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Technology & Digital Risks in the 5IR era

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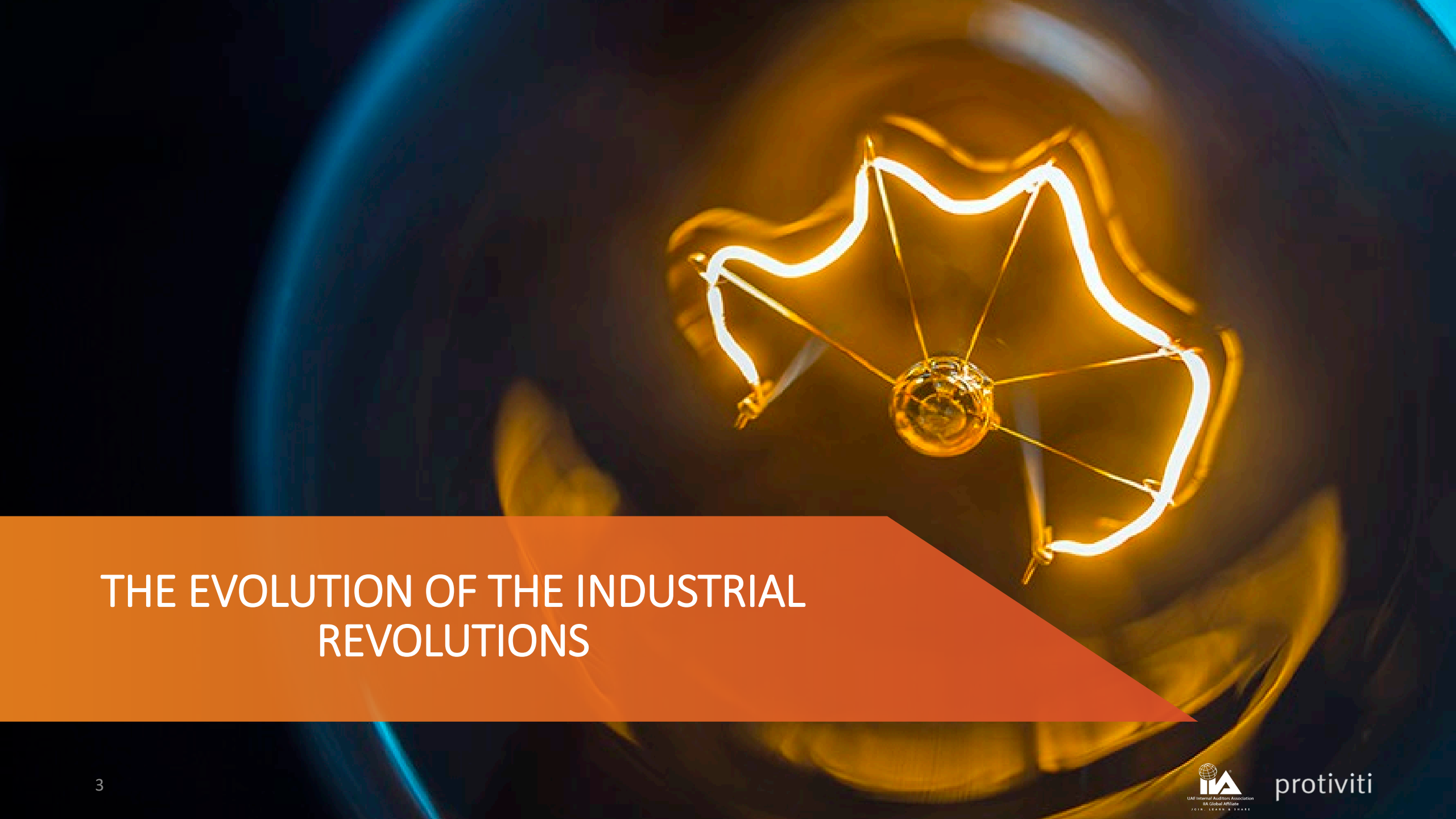
Face the Future with Confidence

