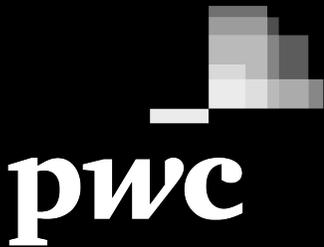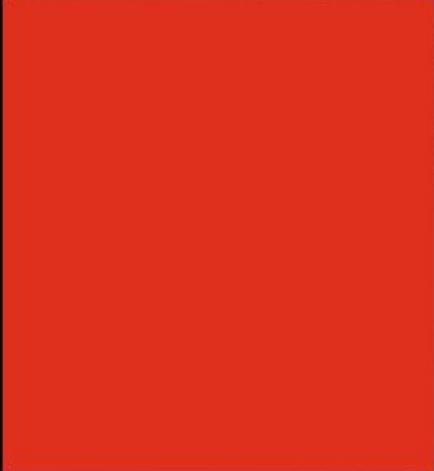# The 4th Industrial Revolution and The Relevance of the Internal Auditor in a Period of Rapid Change
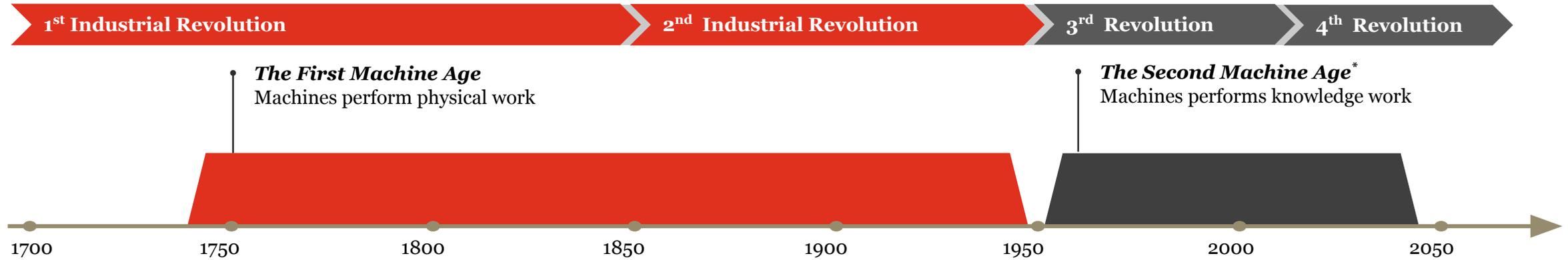
pwc

01

The Emerging Technology of the 4th Industrial Revolution

Technological breakthroughs are significantly changing the way we live and do business

1st Industrial Revolution	2nd Industrial Revolution	3rd Revolution	4th Revolution

The First Machine Age
Machines perform physical work

The Second Machine Age*
Machines performs knowledge work

1700 — 1750 — 1800 — 1850 — 1900 — 1950 — 2000 — 2050

The first machine age
- The 1st machine age lasted during the two industrial revolutions
- When machines were introduced, human labour was replaced and productivity significantly increased
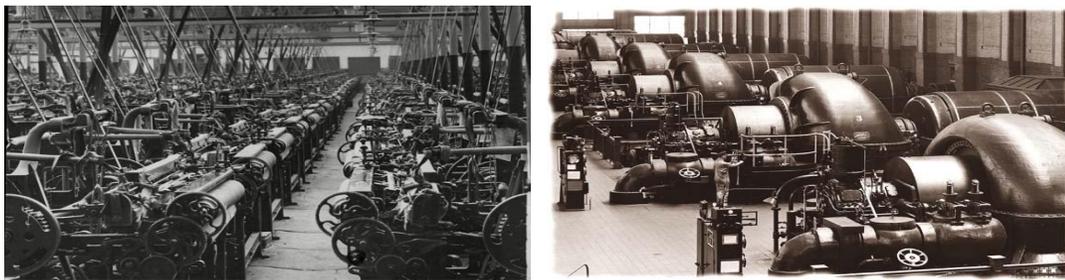
The second machine age
- Instead of performing physical work, **machines are performing knowledge activities**
- Computers and robots **perform complex tasks** that were previously performed by people – in certain areas automation already surpasses humans

IBM Watson

Google car

Our world is rapidly changing...

64% of CEOs believe technology will disrupt how they do business in the next 5 years.

PwC 21st CEO Survey

The dynamics of disruption

- Waves of disruptive change are rolling in. Colliding megatrends, from rapid urbanisation, to climate change and resource scarcity, to technological breakthroughs, are impacting business and society.

- For businesses, based on the economics of mass production the question isn't if, it's when.

