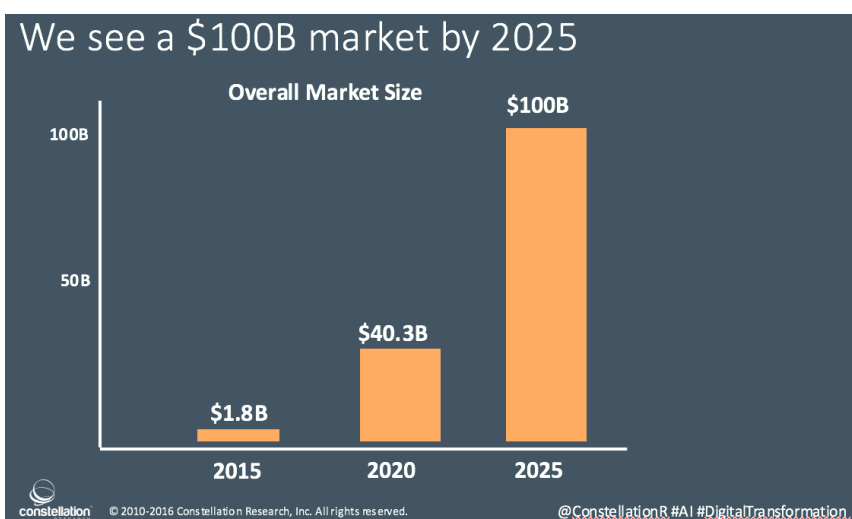


Assume SAM of 2.5% of TAM for Africa & other international opportunities

SOM Serviceable Obtainable Market



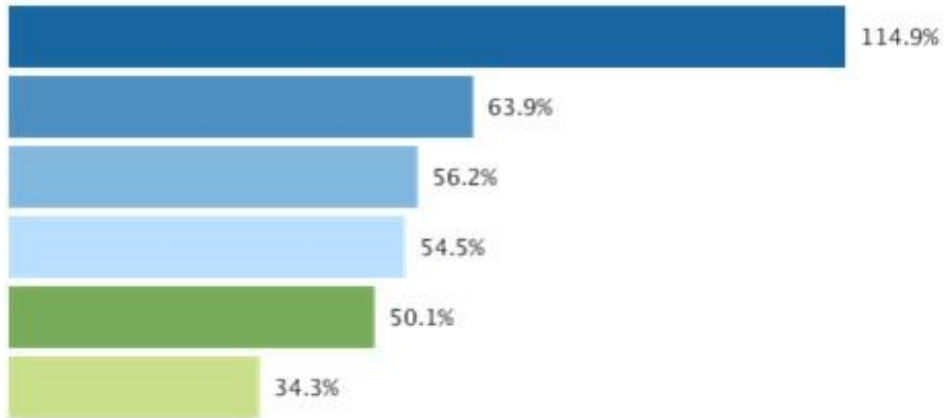
Assume SOM of 50% of SAM for Africa & other international opportunities



Where is Africa?



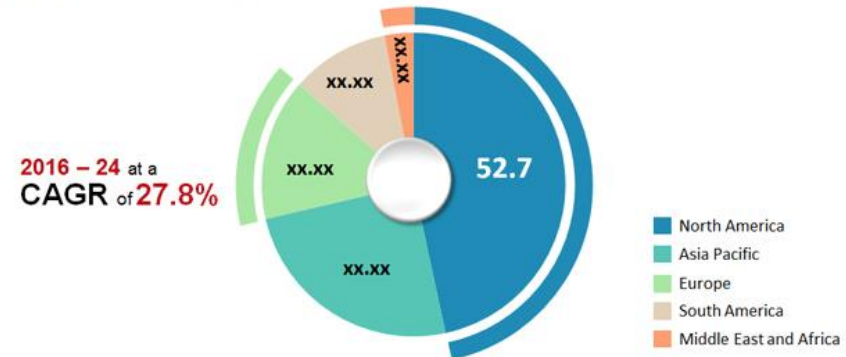
Top Region Based on 5 Year CAGR (2015 - 2020)



Source: IDC Worldwide Semiannual Cognitive Artificial Intelligence Systems Spending Guide

Chatbot Market Revenue

By Region, 2015 (US\$ Mn)

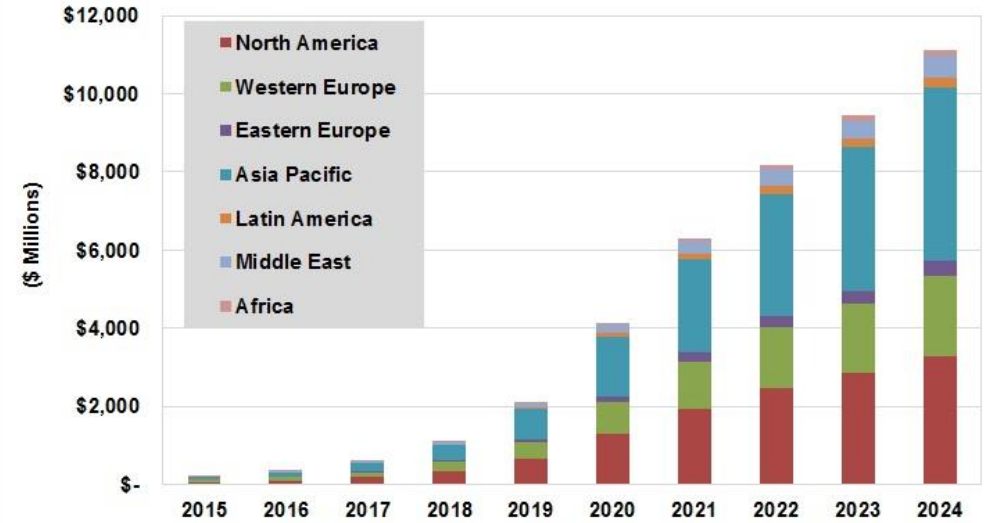


2016 - 24 at a CAGR of 27.8%

Source: TMR Analysis, November 2016

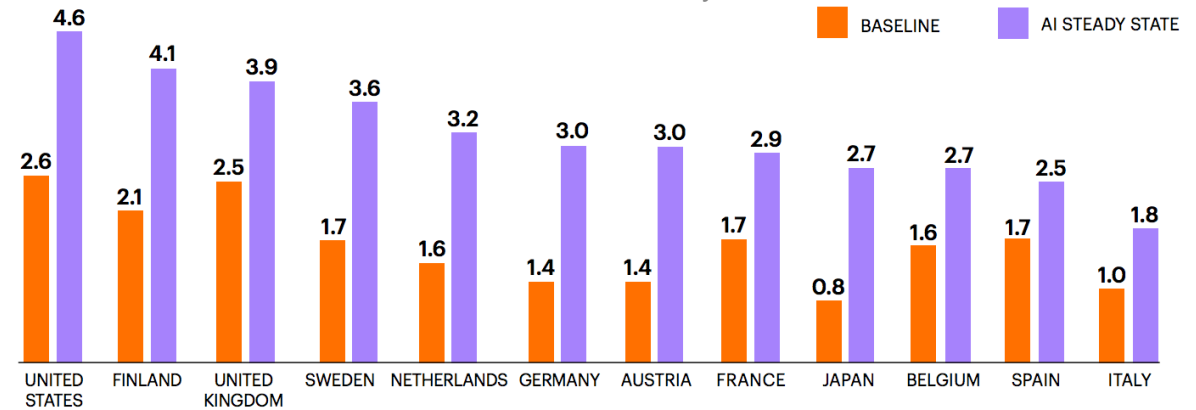


Artificial Intelligence Revenue by Region, World Markets: 2015-2024



Source: Tractica

Annual growth rates by 2035 of gross value added (a close approximation of GDP), comparing baseline growth by 2035 to an artificial intelligence scenario where AI has been absorbed into the economy.