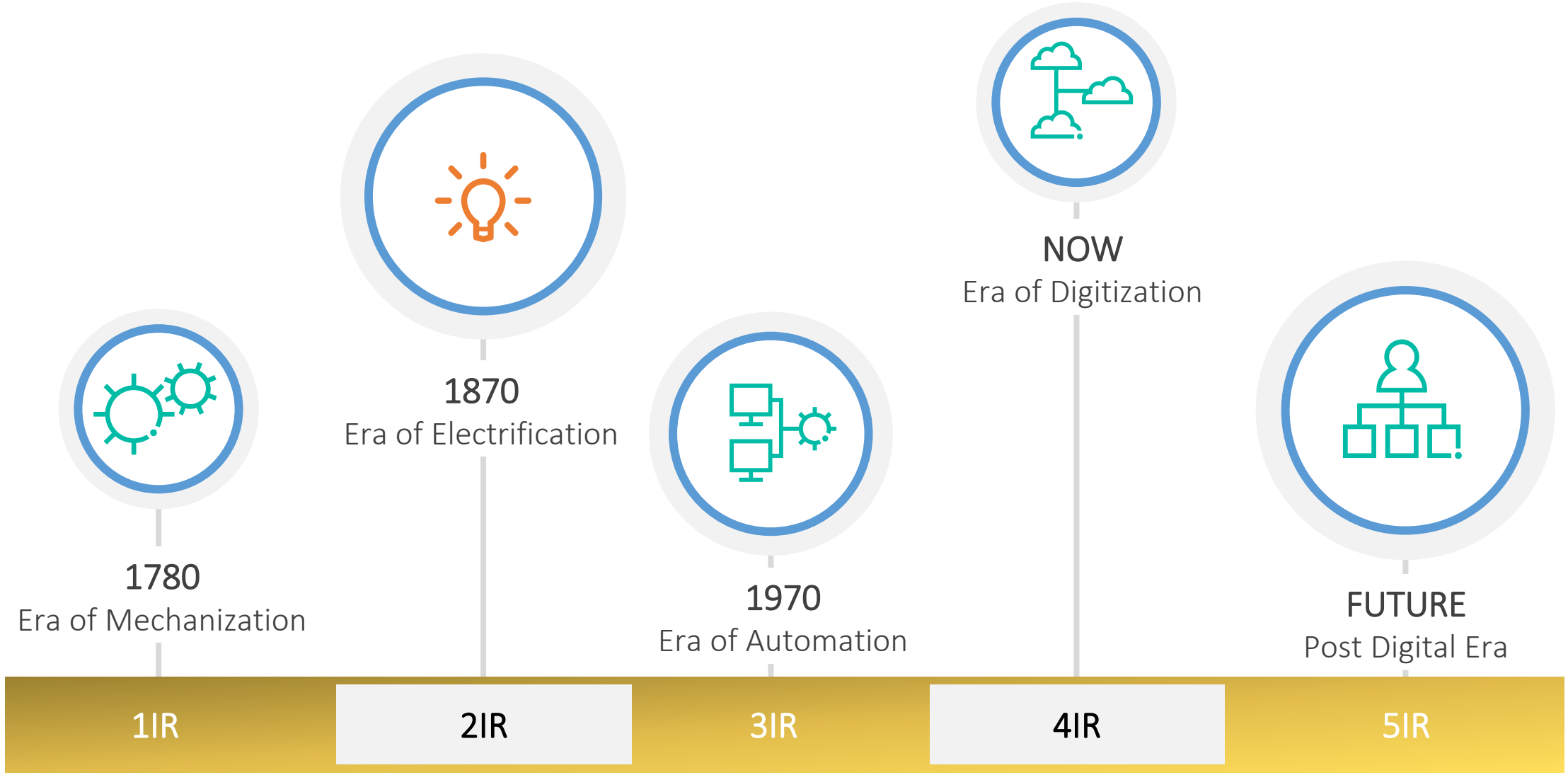
Agenda

- Evolution of the Industrial Revolutions
- What defines 5IR and how is it different from 4IR?
- How is the risk landscape changing with the advent of 5IR?
- Concluding Remarks



