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DeepTech for Social Good Landscape Overview

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Introduction

Developed by Deep Knowledge Philanthropy, DeepTech for Social Good Landscape Overview report contains a comprehensive overview of the DeepTech impact growth in underdeveloped countries.

During the research 386 DeepTech companies, 661 investors and 441 nonprofit organisations (NGOs) were analyzed. The development of new technologies will benefit from this report, which contains a comprehensive overview of the DeepTech applications and solutions aimed at social good.

Advanced technologies (Artificial Technologies, Robotics, Advanced Materials, FinTech and others) help to drive the emergence of tech in the social sector and open up new market opportunities. Thus, start-ups play a crucial role in solving complex questions of the modern world.

The report has been compiled to provide a detailed, systematic description of the leading companies, ambitious startups, and impactful investors and charities associated with the DeepTech Investment.

Report Methodology and Approach
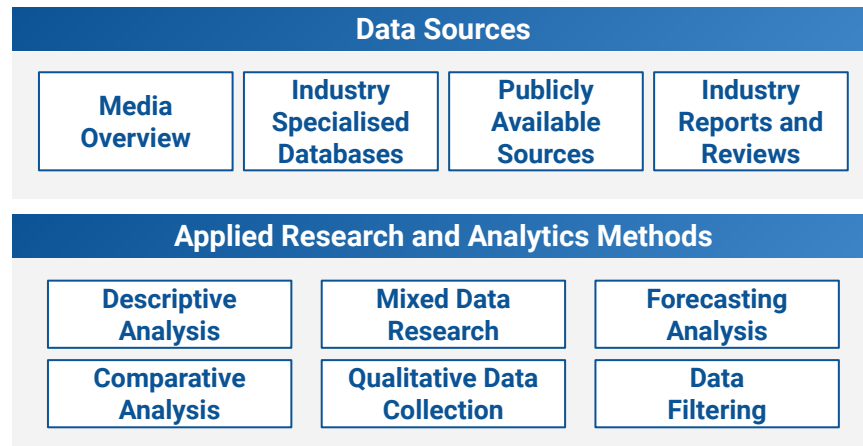
Methodology

In the course of the study, 386 DeepTech companies, 661 investors and 441 nonprofit organisations (NGOs), were analysed. The DeepTech companies were gathered according to the following sectors:

Financial sector	Banking	Investments	Insurance

This report serves as a comprehensive case study, which aimed to provide a detailed overview of the industry from an investment and commercial perspective, as well as major trends and a classification framework for the core technologies enabling the provision of DeepTech applications to the 2 billion unbanked. The report as a whole represents a deep analysis, having an aim to highlight the importance and multiplicity of DeepTech applications in underdeveloped world nowadays. It shows how elaborate and diversified its application is, draws insights, and emphasizes real-life examples while stating distinct facts and figures. Moreover, it reveals not only the DeepTech potential but also the obstacles met by this industry, which are restraining its full aptitude.

Approach

Relying on various research methods and analytics techniques, the analytical report provides a comprehensive overview of the DeepTech solutions. This approach has certain limitations, especially when using publicly available data sources and conducting secondary research. Deep Knowledge Philanthropy is not responsible for the quality of the secondary data presented herein; however, we do our best to eliminate the said risks using different analytics techniques and cross-checking data.

Data Sources

Media Overview	Industry Specialised Databases	Publicly Available Sources	Industry Reports and Reviews

Applied Research and Analytics Methods

Descriptive Analysis	Mixed Data Research	Forecasting Analysis
Comparative Analysis	Qualitative Data Collection	Data Filtering

DeepTech for Social Good Landscape Overview

Companies – 380+
Investors – 660+
R&D and Hubs - 440+

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Companies

NGOs and Charities

Investors

Food Technologies

Healthcare and Support

Energy-Saving and Renewable Energy

Sustainable Development

Nature and Climate Protection

Financial Inclusion

DeepTech Companies by Region*

United Kingdom — 28

Europe — 67

Asia and Pacific — 70

North America — 154

Middle East & North Africa — 11

Africa — 40

Latin America — 16
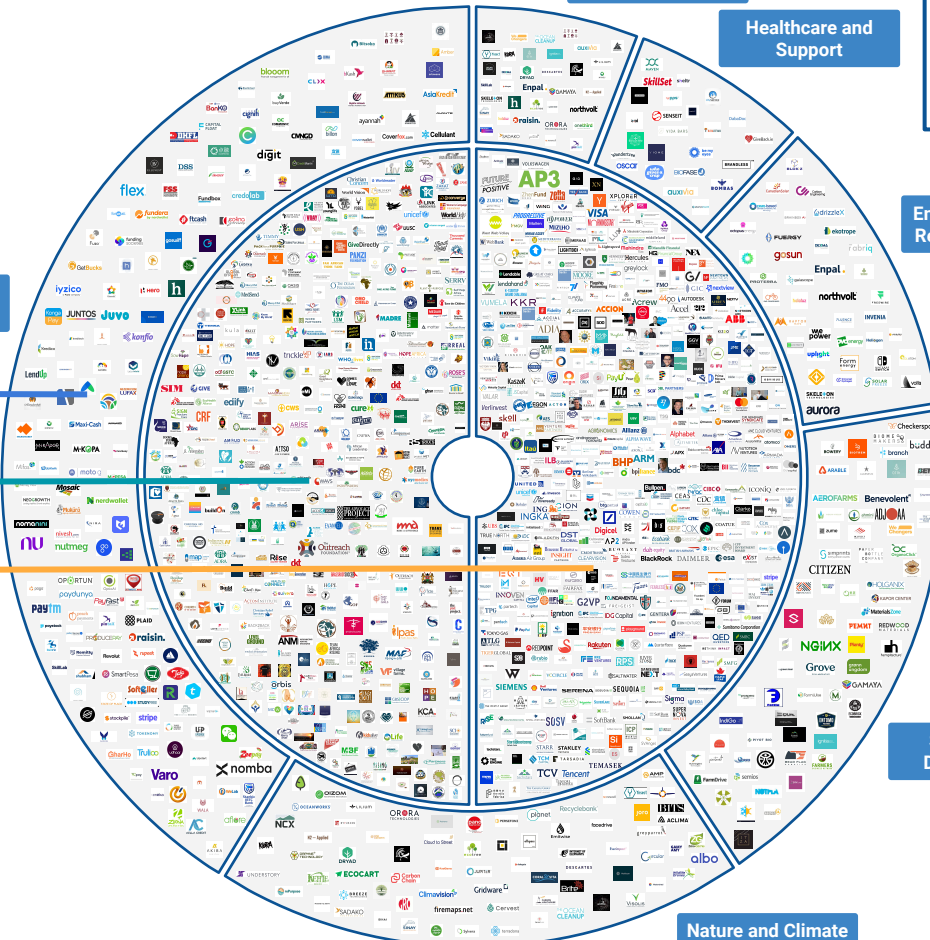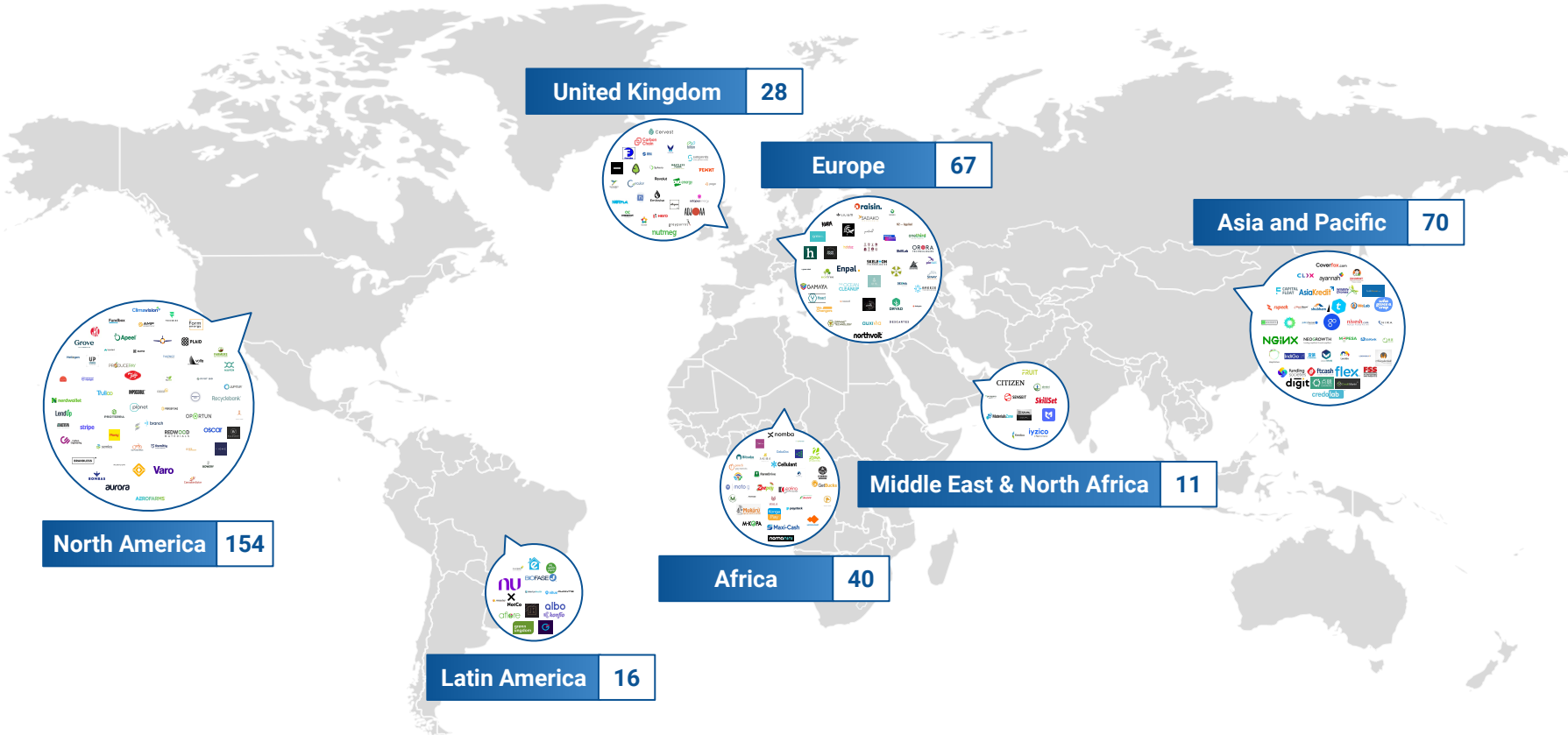
Top DeepTech Humanitarian Companies by Funding

#	Company	Funding
1	Rivian	$10.7B
2	Northvolt	$6B
3	Nubank	$3.9B
4	Stripe	$2.2B
5	Impossible Foods	$2.1B
6	Revolut	$1.7B
7	Oscar Health	$1.6B
8	Octopus Energy	$1.5B
9	Meicai	$1.4B
10	Proterra	$1.2B

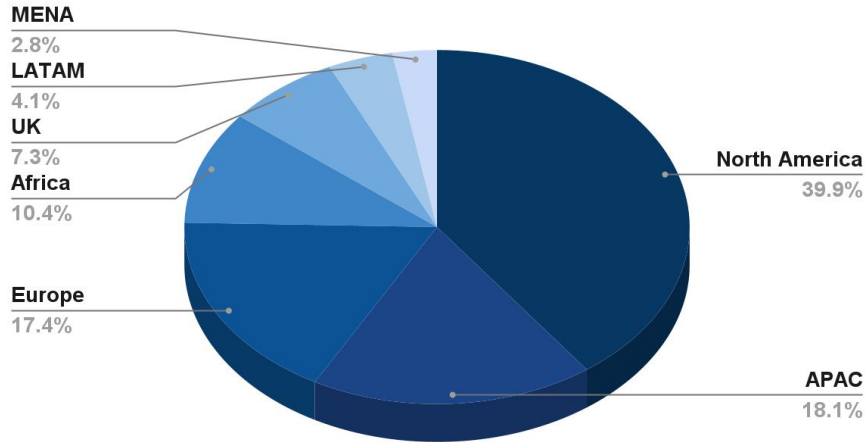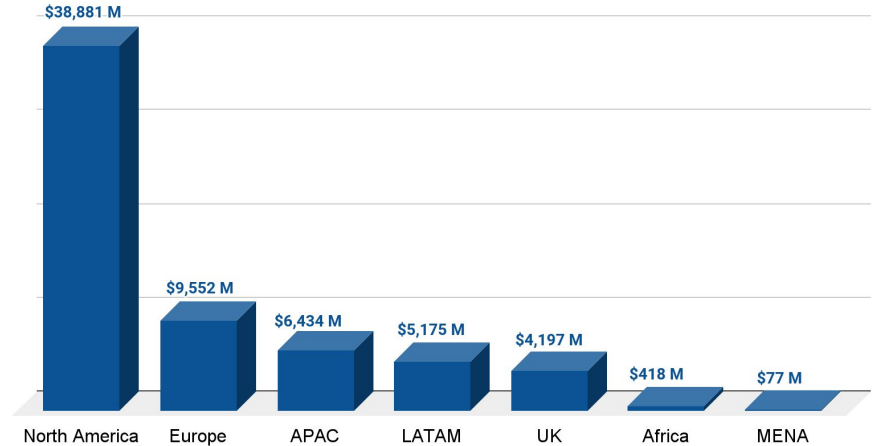| #	Company	Funding
11	Varo Money	$992M
12	Plenty	$941M
13	WeLab	$896M
14	Farmers Business Network	$870M
15	Lilium	$826M
16	Redwood Materials	$792M
17	PolicyBazaar	$766M
18	Plaid	$734M
19	Perfect Day	$711M
20	Enpal	$709M

Landscape and Regional Overview

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Regional Distribution of Humanitarian DeepTech Companies

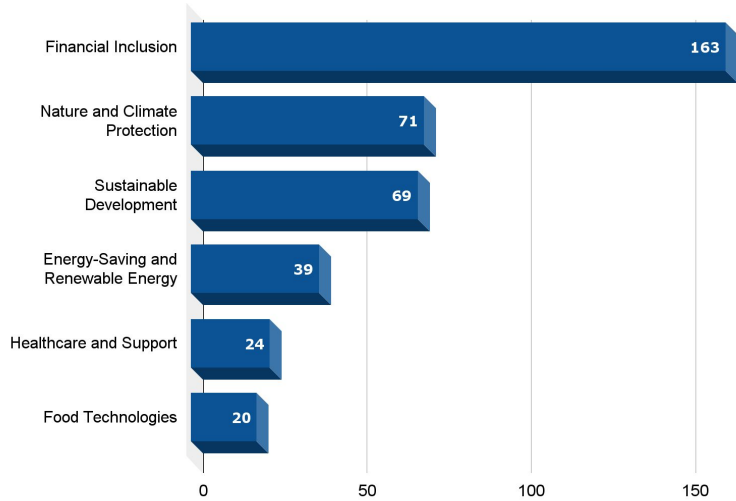## Regional Distribution of Humanitarian DeepTech Companies