Real gross value added (GVA) (% growth)

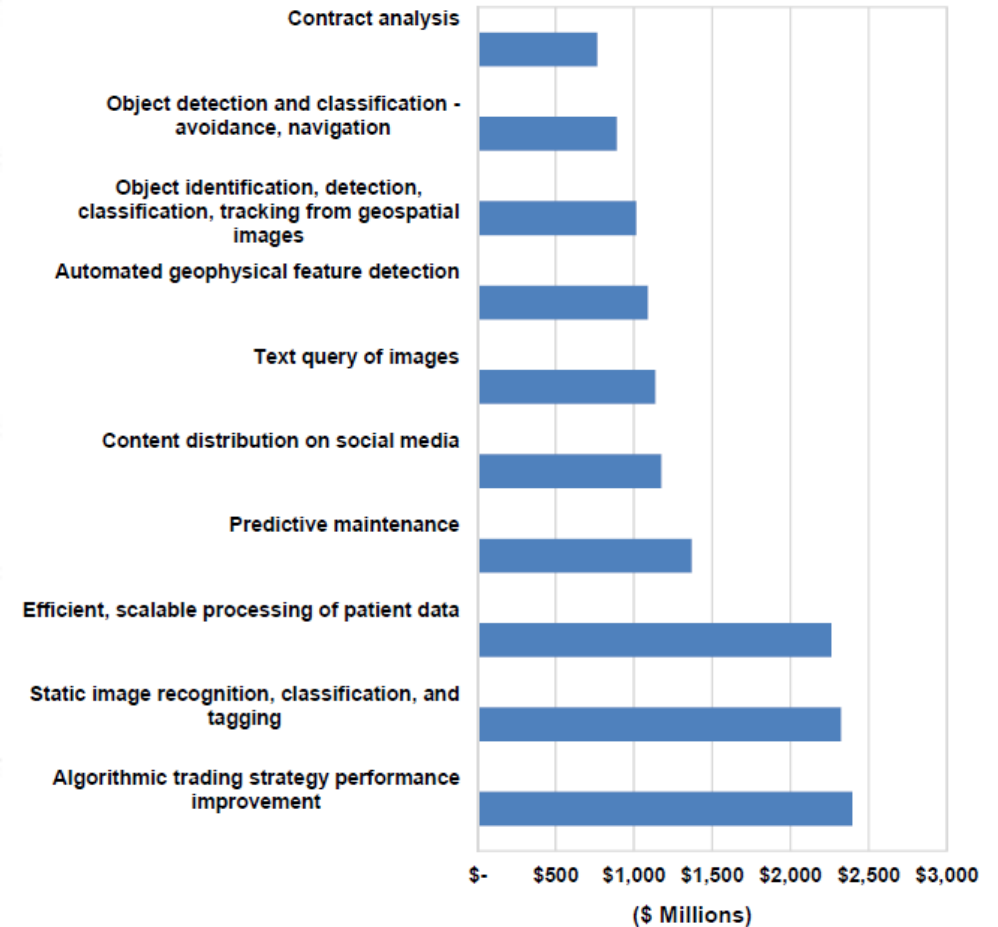
Source: Accenture and Frontier Economics

AI Use Cases & Opportunity size

ARTIFICIAL INTELLIGENCE—USE CASES AND OPPORTUNITY SIZE (2025E)

SECTOR	OPPORTUNITY SIZE	USE CASES
Agriculture	\$20 billion total addressable market	<ul style="list-style-type: none"> Optimizing seed planting, fertilization, irrigation, spraying and harvesting Sorting fruits and vegetables to reduce labor costs Identifying sick livestock based on changes in audio data
Finance (U.S.)	\$34-43 billion annual cost savings and new revenue	<ul style="list-style-type: none"> Identifying and executing trades in the latency period before consolidated data hits markets Scrubbing and packaging satellite images that can be used to inform economic/market forecasts (e.g., images of oil inventory, retail traffic) Identifying credit risk and executing limit reduction/closures on accounts that could go delinquent Email monitoring for compliance
Healthcare	\$54 billion annual cost savings	<ul style="list-style-type: none"> Reducing failed drug discovery Improving care algorithms by connecting historically disparate data sets Decreasing procedural costs
Retail	\$54 billion annual cost savings and \$41 billion annual new revenue	<ul style="list-style-type: none"> Enabling image-based product searches Enhancing recommendation engine capabilities by leveraging large data sets on sales, inventory and customer preferences Improving online search and customer support Predicting product demand and optimizing pricing
Energy	\$140 billion cumulative cost savings	<ul style="list-style-type: none"> Streamlining project identification and planning by fusing geological and production data Improving equipment reliability and reducing redundancies required at the well site Reducing maintenance-related downtime in downstream industries

Artificial Intelligence Revenue, Top 10 Use Cases, World Markets: 2025



(Source: Tractica)

Source: Goldman Sachs: Profiles in Innovation, November, 2016.



