AFRICAN. BLOCKCHAIN REPORT



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Blockchain: The 'truth engine' driving Africa's digital future



f all the emerging technologies making their mark across Africa at the moment, blockchain doesn't initially seem the most revolutionary.

Blockchain is essentially a distributed ledger technology that allows information to be exchanged among several parties but not altered. It can create a shared system of record among network members, eliminating the need to reconcile disparate ledgers.

Compared to some of the weird and wonderful connected devices introduced as

part of the trend towards Internet of Things (IoT) or the science-fiction-meets-reality potential for Artificial Intelligence (AI), it is no real surprise that blockchain hasn't quite captured the general public's imagination in the same way.

But scratch beneath the surface and what blockchain represents is so much more: it is a 'truth engine'. The information inside a blockchain can't be changed or modified. Like an elephant, it never forgets.

To the business community, blockchain represents a new opportunity to improve processes and drive efficiency. And its timing couldn't have been better. Consumer trust in online services and platforms has been shaken by years of fake news, major data breaches and serious misuse of personal data. Blockchain presents an opportunity to shine truth across the internet – placing digital records and transactions into a shared ledger and ensuring there is no single point of failure or no one organisation controlling that data.

In Africa, blockchain also presents another platform for digital empowerment. In a region of fragmented data, complex supply chains and inefficient trade, the technology has the power to transform the way businesses share information, track assets and deliver their services.

It's ability to deliver transparency across transactions and services also makes it an ideal fit for governments and their delivery of public services, which for too long have found themselves susceptible to fraud and corruption.

Yet blockchain's earlier alliance with Bitcoin – the technology was invented by Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency Bitcoin - has led to some misconceptions in the market. Cryptocurrencies have become synonymous with get-quick-rich-schemes in some African countries, and a period of market education is required to demonstrate the full value of blockchain to African economies.

In this report, we take a look at some of the initial blockchains discussions being held by business leaders, start-ups, academics and government entities as they begin examining the potential use cases and applications for blockchain across the region.

What we discover is a real appetite for public and private organisations alike to seize the blockchain opportunity while it still is in its nascent stages.

There is much work to be done. There are no global standards or regulations in place for the technology, and new skills are required in the workforce to support its rise. One thing is for sure, as the global discussions around blockchain technology continue to grow - Africa will be part of it. Editor: Alex Hawkes

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5 questions everybody is asking about **blockchain**



What is Blockchain? The blockchain model, first introduced in a white paper by the mysterious Satoshi Nakamoto in 2008 (see box), presented a disruptive new

system for collating and storing crucial data across multiple nodes, creating a distributed and incorruptible ledger of transactions and records with massive computing power.



What is the link with Bitcoin and other cryptocurrencies?

Cryptocurrencies such as Bitcoin are built on blockchain platforms; but the model's uses

extend to any environment in which digital trust is needed. While the model that subsequently emerged initially focused on Bitcoin, it became a compelling proposition for decentralised apps and systems of records across multiple sectors, after the young Vitalik Buterin introduced Ethereum and smart contracts in a white paper in 2013. Development and use cases emerged in quick succession around the world.



How does it work?

A blockchain comprises numerous nodes who join the network voluntarily, with some incentive to do so. The number of nodes varies, but the

largest public network in the world, Ethereum, is reported to have achieved nearly 25,000 reachable nodes around the world within two years of launch.

In a major public network, anyone can download and start running a node and participate in the consensus process; and anyone can send and read transactions through the network, although the transactions are kept pseudonymous or anonymous.

In a federated or consortium blockchain, participation is restricted to pre-selected or approved nodes in which identities remain known to participants, such as legitimate financial institutions. The right to read the blockchain may be restricted or public, in line with a decision by the participants. Private blockchains are limited to specific groups or organisations. There is no central authority in this decentralised ledger, and it is ruled by consensus.



Why is everyone talking about blockchain?

Described as the most significant breakthrough in technology since the advent of the internet, blockchain is

set to change records and transactions forever. By its design, transparency and integrity is built into the blockchain: in order to participate in the blockchain, each of the networked members must have access privileges, each computer, or node, must conform to the rules, and any suspect transactions are rejected by other nodes. As each transaction occurs, it is encoded into a block of digital data and uniquely signed.

Records added to the blockchain remain linked in a unique chronological 'daisy chain' that will not allow for the insertion of additional blocks between existing blocks; and it cannot be lost, changed or deleted without the consent of all participants. It is therefore highly transparent and incorruptible; providing a clear audit trail of every record added.



Who is interested in blockchain?

As keen interest emerges in the potential for blockchain, major vendors and multiple blockchain specialists are focusing on

offering blockchain and broader distributed ledger technology (DLT) implementation and consulting services.

Thanks to lower bandwidth and storage costs and improved storage and computing capacity, blockchain seamlessly and cost-effectively connects the multiple nodes in the chain across multiple regions and has become a viable solution for pan-African systems of record. Unlike cloud-based data storage, blockchain distributes data into nodes along the chain, making it harder – or virtually impossible – for hackers to access.

What the Nakamoto white paper says:

"The only way to confirm the absence of a transaction is to be aware of all transactions. In the mint based model, the mint was aware of all transactions and decided which arrived first. To accomplish this without a trusted party, transactions must be publicly announced, and we need a system for participants to agree on a single history of the order in which they were received. The payee needs proof that at the time of each transaction, the majority of nodes agreed it was the first received. Timestamp Server The solution we propose begins with a timestamp server. A timestamp server works by taking a hash of a block of items to be timestamped and widely publishing the hash, such as in a newspaper or Usenet post. The timestamp proves that the data must have existed at the time, obviously, in order to get into the hash. Each timestamp includes the previous timestamp in its hash, forming a chain, with each additional timestamp reinforcing the ones before it."

\$706 MILLION

Estimated value of global blockchain market in 2017 Source: **Orbis Research**

\$60.7 BILLION

Estimated value of global blockchain market by 2024

Source: Orbis Research

\$12 BILLION

Estimated yearly savings for the banking sector utilising blockchain technology Source: **Accenture**

The rise of blockchain in AFRICA



Blockchain-based innovation is rising across Africa, but this relatively new technology could need to demonstrate clear value to businesses before it builds enough trust to go mainstream.

nly a few years after the first blockchain hype first began emerging, pockets of blockchain innovation are fast springing up in innovation hubs across Africa, as the public and private sector alike seek effective new systems of record with trust embedded.