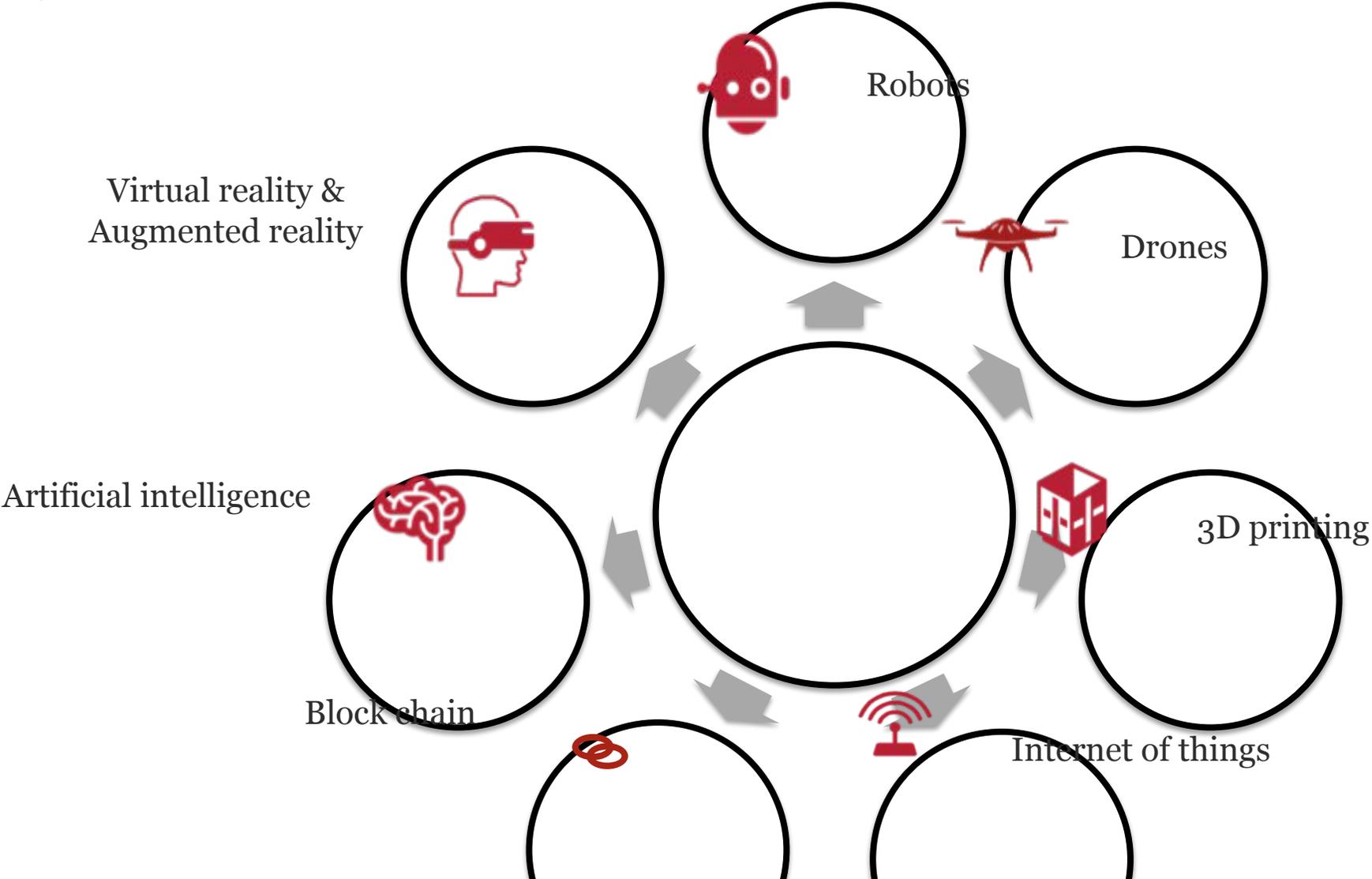- Fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

Technological breakthroughs – The impacts of digital disruption are now so pervasive that no business in any sector is immune from them - PwC

Oxford University predicts that **45%** of jobs will be automated by 2030

With technology, it has become increasingly easy to take and make decision on complex activities by organization and individuals

Emerging technologies transforming the global business landscape

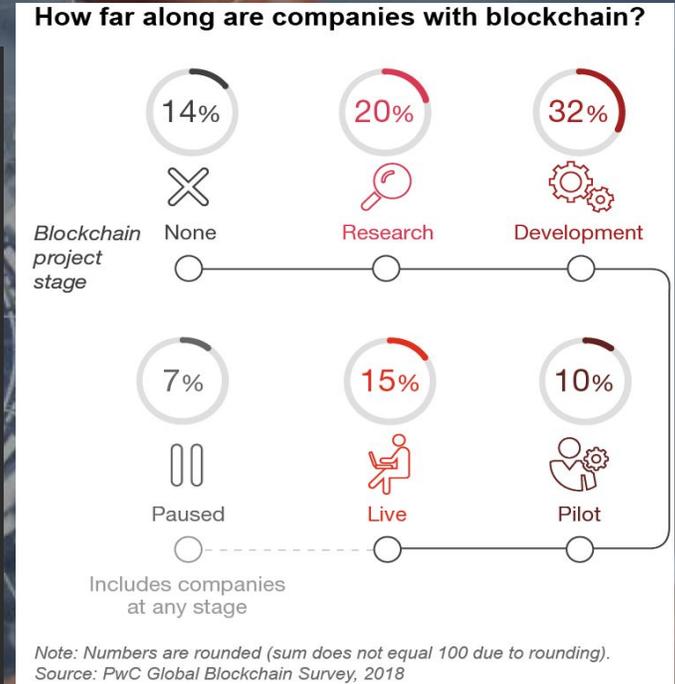Robots

Drones

Virtual reality &
Augmented reality

Artificial intelligence

3D printing

Block chain

Internet of things

02

An insight into how financial services organisations are adopting Emerging Technologies

Blockchain
&
Use Cases

The **Blockchain** is a decentralized ledger of all transactions across a **peer-to-peer** network.
Using this technology, participants can confirm transactions without the need for a central certifying authority.
Potential **applications** include funds transfers, settling trades, voting, and many other uses.