MENA
2.8%

LATAM
4.1%

UK
7.3%

Africa
10.4%

Europe
17.4%

North America
39.9%

APAC
18.1%

Funding of Humanitarian DeepTech Companies by Region

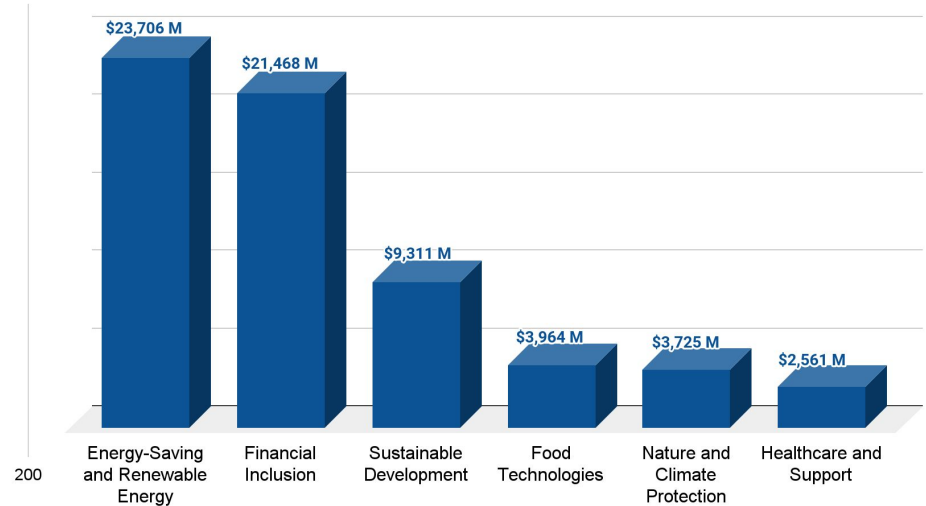| Region	Funding
North America	$38,881 M
Europe	$9,552 M
APAC	$6,434 M
LATAM	$5,175 M
UK	$4,197 M
Africa	$418 M
MENA	$77 M

In regards to digital redistribution of the DeepTech companies, the North American region holds the lead with approximately 40% of the companies originating from the region. The funding map mostly corresponds to the regional distribution, with NA representing more than 60% of all of the funding in the sector. A significant notion is while both the UK and Latin America have less companies than the African region, the funding redistribution shows that there is a significant disproportionate funding between the regions and that African companies receive significantly less funding than in the other regions. Should the African companies receive more funding from the investors, the overall quality of the regional humanitarian efforts could be seen improving.

Industrial Distribution of Humanitarian DeepTech Companies

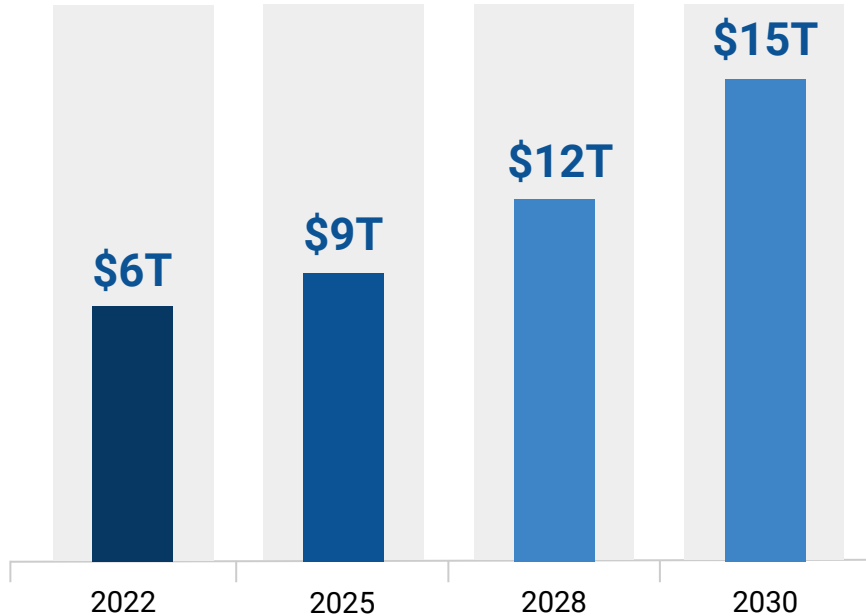## Industry Distribution of Humanitarian DeepTech Companies

Financial Inclusion: 163
Nature and Climate Protection: 71
Sustainable Development: 69
Energy-Saving and Renewable Energy: 39
Healthcare and Support: 24
Food Technologies: 20

Funding of Humanitarian DeepTech Companies by Industry

Energy-Saving and Renewable Energy: $23,706 M
Financial Inclusion: $21,468 M
Sustainable Development: $9,311 M
Food Technologies: $3,964 M
Nature and Climate Protection: $3,725 M
Healthcare and Support: $2,561 M

From the DeepTech companies involved in the Humanitarian efforts, the Financial Inclusion Sector is prevalent with 163 companies involved. The two other major sectors are Nature and Climate Protection and Sustainable Development. However, when it comes to funding, the largest amounts actually went to Energy-Saving and Renewable Energy sector, with Financial Inclusion taking the second place. While being the second place in the number of companies, the Nature and Climate Protection takes the second from last place in terms of funding received.

Predictions of the DeepTech Market Development

Projection of the Global DeepTech Market Growth

The global DeepTech market size is expected to reach **$15 trillion** by **2030**, with its current evaluation at **$6 trillion** in **2022**.

DeepTech is considered to be a revolutionary technological development, and its integration across a host of applications is one of the key factors driving this market. Advances in image and voice recognition are driving the growth of the regional market. Improved image recognition technology is critical in enhanced drones, self-driving cars, and robotics.

2020 **2025**

Various factors such as growth of data-based DeepTech and advancement in deep learning and need to achieve robotic autonomy to stay competitive in a global market are expected to drive the adoption of the DeepTech solutions and services.
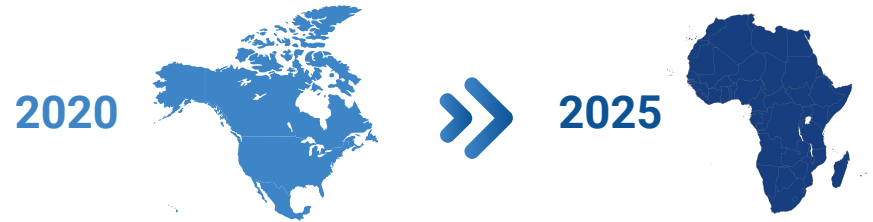
North America held the dominant share in the global DeepTech market in 2021 thanks to the availability of high government funding, presence of leading players, and strong technical base. African market where the adoption of DeepTech technologies is lower showcased rapid growth during the past few years. Meanwhile, increasing adoption of image and pattern recognition in Africa is expected to provide new growth opportunities.

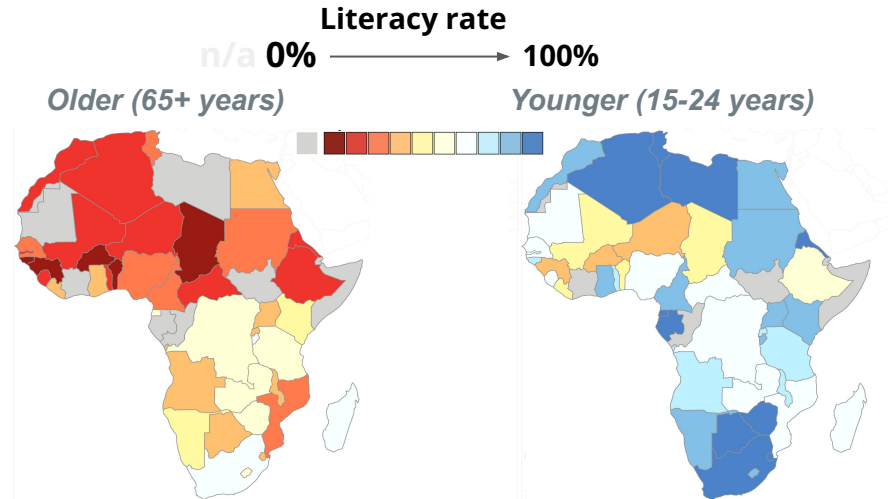# Financial Inclusion in Developing Countries (Africa)

'The African continent is at a leading position concerning mobile money banking, especially in East Africa where more than 73% of Kenyans are mobile money customers. In sub-Saharan Africa (SSA), 36 countries out of 54 have mobile banking services. 2.5 billion people in lower to-middle income countries have no access to banking services.

'Saving habits are different on the African continent in comparison to the world. The main motivations of saving in Africa are 'for education' (21.3%) and 'for farm or business' (19.6%). While 23.9% of individuals worldwide and 40% of individuals of high-income economies save for old age, which is their main saving motivation, only 10.3% of Africa individuals do so.

'The main source of credit in Africa is 'family and friends' (37.5%). The second source of credit in Africa is 'a store' (7.9%), in line with the global trend (7.9%). Borrowing formally (6.7%) and borrowing from another private lender (4.7%) are less common in Africa. 41% of Africa individuals reported having borrowed from an informal source. 51.4% of Africa individuals declared having borrowed from any source in the past 12 months, a figure which is higher than the 42.4 global percent.'

'Kenya shows the highest level of financial inclusion at 67% rate and followed by Nigeria at 60%. Cameroon is at 47% inclusion rate, while the rest of the countries in the sample are all below 30% inclusion rate. The lowest rate is recorded in Mozambique at 13% inclusion rate.'

The young generation in Africa is much better educated than before

Literacy rate

n/a   0% ——→ 100%

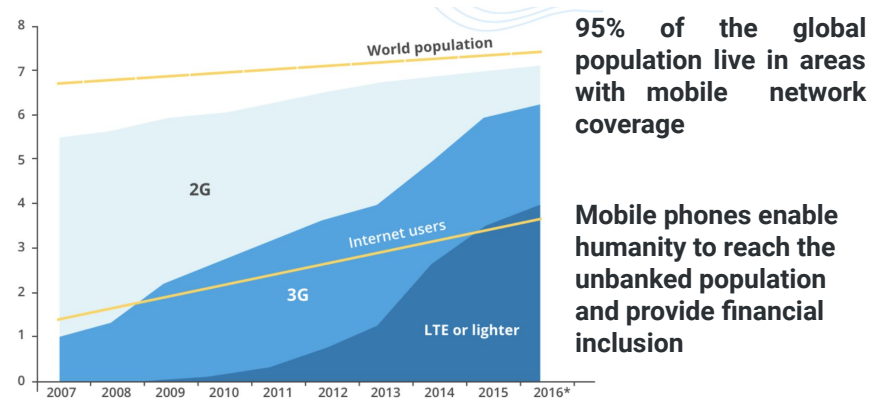*Older (65+ years)*   *Younger (15-24 years)*

Financial inclusion in Developing Countries (Asia)

Digital financial solutions could play a significant part in closing gaps in financial inclusion. They could address about 40% of the volume of unmet demand for payments services and 20% of the unmet credit needs in the BoP and MSME segments. Digital finance alone cannot entirely close the gaps in financial inclusion. But it is estimated that the cumulative effect of digitally driven acceleration in financial inclusion could boost GDP by 2% to 3% in markets like Indonesia and the Philippines, and 6% in Cambodia. For the population earning less than $2 a day, that would translate to a 10% increase in income in Indonesia and the Philippines, and an increase of around 30% in Cambodia. 99% of Indian adults with an account at a financial institution have a bank account. Kenya's extreme poverty is ranking 187 in per-capita GDP, of the country's 47 million people, seven in 10 adults (69%) have financial accounts. The percentage of Bangladeshis with formal financial services accounts almost doubled from 20% to 34% between 2013 and 2016. In 2016, only one in 10 adults (13%) had a registered account. Many Beninese adults are financially active, with 47 percent reporting having saved in some manner and 20 percent reporting having borrowed. Mobile money awareness is high, as is access to mobile phones.

'The Singapore government is looking to boost blockchain development in an effort to improve financial inclusion for Southeast Asian countries. The neighboring nation of Malaysia is also moving to utilize blockchain technology to advance banking services across the region. Similarly, Thailand's Siam Commercial Bank is building out a Ripple-based blockchain remittance platform for cross border payments.'

(from the article entitled 'Singapore plans Blockchain push to boost Financial Inclusion', written by Wolfie Zhao).

The Mobile Network is a gateway to the Global Economy

95% of the global population live in areas with mobile network coverage

Mobile phones enable humanity to reach the unbanked population and provide financial inclusion

Financial inclusion in Developing Countries (Latin America)

The authors of 'Financial Inclusion in Latin America: Facts, Obstacles and Central Banks' Policy Issues' also indicate that:
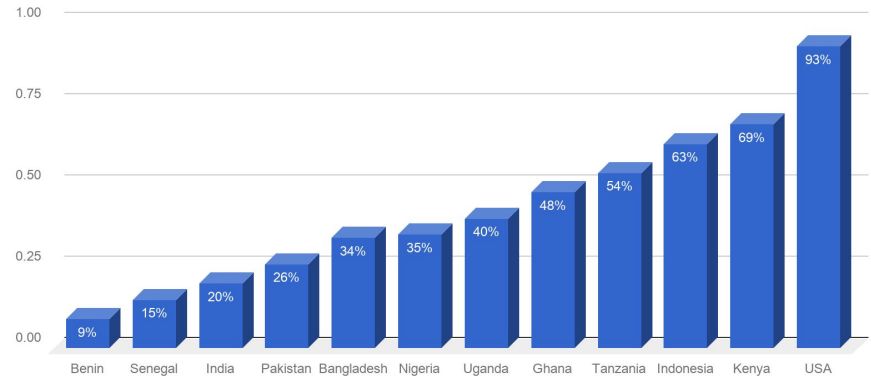
'Latin American countries do not look good relative to their comparators. Among the region, Peru, Honduras, Guatemala and Nicaragua are among the countries with the lowest quality of institutions and a low value for financial inclusion. In contrast, Chile is the only country in the region where the indicator representing institutional quality is closer to those in high-income countries. Modern Latin America is home to over 600 million people across 20 nations.

'The percentage of the Latin American population with a bank account has gone from 39% to over 50% in just the last five years. Online sales don't make up as large a portion of total GDP as regions like Europe (2.5%, $523bn) or North America (2.6%, $562bn), but Latin America still has around 300 million internet users – 135 million of whom shop online.

Over 400 million people in Latin America now own a mobile phone, and there has been significant regional investment in 3G services.'

Amanda Jacobson Manager of Latin America, Village Capital, wrote in a recent report titled 'What does "financial inclusion" really mean, and how can entrepreneurs make the difference?' that 'Low-income unbanked and underbanked people, both from big cities and small towns, often have to struggle to work a half dozen jobs with little certainty of their cash flows. Entrepreneurs across Latin America are emerging quickly to address problems in financial inclusion.'