With Kenya, Nigeria, Uganda and South Africa among the countries taking the lead in blockchain experimentation, the financial sector looks set to be the continent's earliest big adopter. However, development and trials are also underway to apply blockchain technology to virtually every industry sectorfrom health and social development to retail and agriculture.

Helping drive blockchain growth in Africa are factors such as declining costs and rising capabilities in computing, storage, and bandwidth, which allow multiple nodes in a blockchain network to connect and act together seamlessly.

Early signs of progress

It is important to note, however, that blockchain is still relatively new, says George Etheredge, research analyst in Digital Transformation at Frost & Sullivan.

"It's still very experimental and people are looking at use cases rather than actually adopting it at this stage," he says.

"Across Africa there appears to be a great deal of interest, however, particularly in South Africa, Kenya and Nigeria. The banks appear to be leading in this space, which makes sense, since trust is key in that sector."

Etheredge says some of the use cases put forward for the blockchain in Africa may not prove to be the panacea organisations hope it will.

"Cross-border remittance over blockchain is mentioned quite a lot in Africa. However, I'm cautious about how successful this would be, because it's essentially paying in cryptocurrency to avoid paying hefty fees, but at its destination, it must still be exchanged for cash and a fee will still be incurred. In addition, it is very possible for a Bitcoin (or any cryptocurrency) to have a different market value in say, Kenya, than the US. This introduces a lot of risk into the process. This all assumes that it even is possible to exchange the cryptocurrency for cash at the destination."

Where he does expect blockchain to deliver on its promise is in areas such as authentication and fair trade records.

"De Beers is apparently looking at blockchain to authenticate diamonds; by generating a blockchain record of the provenance of each diamond it becomes possible to prove it's not a 'blood diamond'. So there is potential for blockchain use in minerals and the supply chain, allowing organisations to supply a trusted certificate of authenticity that goes along with the goods." However, Etheredge points out that even this trusted record would not be infallible for all goods: "Individual diamonds are easier to identify than other products, such as coffee for example, because you may well have all the records, but who is to say the bag of coffee in your hand is the same as the coffee in the records?"

Etheredge believes it will be several years before the blockchain becomes a mainstream technology. "Blockchain needs very good case studies in order to build market trust," he says. While the technology promises an incorruptible ledger, it will not be widely accepted until there is proof that it is incorruptible and major enterprises use it successfully.

Unfortunately, trust in blockchain is hampered by volatility and speculation around cryptocurrency, he says. "People tend to

"Africa has the levels of innovation and entrepreneurship needed to harness Blockchain effectively."

Dirk Kotze, Partner: Enterprise Solutions at Deloitte Financial Services

conflate cryptocurrency, which is just an app built on the blockchain, with blockchain itself."

The trust game-changer

Dirk Kotze, Partner: Enterprise Solutions at Deloitte Financial Services, says blockchain appears to be taking off in Africa faster than people expected. "You now see significant organisations like the South African Reserve Bank dabbling with it, and there's quite a bit of investment driving it," he says.

Kotze believes that – as with many new technologies – the financial sector is likely to be the pioneer of widespread blockchain use. "Financial services is often a starting point, but blockchain will prove relevant across all sectors, including in the supply chain, shipping environment and airline industries - in fact wherever two parties need to transact."

Commenting on Deloitte's recent report Crunch Time IV: Blockchain for Finance, Kotze says that in many ways blockchain could signify the dawn of a new era as it relates to the way value is stored and exchanged. "In fact, it can be considered one of the biggest technology breakthroughs in recent history, similar to the advent of the internet in the early 1990s," he says.

"Blockchain has the potential to reshape processes that are defined inside finance,

primarily because of its cost and control benefits. Businesses with challenges such as costly slow or unreliable transactions, or that serve markets with underdeveloped payments systems or large numbers of unbanked customers, have good reason to look closely at blockchain as a useful underlying technology."

Deloitte's report notes that because blockchains rely on self-executing smart contracts and that the transactions are irreversible, many auditors and regulators see the technology as a way to save time and improve compliance.

Kotze says: "Over the next five years, blockchain technology could upend how businesses and marketplaces operate completely. Even more interesting, though, is the impact on the broader business processes that intersect with finance such as supply chain management. Consortia of retailers, producers and freight providers could collaborate to ensure the integrity or authenticity of products such as organic products, jewelry, prescription drugs and replacement parts. In the healthcare sector, organisations might track deductibles and out-of-pocket expenses across providers, insurance and prescription plans, pharmacies, life science companies, device manufacturers, patients, and employers."

In Africa, Kotze sees blockchain interest and innovation coming primarily from South Africa, Kenya and Nigeria. "In East Africa, organisations are leapfrogging other technologies and moving to experiment with Blockchain. There is quite an appetite in the region to see where they can leverage blockchain technology," he says. "Africa has the levels of innovation and entrepreneurship needed to harness the Blockchain effectively, with regions like Nigeria, Kenya and South Africa having the innovative spirit necessary to really maximise blockchain's potential. I think Africa will run with this technology. If 2017 was the big year for blockchain pilots, I believe that by 2019 it will start becoming the de facto way of doing things."

The technology is particularly relevant in the African context because it presents the potential to overcome trade finance and cross border payment issues, Kotze says. "However, the key issue here is scalability – its scalability across the continent has yet to be proven," he says. In addition, uptake could be challenged by a lack of uniform standards and best practices; as well as slow introduction of regulations that cover blockchain technologies."

Managing essential data

One company planning to maximise Blockchain's potential in Africa is Ecobank, a pan-African banking conglomerate with operations in 36 African countries. Ecobank's Fintech Challenge actively seeks out fintech innovations harnessing Blockchain, artificial intelligence, machine learning and other nextgeneration technologies.

Dr Edward George, Ecobank Head of Research at Ecobank, says blockchain combined with artificial intelligence and machine learning, presents 'phenomenal' potential for financial services.

"It's one of those technologies perfectly designed for fragmented markets, particularly where integrity is at risk. We are looking at blockchain as we pioneer digital payment technologies in Africa," he says.

As a perfect decentralised and incorruptable 'truth engine' that cannot be hacked, blockchain offers value in areas such as identity management, transaction records, cross-border trade and SME payments.