How far along are companies with blockchain?

14%	20%	32%
None	Research	Development
7%	15%	10%
Paused	Live	Pilot

Blockchain project stage

Includes companies at any stage

Note: Numbers are rounded (sum does not equal 100 due to rounding).
Source: PwC Global Blockchain Survey, 2018

Blockchain	AI	Robotics	Drones	3D Printing	IoT	VR	AR

Blockchain

Structured Green Bonds

- Spain's second-largest bank, Banco Bilbao Vizcaya Argentaria (BBVA) launched the first block chain-backed platform for structured green bonds.

- BBVA, in collaboration with Spanish tech firm Indra, successfully completed the first global corporate loan transaction using blockchain technology from the negotiation of the deal to its signing, leveraging these cutting-edge technologies to streamline business processes. Block chain technology enabled the digitization of the financial processes, and consequently reduced the time frame.

International Transaction Processing

- In April 2018, Banco Santander, S.A. (Santander Group) launched blockchain-based application for providing international payment services using blockchain technology provided by Ripple.

- One Pay FX, the International Payment service for retail customers uses Ripple's blockchain technology to cut the cost and waiting time associated with international funds transfers.
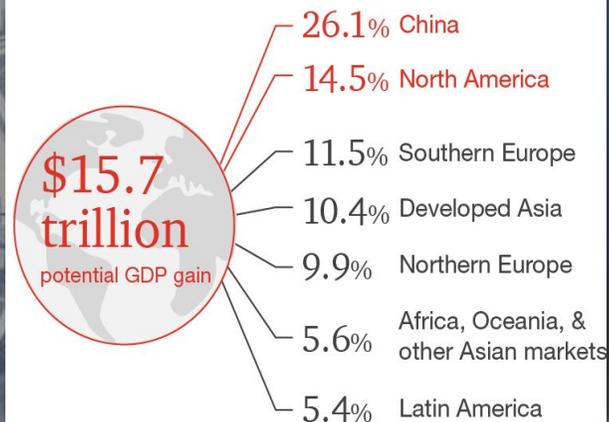
Artificial Intelligence (AI) & Use Cases

Artificial Intelligence is the simulation of human intelligence processes by machines, especially computer systems.

These **processes** include learning, understanding, planning, reasoning and self-correction.

Particular **applications** of AI include expert systems, speech recognition and machine vision.

China and North America will see biggest AI gains by 2030

$15.7 trillion potential GDP gain

- 26.1% China
- 14.5% North America
- 11.5% Southern Europe
- 10.4% Developed Asia
- 9.9% Northern Europe
- 5.6% Africa, Oceania, & other Asian markets
- 5.4% Latin America

Source: PwC Global Artificial Intelligence Study, 2017

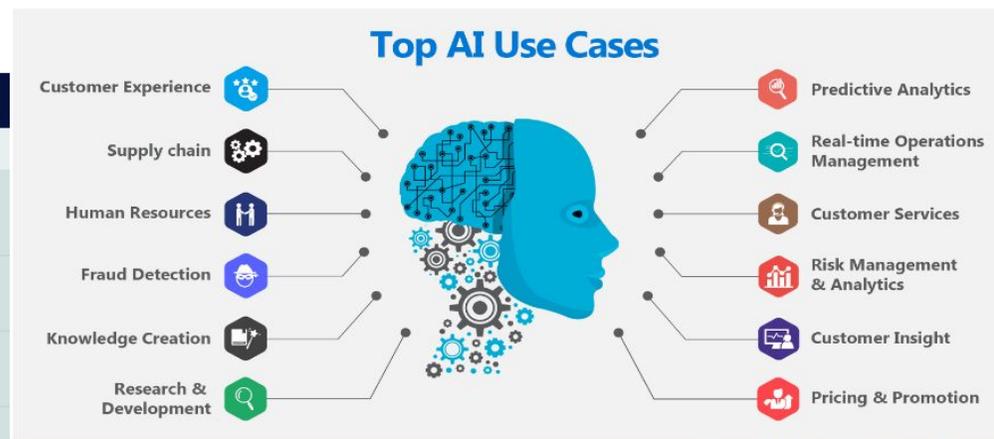| Blockchain | AI | Robotics | Drones | 3D Printing | IoT | VR | AR |

Top AI use cases for by Industry

Artificial intelligence (AI)

Figure 5: Top three AI use cases by industry

% of respondents

- ● Highest scoring answer
- ● Second-highest scoring answer
- ● Third-highest scoring answer

	Financial services	Government/ Public sector	Healthcare & life sciences	Manufacturing	Retail
Predictive analytics	30	22		28	33
Real-time operations management	26	22		26	22
Risk management and analytics		22	23		
Customer services					31
R&D				30	
Fraud detection	25				
Social engagement				21	
Knowledge creation				21	

Source: Economist Intelligent Unit (August 2018) Intelligent Economies

Artificial intelligence

Chatbots and Personalized Customer Service

- Diamond Bank's **Ada**, United Bank for Africa's **Leo,** Bank of America's **Erica**, are chatbots an AI-enabled tool that provides financial guidance for bank's clients through voice and text messages. The service is accessible 24/7, and it can perform day-to-day transactions. This allows clients to have access to services at any time without costing more money hiring customer service personnel.