Finance inclusion in Developing Countries / USA

Country	Value
Benin	9%
Senegal	15%
India	20%
Pakistan	26%
Bangladesh	34%
Nigeria	35%
Uganda	40%
Ghana	48%
Tanzania	54%
Indonesia	63%
Kenya	69%
USA	93%

Entrepreneurial Activity in Africa is Higher Than in Asia and Latin America

More people start a new business in Africa than in LAC or Asia

13%
In Asia

22%
Of working age Africans

18%
In LAC
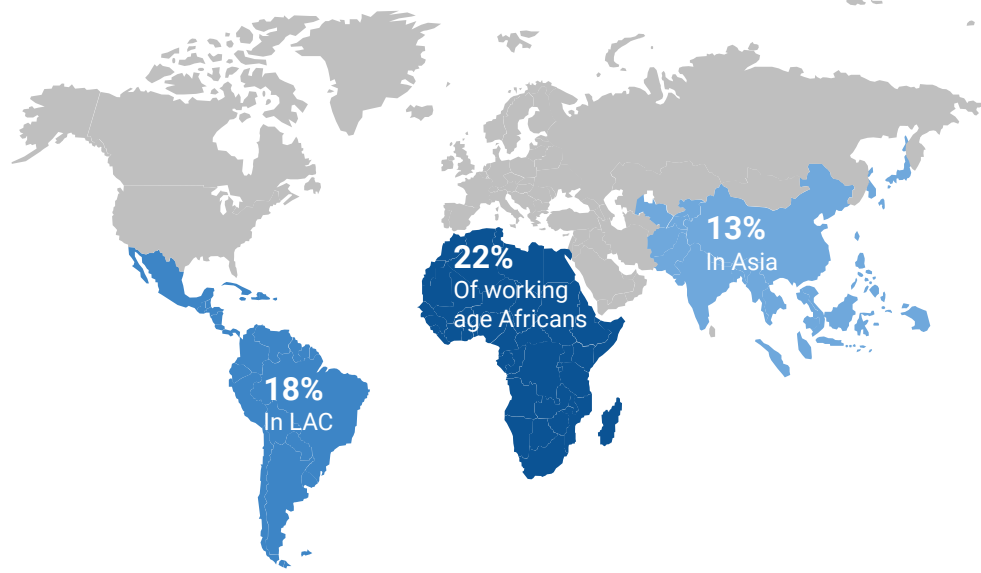
Who are the **African entrepreneurs?**

Entrepreneurship levels in Africa are the highest in the world

Loan providers need to increase their lending by at least $135 billion to meet demand by Africa SMEs

22% of Africans are starting new businesses

Young

31 years old on average in Africa

36 in Asia

35 in LAC

African women are twice as likely to start a business than women elsewhere

Mostly in services

Top early-stage entrepreneurs:

Trade, hotels and restaurants

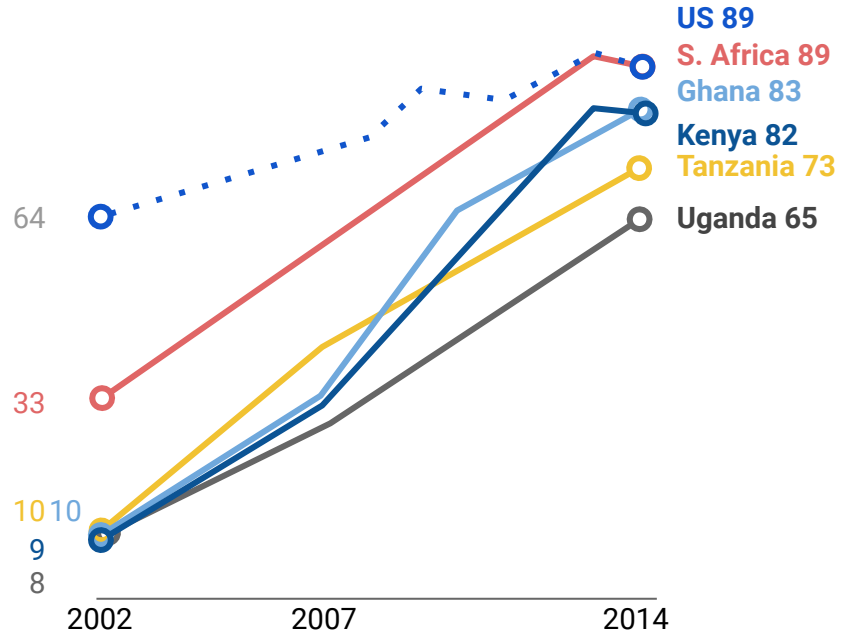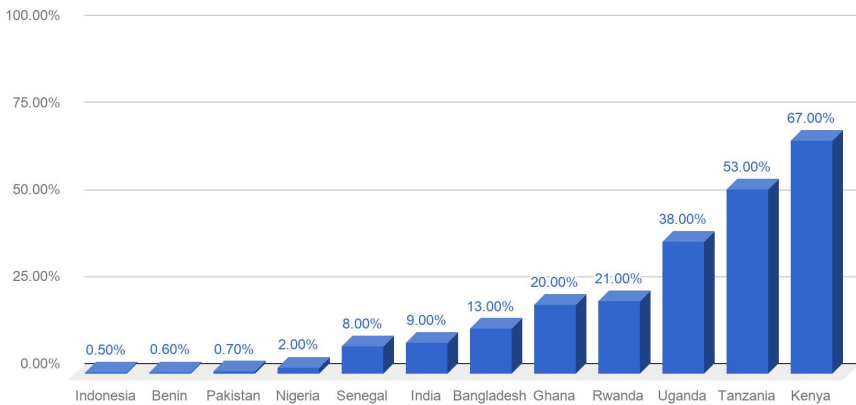Agriculture, forestry and fishing

Manufacturing

Innovative

20% of new African entrepreneurs are introducing **a new product or service**

Mobile Penetration in Some Africa Countries is as High as in the United States

By the end of 2020, **495 million people subscribed to mobile services** in Sub-Saharan Africa, representing 46% of the region's population – an increase of almost 20 million in 2019. Over the period to 2025, **4G adoption in Sub-Saharan Africa will double to 28%**, compared to a global average of 57%. It is still early stages in the journey to 5G in Sub-Saharan Africa; as of June 2021, there were seven commercial 5G networks in five markets across the region. By the end of 2025, 5G will account for 3% of total mobile connections in the region.

Sub-Saharan Africa remains the region with the highest growth rate in mobile subscriptions globally. In 2002 roughly one-in-ten owned a mobile phone in Tanzania, Uganda, Kenya and Ghana followed by exponential growth.

Registered mobile money accounts in Developing Countries

US 89
S. Africa 89
Ghana 83
Kenya 82
Tanzania 73
Uganda 65

The Financial and Digital Inclusion Project

The Financial and Digital Inclusion Project (FDIP) team has published an annual report that evaluates the progress that various developing countries are making toward broader and more inclusive financial inclusion.

The 2017 Brookings Financial and Digital Inclusion Project (FDIP) report was written by Robin J. Lewis, John D. Villasenor, and Darrell M. West, and evaluates access to and usage of affordable financial services by underserved people across 26 geographically, politically, and economically diverse countries.

The report 'assesses these countries' financial inclusion ecosystems based on four dimensions of financial inclusion: country commitment, mobile capacity, regulatory environment, and adoption of selected traditional and digital financial services.'

The Scorecard assesses each country using 33 indicators across four dimensions of financial inclusion: country commitment, mobile capacity, regulatory environment, and adoption of selected basic traditional and digital financial services, including payments and savings.

'For the third year in a row, Kenya ranked at the top of the FDIP scorecard, driven by its robust commitment to advancing financial inclusion, widespread adoption of mobile money services among traditionally underserved groups, an increasingly broad range of mobile money services (including insurance and loan products), and an enabling regulatory environment for digital financial services. In addition to Kenya, the other top-scoring countries were distributed across Latin America and Sub-Saharan Africa: Brazil and Mexico tied for second place, and Colombia, South Africa, and Uganda tied for third.'

DeepTech Trends
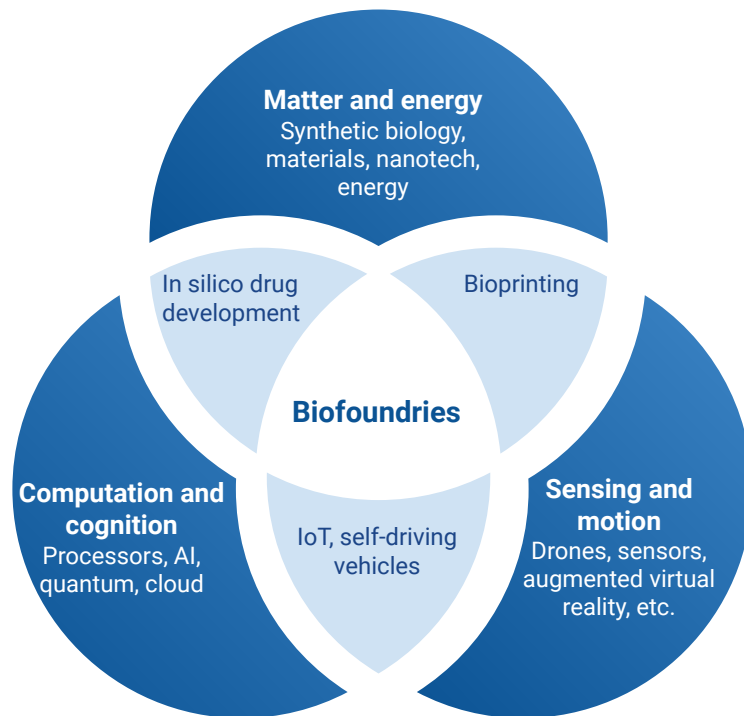# in Developing Countries

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The Convergence of New Technologies Opens New Opportunities

Powerful technologies are emerging faster:
- Artificial Intelligence
- Quantum Computing
- Synthetic Biology
- Nanotechnology
- Nexten UX (AR/VR)
- Blockchain
- Robotics
- Universal Printing

They coverage to solve major business issues:
- Process automation for materials
- New chemical development via AI or QC
- Neuro-machine interface

Matter and energy
Synthetic biology, materials, nanotech, energy

In silico drug development

Bioprinting

Biofoundries

Computation and cognition
Processors, AI, quantum, cloud

IoT, self-driving vehicles

Sensing and motion
Drones, sensors, augmented virtual reality, etc.

DeepTech brings together powerful capabilities:
- Data volume
- Moore's law
- DNA sequencing cost
- DNA synthesis (in progress)
- Quantum (in progress)

These capabilities has deep implications on its own—but when added to technological capabilities in matter and energy, computation and cognition, and sensors and motion, it allows innovative companies to address previously unsolvable problem sets. Deep tech's potential for disruption is unprecedented, and the breadth of problems it could address remains for us to uncover.

Deep Tech Trends in Underdeveloped Countries

DeepTech Trends in 2022

Acceptance of Climate Change	Alternative Energy Sources	Faster and Less Power-Hungry Chips	Cultivate the Sea
Sensors, advanced mapping technology, drones, satellites and predictive modeling of weather impacts on urban areas not only provide early warning but can also help with evacuation and rescue planning. At the same time, advances in materials technology have already led to a new generation of building materials that are more resistant to floods, earthquakes and tornadoes/hurricanes.	The most promising and mature, but also the most controversial source of energy is nuclear energy. While it produces energy with a low carbon footprint, there are safety concerns, high capital costs, and negative public opinion. With small modular reactors producing large amounts of low-carbon electricity for a third of the generation capacity of traditional nuclear power reactors, interest in this energy source could be renewed.	Cryptocurrency mining is energy intensive, but what is less known is that the carbon footprint of working AI models is growing every day. Similarly, the growing interest in the metaverse will also require increased computing power and storage resources. Developing faster, less power-hungry chips that are optimized for AI and other features will become more important if hardware doesn't become a bottleneck for adoption.	Algae and seaweed contain the same nutrients and protein as beans and soybeans. They act as natural carbon sinks, and some companies are already exploring an alternative to setting up racks in the ocean to grow algae, specifically to absorb more carbon dioxide. At the same time, it can also be processed into a cheap and rich source of biofuels.

Deep Tech Trends: Artificial Intelligence

Governments and humanitarian groups can use machine learning algorithms and mobile phone data to get aid to those who need it most during a humanitarian crisis.

The research shows that data collected by mobile phone companies – when analyzed with machine learning technology – can help direct aid to those with the greatest need. The downturn resulting from the COVID-19 pandemic pushed millions of people into extreme poverty. In response, governments and charities launched several thousand new aid programs, providing benefits to over 1.5 billion people and families around the world.

But in the middle of a humanitarian crisis, governments struggle to figure out who needs help most urgently. Under ideal circumstances, those decisions would be based on comprehensive household surveys. But there was no way to gather this information in the middle of a pandemic. The research helps demonstrate how new sources of big data – such as information gleaned from satellites and mobile phone networks – can make it possible to target aid amid crisis conditions when more traditional sources of data are unavailable.

Applications of AI for Humanitarian Issues

- **Usage of AI for Natural Disaster Prediction and Prevention**
- **Advanced Calculation and Approximation of the Necessary Goods**
- **Improved Identification of Those Requiring Aid**
- **Support in Logistical Issues When Applied in Humanitarian Crisis**

Deep Tech Trends: Quantum Computing

Investors believe that 2022 will be the 'year of DeepTech', with many more VCs and corporations jumping in to fund startups, especially as other sectors become overheated and overcrowded.

In 2022, the first quantum computing companies will demonstrate that they have solutions that are competitive only with classic computing clusters, for applications that benefit society as a whole, even if they have a relatively narrow focus to begin with. At the very least, there will be a clear vision of the requirements and laws on scaling for this to happen over the next two years.

There will be big steps forward in 2022, as quantum computing will address key issues in battery modeling that are simply beyond the reach of standard computers, opening up batteries with higher performance and lower cost.
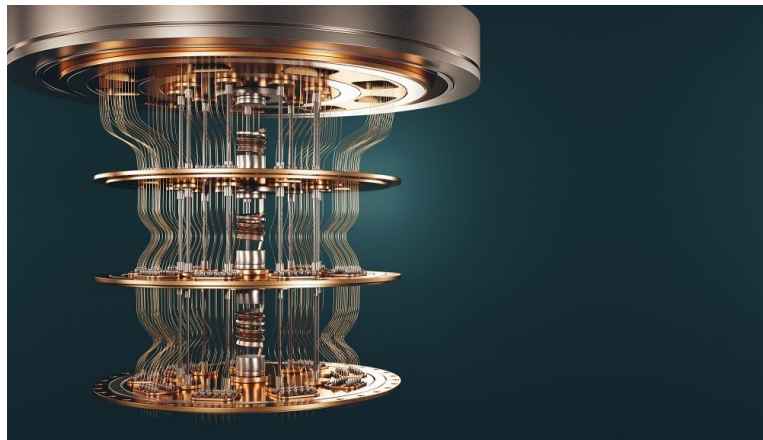
'With significant capital now being invested in quantum computing, we will see more first case uses as innovation in hardware and software accelerates in 2022. As governments in the West begin to take notice of the huge potential applications of quantum computing, 2022 will be the year in which government-backed funding will really take off.'