But, notes George, blockchain is not a panacea: "It's not for all data, and it's only as good as the information you put into it.

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Blockchain is one way of managing essential data; digitising real world systems and giving them transparency. It's not for storing all information in the world, and there's no point in setting it up just because someone read about it."

The next few years will be both critical and formative for blockchain - with responsible use and careful strategy required by businesses in order not to tarnish the technology's reputation.

Paxful has announced plans to establish a blockchain incubator hub in Lagos, Nigeria, as well as to run Blockchain and cryptocurrency events in Nigeria, Ghana and Cameroon.

AID:Tech and PharmAccess are harnessing AID:Tech's blockchain platform to collect and verify digital health data to make antenatal care more effective in Tanzania.

ImpactPPA and the Earth Day Network are launching a blockchain energy platform in Somaliland to manage on-site renewable energy to facilities such as hospitals and schools.

Kenyan real estate firm Land Layby Group plans to use blockchain to store land registry records, eliminating the existing real estate challenges of fraud, double ownership and false documents.

5 Kenyan startup 'Nurse in Hand', has signed a MoU with Apla Tech Company to build a blockchainbased accident and emergency response platform.

6

Binkabi, an e-bartering platform for SMEs, allows traders to settle over the blockchain and pay in local currency, using its own utility token. An initial focus will be trade flows between Côte d'Ivoire and Vietnam.

Blockchain start-up TariLabs has launched in Johannesburg, South Africa, with the aim of building the open source Tari blockchain protocol. The protocol is being constructed as a platform for the management, trade and use of digital assets, and will be mergemined with the Monero blockchain.

BLOCKCHAIN TRIALS ACROSS AFRICA

The South African Reserve Bank (SARB) ran the Project Khokha proof of concept trialling a distributed ledger technology-based wholesale payment system in a 'real world' environment. It reported that the typical daily volume of the payments system could be processed in less than two hours with full confidentiality of transactions and settlement finality.



The Africa Blockchain Alliance actively seeks to bring together organisations and innovators in the blockchain arena. It is based in Nigeria, with partners in the US, Senegal, Ethiopia, UK, Namibia, Zimbabwe, Kenya and Uganda.



Blockchain: A vote for change

Blockchain can not only play a big role in supporting the public sector, but it can be a powerful weapon in the fight against corruption and fraud. Find out how the technology could be put to good use by African governments to drive transparency and efficiency.

here are usually some telling signs that an emerging technology is about to hit the mainstream – a steady stream of related news begins to appear online and in newspapers; the technology receives public backing from some high-profile figures; and it becomes a frequent topic of conversation at industry conferences and events.

Such momentum has certainly accompanied blockchain so far in 2018 throughout Africa. But what could be unusual is the role that governments and public sector organisations could play in raising its profile further.

Typically, the development and application of emerging technologies is first championed by the private sector before the public sector tends to take notice. Given the potential use cases for blockchain align so closely with many public services, this is a technology where the public sector cannot afford to be sat in the passenger seat.

A force to be reckoned with

Globally, a handful of public sector organisations are running pilots and trials examining the application of blockchain in areas such as voting, land registry, tax filing, healthcare and identity management.

This has prompted some African governments to also look at how they can get started with blockchain. In Kenya's case, this has led to the creation of a taskforce dedicated to leveraging emerging technologies – with a particular focus on blockchain and Artificial Intelligence (AI).

The taskforce has been mandated to publish a roadmap for distributed ledger and Al for the country for the next fifteen years, with the primary objective of creating new jobs in Kenya.

In February of this year, Kenya's Information, Communication and Technology Cabinet Secretary Joe Mucheru named former ICT Permanent Secretary Dr. Bitange Ndemo to head the 11-member taskforce - which also includes Safaricom's Head of Corporate Affairs Steve Chege and Juliana Rotich, a tech entrepreneur who is best known as one of the co-founders of BRCK and Ushahidi.

Dr. Ndemo, who was influential in transforming in Kenya's ICT sector while permanent secretary from 2005 to 2013, believes now is the time for decisive action from African governments: "If countries don't begin to build new capabilities and capacities for these technologies then they will be bystanders," says Dr. Ndemo. "Africa missed the first, second and third industrial revolutions, but we have a real opportunity to be a part of the Fourth Industrial Revolution."

Digital transformation in Kenya is paving the way for the application of emerging technologies like blockchain.

For example, Kenyan citizens can now access up to 200 government services online – at Huduma Centres (locations where citizens can access a range of public services online) or on their mobile devices. The government has made a further commitment to widen access to services for citizens from their homes or business premises, and is also exploring the use of biometrics.

"One of our first projects will be creating a trusted identity platform, which would provide us with biometrics on an individual. This removes the need to have multiple data sets to verify a person for a transaction," says Dr. Ndemo.

Creating a trusted identity platform is firmly the public sector's responsibility, believes Dr.

Ndemo: "Everybody engages with the public sector in their everyday life. We need to create an enabling environment – linking together other emerging technologies such as Artifical Intelligence (AI), Internet of Things (IoT) and Big Data Analytics."

Dr. Ndemo sees blockchain as having an immediate impact in several key areas over the next five years.

Firstly, he believes blockchain can be instrumental in improving food security by using the technology to tighten supply chains. In Sub-Saharan Africa, an estimated 50% of fruits and vegetables, 40% of roots and tubers and 20% of cereals, legumes and pulses are lost before they even hit the market. Blockchain solutions can drive transparency across a supply chain and be used to track and trace food products – potentially helping to solve post-harvest losses.

Likewise, Dr. Ndemo sees blockchain being a vital tool for the logistics industry, where it



can be again applied to drive transparency and improve tracking.

This in turn will help stimulate intra-regional trade – with trade amongst African countries currently being amongst the lowest in the world. "To improve this we need better connectivity and traceability to improve the flow of materials and goods across the region," says Dr. Ndemo.

Mobilising public services

Uganda is another African country that is mobilising its public and private sectors to take advantage of the blockchain opportunity.

In May, the country was home to a major new blockchain conference that brought together academia, policymakers, entrepreneurs and industry leaders from across the region and globally.

Organised by the Blockchain Association of Uganda, the 2018 Africa Blockchain Conference was opened by the Ugandan President Yoweri Kaguat Museveni, who welcomed the use of blockchain technology in boosting the local economy.