Credit Agreement Analysis, Customer Service

- JP Morgan is using AI to automate credit agreement analysis. It unveiled its Contract Intelligence (COIN) AI in 2017 to analyze agreements and highlight key clauses and data points. This work previously required 360,000 hours of human labor is now done in seconds!

- Wells Fargo announced the creation of a dedicated Artificial Intelligence Enterprise Solutions team which will pursue payments technologies and improved customer experience for corporate banking customers.

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Robotic Process Automation (RPA) & Use Cases

Robotics is described as **Robotic Process Automation (RPA),** humanoid robots or virtual agents, which automate, improve and/or assist human activities.

Furthermore they may analyze applications for processing transactions, manipulating data, triggering responses and communicating with other digital systems.

Robotics can either operate in compliance with a set of **predefined instructions or autonomously**. Once viewed as quite costly, the technology is increasingly affordable and user-friendly for businesses today.

31%
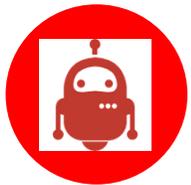of businesses will make significant investments in robotics in three years;

13%
say it will be the most disruptive tech to their business model within the next five years.

PwC 2017 Global Digital IQ Survey

| Blockchain | AI | Robotics | Drones | 3D Printing | IoT | VR | AR |

Robotics Process Automation

Clearing Trades, Boosting Accuracy

- Bank of New York Mellon (BNY Mellon) began adopting RPA in 2016; bots have streamlined trade settlement by performing research on orders, resolving discrepancies, and clearing trades. Web robots are able to reconcile a failed trade in just a quarter of a second when compared to the 10 minutes required by human workers.
- Other RPA benefits noted by the bank include an 88% improvement in transaction-processing times and account-closure validations—across 5 different systems—with an impeccable accuracy rate of 100%.
- The deployment of the RPA bots at BNY Mellon has allowed banking employees to devote more time to operational quality control and outliers.

Speed Training, Slashing Errors

- Suntrust Bank (HQ in Atlanta), implemented Pega Robotic Desktop Automation (RDA) in payment-operations areas such as Consumer Bank Cards, Wires, and Automated Clearing House (ACH).

- Among the results delivered by robotics, the bank noted that average transaction speed improved 3.8x, average training time improved 4x, an average SLA improvement of 5x, and the average error rate was reduced by 65%.

Drones & Use Cases

Drones can operate **autonomously** (via on-board computers) on a **predefined flight plan** or be controlled remotely. They are a powerful tool for many industries and have revolutionized the way, in which a company can collect **high-quality data**.

5%

of businesses are making significant investments in drones today; 14% will in the next three years.

Source: PwC 2017 Global Digital IQ Survey

Blockchain	AI	Robotics	Drones	3D Printing	IoT	VR	AR
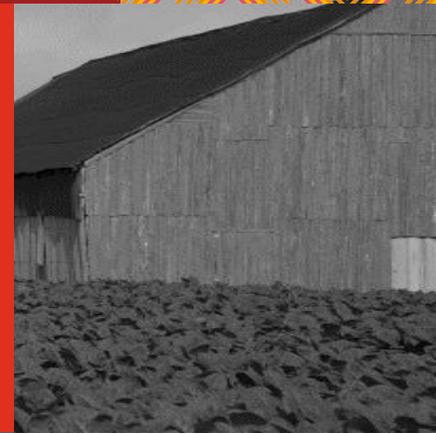
Agriculture – Crop monitoring

Drones

- PwC worked with an agriculture client to use drone technology and sensors to detect soil drought and crop diseases.

- The sensors identified specific endangered areas within their fields, enabling the client to prevent crop waste and damage caused by disease and pest activity

Energy– Stock count

- PwC employed the use of drones in the audit of an energy firm (RWE) in the United kingdom. The drones were used to measure volume of its coal reserves as part of the audit process. The drones resulted in speedy, efficient, cost effective and safe audit processes.

- The drones were designed as cloud-based software that give users instant access to all the assets to be measured from any location, at any time.

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3D Printing
&
Use Cases

A manufacturing process that **builds layers to create a three-dimensional object** from a digital model.

The printing process uses various materials, or inks, most commonly plastic polymers and metals, and more recently glass and wood.

The development of desktop 3D printers has made the technology more accessible to small and mid-sized businesses and home users.