AFRICA'S RAPID URBANIZATION CAN BE A DRIVER OF INDUSTRIALIZATION

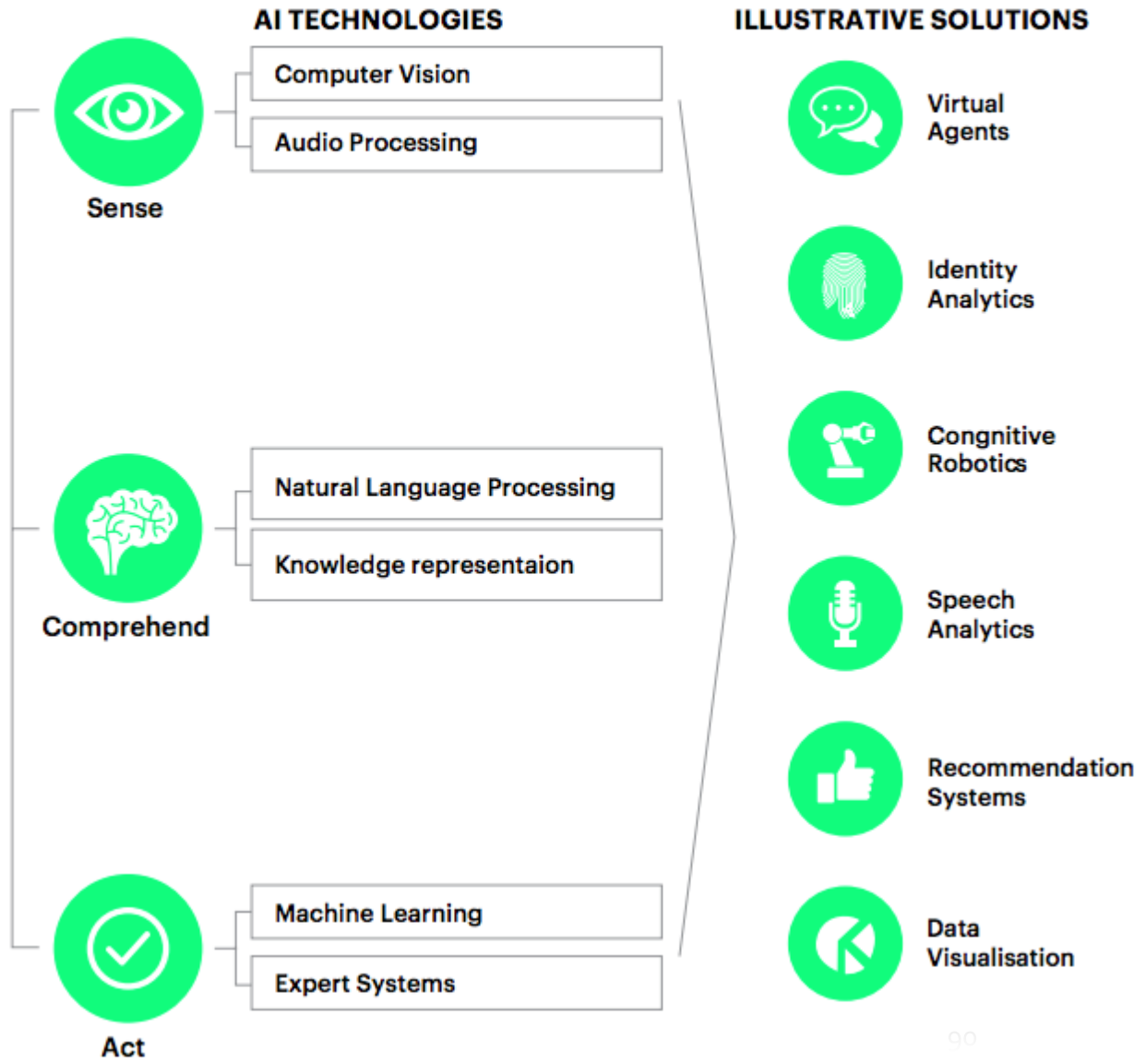


AFDB PRESIDENT ADESINA COMMITS \$250,000 WORLD FOOD PRIZE MONEY TO SUPPORT YOUNG AFRICAN FARMERS

ARTIFICIAL INTELLIGENCE IS SOUTH AFRICA READY?



Accenture



WHY DO WE NEED AI?

1. Most consumers and enterprise clients **will select products and services based on a company's AI**, instead of that company's traditional brand.
2. Most **interfaces** will not have a screen and will be **integrated into daily tasks**.
3. **An adaptive workforce**
4. **Ecosystem power plays**
5. AI as the **new UI**

In fact, most executives agree that AI will revolutionise the way they gain information from and interact with customers. In South Africa, some **78% of South African executives** say they **need to boost their organisation's competitiveness by innovating through investments in AI technologies**, notably embedded AI solutions and computer vision. But the reality, though, is that only about a third of these organisations are planning significant AI investments over the next three years.

WHAT'S HOLDING SOUTH AFRICA BACK?

With the recent convergence of technologies, economies are entering [a new era in which AI](#) has **the potential to overcome the physical limitations of capital and labor and open up new sources of value and growth.**

AI can be seen as a new factor of production that can help [address future labour shortages](#) and a [chronic productivity deficit](#) in South Africa.

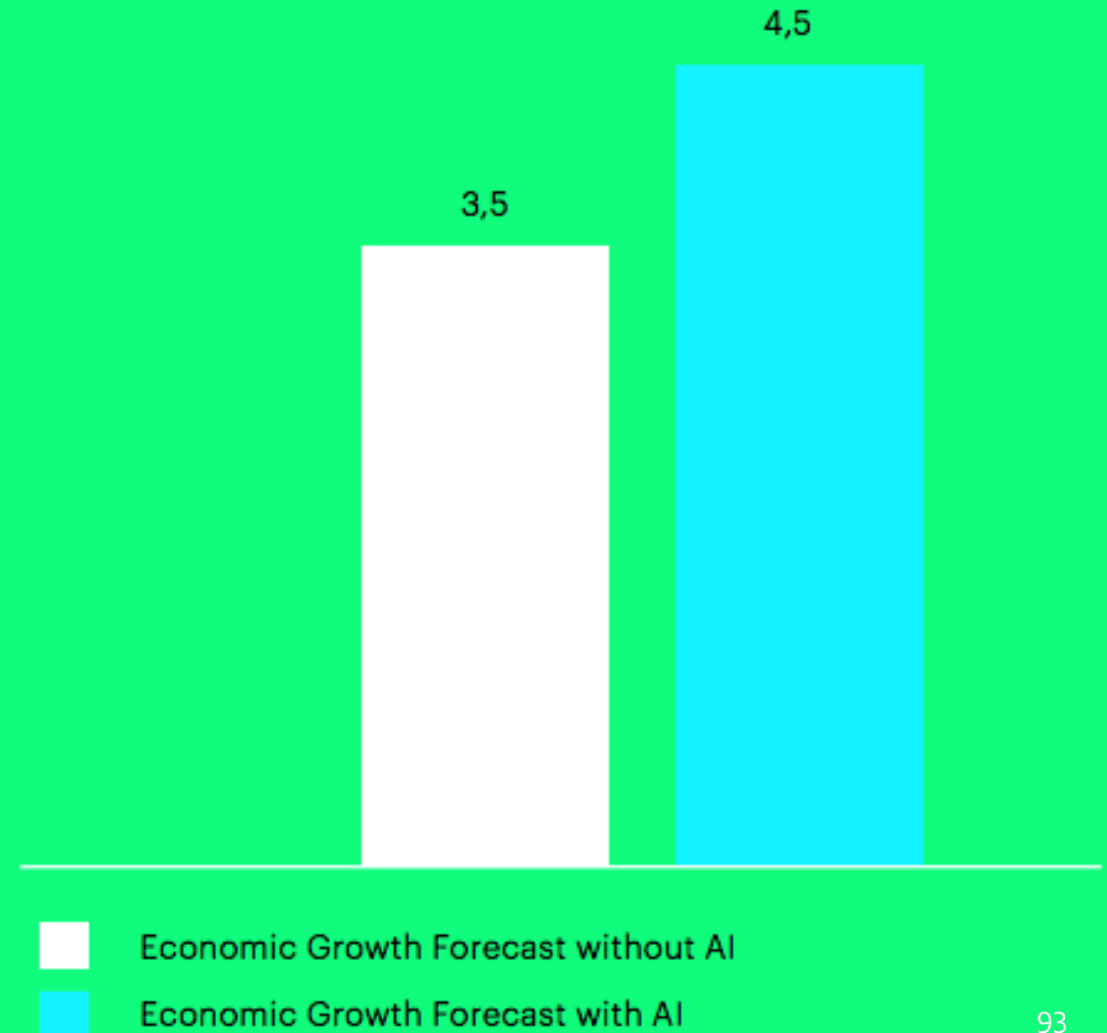
To estimate the true potential of the impact that AI can make, we developed an economic model built upon three main channels through which value is generated.