According to Kwame Rugunda, Chairman of the Blockchain Association of Uganda, the conference provided a platform for Uganda and the rest of the region to be a part of the global conversation on blockchain.

"The level of political leaders that attended really helped raise the profile of the event. We also had representatives from the central bank and from the largest global crypto exchange," he says.

"What is apparent from all these key stakeholders is that there is a hunger and deep desire to know and understand what blockchain means for Africa."

The Blockchain Association of Uganda was established earlier this year to create a credible vehicle for driving standards for blockchain across industries in Uganda. The membership organisation also aims to make blockchainrelated resources available to government and public-sector consumers.

"There has been some great misunderstanding around cryptocurrencies across Africa. We thought it was critical for those with the skills and knowledge on cryptocurrencies and

" If countries don't begin to build new capabilities and capacities for these technologies then they will be bystanders."

Dr. Ndemo, Chairman of Kenya's Blockchain and Al Taskforce

blockchain to step forward and add credibility. We want to demonstrate where these technologies can add value to our economy by working alongside the government," says Rugunda.

Rugunda says that businesses and governments across Africa are still coming to terms with the implications of blockchain and cryptocurrencies: "The tech community has a good understanding of these technologies which is now permeating into the rest of society. Everybody is asking: what can blockchain do for my industry?"

Access to information and resources will be important in stimulating greater investment in blockchain, but Rugunda feels the technology could be poised for quicker adoption than other emerging technologies: "With blockchain, you're riding over existing infrastructure. The investment is more in software and building platforms, which doesn't compare to the cost of deploying fibre or building mobile towers," he says.

There is no lack of incentive for either private or public organisations to begin embracing this technology, says Rugunda: "We are convinced that this technology has come at the right time for Africa. The benefits of adopting this technology at its nascent stages will deliver long-term gains for the region. We've traditionally been only consumers of global innovation, but we need to learn from our experiences with that and embrace a technology that can define our future."

Fighting fraud and corruption

The Sierra Leone elections in March alerted the media to a compelling use case for blockchain – even if the project did end up marred in controversy.

Α Swiss-based blockchain start-up called Agora claimed to have facilitated the first blockchain-based election - a claim subsequently contested by the country's National Electoral Commission (NEC). It later emerged that the start-up had acted as an international observer at 280 of the country's 11,200 polling stations, recording the votes on its blockchain as part of a proofof-concept experiment. Even if the project was overshadowed by the hyperbole, it does highlight the interest in using blockchain to improve transparency in the electoral process - an enticing prospect for a region accustomed to controversial elections. "Blockchain technology gives government powerful tools to fight corruption both outside and within the government," says George Etheredge, Research Analyst at Digital Transformation Practice for Frost & Sullivan. "Blockchains can accurately verify the identities of individuals while offering a method to register assets and track transactions, all of which can contribute to limiting the potential for corruption."

Yet he predicts that the adoption of blockchain-based solutions to prevent corruption could be slow: "Although blockchains do have the potential to limit internal government corruption and bring transparency to the public sector, these use cases are far less explored than those which allow governments to combat external corruption," says Etheredge.

"One possibility is to use blockchain technology to track the tender process. A key barrier to adoption here is a misalignment of incentives: such a project would have to be implemented by government itself and thus constitute government voluntarily subjecting itself to further checks and balances."

While the South African Reserve Bank has run a proof-of-concept trialling a distributed ledger technology-based wholesale payment system (see page 6) and the Tunisian government is using blockchain to boost its eDinar digital currency, African governments have overall been quiet on the blockchain front.

However, with the governments of Kenya and Uganda making the right noises, expect that to change soon.

Through careful nurturing and technical support, Africa's tech start-up ecosystem can be a major driver of Blockchain-based innovation, says Ben Roberts, Liquid Telecom's Group Chief Technology and Innovation Officer.



Ben Roberts CTIO, Liquid Telecom

frican communities have always come-up with inventive solutions to local problems. Take Somalia as an example. The country is said to

have one of the largest diaspora populations

in the world. It has few commercial banks and relations with international creditors remain frozen due to debts incurred in the late 1980s.

So its population uses Hawala; an informal value transfer system based on the performance and honour of a large network of money brokers. For example, it would mean a Somali based in the US would give money to a local branch agent, where it is sent to a central country clearing house, then onto a clearing house based in another country (typically somewhere in the Middle East). From there it goes to a Somali agent, before the funds are finally collected by an individual in Somalia.

Much like blockchain, the Hawala system is built on trust - but that's where any similarities end. In fact, cryptocurrencies - many of which are blockchain-powered - may eventually become a replacement for Hawala and other existing forms of international remittances. Cryptocurrencies can enable people to exchange currency online without any middleman - even banks.

International remittance is one of many compelling use cases for blockchain. The technology's ability to digitise trust makes it a unique fit for many African countries, particularly those where processes and supply chains remain poorly designed and susceptible to corruption.

At Liquid Telecom, we're excited about the potential for blockchain technology across the region. Along with other emerging technologies, we recognise this as another major new digital opportunity for businesses that utilises our network infrastructure and services. The rise of blockchain innovation will rely on the skills and talent of the region's software developers, who themselves rely on a high-speed internet connection and access to cloud-based tools. Our fibre footprint - which will soon stretch all the way from Cape Town, South Africa, to Cairo, Egypt – is providing the foundations for digital innovation, while our

ABOUT BEN

Ben became CTO at Liquid Telecom in 2006, joining from the Econet Group. With over 20 years' experience across a range of technologies in design, support, integration and operational management roles, he has led the group's networking and product strategy, expanding its technology base and fibre network across Africa

Ben led the integration and business transformation of Liquid Telecom Kenya as CEO from 2013 to 2017 and remains in Kenya as the company's Board Chairman. Having returned full time to the role of CTO, he is now additionally looking at future innovation and digital transformation of services.



partnership with Microsoft is enabling access to the cloud-based services and tools needed to create digital solutions for local problems.

Last year, with support from Microsoft, we set-up our Go Cloud initiative, which is helping to provide the region's start-up communities with technical support, training and access to software. Using Azure Cloud, start-ups can cut development time and experiment easily with modular, preconfigured networks and infrastructure, enabling them to iterate and validate blockchain scenarios quickly by using built-in connections to Azure.