Moray Wright, CEO at Parkwalk Ventures

FinTech for Social Good

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FinTech Inclusion Framework

Payments/Transfers

Savings

Insurance

Loans
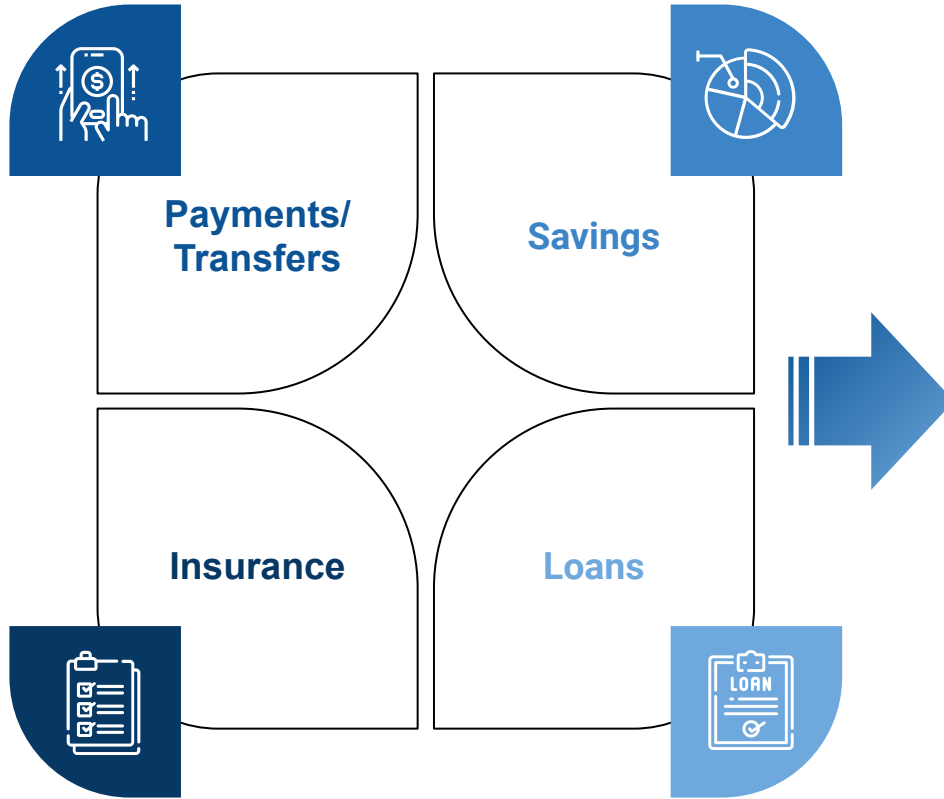
The problems financial inclusion companies are facing on the ground

Banks which are too far away from the places that citizens are living

The bank services are too expensive

Lack of documentation and thus, inability to pass KYC and/or open a bank account

The problem of trust towards institutions and banks. The lack of trust makes it impossible to increase the level of financial inclusion among researched countries

Highly illiterate population, which makes economic and social development impossible

FinTech Inclusion Framework

A detailed overview of several technologies which serve as the hallmarks of successful financial inclusion technologies and services:
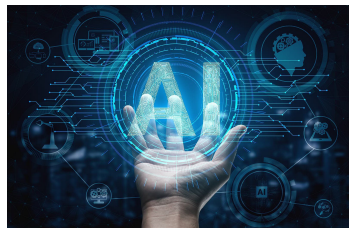
Artificial Intelligence which, for instance, is widely used by lending companies in order to choose clients.

Bio-identification mechanisms which can be used in order to integrate those who do not have a government issued IDs.

Blockchain technologies makes transaction secured and proved, using the safest cyber security protocols.

Gamification will help to optimize the technologies adoption and quick penetration into the market.
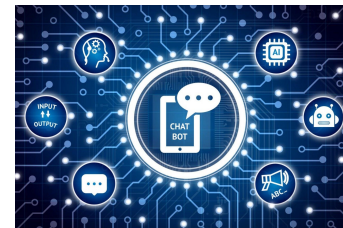
ChatBots will make the procedures look easier and reduce the documents load from social institutions.

Payments/Transfers

A Gallup, Inc. survey of 11 countries in Sub-Saharan Africa found that more than 80 percent of adults make bill payments or remittances using cash. Given the lack of digital-payment penetration, governments, consumers, and financial providers in all developing regions are still bearing the high cost of cash payments.

'In some African countries, only 10% of the people have a bank account, but 60% have a mobile phone. The mobile phone is therefore the only way for them to collect their wages, pay an invoice, save money or get a loan. Orange Money was launched in 2008 in Côte d'Ivoire to simplify money transfers. In 2016, transactions carried out amounted to nearly € 2 billion per month. A success that shows how technology, when accessible to all, improves daily life.

While cash transfers are already widely accepted as a tool for "social protection" (e.g., alleviating present suffering, hunger, etc.), they are also one of the few interventions that have been shown to have positive impacts years after delivery. Studies in Uganda and Sri Lanka, for example, have found earnings increases of $0.40 to $0.80 per $1 delivered after 4–5 years.'

'The latest World Bank report mentions how remittances to developing countries only saw marginal growth in 2015. The most well-known system, M-PESA, started in Kenya and is now operational in six countries; it has 20 million users who transferred $500 million a month during 2011 and are served by more than 28,000 agents.'

Total Transactions by Year

Year	Value
2016	15
2017	26
2018	29
2019	25
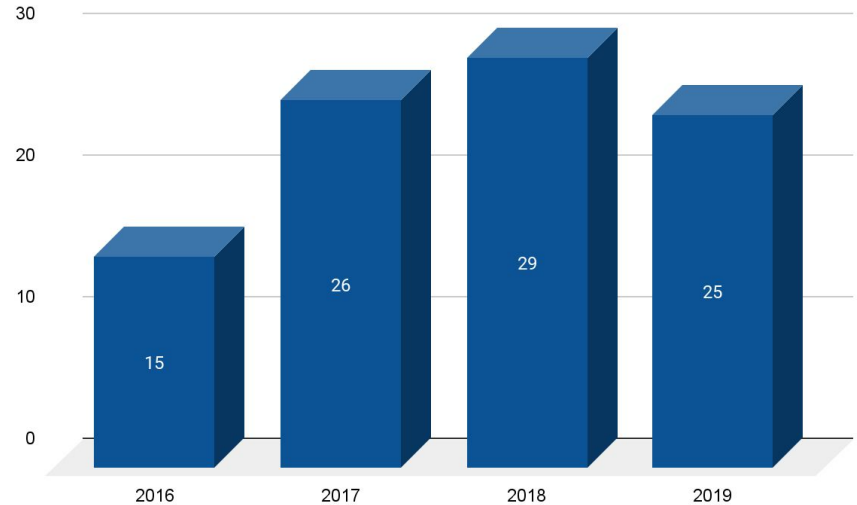
Savings

According to a World Bank press release, a 2013 Global Development Horizons (GDH) report supported by the World Bank and written by Maurizio Bussolo, outlined that:

'In less than a generation, global saving and investment will be dominated by the developing countries. By 2030, half the global stock of capital, totaling $158 trillion will reside in the developing world, compared to less than one-third today, with countries in East Asia and Latin America accounting for the largest shares of this stock which explores patterns of investment, saving and capital flows as they are likely to evolve over the next two decades.

'Developing countries' employment in services will account for more than 60 percent of their total employment by 2030 and they will account for more than 50 percent of global trade. Aging populations in East Asia, Eastern Europe and Central Asia, will see the largest reductions in private saving rates.

'In contrast, Sub-Saharan Africa, with its relatively young and rapidly growing population as well as robust economic growth, will be the only region not experiencing a decline in its saving rate.'

The savings rate throughout Africa is considerably lower than in more developed countries, but surprisingly even significantly lower than the savings rate in China, where around 50% of income is saved. Sub-Saharan Africa has the lowest savings rate which is continuing on a declining path compared to East Asia, Pacific, Latin America and South Asia.

Factors Driving FinTech in Africa

|		
66% Of people in Sub-Saharan Africa are unbanked	**65%** Of the population is under-35	**80%** Mobile penetration in the continent
$46B Remittance inflows to Sub-Saharan Africa in 2018	**4.5** Number of branches per 100K people	**46%** Internet penetration in the continent

Loans

In the article 'Alternative Data Is Making (Credit) History in Sub-Saharan Africa', written by Mipe Okunseinde, it is mentioned that:

'In developing markets, conducting the due diligence needed to assess a borrower's credit risk is a challenge for two main reasons: geographic inaccessibility and little to no information as to the person's credit history. Considering that Africa is home to the world's fastest growing middle class, this is a significant missed opportunity. Cignifi uses mobile phone usage to assess not only a person's credit risk but also the probability that a person will use a particular financial service or product.

First Access analyzes additional financial information (such as the individual's water, utilities and educational payments history) to assess a person's credit risk. Lenddo offers loans and free financial education to individuals based on their LenddoScore, a creditworthiness rating that the company generates through analysis of the prospective borrower's social media activity and related data sources.'

'Digital credit is growing fast in developing markets, particularly in Sub-Saharan Africa. Lenders such as M-Shwari, Jumo, M-Pawa, Eazzy Loan, Branch, EcoCashLoan, Timiza, KCG M-Pesa and others are attracting interest and investment. They are seen as having the potential to improve financial access and to make banking with poor clients more feasible and sustainable through technology that reduces underwriting and infrastructure costs.'
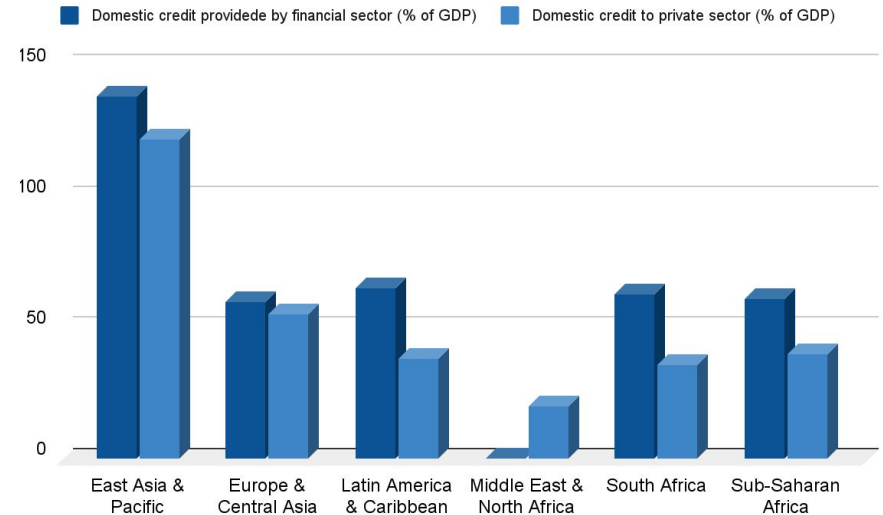
Insurance

In 2016, the insured catastrophe losses for the Latin American region amounted to around 1.4 billion dollars. Currently around 135 million, or 5%, of low income people in developing countries are using microinsurance products.

Africa's insurance market is growing, and the Financial Times refers to this market as going through a 'giant waking up'.
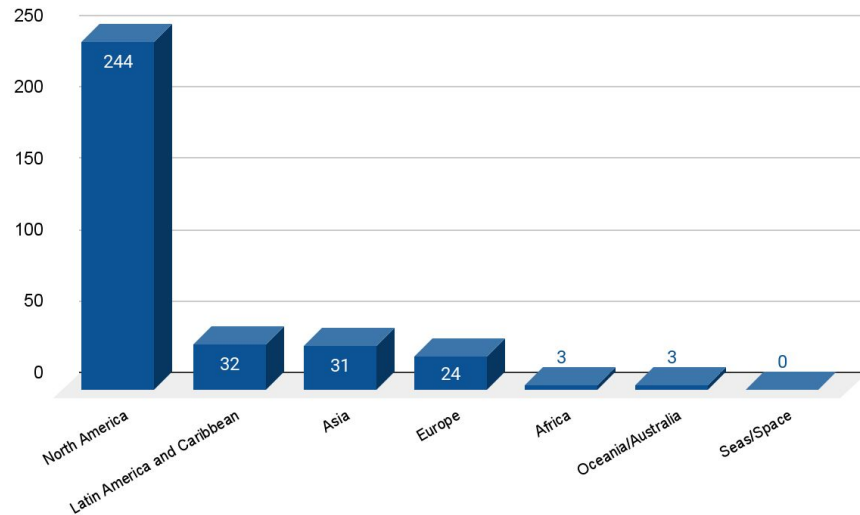
Within the South African context, well-established, traditional Long-Term (Life) Insurance players are increasingly collaborating and partnering with InsurTech firms, in order to offer personalised and innovative products to recapture consumer interest.The African insurance market immaturity points to significant growth.

In the research 'Sub-Saharan Africa becomes increasingly attractive to insurers' conducted by EY, a global leader in assurance, tax, transaction and advisory services expected that:

'8.5% annual growth for Ghana's insurance market between 2014 and 2018, expanding from US$400m to $600m. Just one in 10 Ghanaians own any kind of insurance, though the country has been the focus of foreign investors who have harnessed competition among mobile phone providers to offer free insurance as a market differentiator. Kenya is the most mature market among the seven countries included in the report, which forecasts that its insurance market will grow to $2.2bn by 2018 from $1.8bn in 2014. Respondents from Kenya view regulatory changes and mobile underwriting platforms as potential growth drivers in the coming years.'

Bar chart values: North America 244, Latin America and Caribbean 32, Asia 31, Europe 24, Africa 3, Oceania/Australia 3, Seas/Space 0

Barriers to Financial Inclusion, Which Must be Addressed

Both regions, Asia and Africa, have similar challenges in the financial inclusion process. Modern companies which are operating on the ground and want to succeed need to find a proper solution.

The challenges to financial inclusion include:
Banks are often too far away from the place where the person lives
Bank services are too expensive
Lack of documentation - inability to pass KYC to open a bank account
Lack of trust towards financial institutions and banks
Highly illiterate population
Lack of money makes it unnecessary to be engaged in financial life
Cultural and religious reasons
Institutional regulations and adoption is important for crypto startups

The weaker sections of the society are generally ignored by the formal financial institutions in the race to make huge profits. Financially educated customers tend to make better financial choices. Access to financial services at an affordable cost will improve life of the poor.

Most of the issues mentioned above can be resolved by using modern technologies. Some companies are successfully addressing these issues. Recent development has shown that technology plays an important role in improving financial inclusion because:

1 It helps to reduce cost of the product

2 Reduces transaction cost

3 Improves quality of the product

4 Helps in increasing choices and flexibility to customer

Deep Tech Trends: Digital Identity

With an estimated 500 million people in Africa living without any form of legal identification (World Bank, n.d.), digital identities have become increasingly popular because of their relative ease, low cost, and convenience compared to more analogue systems.