3 main channels through which value is generated

1. **Intelligent automation**, which differs from all previous forms of automation in that AI machines can learn and improve over time, rather than degrade.
2. **Augmenting** existing labour and capital, which means that people can be far more productive when supported by machines, and machines themselves can learn and improve their own performance without human supervision.
3. **Innovation diffusion**, which refers to how innovation begets further innovation—for example, by stimulating new ideas and business models among adjacent businesses and industries in a spill-over effect.

ECONOMIC IMPACT OF AI IN SOUTH AFRICA

Real Gross Value Add by 2035 (% growth)



FORGING A PATH TO AN **AI FUTURE**

WHAT MUST SOUTH AFRICA DO NOW?

South Africa needs to fundamentally shift its thinking about AI and strategically plan to create a vibrant ecosystem where AI flourishes.

A first step in this direction for South Africa is to create a **comprehensive long-term vision of the role of AI in the country's economic development.**

E.g., China has laid out clear targets for AI development in phases, initially by 2020 and going forward by 2030.

1. CREATE A VIBRANT ECOSYSTEM

Universities

Startups

Large companies

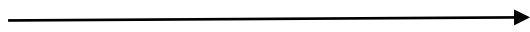
Policymakers

Multi-stakeholder partnerships

2. TURN AI INVESTMENT INTO AI-DRIVEN GROWTH

3. PRACTICE RESPONSIBLE AI

2. TURN AI INVESTMENT INTO AI-DRIVEN GROWTH

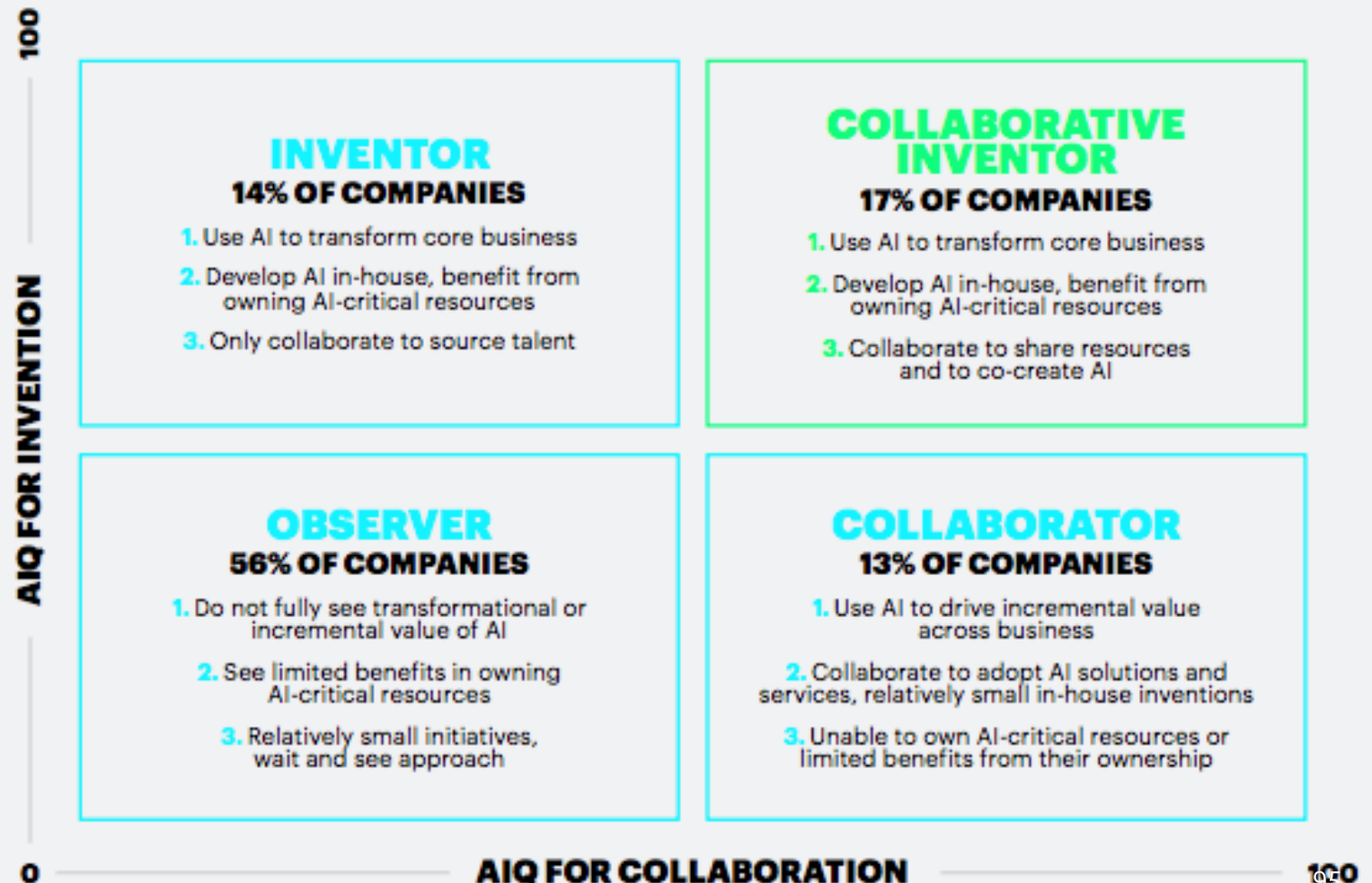


3. PRACTICE RESPONSIBLE AI

The most significant challenges to the adoption of AI are no different in South Africa than anywhere else. They are about preparing stakeholders thoroughly for the major intellectual, technological, political, ethical and social questions that will arise as AI becomes more deeply integrated into our lives.