We're starting to see the first crop of African start-ups experimenting with blockchain and cryptocurrencies. Take Rwandan start-up Uplus, which is utilising blockchain to secure all transactions on its digital crowdfunding platform. The technology also allows the platform to take contributions from any country and covert it to the local currency.

A lot of existing applications in Africa tend to fall short when it comes to user experience, and blockchain could certainly help address some of these issues - be it by creating a new trusted way to make payments or verify user identification. During this early stage of blockchain experimentation and proof of concept, it will be crucial for start-ups and businesses to develop solutions that are relevant for African communities. Without that, the technology won't gather momentum.

Regulation can nurture or constrict the technology and will have a role to play in being a 'make or break' for blockchain. Living in Kenya, I'm proud to see how proactive the government has been in seizing the blockchain opportunity. The creation by the President of a taskforce earlier this year dedicated to blockchain - led by the former permanent secretary for Ministry of Information and Communications, Dr. Bitange Ndemo (see page 7) - shows how committed the country is to being a leader in emerging technologies. As more African countries follow Kenya's lead, blockchain should hopefully find itself resonating more powerfully with local businesses and consumers.

Preparing for the era of blockchain

The era of blockchain is almost upon Africa and stakeholders sector-wide are busy preparing for its arrival. We talk to a range of experts about their predictions for the technology and ask what new skill sets are required to support its success in the market.



Babu Paul

Director in the Institute for Intelligent Systems at The University of Johannesburg

cademic institutions such as the University of Johannesburg (UJ) will play a vital role in preparing the nextgeneration with the skills they need to thrive in the Fourth Industrial Revolution. UJ's vision is to be "an international University of choice, anchored in Africa, dynamically shaping the future". Specialising in research and innovation, UJ has a student population of over 50,000, of which more than 3000 are international students from 80 countries making it one of the largest contact universities in South Africa.

As well as already providing a course on cybersecurity, UJ is currently in the process of rolling out a postgraduate course in financial engineering which will have aspects of blockchain in the curriculum. Professor Babu Paul, Director for the Institute for Intelligent Systems at the University of Johannesburg, says it is only natural that advanced education providers should be at the forefront of preparing Africans for the opportunities presented by blockchain technology.

"The technologies required in the Fourth Industrial Revolution are becoming more and more multidisciplinary and multi-sectoral. This is why universities with expertise from various disciplines are best suited for the task of training entrepreneurs and developers with the skills they need to prepare for blockchain," Professor Paul says.

Given how early days it is in Africa's blockchain trajectory, providing all the necessary resources and knowledge for students to be able to thrive in the space requires substantial effort and investment on the part of universities.

"Blockchain technology is still at its nascent stage. The technology is evolving regularly. Therefore as an education provider we have to keep updated with the latest developments in the technology so that we can empower our students with the latest that is available in the market," Professor Paul says.

"We are engaging with different sectors of the industry so that we may work together in the implementation of the new technology to their benefit – to improve efficiencies, reduce costs and eliminate inherent risks," he adds.

In addition to supporting students, blockchain will also impact academic institutions on an internal level, Prof Paul points out. Universities will need to hire new staff with sufficient knowledge and skills pertaining to blockchain, while elements of internal administration and processes will benefit from using blockchain solutions. With its wide-ranging applications

- spanning cryptocurrencies, property exchanges, retail supply chain tracking and transportation of export goods - and ability to improve internal admin efficiencies, blockchain is not a technology that academic institutions can afford to ignore.

"Blockchain technology is not hype - it is a real opportunity," Professor Paul concludes.



Zachariah George

Co-founder and CIO of Startupbootcamp AfriTech

tartupbootcamp is a global network of industry-focused startup accelerators, which recently launched its first accelerator in Africa last year. It is currently in the process of selecting local startups to join its second African programme.

Among its focus areas are connected devices, payment solutions, e-commerce and, most notably, blockchain. Although it is still early days, Startupbootcamp AfriTech's Co-founder and Chief Investment Officer Zachariah George says that the blockchain opportunity is "definitely real" on the continent.

"Developers and entrepreneurs in Africa are working towards incorporating blockchain

technology into their apps and platforms. However, it is still a relatively new and 'underunderstood' space. We are yet to see too many relevant applications involving blockchain technologies," George says.

While a number of cryptocurrency traders have set-up platforms to trade digital currencies, Startupbootcamp is more interested in the application of blockchain technology to create utility tokens.

"Too many founders have jumped upon the opportunity to 'get rich quick' by launching ICOs with a promise of returns generated through trading of securities linked towards a service that has no utility. This is dangerous from an investor's perspective. But utility-based tokens that are linked to a clear, concrete store of value are perfectly viable, and attractive from an investment perspective," he says.

Utility-based tokens give buyers access to a valuable asset or service - whereas many companies sell tokens to raise money without offering access to any benefit other than the current value of the token itself (which may fluctuate). Examples of utility-based tokens include South African company The Sun Exchange, which operates a blockchain-based buy-to-lease solar panel marketplace, as well as US-based Civic, which uses blockchain and biometric technologies to help people securely manage fully verified identity data.

In order to tap into the opportunities presented by blockchain, George says African entrepreneurs should focus on developing a deep technical knowledge of programming specific to security, as well as develop an understanding on the concept of smart contracts.

Private institutions and local universities are best placed to help prepare the current and next-generation of digital entrepreneurs for the blockchain era.

"Academic institutions and private programmes are best suited [to providing support and training for entrepreneurs] primarily because of the non-partisan nature of their work. Information on the blockchain changes on a daily basis, so getting a credible institution of higher learning to provide dynamic training on the subject is ideal," George says.





John Karanja Co-founder and CIO

he BitHub Africa incubator was launched in Kenya in 2016 and is dedicated to the development of blockchain technologies in Africa.

BitHub

To date, three blockchain projects have been incubated by BitHub, with financial and energy access having emerged as key focus areas for the organisation.

According to John Karanja, Founder of BiHub Africa, these are the two sectors in which blockchain could have the most meaningful impact for businesses in Africa over the coming years. "We mostly see people experimenting with different blockchain platforms. There are challenges with scalability on these platforms, which will hopefully get resolved soon," he says.

"Scalability will allow for the use of blockchain and cryptocurrencies in the mainstream economy, therefore providing much needed services to those who are under-served or excluded by current financial institutions."

With relatively few dedicated and experienced blockchain programmers currently working on the continent, Karanja says it is difficult to help entrepreneurs learn new skills and prepare for the blockchain era.