With this background in mind, Research ICT Africa and the Centre for Internet and Society (CIS) partnered in 2020 and 2021 to investigate, map, and report on the state of digital identity ecosystems in 10 African countries. The project looked at local, digitised (in full or partially) foundational ID systems in Ghana, Kenya, Lesotho, Mozambique, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zimbabwe.

The evaluation framework (Centre for Internet and Society, 2020), through its rule of law, rights-based, and risk-based tests, has been used to scrutinise several African countries chances of implementation of Digital ID and it was found that although the legislation empowering the digital ID does have provisions which ensure that the digital ID programme respects human rights and minimises risk, it does not go far enough.

Risks and Recommendations of Digital ID implementation

Privacy

Policy makers are encouraged to pay closer attention to the data privacy concerns around the sharing of digital identity with public and private organisations.

Legality

The Governments are encouraged to expedite the passage of relevant bills into law.

Scope

With the scope of the Digital ID program, the Governments and the relevant start-ups should ensure as full of an implementation as possible.

Deep Tech Trends: Digital Identity

Legal identification has become crucial for social protection, financial inclusion, migration, and even for coping with crises. Many have argued that work towards this goal must start in Africa, where more than 40% of those lacking IDs in the world reportedly reside. Efforts to improve national identification systems have coincided with the increasing deployment of mobile technology, meaning that global identification processes are evolving quickly. The growing availability of mobiles have led to some actors promoting digital interventions for facilitating forms of identification – often via biometric attributes. Digital IDs, for example, have become increasingly popular since 2015 because of their relative ease, low cost, and convenience compared to more analogue systems. At an intergovernmental level, for instance, the World Bank developed Principles on Identification in the context of development and has brought together various stakeholders under the ID2020 partnership, which focuses on how digital technologies can support legal identity deployment. And in 2021, the African Union Commission is also reportedly working on developing a continental digital ID framework for adoption in October.

Digital ID Lifecycle

- Data Collection
- Registration
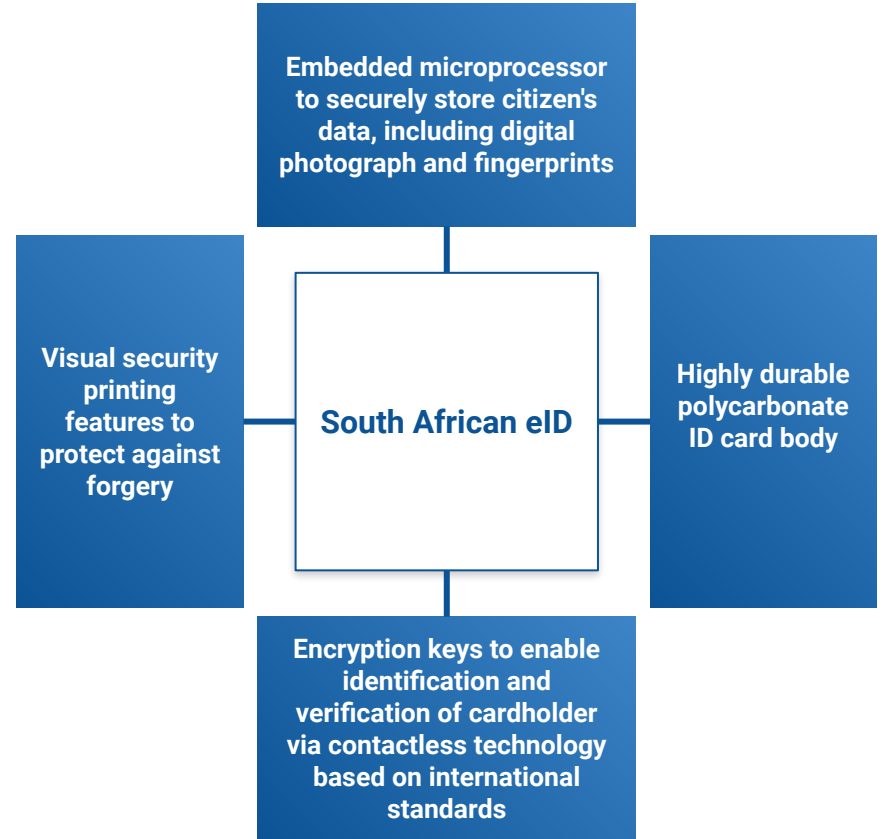- Credentialing
- Authentification
- Update

South African ID Card

Republic of South Africa, with a population of over 59 million, is a multi-ethnic democratic nation.The green bar-coded identity book is used as proof of identification for many uses, such as applying for a driver's license or passport, voter ID authentication, and opening a bank account. However, fraud and theft have made the paper book increasingly insecure for individuals and the authorities. As part of a significant national investment in technology modernization, the Department of Home Affairs (DHA) decided to put in place a new national identity card. Following research into national eID programs implemented by governments worldwide, the DHA opted for an eID card - for its high level of security and advanced data-protection mechanisms. Two means of authentication are implemented:

- biometric fingerprint verification
- a pin code known only to the user.

An embedded secure software with its microprocessor securely contains identification details and ensures that only authorized authorities can read and verify the card's data using contactless readers. Today, the high-end national identity card, equipped with contactless capability, is bringing added levels of convenience and security for citizens.

Embedded microprocessor to securely store citizen's data, including digital photograph and fingerprints

Visual security printing features to protect against forgery

South African eID

Highly durable polycarbonate ID card body

Encryption keys to enable identification and verification of cardholder via contactless technology based on international standards

Digital Identification and Finance Initiative in Africa

The Digital Identification and Finance Initiative in Africa (DigiFI) aims to generate rigorous evidence on how African governments, private companies, and NGOs can leverage digital payments and identification systems to improve lives through better public service delivery, governance, and financial inclusion. To achieve this vision, DigiFI plans to support governments and other implementers to monitor and evaluate relevant reforms.

DigiFI Africa aims to fill this evidence gap by funding cutting edge research projects focused on the study of innovative government payment systems, and ID reforms. We expect the evidence produced by this initiative will inform governments on how best to design and implement reforms to maximize benefits to citizens and mitigate risks. Recognizing the importance of prompt and reliable information on the performance and impact of reforms, the initiative will take a two-pronged approach, funding:

Formative research that includes pilot and high-frequency monitoring systems to assess the status and health of payments and ID programs at various stages of reforms, and Rigorous randomized evaluations to assess the impact of roll-outs of promising payment and ID reforms.

DigiFi Questions to Solve

How can digital ID systems assist with targeting and efficiency in public programs? Do digital ID systems assist or hinder in reaching marginalized populations?

How do digital IDs affect voter participation, the fairness of elections and electoral outcomes? Does increased enfranchisement affect policy decisions?

How can digital ID systems and digital payments assist in building incentive systems to motivate public servants?

Can expanding the formal economy increase the tax base through incentives and simplified processes introduced by digital payments and digital IDs?

What is the impact of digital ID and digital payment systems on market-level general equilibrium effects? What are their impacts on wages and employment? Are there impacts on occupational choice or migration?

Can digital ID systems encourage businesses to enter the formal sector? Do these reforms reduce entry costs to entrepreneurship and enable productive investment?

How do different privacy measures impact take-up of digital IDs?

Deep Tech Trends: Digital Identity

Benefits of Digital ID implementation

One clear benefit of uniquely identifiable beneficiary data is the ability to determine who is genuinely eligible and who may be a 'ghost' or not actually eligible. It is difficult to know exactly why 'ghost beneficiaries' may exist in a database. One plausible reason is that paper-based IDs (used to access the service) are difficult to update centrally and duplicates are easily created. If a beneficiary loses their paper-based ID, they could be issued with a new ID and a new number. The individual associated with the lost paper-based ID would be a 'ghost' in the system—the service that individual could claim would not be directly associated with a genuine beneficiary, but would still be on the books.

A second key benefit of uniquely identifiable data is the ability to link datasets at an individual level over time, which can allow for improved monitoring and feedback systems to governments who are delivering these services. The improved record-keeping and generation of more automated administrative data increases the possibility of identifying areas of improvement of service delivery in a more timely manner. In addition, by linking beneficiary data to other datasets that have more detailed information on household characteristics, such as social registries, governments could improve their ability to identify which specific citizens are most in need of a particular service.

Other reasons include more purposeful deception, often with middlemen extracting a share of these benefits. If there are many 'ghost beneficiaries' in the data, then removing these duplicate or false entries could decrease the misallocation of resources and increase the total amount spent on actual program outcomes.

Sources: Media Overview

Other Technologies for Economic Development

DEEP
KNOWLEDGE
PHILANTHROPY

Secure Money Transfers: Blockchain and Crypto

One factor contributing to lack of financial inclusion is a general distrust of financial institutions and banks. This distrust makes it very difficult to increase the level of financial inclusion in researched countries. Fraud and money laundering are the main problems in the African and Asian regions. Economically undeveloped countries tend to have such problems. Blockchain technologies help prevent crime and can provide users with the secure transfer of money. For now, there are only a few companies which are using blockchain technologies for secure transfers.

In the article 'Cryptocurrencies Can Boost Financial Inclusion Experts Agree' by Angeline Mbogo, it is mentioned that: 'Globally, two billion working-age adults are excluded from formal financial services while only 34 percent adults in Sub-Saharan Africa had an account in 2014 as indicated by World Bank data. According to industry experts, financial exclusion is caused by lack of trust, high costs, and inaccessible formal financial institutions. To increase financial inclusion, the G20 Global Partnership for Financial Inclusion (GPFI) developed high-level principles that will help governments promote financial inclusion digitally.'

While many associate blockchain with cryptocurrencies like Bitcoin or Dogecoin — and perhaps with greed, illicit activity, or environmental carnage — the technology, at its core, is simply a decentralised way to organise transactions in a database or ledger, so that multiple untrusted parties agree on the state of those transactions without the need of a middleman. In this sense, blockchain is redefining the role of banks, governments, or corporations by enabling financial transactions that can be more secure, cheaper, and more efficient than traditional alternatives.

'The reason a lot of these systems are broken here is [that] consumers do not trust them. There is a lot of corruption [and] there is a lot of fraud. You always have a middleman monitoring and managing everything. One has to trust [that] a bank is actually going to take care of my money and not take it away.'
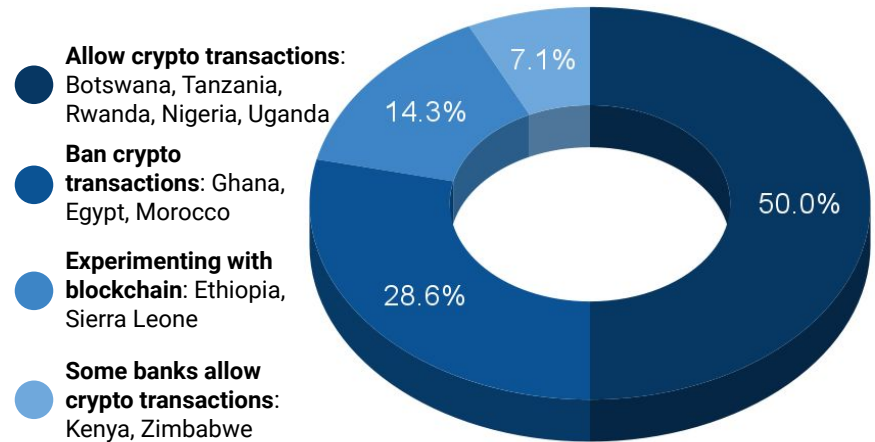
Moray Wright, CEO at Parkwalk Ventures

Blockchain and Crypto (Africa)

In 'The Trouble With Cryptocurrency in Africa – the Truth Behind the Hype', Saibu Baba makes the following point:

'Though many governments like South Africa, Nigeria, Kenya, and Zimbabwe are making big strides towards finding out how to regulate the sector, a lot needs to be done on a continent-wide scale. Some start-ups are operating blindly without support or any regulation. Institutions find the cryptocurrency market to be too risky to invest. Some governments don't even know of anything called cryptocurrencies. Some religious-oriented people see cryptocurrencies to be the end of the world. That is Africa and cryptocurrencies.'

In 2022, Africa is the fastest-growing cryptocurrency market among developing economies as well as the third fastest-growing market in the world, yet it remains the smallest. Notably, Africans living abroad have begun using the novel digital currency to send remittance payments back home. In fact, Africa also comprises the highest ratio of retail transfers, which is an indicator of crypto's usage for remittances. Cryptocurrencies are well-positioned to facilitate remittances since crypto transfers bypass traditional banking services, allowing faster and cheaper money transfers.

In Africa, there are quite a few companies that are mainly involved in blockchain, and they are quite successful in this business, despite the inclusiveness of this direction in many African countries. The greatest example of this is **Bitsoko**, a mobile wallet and a point-of-sale service for merchants that allows money to be easily and securely transferred around the world using only a Bitsoko username, phone number, or bitcoin wallet address. Bitsoko will also offer simplified options for paying household bills and payrolls.

Allow crypto transactions: Botswana, Tanzania, Rwanda, Nigeria, Uganda

Ban crypto transactions: Ghana, Egypt, Morocco

Experimenting with blockchain: Ethiopia, Sierra Leone

Some banks allow crypto transactions: Kenya, Zimbabwe
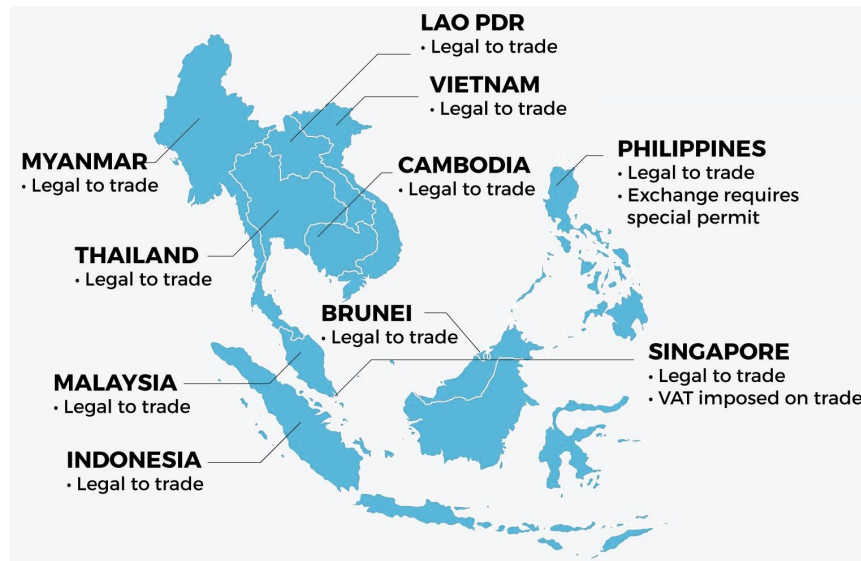
7.1%
14.3%
50.0%
28.6%

Blockchain and the Crypto Economy (Asia)

Over 90 central banks across the globe are engaging in research and development of the technology. Blockchain networks could eliminate high structural costs of financial services, provide a shared ledger that minimizes risk for banks, and strengthen regulatory reporting of banking activity. Tax authorities, securities and exchange agencies, creditors, and national governments all have a stake in the unregulated crypto market, whether voluntarily or not.