THE ARTIFICIAL INTELLIGENT QUOTIENT (AIQ) FOR INVENTION AND COLLABORATION

Less than 20 percent of analysed companies are strong on both — we call them “collaborative inventors”



NEXT STEPS FOR POLICY MAKERS AND BUSINESS LEADERS

1. DESIGN

- **Take the lead.** Attaining value from AI demands recognition and action from leadership. To create an AI roadmap focussed on growing the business, leaders need a sufficient grasp on AI. This means AI must be made tangible to the C-Suite. They must spend time with real AI machines, and visit AI labs where experts can be probed, ideas can be tested and prototypes can be developed.
- **Create an open AI culture.** Corporate culture must adapt to the presence of its new AI employees. It will demand trust, openness and transparency. It must address not only interactions but employees' concerns over the impact of AI on job security, wages and privacy. Indeed, AI can be used to proactively improve workplace culture.
- **Adopt a holistic AI approach.** Keeping abreast of technology can expose business opportunities, as does staying current with ever-changing customer dynamics. By reducing the distance between business-unit leaders and IT, businesses will be more able to identify and pick lower-hanging fruits. Introducing change management will also reduce the organisational emotional divide between those that fear AI and those that embrace it.
- **Leverage the Ecosystem.** Explore the AI platforms preferred by customers and forge strategic partnerships. Also consider the value of sharing and enhancing business intelligence through collaboration with other companies and organisations to target higher value return.
- **Take the crowd into the cloud.** Cloud technologies have provided an opportunity to scale rapidly with lower computing costs and without the confines of internal IT structures. The next step in innovation will be to combine the crowd-sourced data in the cloud with AI capabilities to create new and disruptive business opportunities.

NEXT STEPS FOR POLICY MAKERS AND BUSINESS LEADERS

2. EXECUTE

- **Reinvent HR into HAIR (Human and AI resources).** As AI becomes part of the workforce, HR leadership will play a much bigger role in business strategy and innovation, as well as accumulate a greater technical understanding of AI technologies and how these will shape the future of work. The HR function will need to incorporate AI technologies in all aspects of its work, from hiring to retirement.
- **Learn with machines.** AI will transform not only what people learn, but also how they learn. To fully exploit the potential of AI, human and machine intelligence must be tightly interwoven. With AI taking over mundane and low-value-added tasks, a skills gap will open between young professionals and older workers, favouring workers with experience and placing emphasis on human abilities such as judgment, communication, and creative thinking, which will all complement AI technologies.
- **Converge data for intelligence.** The true value of AI will not be found in, say, an algorithm or a neural network itself. Rather it will be found in the way data intelligence transforms the business. The performance of AI will depend on the quality and amount of data available. It will also depend on the ability to converge and make sense of data from sources such as Internet of Things (IoT) sensors and social networks. In addition to focusing on data security, regulations and governance, chief data officers must construct an integrated, end-to-end data supply chain to maximise the value derived from enterprise data. This will also increase the impact of, and value derived from, AI.
- **Take a step beyond automation.** With recent strides in AI, companies need to take a step beyond automation to harness the intelligence of dynamic, self-learning and self-governing machines. This means enabling AI-powered machines to self-diagnose technical failures, autonomously order replacement parts and anticipate maintenance needs.

3. MONITOR

- **Measure your return on algorithms.** CFOs will need a new toolbox of financial metrics to properly assess the “Return on AI.” Unlike traditional assets that depreciate over time, AI assets, with their self-learning technologies, gain value as time passes. But because of the learning nature of AI, benefits will stem from yet-to-be determined sources. This complexity may deter AI investment decisions, underlining the need for new thinking and new terminology for capital expenditure and valuation models.
- **Analyse and Audit** – the performance of AI against key value-driven metrics, with respect to algorithmic accountability, bias and cybersecurity.

MCKINSEY GLOBAL INSTITUTE

ARTIFICIAL INTELLIGENCE THE NEXT DIGITAL FRONTIER?

1. Artificial intelligence is getting ready for business, but are businesses ready for AI?

2. Artificial intelligence promises to boost profits and transform industries

3. Businesses, developers, and governments need to act now to realize AI's full potential



ARTIFICIAL INTELLIGENCE

The next digital frontier?

The current AI wave is poised to finally break through

Investment in AI is growing at a high rate, but adoption in 2017 remains low

In 2016, companies invested
\$26B to \$39B
in artificial intelligence

TECH GIANTS
\$20B to \$30B

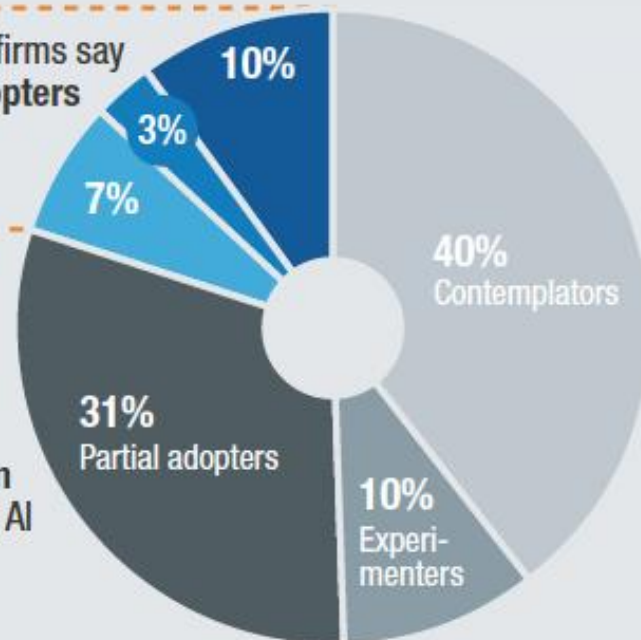
STARTUPS
\$6B to \$9B

3x External investment growth since 2013

20% of AI-aware firms say they are adopters

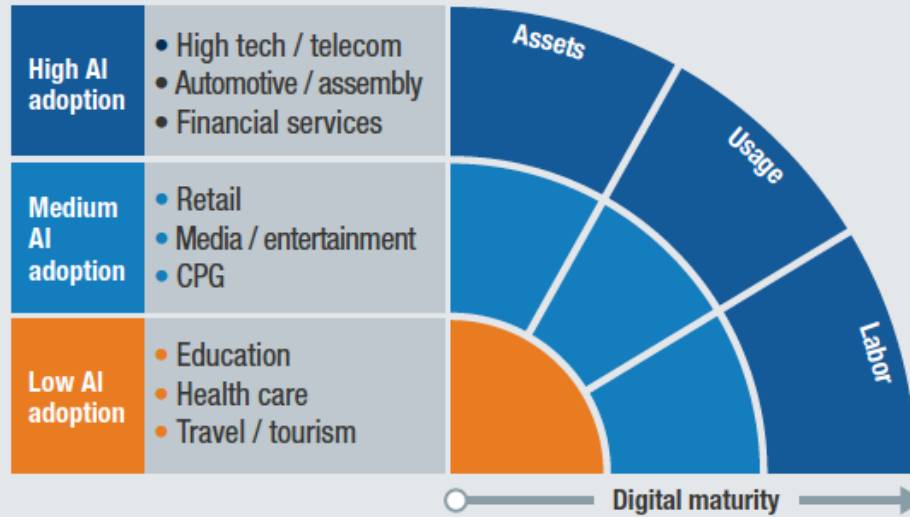
- 3+ technologies
- 2 technologies
- 1 technology