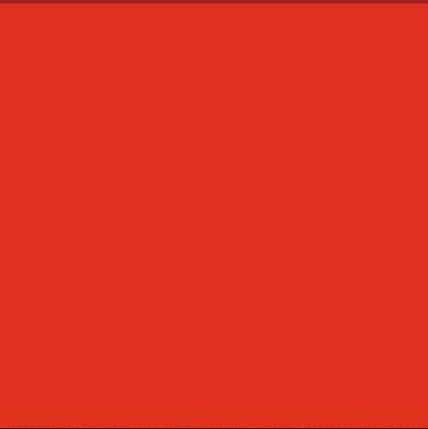**Top industries making 3-D printing investments over next three years**

35%
of automotive companies
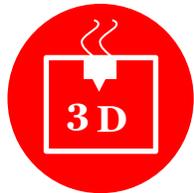
29%
of industrial product companies

29%
of healthcare companies

Source: PwC 2017 Global Digital IQ Survey

| Blockchain | AI | Robotics | Drones | 3D Printing | IoT | VR | AR |

Managing spare parts, Reducing Operating Expenses

3D printing

- PwC's assisted a client with 3D printing in the overall spare part supply chain. 9% of the total spare part portfolio representing 18% of inventory value was considered for 3D printing.

- Reduced yearly OPEX costs by 30%, as a result of 3D printing (improved design – Supply Chain benefits)

Supply Chain Cost Model

- PwC's assisted a client client with a portfolio of >46.000 Stock Keeping Units (SKU's) to keep the manufacturing site operational and manage cost of obsolescence by considering opportunities for 3D printing.

- Long-term benefits: PwC identified 9% of the total spare part portfolio to have beneficial characteristics to consider 3D printing, representing 18% of inventory value

- Short-term benefits: For the selected parts, the client was able to reduce yearly OPEX costs with 30%, as a result of 3D printing.

IoT
&
Use Cases

Network of objects – devices, vehicles, etc. – embedded with sensors, software, network connectivity and computing capability, that can collect and exchange data over the Internet. IoT enables devices to be **connected and remotely monitored or controlled**. IoT represents any device that is now "connected" and accessible via a network connection.

73%
of companies are making IoT investments today;

47%
say it will be the most important tech for cutting costs.

PwC 2017 Global Digital IQ Survey

| Blockchain | AI | Robotics | Drones | 3D Printing | IoT | VR | AR |

Internet of things

Banking on Wearable Devices

- Many banks now provide applications for popular wearable devices that have contactless payment capabilities.

- Bank of America and contactless payment platform provider FitPay have extended wearables payment services to the bank's customers. This will enable the bank's credit and debit cardholders to make contactless payments directly from wearable devices at NFC-enabled point of sale (POS) locations and more than 9,000 Bank of America ATMs.

- Barclays Bank unveiled bPay, a wearable contactless payment solutions; other wearable bands are coming from Caixa Bank, Hellenic Bank and Australia's WestPac (with PayWear).

Branching out to connected cars

- Smarter vehicles represent an opportunity for banks; for example, Idea Bank runs a fleet of cars, each customized with an integrated security deposit box and an ATM, which can visit the customer, rather than vice versa.
- The bank's data suggests that the average deposit at one of its mobile, car-based ATMs is three times higher than at the branch.

Virtual & Augmented Reality (VR & AR) & Use Cases

VR is a **computer-generated simulation** of a three-dimensional image or environment, like a building or product design.

Users may enter the world of **VR** by means of headsets and VR-enabled smartphones and experience a more actionable surrounding.

While Virtual Reality is often associated with gaming and entertainment, VR **applications for businesses** hold great promise in manufacturing, virtual workspaces or educational purposes, for instance.

AR-devices or wearables provide additional information to the existing space in real time, like **Pokémon Go**.

Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the **existing environment** and overlays new information on top of it.

7%
of companies are making significant investments in VR today; 15% in three years.

Source: PwC 2017 Global Digital IQ Survey

24%
of companies will make significant investments in AR in three years; 5% think it will be the most disruptive tech to their industry.

Source: PwC 2017 Global Digital IQ Survey

| Blockchain | AI | Robotics | Drones | 3D Printing | IoT | VR | AR |

Virtual reality (VR) & Augmented reality (AR)

VR Banking Applications

- In June 2017, BNP Paribas introduced a VR app allowing retail banking users to access their account activity and transaction records in a VR environment, and a separate app giving a guided tour of steps involved with buying a home.

Digital Banking Experience

- Hatton National Bank in Sri Lanka created an immersive brand experience using the Oculus Rift system. Their "New World Banking" project aims to build awareness about the bank's array of digital and mobile banking products.

Wealth Management

- Comarch, the Polish fintech innovator demoed a virtual reality investing app at Finovate in 2016. The mobile app prototype combines financial planning and investment advisory into a single tool, and ties in with a smart watch.