Taiwanese financial authorities are open to experimentation with blockchain tech for internal uses. The central bank plans to incorporate the technology with services in the capital city, Taipei, to create a 'smart city'. Thailand's Finance Ministry plans to collect a 15 percent capital gain tax on cryptocurrency profits, which was proposed in early March 2018. The government does not plan to further restrict or ban the crypto industry in Thailand. India's largest private bank, HDFC, banned the purchase of cryptocurrency via debit or credit card in order to 'protect customers' from market fluctuations in March 2018. India is one of the top global tech leaders, but there is a little understanding of the crypto market in the country, although people have taken an interest in the underlying blockchain technology.

Crypto exchanges in Malaysia are now required to identify traders after the government enacted AML legislation in February 2018. Malaysia has one of the most progressive plans for regulation of Blockchain and virtual currency and has already enacted legislation which sets standards for virtual exchanges.

### Status of cryptocurrencies in Southeast Asia

LAO PDR
· Legal to trade

VIETNAM
· Legal to trade

MYANMAR
· Legal to trade

CAMBODIA
· Legal to trade

PHILIPPINES
· Legal to trade
· Exchange requires special permit

THAILAND
· Legal to trade

BRUNEI
· Legal to trade

MALAYSIA
· Legal to trade

SINGAPORE
· Legal to trade
· VAT imposed on trade

INDONESIA
· Legal to trade

Chatbots and AI

Only 8% of companies from our list of 386 DeepTech Inclusion companies have Chatbots and 24% has Machine Learning Algorithms.

ChatBots
8.3%

Has ML Algorythms
24.0%
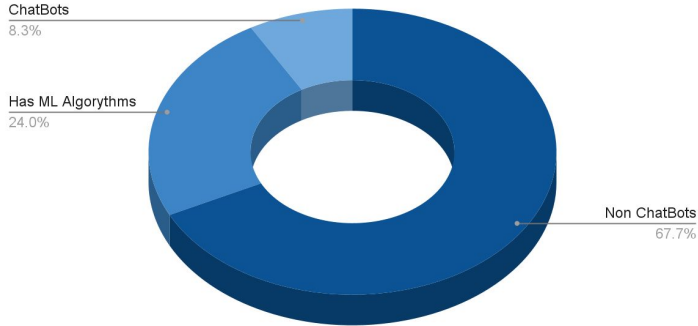
Non ChatBots
67.7%

Only 8% of companies from the list have Chatbots and 24% have Machine Learning Algorithms.

Basic AI
22.2%

Non AI
77.8%
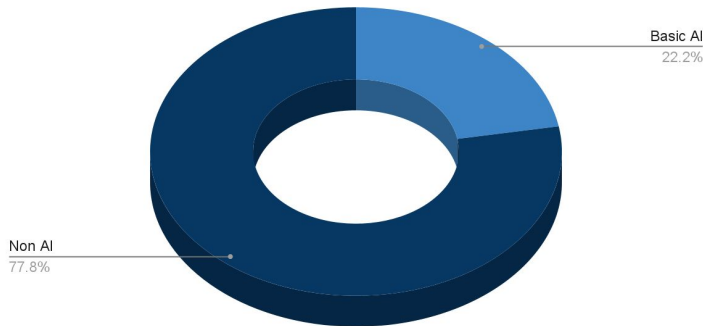
Chatbots are increasingly gaining popularity among developers and especially in the targeted regions. Issues related to cultural specifics and religious reasons are another barrier for financial inclusion in some of the regions. Humaniq is an example of how chatbots integrated into apps can improve user experience.

'The Humaniq team helps users with any issues they may encounter regarding the obtainment of HMQ coins, passing the bio-ID process, P2P transactions, resetting passwords, or anything else. The new Humaniq support will be integrated automatically in the App chats along with the Humaniq helper, the bot assistant which educates customers how to earn up to $20 equivalent in HMQ in the App by referring friends and undertaking microtasks, while also helping users to navigate the app.'

Chatbots have one more important role – educating population about the possibilities that come from being financially included in the economic life of their country.

Sources: Media Overview

Engagement and Gamification

Gamification is the use of engagement elements and game design techniques in a non-game context, and it can be a very useful tool for financial education purposes. Gamification is all about improving the user experience, engagement, loyalty, and satisfaction. Gamified applications only incorporate some elements of game design and are not full-fledged games. However, they are more than just a one-time promotion with a prize that may lead a customer to undertake a single action such as opening an account. The elements of games can potentially increase the involvement in usage of application.

Only 9.4% of companies we analysed have gamification elements.
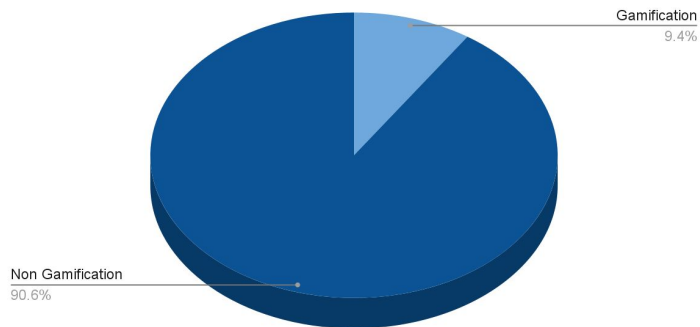
Games have clear similarities with how we think about the structure of the economy in economics. According to one definition of economics, choices in an economy are made in a situation of scarce resources. Each actor seeks, with the resources provided, to make the best possible choices from their own perspective within institutional constraints. It is good to remember, however, that in financial games it is worth focusing on some limited and relatively simple theme, because the economy is a multidimensional entity.

Gamification
9.4%

Non Gamification
90.6%

Gamification (Personal Financial Saving)	
User Types	**Game Settings**
Ambitious Saver	Goal Plotting
Aimless Saver	Learning Pursuit
Social Saver	Social Involvement
Casual Saver	Rewards

Augmented and Virtual Reality

The most advanced technologies, such as AR, VR, AI, and the Internet of Things, are now within reach of almost the entire global population, thanks to the increasing spread of smart devices such as smartphones, including in developing countries. Thus, humanitarian aid organisations can rely on innovative digital tools to reach people in need as well as to coordinate their staff, provide support remotely, and gather data and funds in a more effective way. However, since the nonprofit sector has limited resources, it is becoming ever more natural for humanitarian organisations to start collaborating with large companies, universities, and even start-ups that can quickly implement and scale new technologies.

The applications of AR and VR technologies are so far-reaching and fundamentally game-changing that we can expect some of the same organic spillover into the humanitarian sector as seen with drone and mobile technologies. These kinds of solutions were not designed specifically for the humanitarian community but were general advancements in human technology. Given the wide range of possibilities AR and VR offer, they will eventually apply to almost all aspects of humanitarian activities and prospects.

UNICEF is investing in augmented reality/virtual reality prototypes to identify scalable solutions that can solve real problems; to strengthen its interventions; and to provide the same technological advances to children from programme countries as to their peers in other parts of the world.

UNICEF is supporting solutions that:

Impact specific areas of UNICEF's programmatic work (e.g. health, education)

Teach the language of AR/VR (e.g. content creating platforms)

Reduce friction and increase AR/VR accessibility, particularly through WebVR based solutions)

Internet of Things

In some ways, the Internet of Things (IoT) represents the culmination of an original projection made by those responsible for creating the internet in the first place. These innovators envisioned that people, computers, and other electronic devices would all be interlinked in a network of communication that served as the apotheosis of all others. That description, more or less, matches the IoT. In both the consumer and enterprise arenas, the common availability of smart building systems, industrial workflow management platforms, utility networks, various public sector oversight tools, and so much more serves as proof positive that the internet's full spectrum of possibilities has, by and large, been realized.

The true potential of IoT technologies, however, has yet to reach its peak, with developers and engineers working tirelessly to expand the horizons of the systems. In recent years, they have been brought to bear in a wide variety of altruistic applications. The IoT has afforded humanitarian organisations and public sector agencies the opportunity to do a great deal more good than ever before for the causes and communities they serve. Application development platforms could be valuable solutions for charities and nonprofits seeking to create similar IoT tools.

The hunger-focused nonprofit Sanku, also known as Project Healthy Children, uses devices called 'dosifiers' to fortify flour with vitamins and minerals that those consuming it might not otherwise receive in their regular meals. The organisation has implemented IoT technologies to monitor the production of several mills in Africa in real time. This provides oversight in case of any technical issues and ensures the facilities are operating in a cost-efficient manner. It also helps reduce vehicle usage by Sanku personnel, who would otherwise have to visit the mills in person to review their performance.

The Alliance for Financial Inclusion

The Alliance for Financial Inclusion (AFI) is a policy leadership alliance owned and led by member central banks and financial regulatory institutions with the common objective of advancing financial inclusion at the national, regional, and international levels. AFI partners with regulators, international organisations, and private sector leaders to drive practical solutions and facilitate the implementation of impactful policy changes through a cooperative model that embeds peer learning, knowledge exchange, and peer transformation.

Services Provided by AFI

01 Working Groups	**02** Knowledge Products	**03** Peer Review	**04** Regional Initiatives	**05** Capacity Building for Development	**06** In-country Implementation (ICI)
07 AFI Global Policy Forum (GPF)	**08** The Maya Declaration	**09** Public-Private Dialogue (PPD) Platform	**10** Global Advocacy of Financial Inclusion	**11** AFI Data Portal (ADP)	**12** AFI Covid-19 Policy Response Project

The Council for Scientific and Industrial Research

The Council for Scientific and Industrial Research, commonly known as the CSIR, is a world-class African research and development organisation established through an Act of Parliament in 1945. The CSIR undertakes directed, multidisciplinary research, and technological innovation that contributes to the improved quality of life of South Africans. The CSIR's shareholder is the South African Parliament, held in proxy by the Minister of Higher Education, Science and Innovation.

Applied Research and Analytics Methods

Advanced Agriculture and Food	Future Productions: Chemicals	NextGen Health
Future Production: Manufacturing	Future Production: Mining	Defence and Security
NextGen Enterprises and Institutions	Smart Mobility	Smart Places

CSIR at a glance

Geographic profile		Pretoria; Johannesburg; Durban; Cape Town; and Stellenbosch		

CSIR Staff profile

CSIR Total Staff Base	Black South Africans	Female South Africans	Total SET base	Black South Africans in SET base
2 140	1 561	946	1 512	1005

Female South Africans in SET base	Employees with disabilities	SET base with Master's	SET base with PhDs
575	40	492	314

Our impact - output and outcomes

SMMEs supported	Staff in exchange programmes with industry	New patents	Publication equivalents	Technology demonstrators
96	9	26	407	48

Joint technology development agreements being implemented for industry	Reports contributing to national policy development	Standards delivered or contributed in support of the state
25	21	11

Projects implemented to increase the capability of the state	CSIR's total income for 2020/21		Consecutive clean audit status
44	R2.57 billion	LEVEL 1 B-BBEE CONTRIBUTOR	

African Institute for Mathematical Sciences (AIMS)

Research activity commenced at AIMS South Africa in 2003, mostly through a limited number of short-term research fellowships sponsored by the Ford Foundation, the Victor Rothschild Memorial Fund, and the National Research Foundation. However, research at AIMS South Africa started off in earnest after the AIMS South Africa Research Centre was launched during May 2008 (following the purchase and refurbishment of two historical double-storey houses opposite the AIMS main building in Melrose Road) and after a grant was secured from the Department of Science and Technology at the end of 2008.

The Research Centre was launched with the mission to conduct and foster outstanding research and learning in the mathematical sciences, thus contributing to the next generation of pan-African leaders in many spheres and the advancement of African science and academia within a multicultural environment.

This is achieved by creating a research environment with focused themes; integrating research with postgraduate training and developing young researchers; and providing a space for mathematical scientists to work together and interact with local and international researchers within their focus framework.

Research is focused on the following areas:

Cosmology & Astrophysics

Mathematical & Physical Biosciences

Mathematical Finance

Mathematical Foundations & Scientific Computing

Data Science & Information Systems

iThemba Laboratories at National Research Foundation

iThemba Laboratories for Accelerator Based Science (LABS) is committed to investing in the growth and development of scientific and technical talent, with a special focus on creating opportunities for women and designated communities. iThemba LABS provides laboratories within which particle accelerators (linear accelerators and cyclotrons) are exploited as research tools to probe the nature, structure, and properties of matter and materials and to produce radioisotopes that can be used for diagnostics, imaging, and therapy in nuclear medicine applications.

The biggest accelerator is the 200-MeV Separated Sector Cyclotron (SSC), which is fed by two solid-pole cyclotrons used to pre-accelerate the projectiles before injection into the SSC. The cyclotron currently provides in the needs of two user communities, namely nuclear medicine and the (fundamental and applied) nuclear physics research community.

The establishment of the South African Isotope Facility (SAIF) in 2022 will signal the dawn of a new dispensation where all beam-time from the SSC will be devoted to applied and fundamental nuclear physics. In addition, iThemba LABS has two laboratories dedicated to research at the atomic scale.

The workhorse of iThemba LABS is the Separated Sector Cyclotron (SSC), which was commissioned in 1985 to provide accelerated particle beams with energies that can reach 200 MeV for protons. Since 2016, the SSC delivers beams of a large variety of ions and particles to two user groups, namely radioisotope production and basic and applied research, which includes radiation biophysics, among other areas.

University of Cape Town

The University of Cape Town (UCT) is South Africa's oldest university and one of Africa's leading teaching and research institutions.

The university has 6 faculties: **Commerce, Engineering & the Built Environment; Law; Health Sciences; Humanities; and Science – which are all supported by the Centre for Higher Education Development,** which addresses students' teaching and learning needs.

UCT also has more than 80 specialist research units that provide supervision for postgraduate work and is home to more than a third of South Africa's A-rated researchers – academics who are considered world leaders in their fields.

Research Strengths				
Astronomy, Cosmology and Gravity	Democracy, Public Policy and Citizenship in Africa	Infectious Diseases and Molecular Medicine	Preserving African Heritage	Biodiversity
Drug Discovery	Schools	Future Water	Mineral Beneficiation	Catalysis: Accelerating Chemical Change
Urban Africa	Climate and Development	High-energy Physics	Neurosciences	Data-intensive Research

Government Approaches and Initiatives to Implementing DeepTech Developments

The Digital Economy for Africa Initiative

The Opportunity

Africa needs to think big on digital development. At the current incremental pace of economic and social advancement, too much of Africa's expanding youth population will be denied the opportunity to live up to their potential. Digital technologies offer a chance to disrupt this trajectory by unlocking new pathways for rapid economic growth, innovation, job creation, and access to services which would have been unimaginable only a decade ago. Yet, there is also a growing 'digital divide' and increased cyber risks, which need urgent and coordinated action to mitigate.

The time for action is now

Access to the internet remains out of reach for most people in the continent, with only 22% reporting having access in 2017. Too few citizens have digital IDs or transaction accounts – locking them out of access to critical services and e-commerce. Africa has the opportunity to harness the digital economy as a driver of growth and innovation, but if it fails to bridge the digital divide, its economies risk isolation and stagnation.