41% of firms say they are uncertain about the benefits of AI

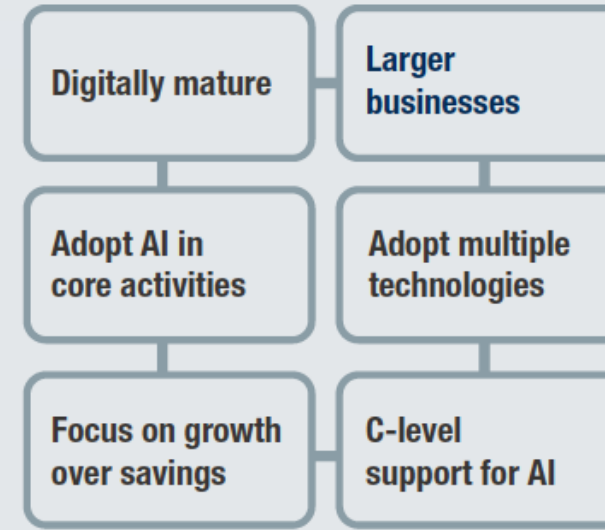


How companies are adopting AI

AI adoption is greatest in sectors that are already strong digital adopters



Six characteristics of early AI adopters



Four areas across the value chain where AI can create value

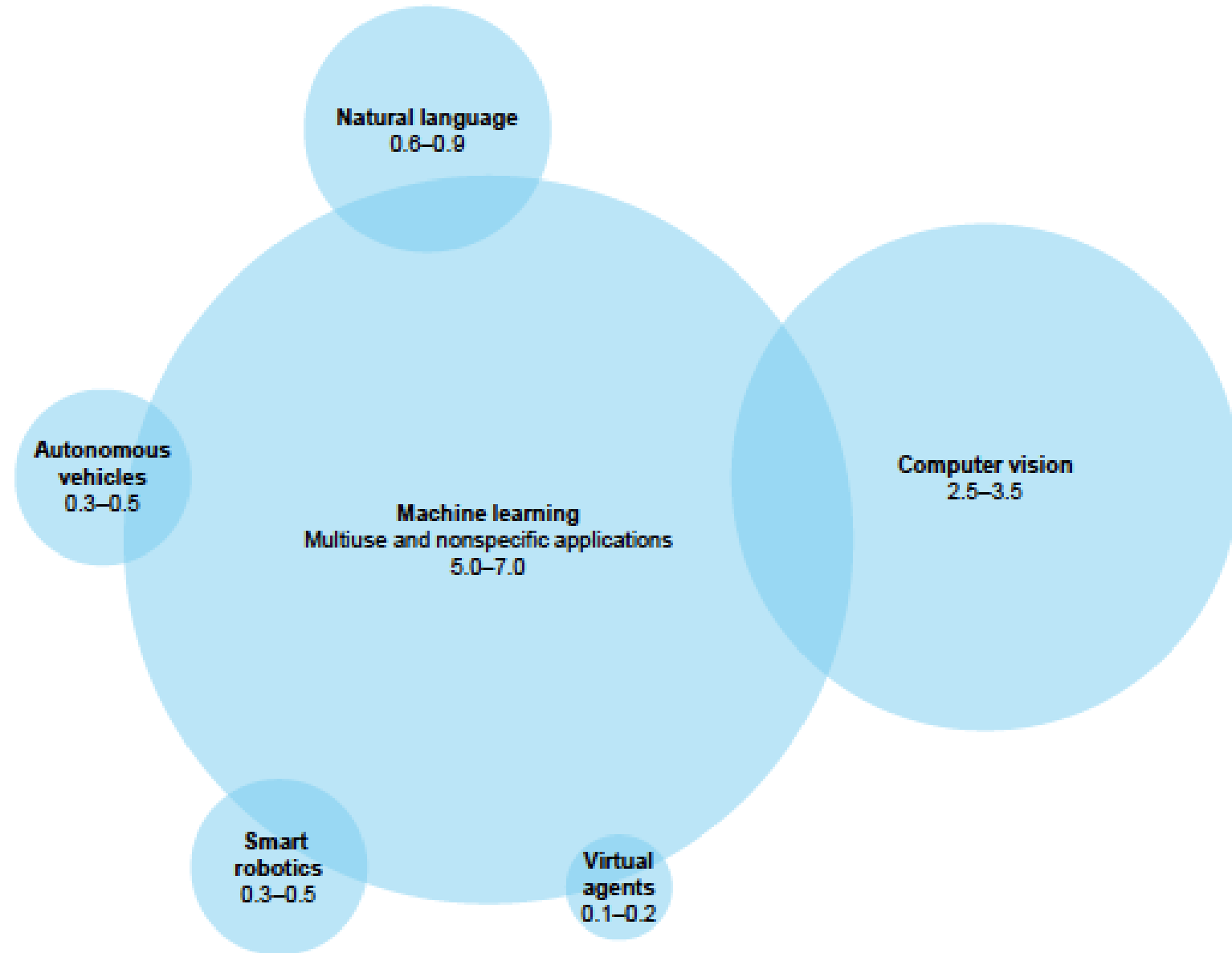


Five elements of successful AI transformations



Machine learning received the most investment, although boundaries between technologies are not clear-cut

External investment in AI-focused companies by technology category, 2016¹
\$ billion



AI adoption is occurring faster in more digitized sectors and across the value chain