THE EVOLUTION OF THE INDUSTRIAL REVOLUTIONS

Since the 18th century, we have witnessed 4 industrial revolutions and are in the cusp of the 5th



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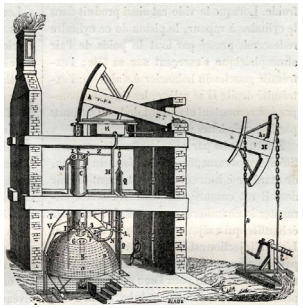

Industrial production based on machines powered by water and steam

1780

Era of Mechanization

1IR | 2IR | 3IR | 4IR | 5IR

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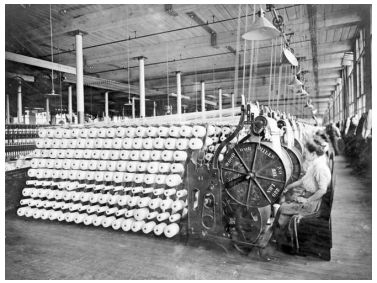


1870

Era of Electrification

Mass production using assembly lines

1IR	2IR	3IR	4IR	5IR

Since the 18th century, we have witnessed 4 industrial revolutions and are in the cusp of the 5th

Automation using electronics and computers. This also marked the era of globalization whereby offshoring of production to low-cost economies became popular

1970

Era of Automation

1IR | 2IR | 3IR | 4IR | 5IR

Since the 18th century, we have witnessed 4 industrial revolutions and are in the cusp of the 5th

NOW

Era of Digitization

Connected devices, data analytics, and Artificial Intelligence technologies for smart automation

1IR	2IR	3IR	4IR	5IR

Since the 18th century, we have witnessed 4 industrial revolutions and are in the cusp of the 5th

Focused on cooperation between man and machine. Human intelligence would work in harmony with cognitive computing. Humans would be back to the industrial production with collaborative robots, workers will be upskilled to provide value added tasks in production, leading to mass customization and personalization for customers

FUTURE

Post Digital Era

1IR	2IR	3IR	4IR	5IR

WHAT DEFINES 5IR AND HOW IS IT DIFFERENT FROM 4IR?