- Banking data is presented in a reactive 3D environment, and the VR experience offers a personalized newsroom, meetings with advisors, and portfolio overviews.
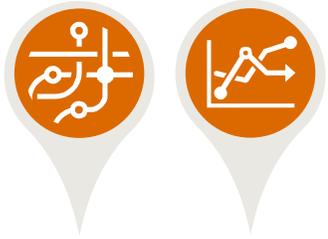
03

Responsibility of the Internal Audit Function

The 4th Industrial Revolution
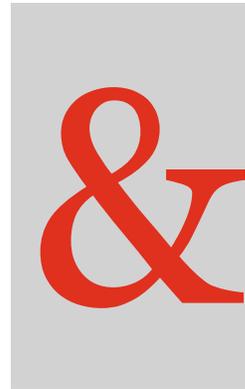
Is feeding new trends

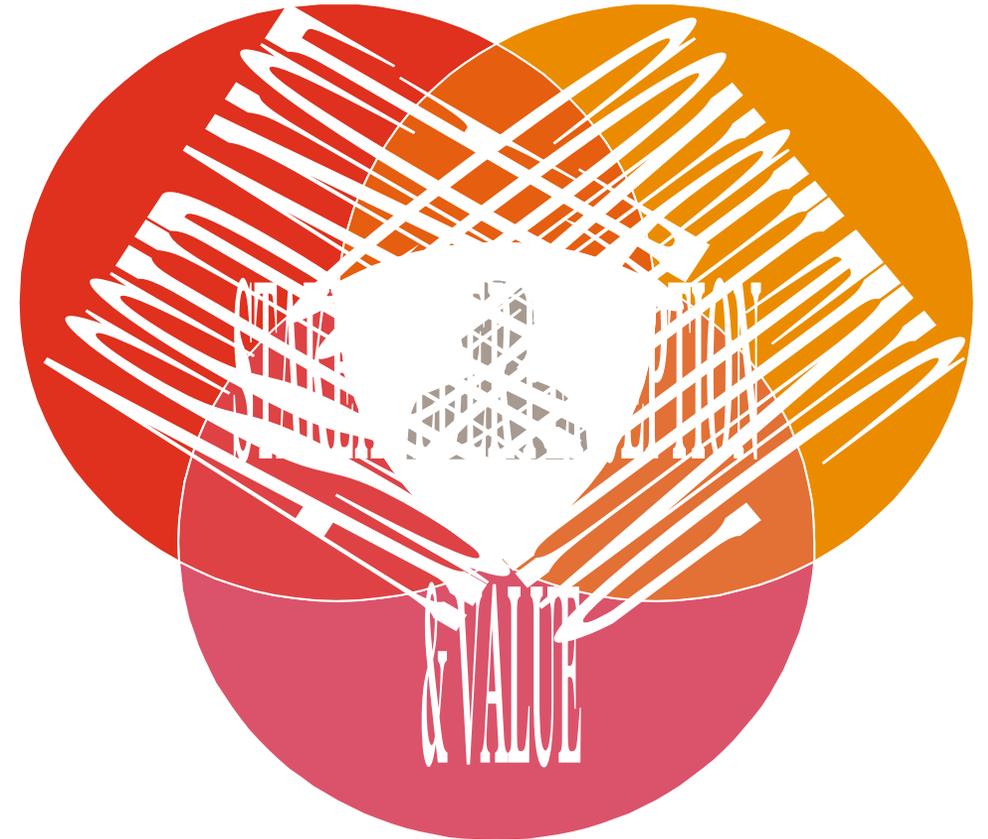Data explosion fueling the digital disruption

Emerging Technologies' convergence accelerating the pace of change

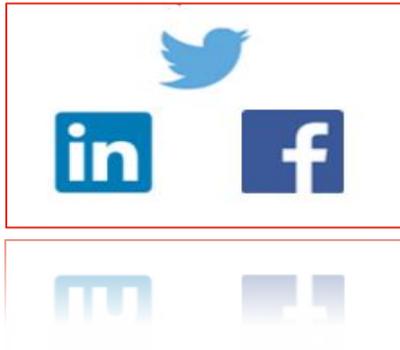Increasing complexity of managing trust

&

Changing the face of Internal Audit

Globally, what organizations are required to review is changing, affecting the scope of the Internal Audit activity
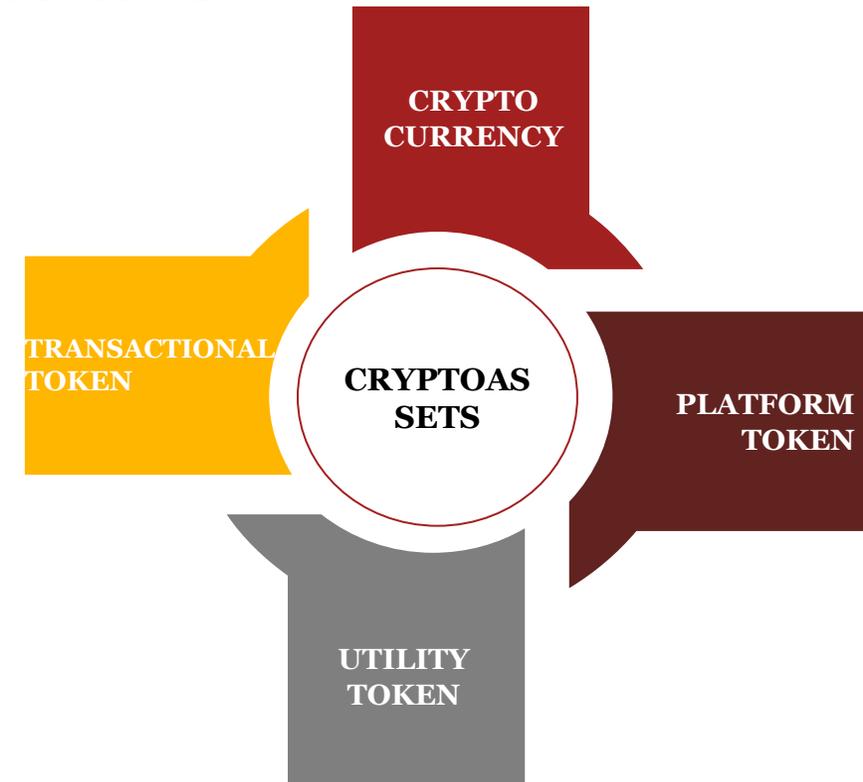
Newer and broader set of data e.g. *social media*