Africa population
1.3B
15.7%
of global population

Internet users
298M
9.8%
of global users

Mobile usage is
Growing Fast
In Africa

880M
Subscribers

23.6%
Of global subscriptions
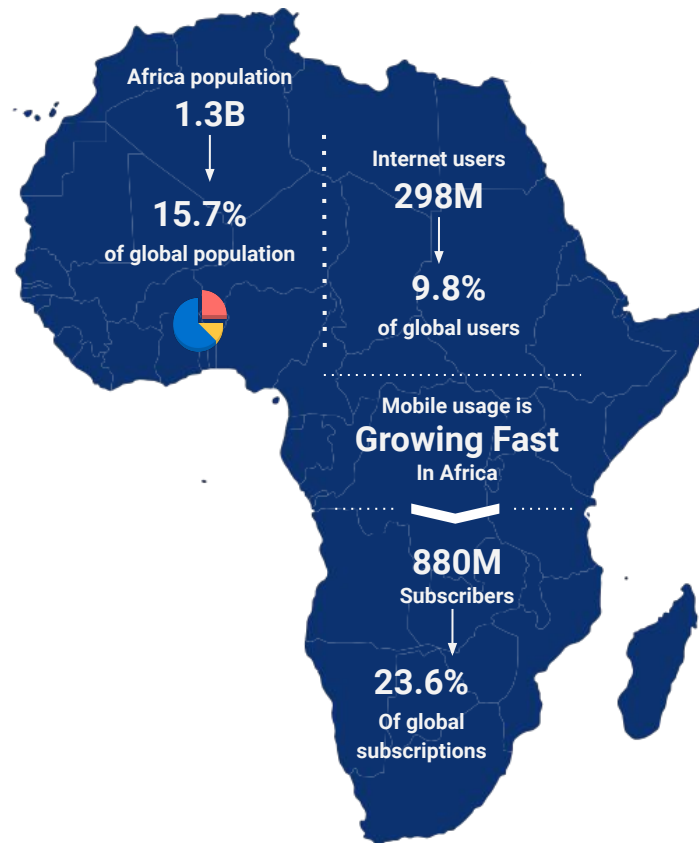
Sub-Saharan Whole-of-Government Transformation: The Three Principles

Purposeful governance	Enabling infrastructure	Responsive institutions
Of 46 sub-Saharan countries, a total of 43 have established their own ICT ministries that are responsible for leading both the digitalisation of government and the wider economy, with the majority having a national digital-transformation strategy in place. However, the implementation of these strategies and policy frameworks is hampered by the absence of robust legislative and regulatory frameworks governing their execution.	Digital-ID systems are a core component of enabling infrastructure, yet many countries still struggle to issue their citizens with a legal identity. It is estimated that more than 500 million people on the continent do not have any form of ID. Only 11 countries (Angola, Ghana, Kenya, Lesotho, Mauritius, Nigeria, Senegal, Seychelles, South Africa, Tanzania, and Uganda) have national digital IDs with electronic components and associated public-service-delivery functions.	Several countries have gone beyond the digitalisation of existing processes to implement a digital-by-design approach to public service delivery. This involves the re-engineering and simplification of government services for an efficient and sustainable citizen experience regardless of the channel or platform used.

Supranational political bodies and non-governmental organisations have supported citizens' demands for more effective government by pushing digital transformation up the political agenda and helping to establish it as a strategic priority. As early as 1996, the UN Economic Commission for Africa (ECA) adopted a resolution calling for increased information and communications technology (ICT) adoption in governments, with the aim of improving service delivery.

Sources: Africa Union

Innovative Platforms in Sub-Saharan Africa
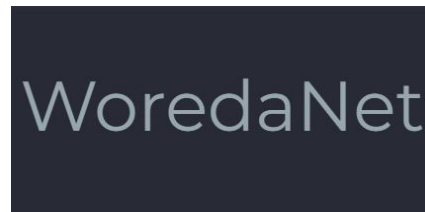
The Ghana Community Network (GCNet) Trade Facilitation Platform is an online system providing an end-to-end solution for handling trade and customs operations at all sea and inland ports in the country. The system – based on a common digital platform for all relevant stakeholders – ensures accurate 'real-time' revenue accounting and reconciliation.

Huduma Kenya is a government initiative that aims to transform public service delivery by using a network of integrated platforms. It has a multi-channel approach that combines bricks-and-mortar Huduma centres across the country with the deployment of digital technologies to simplify transaction processes via automated services. These technologies range from birth certificates and ID-card applications to taxes and land rates.

Rwanda's e-government digital platform, Irembo, gives citizens access to more than 85 online services, with plans underway to add an additional 100 within the next three years. From birth-certificate applications and driving-licence registrations to land-title transfers, Irembo has processed more than 2.7 million transactions from 2.4 million unique users.

WoredaNet is a terrestrial and satellite-based communications network that provides internet connectivity and allied services such as video conferencing and messaging to federal, regional, and woreda-level government entities in Ethiopia. A woreda is an administrative division in Ethiopia managed by a local government, equivalent to a district with an average population of 100,000.

Can Latin America Find a Faster Path to Digital Government?

João Pacheco, vice president for public sector, Latin America at Oracle

'Currently, 73 percent of Latin American countries have a digital agenda in place. However, only 30 percent of their functions can be carried out digitally, and prior to the pandemic, just 7 percent of citizens' last contact with their governments was online. Therefore, governments have a large opportunity to adopt and incentivize the use of new digital technologies and services and to enhance existing ones.'

Silvina Moschini, founder and CEO of SheWorks

'According to the World Bank, Latin America is one of the world's most unequal regions. The protocols imposed by the pandemic quickly revealed the differences in connectivity among countries and, within them, the gap between urban centres and the countryside. The CAF Observatorio del Ecosistema Digital measures Internet access in the region at an average of 78 percent.'

Luis Tejerina, lead specialist in the Inter-American Development Bank

'Covid-19, as terrible as it is, has been hailed as a catalyst for digital transformation in the world. Temporary or permanent laws enabling the use of telemedicine were passed, and regulations to open bank accounts were relaxed, giving a boost to digital agendas in Latin America and the Caribbean. No law can provide a health workforce with basic training on digital health overnight.'

E-Government in Asia and the Pacific: The Six Stages

A personnel information system can routinely prepare separation documents for staff past the normal retirement age instead of letting them stay on as they do in many Asia-Pacific governments.

The next stage allows two-way communication between the government and the public using ICT. The first step for this is to post one or more telephone or fax numbers or e-mail addresses on a website and to encourage the public to send in messages.

At least two important sets of ICT applications can potentially support participatory and democratic processes in the region: applications that empower civil society organisations; and those that allow citizens to vote and otherwise express opinions over the Internet.

Internal network → **Inter-organisational and public access to information** → **Two-way communication** → **Exchange of value** → **Digital democracy** → **Joined-up government**

The next stage is to enable better access to information by other organisations and the general public. To start with, this often involves developing systems for managing workflow.

In the next stage, ICT supports the development of more flexible and convenient ways for citizens to do business with the government.

In the sixth, and last, stage of e-government, service delivery is both vertically and horizontally integrated. A Web portal or smart card, with a built-in microprocessor, is used for identification and/or financial transactions.

Global Impact Investing Factsheet

$299.9B

Impact investing market size in 2021

17.6%

Of CAGR is expected over the years 2021-2027

~60%

Of investment came from USA investors between 2010-2021

42.4%

Growth of the impact investing market size during the pandemic

Global Impact Investing Overview 2021 Q4: Main Parameters

445 Companies

220 Start-Ups

5 Regions

Global Impact Investing Industry

100 NGOs

15 Social Impacts Categories

834 Investors

DeepTech as an Innovative Driver in the Social Sector

DeepTech's 'profound enabling power' has the potential to bring about real change. It harnesses cutting-edge technologies to create tangible societal shifts, and never has it been more relevant. The COVID-19 pandemic, the urgency of the climate crisis, and the rapid expansion of global populations have added strain on fragile systems, and it is these fundamentals that DeepTech is designed to address.

Frequency of Use of Deep Technologies to Solve Global Problems

	Environment	Global Health	Poverty	Hunger	Education
Artificial Intelligence					
FinTech					
Blockchain					
Imaging Sensors					
Deep Learning					
Robotics					
Augmented/Virtual Reality					
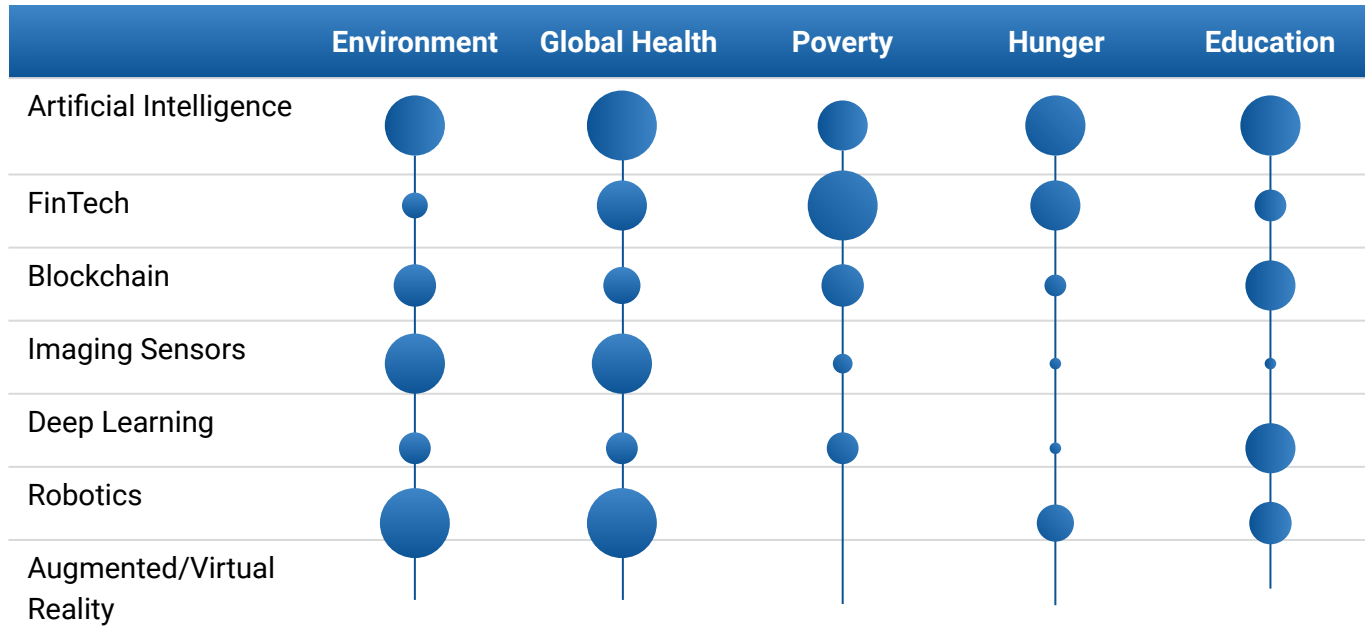
This chart is constructed from a database of 220 use cases of advanced technologies aimed at solving global societal and environmental issues.

Frequency of use is an estimate of the number of applications of a given technology to one of the major global challenges.

Number of use cases:

0	1	5	10	15
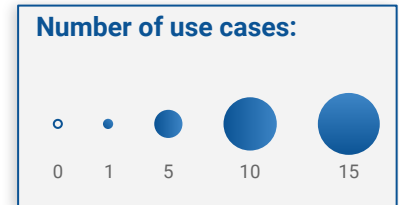
Impact Start-Ups by Volume of Funding

Country Comparison Matrix
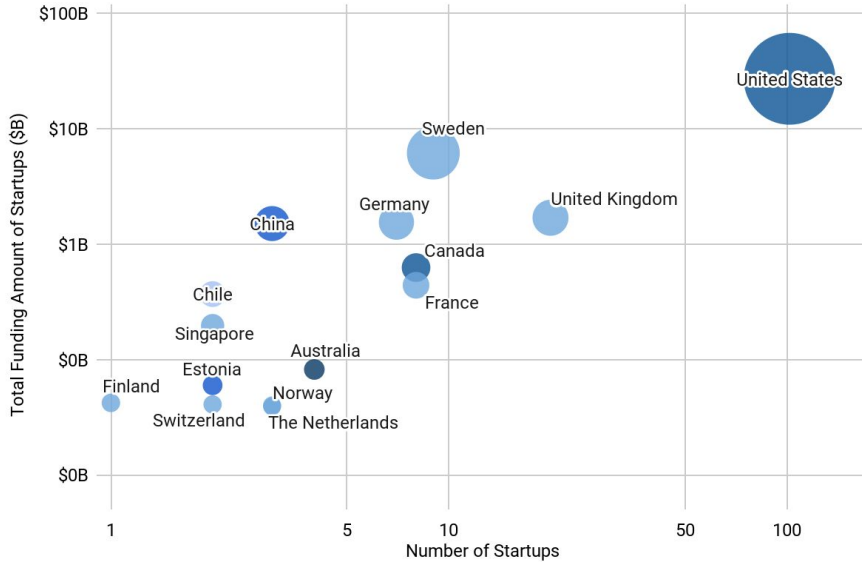
Top 10 Impact Start-Ups by Total Funding Amount
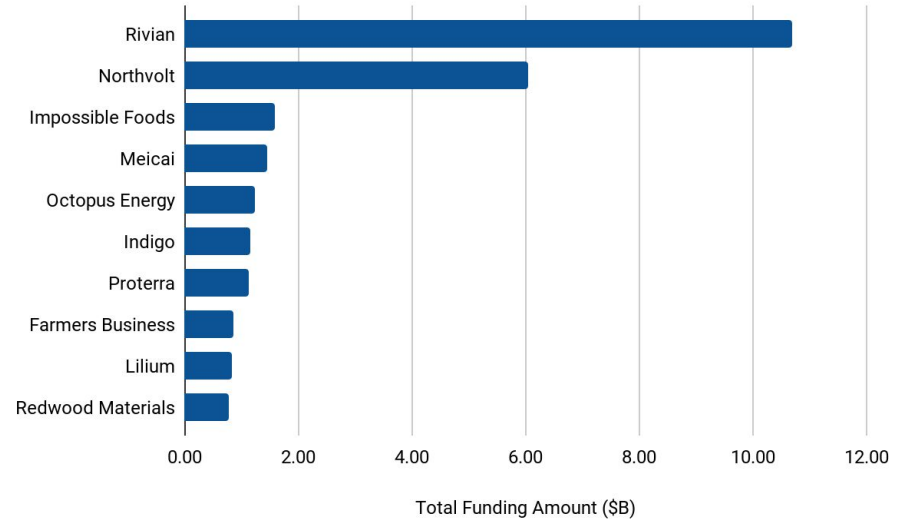
The United States is the clear leader in both the number of social impact start-ups (102) and the volume of funding received ($27 billion). As shown by the graph on the right, the most heavily-funded companies are Rivian ($10.70 billion) and Northvolt ($6.04 billion), while the average amount of funding among those companies that received it is $0.25 billion.