AI Index

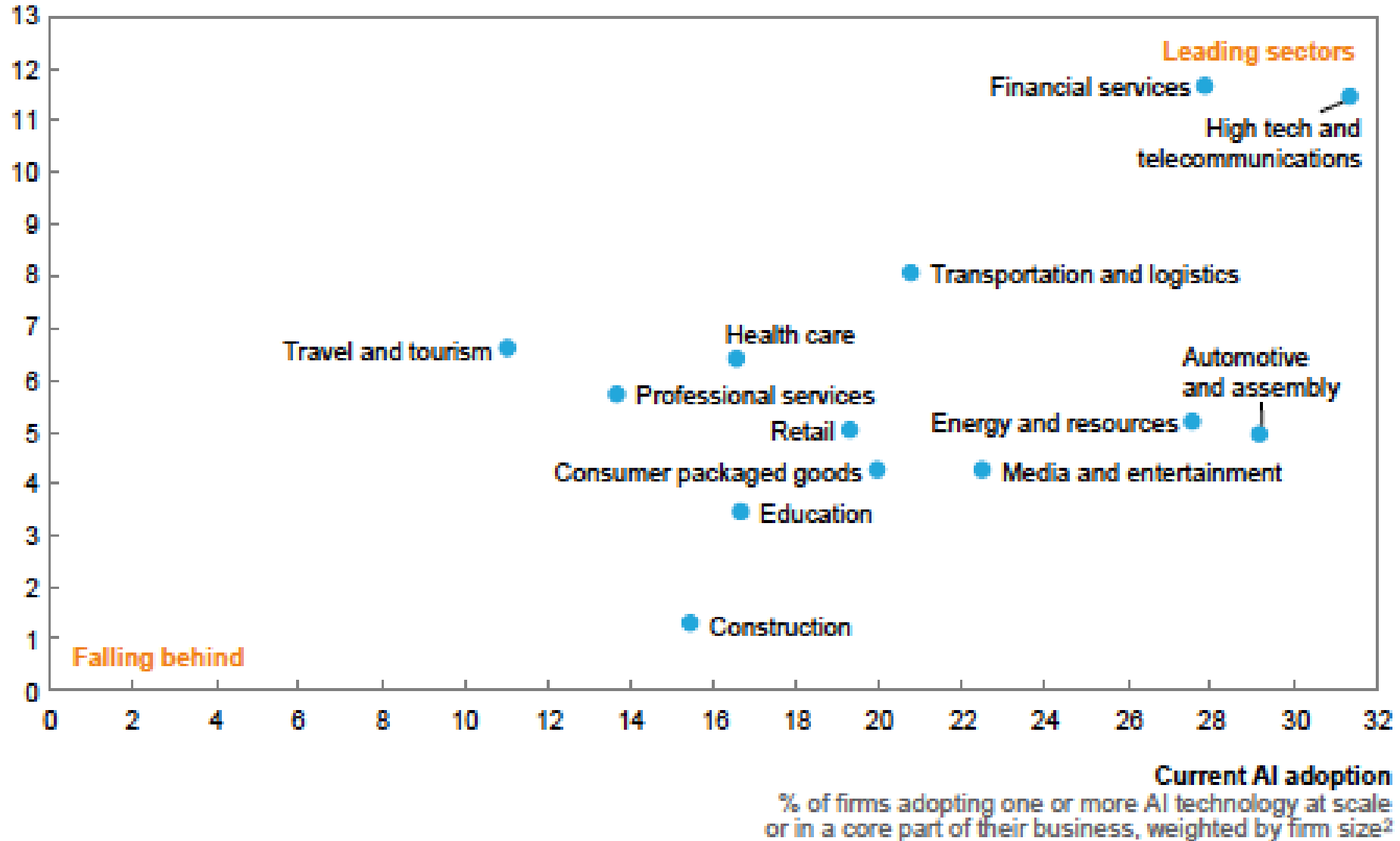
Relatively low  Relatively high

	Overall AI Index	MGI Digitization Index ¹	Assets			Usage						Labor	
			Depth of AI technologies	AI spend	Supporting digital assets	Product development	Operations	Supply chain and distribution	Customer experience	Financial and general management	Workforce management	Exposure to AI in workforce	AI resources per worker
High tech and telecommunications	Highly High	Highly High	High	High	High	High	High	High	High	High	High	High	High
Automotive and assembly	High	Medium	High	Medium	High	High	High	High	High	High	High	High	Medium
Financial services	High	Highly High	Medium	Medium	High	High	High	High	High	High	High	High	Medium
Resources and utilities	High	Medium	High	Medium	High	High	High	High	High	High	High	High	Medium
Media and entertainment	High	High	Medium	Medium	High	High	High	High	High	High	High	High	Medium
Consumer packaged goods	High	Medium	High	Medium	High	High	High	High	High	High	High	High	Medium
Transportation and logistics	High	Medium	Medium	Medium	High	High	High	High	High	High	High	High	Medium
Retail	High	High	High	Medium	High	High	High	High	High	High	High	High	Medium
Education	High	Medium	Medium	High	High	High	High	High	High	High	High	High	Medium
Professional services	High	High	Medium	Medium	High	High	High	High	High	High	High	High	Medium
Health care	High	High	Medium	High	High	High	High	High	High	High	High	High	Medium
Building materials and construction	High	Medium	Medium	Medium	High	High	High	High	High	High	High	High	Medium
Travel and tourism	High	Medium	Medium	Medium	High	High	High	High	High	High	High	High	Medium

Sectors leading in AI adoption today also intend to grow their investment the most

Future AI demand trajectory¹

Average estimated % change in AI spending, next 3 years, weighted by firm size²



While few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities

Automation potential based on demonstrated technology of occupation titles in the United States (cumulative)¹

Example occupations

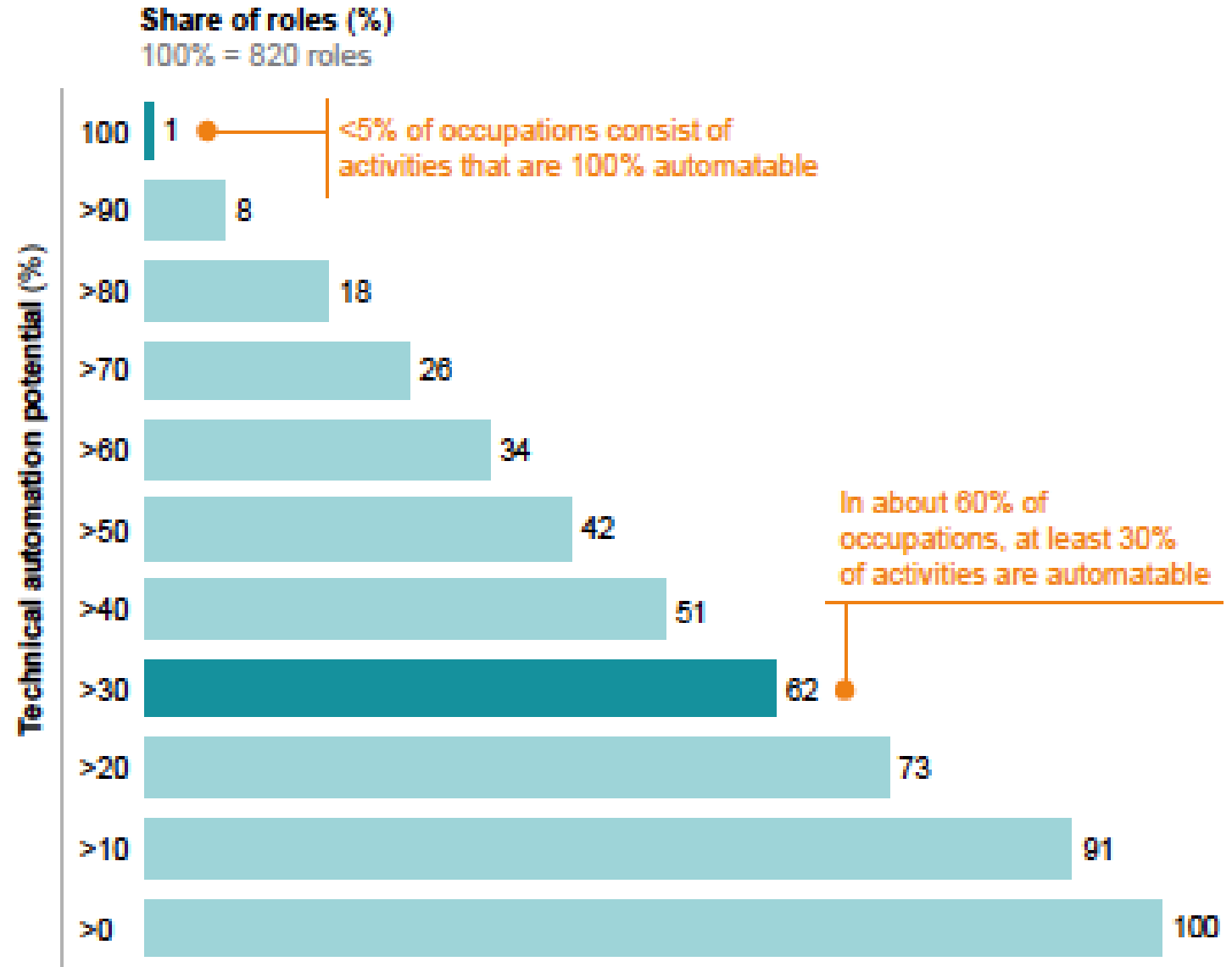
Sewing machine operators,
graders and sorters of
agricultural products