New digital asset class: e.g. *Cryptocurrencies & digital tokens*

Changing technology landscape driving business e.g. *cloud computing, big data analytics, cybersecurity*

CRYPTO CURRENCY

TRANSACTIONAL TOKEN

CRYPTOASSETS

PLATFORM TOKEN

UTILITY TOKEN
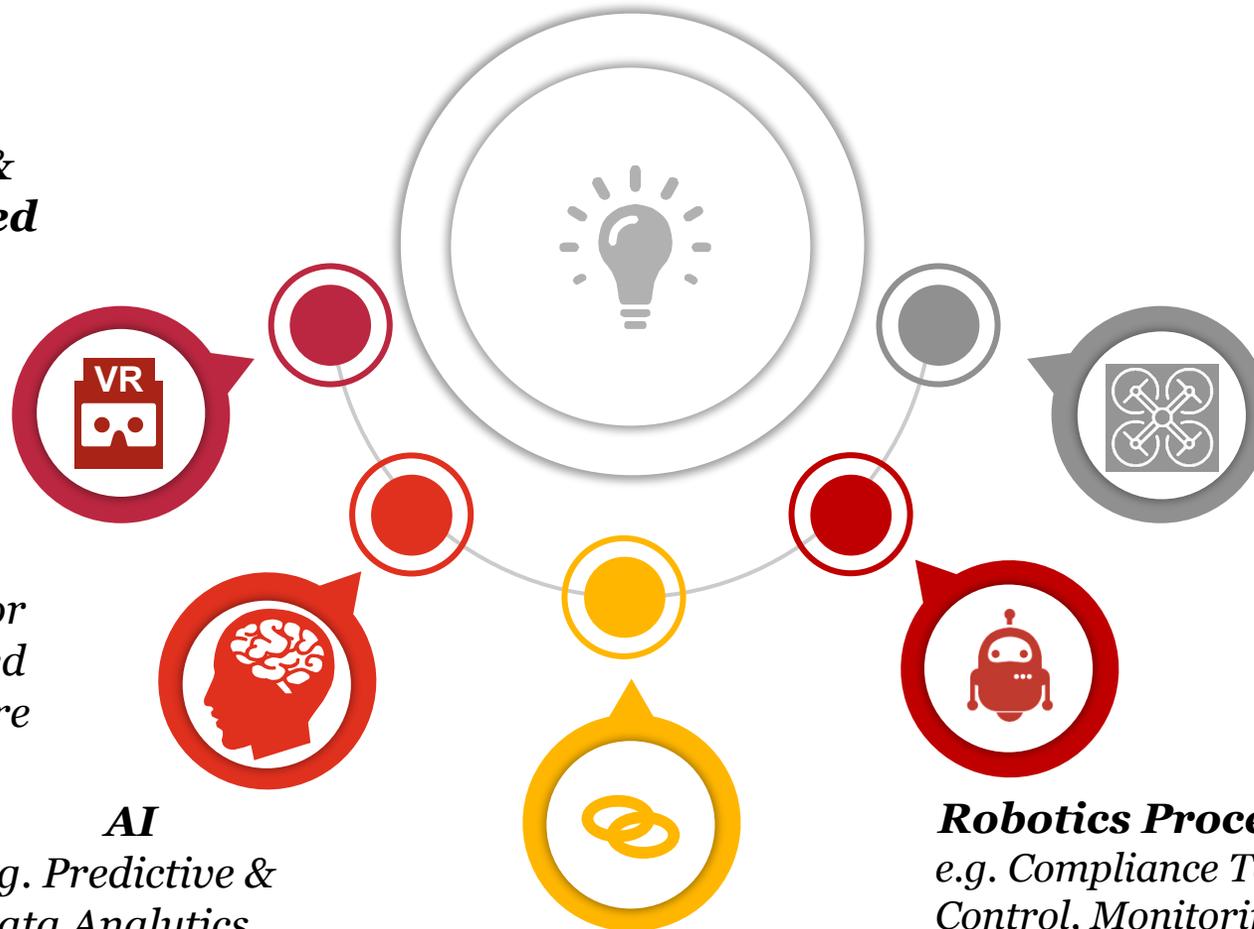
04
Adopting & Leveraging Emerging Technology in Internal Audit

Adoption of emerging technologies in Internal Audit

Virtual Reality & Augmented Reality

e.g. Virtual opening or closing out meetings,

Perform risk assessment for newly adopted tools/structure

AI
e.g. Predictive & Data Analytics, Audit Assistant

Block Chain
e.g. Address risks associated with Account Security, Smart contracts, business processes, access and permissions and effectiveness of automated controls

Drone
e.g. Stock counts, Asset verification Compliance Checks, KYC Audit, etc.