As a result, BitHub is increasingly including developer training in its incubation curriculum, and also encourages knowledge sharing and collaboration between experienced blockchain programmers and startups in the incubator. "We need more blockchainfocused programmers, so we are developing a curriculum that will support the development of developers and engineers," says Karanja.

"Experienced developers in the space will then be able to support the blockchain projects that emerge from the ecosystem."

Collaboration will be key to unlocking the potential of blockchain in Africa, and Karanja says the region needs to follow global examples of partnership-led approaches to developing blockchain capacity and projects.

"It will require a diverse group of organisations to develop blockchain solutions, namely, academia as well as incubators such as BitHub Africa," says Karanja.

"We are partnering with universities, particularly around building capacity in foundational maths and cryptography. These cross-organisational partnerships are quite common around the world, and need to take root in Africa too."



Kreaan Singh

Partner at Blockstarters

lockchain-focused incubators are beginning to appear across the region, with South Africa-based Blockstarters launching earlier this year.

The organisation is already incubating two blockchain companies, and is in the process of onboarding a number of other startups as operations ramp-up.

According to Kreaan Singh, Partner at Blockstarters, blockchain is Africa's chance to "forge our own direction" in the tech landscape.

"There is a huge opportunity to adopt blockchain technology to solve many of Africa's technological needs. The most obvious is remittances, which is clear by the concentration of companies in that sector," says Singh.

"Blockchain technology also creates an opportunity for African companies to solve challenges in a unique, African way, and not simply 'leapfrog' existing solutions. Leapfrogging suggests moving in the same direction - it is time to forge our own direction. Decentralised technologies such as blockchains are perfect for this."

There are already various innovative applications of blockchain being put to use across the continent. Singh identifies Ghana, where transfer and ownership of title deeds using blockchain technology is being trialled, or South Africa, where the reserve bank in partnership with Consensys is actively testing the use of blockchain for instant interbank settlements.

"On the private front, we have companies that are removing inter-mediation (third party) involvement in the music and video industry, decentralising academic records, and researching use cases for the medical industry," he says.

Despite the potential, there are significant hurdles to be overcome.

There is a dearth of blockchain developers, and Singh estimates there are around 14 opportunities for every qualified developer. In addition, there is a lack of general knowledge and willingness to get to grips with the quirks and risks involved with the early days of blockchain solutions.

"This industry is arguably still in the R&D phase, and with that comes a challenge of getting public involvement to interact with the technology. Blockstarters aims to create a credible springboard for startups to leverage, by involving industry leaders, corporates and regulators from the start," he says.





Oswald Jumira

Head of Innovation Partnerships at Liquid Telecom

communications services and or solutions providers such as Liquid Telecom, blockchain presents a new opportunity to support both its customers and the wider tech ecosystem. The company is currently investigating ways of improving operational efficiencies and introducing new products supported by Blockchain. "For example, we're looking at improving billing, customer contract management, identity management, asset management, connectivity provisioning, smart cities and the use of cryptocurrencies for payments," says Oswald Jumira, Head of Innovation Partnerships at Liquid Telecom.

In addition to investing in network infrastructure and cloud services that can sustain the long-term growth of emerging technologies, such as blockchain, Liquid Telecom is also supporting the next-generation of developers, startups and students through its Innovation Partnerships Initiative.

"Blockchain is an area that we are passionate about and we're continuously investigating how we can accelerate the growth of startups focusing on blockchain through our infrastructure," Jumira says.

While access to infrastructure is improving across Africa, the training and mentoring networks for blockchain innovators are not yet as readily available, says Oswald: "What is key for Africa is skills development, mentorship and the acceleration of blockchain startups. This is an area we are spearheading through our Innovation Partnerships Initiative, where we are working with different partners across Africa to grow blockchain skills."

Through its new internship programme, Liquid Telecom is exploring how to support the arrival of Generation Z to the workplace. Working alongside Carnegie Mellon University Africa in Rwanda, for example, Liquid Telecom will select promising IT and engineering students for paid work opportunities at its Kenyan and Rwandan operations. During their internship at Liquid Telecom, students will gain experience in a variety of roles, including technology, product development, and technical support.

The success of blockchain, says Jumira, hinges on the following: Companies like Liquid Telecom need to continue to provide the necessary infrastructure and frameworks to support emerging technologies; universities need to drive education and awareness of blockchain; and governments need to do more to support the blockchain agenda.



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Building Africa's digital future

BEYBND BITCBIN

Digital currencies and services are starting to make their mark across African economies, helping to bank Africa's unbanked, simplify cross-border remittances and generate employment. But can this next-generation of financial services really gain traction and have a lasting impact?

Ub-Saharan Africa as a region continues to have the highest proportion of adults without access to formal financial services in the world. While progress is being made, only 43% of Sub-Saharan Africa's adult population had access to any form of financial account in 2017, according to the World Bank.

With this in mind, it may seem premature to focus on the emergence and role of digital currencies in Africa.

However, it is exactly this lack of formal banking presence which makes the region one of the most exciting markets for cryptocurrencies.

While large parts of the population do not have access to a physical bank, many of them do carry a potential banking solution in their pocket. Digital currencies and services allow people to access all sorts of financial products from their mobile phones.

Clement Muhirwa, founder of Rwandan ethereum-powered peer-to-peer lending and savings platform Uplus, says that more relevant apps and services need to be developed to help better serve African consumers. The emergence of cryptocurrency-based products and services are an important part of this process, he says.

Introducing cryptocurrency-enabled solutions to African consumers can unlock a much broader range of financial transactions for the continent. In particular, cryptocurrencies can remove the common barriers to cross-border transactions and remittances that traditional banking systems are hindered by.

"Sending a crypto from one wallet to another anywhere in the world is just a shift in digits. Once those digits are written on your wallet then you can make an exchange and get physical cash from anywhere in the world – the same as using an exchange for any other currency," he says.

"Right now the cost of remittance is still high and some of the solutions available are hard to use. With cryptocurrencies, the rate at which the African diaspora send money back home will increase, and the rate of cross-border trade will increase because of no currency and remittance barriers."

A cashless society

For others, blockchain technology and cryptocurrencies are less about directly introducing new financial products to consumers, and more about helping to address the underlying cash-dependency of the continent.