Stock clerks, travel agents,
watch repairers

Chemical technicians,
nursing assistants,
Web developers

Fashion designers, chief
executives, statisticians

Psychiatrists, legislators



AI and Life in the Future

SOME THOUGHTS

Many have already grown accustomed to touching and talking to their smart phones. People's future relationships with machines will become ever **more nuanced, fluid, and personalized**.

Society is now at a **crucial juncture** in determining how to deploy AI-based technologies in ways that promote rather than hinder democratic values such as freedom, equality, and transparency.

The field of AI is shifting toward building intelligent systems that can **collaborate effectively** with people, including creative ways to develop interactive and scalable ways for people to teach robots.

Longer term, AI may be thought of as a radically different mechanism for **wealth creation** in which everyone should be entitled to a portion of the world's AI-produced treasures.

Misunderstandings about what AI is and is not could fuel opposition to technologies with the potential to benefit everyone. **Poorly informed regulation** that stifles innovation would be a tragic mistake.

AI and Life in the Future

SOME THOUGHTS

Intelligence lies on a **multi-dimensional spectrum**. According to this view, the difference between an arithmetic calculator and a human brain is not one of kind, but of scale, speed, degree of autonomy, and generality.

Human intelligence has no match in the biological and artificial worlds for sheer versatility, with the abilities “to reason, achieve goals, understand and generate language... create art and music, and even write histories.”

AI technologies already pervade our lives. As they become a central force in society, the field is shifting from simply building systems that are intelligent to building intelligent systems that are **human-aware and trustworthy**.

Natural Language Processing is a very active area of machine perception. Research is now shifting towards developing systems that are able to interact with people through dialog, not just react to stylized requests.

A growing body of research is devoted to the idea that a **wide array of devices can be interconnected** to collect and share their sensory information. Such devices can include appliances, vehicles, buildings, cameras, and other things.

AI and Life in the Future

EDUCATION

Though quality education will always require active engagement by human teachers, AI promises to enhance education at all levels, especially by providing **personalization at scale**.

It can be argued that AI is the secret sauce that has enabled instructors, particularly in higher education, to **multiply the size of their classrooms** by a few orders of magnitude—class sizes of a few tens of thousands are not uncommon.

The **current absence of sophisticated use of AI** technologies in schools, colleges, and universities may be explained by the lack of financial resources as well as the lack of data establishing the technologies' effectiveness.

While formal education will not disappear, **MOOCs and other forms of online education will become part of learning at all levels**, from K-12 through university, in a blended classroom experience.

LOW-RESOURCE COMMUNITIES

With **targeted incentives and funding priorities**, AI technologies could help address the needs of low-resource communities. Budding efforts are promising.

PUBLIC SAFETY AND SECURITY

One of the more successful uses of AI analytics is in **detecting white collar crime**, such as credit card fraud. **Cybersecurity** (including spam) is a widely shared concern, and machine learning is making an impact.

Predictive policing tools raise the specter of **innocent people being unjustifiably targeted**. But well-deployed AI prediction tools have the potential to actually **remove or reduce human bias**.

AI and Life in the Future

EMPLOYMENT AND WORKPLACE

AI will likely replace tasks rather than jobs in the near term, and will also **create new kinds of jobs**. But the new jobs that will emerge are **harder to imagine** in advance than the existing jobs that will likely be lost.

As **labor becomes a less important factor** in production as compared to **owning intellectual capital**, a majority of citizens may find the value of their labor insufficient to pay for a socially acceptable standard of living.

ENTERTAINMENT

AI will increasingly enable entertainment that is **more interactive, personalized, and engaging**. Research should be directed toward understanding how to leverage these attributes for individuals' and society's benefit.

More sophisticated tools and apps will become available to make it even **easier to produce high-quality content**, for example, to compose music or to choreograph dance using an avatar.

Impact on People

- The 4th Industrial Revolution ***will change not only what we do but also who we are.***
It will affect our identity and all the issues associated with it:
our sense of **privacy**, our notions of **ownership**, our **consumption** patterns, the time we devote to **work and leisure**, and how we **develop our careers**, cultivate our **skills**, **meet people**, and **nurture relationships**. It is already changing our **health and leading to a “quantified” self**, and sooner than we think it may lead to **human augmentation**.
The list is endless because it is bound only by our imagination.
- Question: Could the ***inexorable integration of technology in our lives diminish some of our quintessential human capacities?***
E.g., such as **compassion and cooperation**.
Our relationship with our smartphones is a case in point.
Constant connection may deprive us of one of life’s most important assets:
the time to pause, reflect, and engage in meaningful conversation.

Impact on People

- One of the greatest individual challenges posed by new information technologies is **privacy**. *We instinctively understand why it is so essential, yet the tracking and sharing of information about us is a crucial part of the new connectivity.*
 - Debates about fundamental issues such as the impact on our inner lives of the loss of control over our data will only intensify in the years ahead.
- Similarly, the **revolutions occurring in biotechnology and AI**, which are redefining what it means to be human by **pushing back the current thresholds of life span, health, cognition, and capabilities**, will compel us to redefine our moral and ethical boundaries.

Shaping the future

- *Neither technology nor the disruption that comes with it is an exogenous force over which humans have no control. All of us are responsible for guiding its evolution, in the *decisions we make on a daily basis as citizens, consumers, and investors*. We should thus **grasp the opportunity and power we have to shape the Fourth Industrial Revolution and direct it toward a future that reflects our common objectives and values**.*
- To do this, however, we must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or one of greater potential peril. **Today's decision-makers, however, are too often trapped in traditional, linear thinking, or too absorbed by the multiple crises demanding their attention, to think strategically about the forces of disruption and innovation shaping our future**.

Shaping the future

- It all comes down to people and values. We need to **shape a future that works for all of us** by **putting people first and empowering them**.
- In its most pessimistic, dehumanized form, the Fourth Industrial Revolution may indeed have the **potential to “robotize” humanity** and thus to deprive us of our heart and soul.
- **But as a complement to the best parts of human nature—creativity, empathy, stewardship— it can also lift humanity into a new collective and moral consciousness based on a shared sense of destiny**. It is incumbent on us all to make sure the latter prevails.