Robotics Process Automation
e.g. Compliance Testing, Quality Control, Monitoring and Surveillance, Reporting (KPI, Regulatory Findings), Controls Testing

05

Navigating the risks of adopting Emerging Technology

Responding to Risks

According to Gartner's Audit Plan Hot Spots for 2019, there are **five (5)** key risk areas that that audit departments need to focus on in 2019

1 Cybersecurity Preparedness

2019 Drivers

1. Growing Attack Sophistication
2. Expanding Attack Surface

2 Data Governance

2019 Drivers

1. Magnification of Poor Data Quality
2. Democratization of Data Analysis

3 Third Parties

2019 Drivers

1. Proliferation of Business Ecosystems
2. Nth-Party Risk

4 Data Privacy

2019 Drivers

1. GDPR Enforcement Uncertainty
2. Consumer Awareness

5 Ethics & Integrity

2019 Drivers

1. Gender and Racial Bias in the Workplace
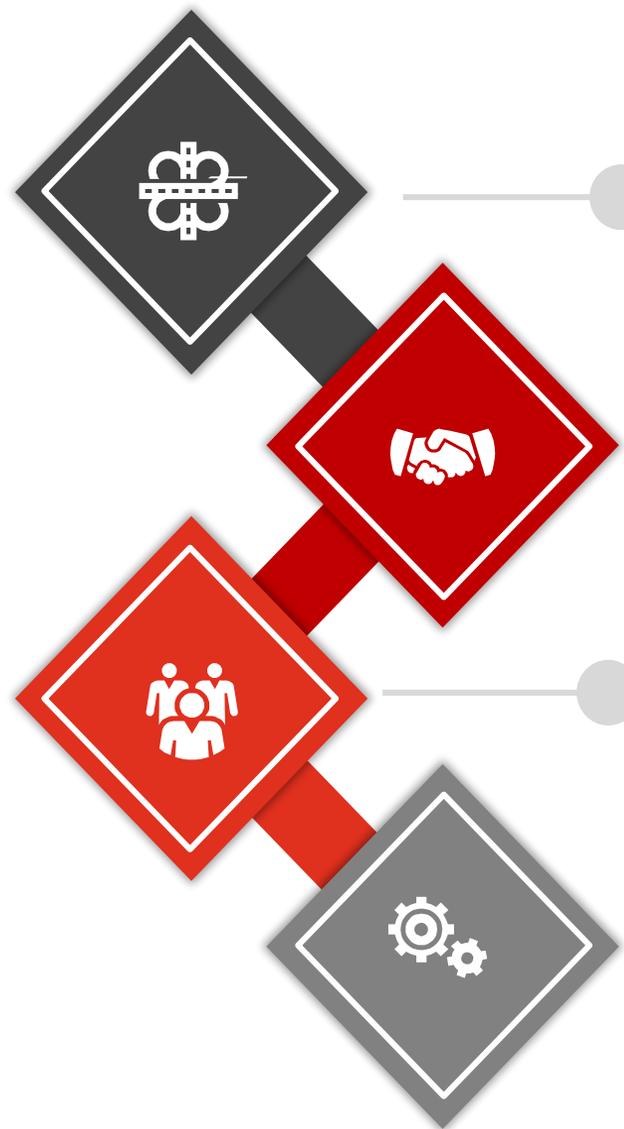2. Inattention to Digital Ethics

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06
Conclusion

In embracing the future, the Internal Audit function needs to be agile and dynamic

Moving with the trends in Emerging technology

Focus on Assurance & Consulting
Continually focus on consulting, risk management, control, and governance & ensure that processes are designed and operating effectively regardless of the speed of disruption.

Engage with Stakeholders and Subject matter Experts
Align internal audit's work with the expectations of internal audit's key stakeholders. Work closely with subject matter experts on disruptive technologies to focus on the most relevant and significant issues.

Invest in Capacity on Disruptive Technologies
Constantly learn about new technologies and the complex and emerging risks that face your organization. Develop an adaptive, flexible, innovative staffing model with technological competence and the ability to rapidly understand and leverage new tools, techniques, and processes.

Put New Technologies to Work
Embrace and leverage new technologies in performing internal audit work. Be at the forefront of adopting emerging technology in audit processes as organizations implement new business processes.

What PwC Nigeria is doing

PwC Nigeria's Innovation Center

When: April 2019

Why

- Technological breakthroughs are disrupting business models and the way business is done.

- To remain relevant and to succeed, emerging technology strategy needs to be a part of every company's corporate strategy and short – medium term plan.

What

Fast track the delivery of innovative digital solutions which clearly solve client problems within the Nigerian Market.

How

PwC would achieve this by:
- Attracting and retaining best talent
- Sustaining efficient operations
- Creating environments which spark creativity and innovation

PwC

The Innovation center
will be the home of experience center and emerging technologies

PwC Innovation center Offerings

Artificial intelligence	Augmented reality	Blockchain
Drones		Internet of things
Robotics	Virtual reality	3-D printing

The future is digital.
Let's shape that future. Together.
Reimagine the possible.

The **future** belongs to those who **prepare** for it **today**...

Malcolm X

Thank you!