Kenyan agri-tech company Twiga Foods earlier this year partnered with IBM Research to trial a blockchain-based financing system to provide microloans to food stall retailers in the country.

The trial involved machine-learning to calculate credit scores for the stall holders, with the pursuant lending process conducted entirely on the blockchain - from application and receiving offers through to accepting the terms and repayment.

Grant Brooke, CEO of Twiga Foods, believes the primary impact of digital currencies in Africa will be to tackle the general mistrust towards financial service providers.

"Blockchain is about providing certainty for uncertain, low-trust environments. Cash tight environments breed distrust. So I don't see blockchain as providing financial services, perse. I see it more as a way of dealing with one another in an environment of trust," Grant says.

"That could be a commitment that I will pay you for the tomatoes I just bought, or that this land is actually mine. The opportunities in blockchain are first about trust, then about finance."

Grant hopes the learnings of the IBM project could be taken on-board by financial services providers with a view to incorporating blockchain solutions into their products targeting unbanked African consumers.

"Our hope is that we can now take a verifiable loan and transaction history, remove Twiga from the transaction completely, and go to financial institutions and say: Here is the blockchained user-base, let's lower interest rates for them because you can trust this data. My hope is that this is a first salvo into a conversation about bringing trust into this henceforth "informal," and thereby un-addressable, user base, "he says.

The cryptocurrencies quandary

Bitcoin's wild skyrocket last year may well have turned the world's interest

firmly on to cryptocurrencies, but in Africa they "still have a long way to go" before they will be considered legal tender, and

as such are not of major interest to investors, says Toro Orero, managing partner of Africafocused venture capital firm DDF Capital.

In terms of getting involved with a token sale in Africa, Orero says he would treat it as "an experiment and not as an investment". Any decision to buy into a new cryptocurrency would be guided by the same criteria as other

on avoiding the "cloud" created by the crypto buzz.

African Cryptocurrency exchanges - allowing people to trade various digital currencies against African currencies - may present a more valuable prospect in the short term, but overall, he leans away from the crypto proposition in favour of blockchain solutions. These, he says, will be far more attractive investment opportunities: "Launching your own coin or cryptocurrency is probably a terrible idea, especially if it's not using a unique technology at its core or solving an extremely unique problem. For me, the bigger and more exciting picture is the blockchain, and building new tech products on the blockchain is where the magic is and will happen," says Orero.

Central banks around Africa have also urged caution on the hype surrounding cryptocurrencies.

As early as 2015, the Central Bank of Kenya issued a public notice listing some of the risks of investing in digital currencies, such as a susceptibility to abuse by criminals, lack of

investment decision, with a focus "I don't see blockchain as providing financial services, per-se. I see it more as a way of dealing with one another in an environment of trust."

Grant Brooke, CEO, Twiga Foods

guarantee in case of the currency collapsing and the high volatility of cryptocurrencies.

The bank advised the public to "therefore desist from transacting in Bitcoin and similar products".

Nigeria's Central Bank also cautioned the public earlier this year on the "inherent risks" of trading in crypto, underlining that "dealers and investors in any kind of cryptocurrency in Nigeria are not protected by law".

ICO: Fab or Fad?

Initial Coin Offerings (ICOs) are emerging as a popular alternative fundraising mechanism for African start-ups. However, with only a handful of experiences to go on so far, opinion is divided as to whether ICOs can - or should - be viewed as a viable model for securing additional capital.

Nigerian remittance platform SureRemit hit the headlines earlier this year, when it successfully raised US\$7 million via an ICO. It was the first ICO success by a start-up in Africa. While SureRemit co-founder Adeoye Ojo believes ICOs as a fundraising model could have "enormous benefits" for start-ups, he warns start-ups to do their homework before pursuing such a complex model.

"The ICO fundraising model is still evolving. It has enormous benefits as it democratises access to funds," Ojo says.

"African start-ups typically have major difficulties establishing connections in traditional investment circles, and debt is either inaccessible or too expensive. ICOs put the fate of entrepreneurs' capital-raising efforts in their own hands by opening it up to potential users globally, rather than in the hands of a few brokers. While the future of ICOs is uncertain, it is definitely an interesting model that can only benefit start-ups."

For South Africa's blockchain-powered financial services provider Wala, the whole concept of using ICOs as a fundraising model is misguided, and ultimately serves to cast shadow on the real problem - a lack of accessible funding for emerging market entrepreneurs.

"Token sales should not be seen as a fundraising mechanism. The problem with the market today is that entrepreneurs are looking to token sales not to issue a crypto-token, but instead just to fundraise. The vast majority of companies who do a token sale will fail because they have no use case for a token economy," says Tricia Martinez, CEO of Wala.

Martinez believes that introducing a token element to a startup's business model without a real need or strategy can badly damage a company - and as such she feels the ICO fundraisingfad is detrimental overall to the start-up ecosystem.

"The problem is that non-blockchain companies try to design token economics into their offering just to raise funding. Forcing a token economic model into your offering is a bad start-up strategy especially when it doesn't fit, because you are now a public company being held accountable to deliverables on top of a regulatory environment that changes every day," she says.

Rather than encouraging the ICOs as a fundraising mechanism, Martinez says the ecosystem should focus on attracting more early stage growth and later stage funding to the continent. For those wishing nonetheless to launch an ICO, Ojo has some cautionary advice.

"A token sale is not as easy as it looks from the outside, it involves proper planning and understanding of what the tokens are meant to be used for," he says.

He underlines that a start-up needs to be sure if the tokens being sold are security tokens or utility tokens, as this is important from a regulatory point of view. In addition, he notes ICOs expose the project and its members to heightened scrutiny, as such, it's imperative the project is "legit".

"It's important to build a strong community around the project, community members are going to be the early adopters and users, and also contribute valuable feedback during product development," summarises Martinez.



Building blocks of the future



The non-profit sector is increasingly looking at possible applications of blockchain to support global development and humanitarian work. Find out how the technology is already having an impact.

he United Nations' World Food Programme (WFP) is an early player in the NGO space to experiment with applications of blockchain technology in various

aspects of the humanitarian aid process.