The Return to Impact Investing in Developing Countries

The oldest and most diversified international impact investor has earned superior returns by deploying its funds in emerging-market and developing nations, according to findings reported in 'Long-Run Returns to Impact Investing in Emerging Markets and Developing Economies'.

Over six decades, the International Finance Corporation (IFC) has invested in private equity and venture capital in 130 such countries. The portfolio has outperformed the US stock market over this period. At the end of 2019, an investor who had earned returns on the IFC's portfolio since 1961 would have 15 percent more wealth than one who invested the same initial amount in the S&P 500.

The IFC was founded in 1956 with a World Bank mandate to encourage growth in productive private enterprise, especially in less-developed areas. It made its first loan in 1957 and its first equity investment in 1961. Its portfolio includes investments in more countries than are included in the MSCI Emerging Markets index, which is heavily concentrated in large economies like China and Brazil.

The IFC also has a higher share of investment in very poor nations. An investor holding the IFC's equity portfolio since 1988, would have 30 percent more wealth at the end of 2019 than an investor who started with an equal-sized investment in 1988 but who held the MSCI Index instead. The researchers measure the performance of the IFC portfolio and each individual investment by computing its public market equivalent (PME).

Financial Return to the International Finance Corporation's Investment

Sources: National Bureau of Economic Research
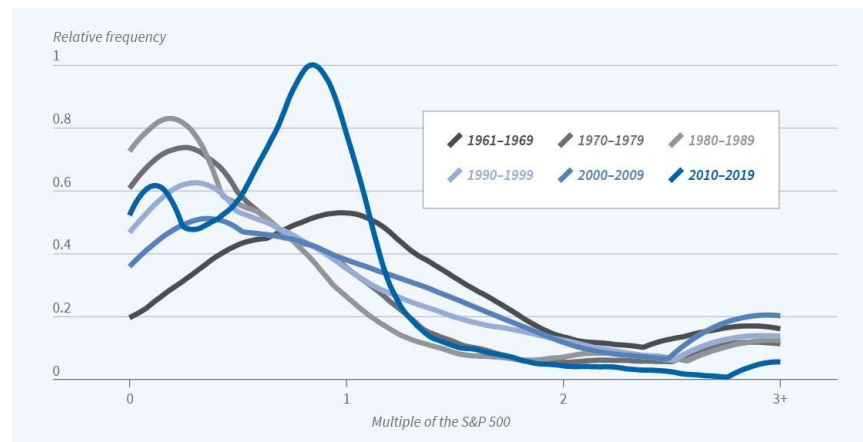
Social/Development Impact Bonds

One innovative instrument in impact investment is known as the **social impact bond (SIB)** – or, in the case of development cooperation, the **development impact bond (DIB)** – through which private investors pre-finance the intervention, and governments or donors provide funding solely when the intended outcome goes beyond what would have occurred otherwise.

Advocates of impact investing see SIBs and DIBs as useful instruments for the financing of the 2030 agenda. However, they are still largely unproven; even though some promising interim evaluations exist, this innovative financing approach faces a number of challenges. Besides questionable or outstanding evaluations, the most important challenges are: limited transferability, the nascent development of the market, high transaction costs, and hurdles for investors.

Nevertheless, given the urgency to mobilise finance for sustainable development in developed and developing countries, it is worth further considering and prudently developing impact bonds and impact investing in general. Supporting them would entail the following:

1 Data- and information-sharing have to be furthered by the impact investing community in order to critically evaluate the first experiences of pilot SIBs and DIBs, provide recommendations, and enable basic education for entrepreneurs and investors.

2 Further research should be encouraged in order to improve understanding of how to create additional impact and to deploy different instruments in the development context as well as to offer exit opportunities for private investors.

3 Policymakers should support the development of clearer definitions and a common impact-measurement system as well as standardised and mandatory reporting requirements to ensure effectiveness and quality.

4 Development finance institutions should become more active in the market by providing resources to encourage the implementation of SIBs and DIBs. Governments and/or donors need experienced partners who provide catalytic capital for first initiatives and serve as intermediaries.

Current Challenges With Impact Investing

Despite the progress made thus far in impact investing, it has yet to maximise its full potential as a development financing instrument. Currently, most impact investing comes from DFIs and major social foundations. The full power of the private capital market is waiting to be harnessed.

Another key challenge is the issue of measuring and quantifying impact. As impact investing ventures vary, so do their measurement techniques, making it difficult to attain universal standardisation. The lack of standardised metrics makes it harder to quantify and compare non-financial impact, thereby reducing consistency across sectors.

The lack of an efficient impact investing 'ecosystem' results in significant consumption of time and resources before investors can successfully venture into the market.

Finally, because the impact investing market is still in its intermediate stages, there is a lack of widespread awareness on investing options. According to a recent study by the *Financial Times*, the biggest concern for investors is finding suitable impact investing opportunities and obtaining tailored mentorship for the process.

Social/Environmental Value Realisation

Beneficiaries

Legal/Policy

Measurement/Verification

Impact Investee

Regulatory Authority

Advisory and Business Development Services/R&D

Investors

Value Contribution

Financial Value Realisation
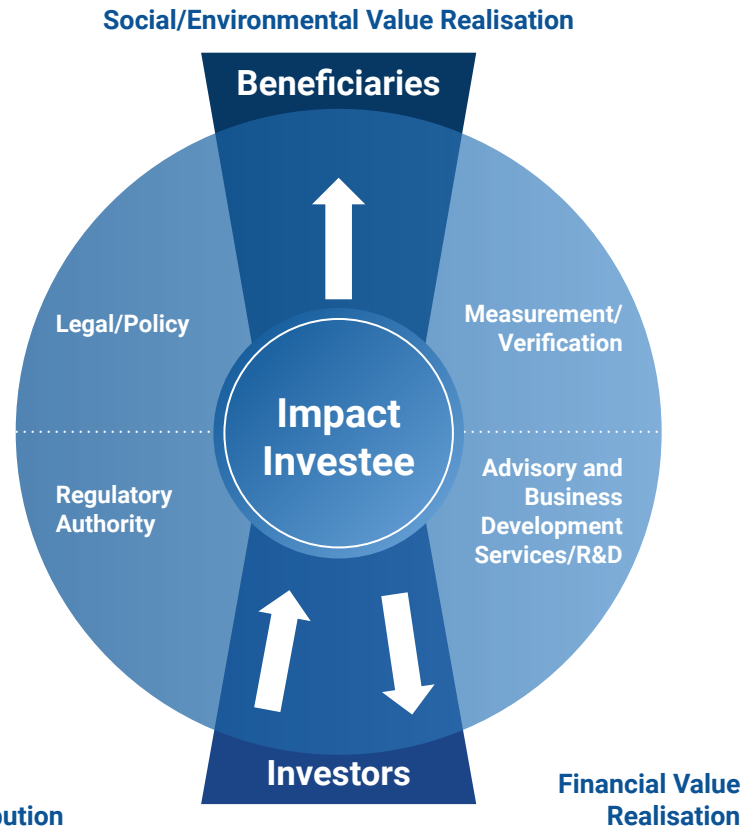
Key Takeaways

Key Takeaways

Advanced technologies (artificial technologies, robotics, advanced materials, FinTech, and others) help to drive the emergence of tech in the social sector and open up new market opportunities. Thus, start-ups play a crucial role in solving complex questions of the modern world, especially those involved in the development of advanced DeepTech technologies aimed at increasing of the wellbeing of developing countries.

In the digital redistribution of DeepTech companies, the North American region holds the lead, with approximately 40% of companies originating from the region.

Among the DeepTech companies involved in humanitarian efforts, the Financial Inclusion sector is the most prevalent, with 163 companies involved. The two other major sectors are Nature and Climate Protection and Sustainable Development.

When it comes to funding, the largest amounts actually went to the Energy-Saving and Renewable Energy sectors, with Financial Inclusion taking second place. While taking second place in the number of companies, the Nature and Climate Protection sector takes second-to-last place in the amount of funding received.

The African market, where the adoption of DeepTech technologies is lower, has showcased rapid growth during the past few years. Meanwhile, the increasing adoption of image and pattern recognition in Africa is expected to provide new growth opportunities.

DeepTech's potential for disruption is unprecedented, and the breadth of problems it could address remains for us to discover. Among the most popular trends in DeepTech for 2022 are awareness of climate change, alternative energy sources, faster and less power-hungry chips, and cultivation of the power of the sea. These trends are well-aligned with the UN Sustainable Development Goals and can bring a lot of benefit to Africa, Asia, and LATAM.

Key Takeaways

The global DeepTech market size is expected to reach $15 trillion by 2030, with its current evaluation at $6 trillion in 2022. DeepTech is considered to be a revolutionary technological development, and its integration across a host of applications is one of the key factors driving this market. Advances in image and voice recognition are driving the growth of the regional market. Improved image recognition technology is critical in enhanced drones, self-driving cars, and robotics.

DeepTech brings together powerful capabilities: data volume, Moore's law, DNA sequencing cost, DNA synthesis (in progress), quantum computing (in progress). These capabilities have deep implications on their own — but when added to technological capabilities in matter and energy, computation and cognition, and sensors and motion, they allow innovative companies to address previously unsolvable problem sets. DeepTech's potential for disruption is unprecedented, and the breadth of problems it could address remains for us to uncover.

The regions of both Asia and Africa face similar challenges in the financial inclusion process. Modern companies which are operating on the ground and want to succeed need to find a proper solution. Among the challenges to financial inclusion are that banks are often too far from the place where a person lives and the services are too expensive. Other issues include lack of documentation, lack of trust in financial institutions, cultural and religious issues, etc.

One innovative instrument in impact investment is known as the social impact bond (SIB) – or, in the case of development cooperation, the development impact bond (DIB). These instruments allow private investors to pre-finance the intervention, and governments or donors provide funding solely when the intended outcome goes beyond what would have occurred otherwise. Advocates of impact investing see SIBs and DIBs as useful instruments for the financing of the 2030 agenda.

Despite the progress made thus far in impact investing, it is yet to maximise its full potential as a development financing instrument. Currently, most impact investing comes from DFIs and major social foundations. The full power of the private capital market is waiting to be harnessed. The lack of an efficient impact investing 'ecosystem' results in significant time and resources being consumed before investors can successfully venture into the market.

About Deep Knowledge Philanthropy

Deep Knowledge Philanthropy is a data-driven nonprofit project by Deep Knowledge Group committed to the support, development, and advancement of DeepTech for the social good. It was founded on the belief that DeepTech innovation is the most efficient driver of 'social profit', technological humanitarianism, and societal development and that venture philanthropy is the profitable long-term investment for individuals, national economies, and humanity itself.

Deep Knowledge Philanthropy employs the most sophisticated approaches to analytics used by its founder, who is also the Deep Knowledge Group leader of proprietary analytical research in the Longevity and advanced science fields. We aim to use pioneering scientific discoveries to efficiently prolong human lifespan and bring socially-inclusive humanitarian benefit by supporting innovations, science, charitable, and sponsorship projects.

The organisation was founded in 2021 to house the sum of philanthropic, nonprofit, and influence investment activities, projects, and initiatives conducted over the past 5 years under the Deep Knowledge Group umbrella. Its activities are backed by the quantitative analytics produced by Deep Knowledge Group's 10+ analytical subsidiaries, implementing the most advanced approaches to analytics, benchmarking, predictive forecasting, and data-driven strategy formulation and execution in order to deliver 10x-50x the social impact and ethical ROI per dollar than the nonprofit and philanthropy sector average.

Deep Knowledge Group's analytical and nonprofit activities are powerful tools for extremely efficient and productive engagement with governments, progressive top-tier corporations, industry influencers, journalists, and a wide range of other strategically relevant personalities and organisations. All Deep Knowledge Group's activities (both for-profit and nonprofit) are structured in order to support, develop, and leverage the power of DeepTech for socially-inclusive humanitarian benefit, based on the foundational principle that technological innovation is the key driver and most efficient tool for improving quality of life, safety, stability, and growth potential for global society and the belief that the highest return on investment is not just profit but ethical returns and the delivery of added quality of life and developmental opportunities for humanity.

African Charities Analytical Dashboard

This unified platform aims to map, categorise, and rank market participants of their respective sectors by filtering them through geographical maps and mindmaps with visualised analytics of associated global challenges. The platform also features profiles of organisations, donors/investors, and tools for matchmaking impact start-ups with investors and charity organisations – donors and charities – with impact start-ups as well as with financial institutions, volunteers, and other partners.

Deep Knowledge Group: Books
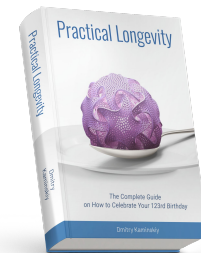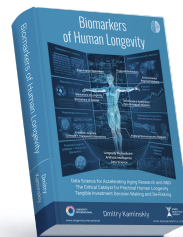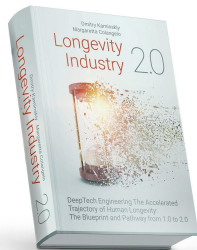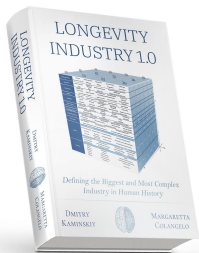
Longevity Industry 1.0
2010-2020: Evolution of the Longevity Industry from Zero to 1.0

Longevity Industry 2.0
2020-2025: DeepTech Engineering The Accelerated Trajectory of Human Longevity — The Blueprint and Pathway from 1.0 to 2.0

Biomarkers of Human Longevity
The Critical Catalyst for Practical Human Longevity, Tangible Investment De-Risking, and Accelerated Ageing Research and Longevity R&D

Practical Longevity
Practical, Market-Ready Tools, Approaches and Frameworks for Optimizing Personal, Practical, Healthy Human Longevity
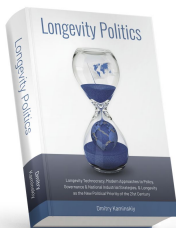
Longevity Politics
2021-2030: The Rise of Longevity Politics, and the Solidification of Longevity as the New Political Priority of the 21st Century
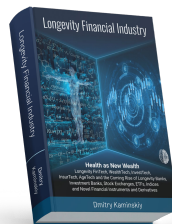
Longevity Financial Industry
Health as New Wealth, Engineered Solutions to Bridge the Longevity Liquidity Gap, and the Rise of Longevity Investment Banks, Stock Exchanges and Financial Instruments
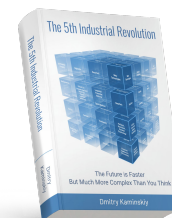
The 5th Industrial Revolution
2030-2035: Defining, Forecasting, Optimizing and De-Risking the Accelerated Trajectory of Progress Toward the 5th Industrial Revolution

Longevity Governance Big Data Analytics Dashboard

DEEP KNOWLEDGE PHILANTHROPY

Link to the Report: www.deep-knowledge.org/deeptech-for-social-good-q2-2022	
E-mail: info@deep-knowledge.org	Website: www.deep-knowledge.org

Deep Knowledge Philanthropy Disclaimer