According to Leighla Bowers. Communications Officer at the WFP, the area of cash transfers is where blockchain is proving to have the biggest impact to the organisation's operations to date - although she says the potential future use-cases are sure to be extensive, once the technology has been trialled and perfected. Since 2016, the WFP has been testing "Building Blocks" - its blockchain-based food-aid solution in refugee camps, primarily in Jordan. Aid for food has traditionally been distributed to refugees at supermarkets within the camps. With the introduction of new technologies, supermarket cashiers now identify refugees using an iris scanner, with the individual's aid entitlements verified against internal databases. Whereas the corresponding food-aid was previously distributed in the form of cash vouchers, these transactions are now conducted via the Building Blocks blockchain system.

As of June 2018, 106,000 Syrian refugees redeem their cash transfers using WFP's blockchain-based system. "Through blockchain, transaction costs have been reduced significantly, with monthly savings of around US\$40,000. In addition, it's important to recognise the value of the current Building Blocks solution beyond pure monetary savings. Our results show that the platform is making cash transfers much more efficient, secure and transparent - benefitting WFP, donors and the people we serve," Bowers says.

The trials in Jordan are intended to iron out the technical architecture behind the blockchain solution, with a view to extending it to other applications and geographies. The most obvious extension will be in the field of digital identification. The refugees participating in the current trials each have a unique identifier on the blockchain, to facilitate the disbursement of the correct aid entitlements.

Bowers says this could lend itself to building out a blockchain-based digital ID system. "Their identifiers could be enriched with data such as health records, education data and asset registries – and support full ID "cards" where people lack birth certificates, passports, social security cards or other forms of legal identity," she says.

Furthermore, the WFP is also interested in the possibilities presented by blockchain in supply chain management, and is currently looking at testing possible use cases in Africa.

It's not only high-profile international NGOs innovating around uses of blockchain in the development space. A number of smaller nonprofits as well as impact-oriented companies are looking to apply the technology to solve all manner of problems in their communities.

In Africa, for example, Ghana's BitLand is looking to integrate blockchain into its work to

automate the land registration process. Still in an experimental phase, the company aims to allow individuals and organisations to survey land and record deeds on the blockchain.

Kenyan-French company Gravity is working on a similar solution to the WFP - hoping to address the identification conundrum faced by over 1.5 billion people worldwide without any official form of ID, using blockchain technology. The company aims to make it possible for anyone to create and then share a digital identity, on any type of mobile phone.

South Africa's education space is also already benefiting from blockchain, through the Amply project, run by local blockchain venture production studio TrustLab and Swiss nonprofit ixo Foundation, funded by Unicef.

Amply is a digital application built on the ixo blockchain-powered platform, that enables early childhood development service providers to track school attendance. The app replaces existing paper-based systems to register children for a government funded pre-school subsidy and leverages blockchain technology to ensure accurate and secure data capture and storage.



Syrian refugees are purchasing food through WFP's cashbased assistance programme, which uses an 'iris scan' payment system. In lieu of mobile money or physical cards, refugees scan their eye to pay for their purchases.

Image credit: WFP/Mohamed Batah

About Liquid Telecom

Liquid Telecom is a leading communications services and solutions provider across 13 countries in Eastern, central and Southern Africa that serves carrier, enterprise and retail customers with high-speed, reliable connectivity and digital services.

It has built Africa's largest independent fibre network, spanning over 50,000km, and operates state-of-the-art data centres in Johannesburg, Cape Town and Nairobi, with a combined 6,800 square meters of rack space.

This is in addition to leading cloud-based services, such as Microsoft Office365 and Microsoft Azure, and innovative digital content provision, including Netflix, NBA, TED and Kwese Play.

Through this combined offering, Liquid Telecom is enhancing customers' experience on their digital journey.

About Liquid Telecom Innovation Partnerships

The Liquid Telecom Innovation Partnerships initiative was launched in 2017 and is aimed at supporting the growth of digital technology innovation across Africa.

By bringing together key players from within the region's innovation ecosystem, Liquid Telecom is helping technology companies originated and founded in Africa to scale through mutually beneficial partnerships.

Under the Innovation Partnerships initiative, Liquid Telecom is providing start-ups in the region with connectivity and cloud-based services, and through Go Cloud - a new programme launched by Liquid Telecom and supported by Microsoft – is also raising awareness, adoption and usage of Azure Cloud across Africa.

A look at some of our partnerships so far...

July 2018: We recently partnered with AfriLabs, the largest network organisation of 100 innovation centres across 30 African countries, to explore new ways to support local start-ups and promote sustainable innovation across Africa. From digital skills training and workshops to accelerator competitions, Liquid Telecom and AfriLabs will launch a new series of joint programmes designed to accelerate growth within the region's tech start-up communities, ultimately helping to stimulate economic growth.

April 2018: Liquid Telecom and Serianu, a pan-African cybersecurity specialist firm, announced a new partnership to improve cybersecurity standards and practices across Africa. The partnership brings together Liquid Telecom's award-winning fibre network, data centres and cloud-based offerings with Serianu's dynamic, business-focused security monitoring and analytics solutions to offer end-to-end protection for businesses of all sizes.



In April, we partnered with the Impact Hub in Kigali, Rwanda



Liquid Telecom is providing start-ups in the region with connectivity and cloudbased services. **April 2018:** We announced a partnership with Impact Hubs, a global network of innovation labs, business incubators and social enterprise community centres, to explore new ways to support start-ups in Kigali. Launched in 2015, Impact Hub Kigali has played an important role in nurturing Rwanda-based start-ups by providing flexible co-working space and a range of innovative programmes and events.

January 2018: We partnered with Strathmore Business School (SBS), the graduate business school of Strathmore University, to launch a new data analytics centre focused on data-driven research and practices for African businesses. Strathmore Africa Data Analytic Centre will be hosted at East Africa Data Centre (EADC) in Nairobi where it will provide businesses with data analytics services.

December 2017: In Zambia, CEC Liquid Telecom is helping to accelerate Zambia's emerging gaming and Internet of Things (IoT) ecosystem through a new partnership with BongoHive; Zambia's first innovation and technology hub. As part of Liquid Telecom's ongoing African Innovation initiative, start-ups in Zambia will have greater access to high-speed internet and cloud-based services.

November 2017: In Uganda, we partnered with The Innovation Village, a hub and co-working space in Kampala, to support Ugandan start-ups with high-speed internet and cloud-based services. Liquid Telecom Uganda will work alongside The Innovation Village to provide new opportunities for start-ups operating in Kampala, enabling access to additional resources and expertise that can help them scale and launch locally relevant solutions.

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