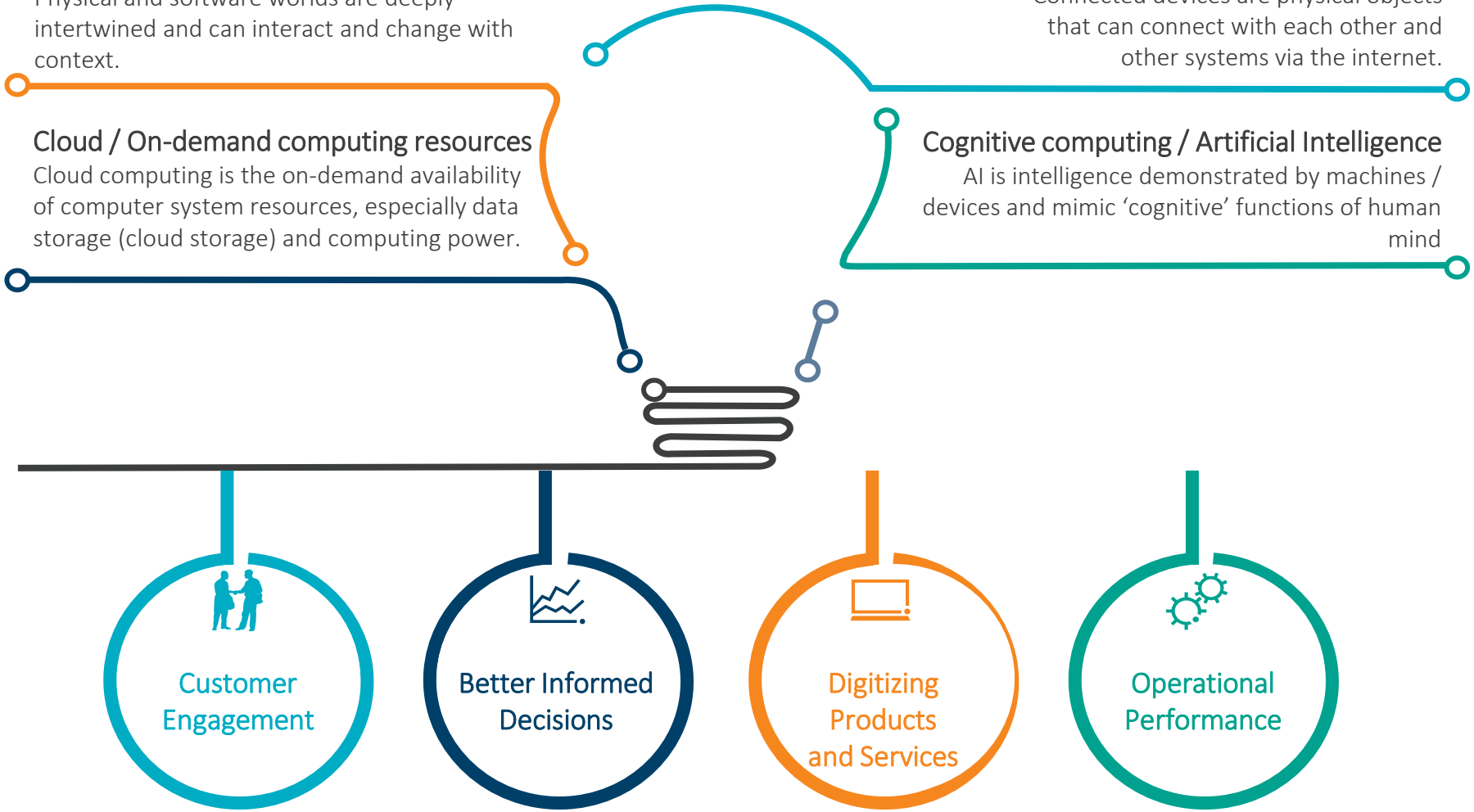
Industry 4.0 is characterized by …

Cyber-Physical Systems
Physical and software worlds are deeply intertwined and can interact and change with context.

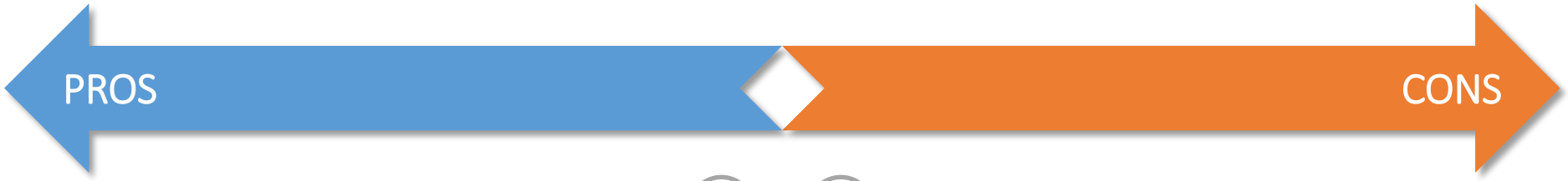
Connected devices
Connected devices are physical objects that can connect with each other and other systems via the internet.

Cloud / On-demand computing resources
Cloud computing is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power.

Cognitive computing / Artificial Intelligence
AI is intelligence demonstrated by machines / devices and mimic 'cognitive' functions of human mind



The Pros & Cons of 4IR



PROS	CONS
Strategic competitive advantage	Human implications of digitization was ignored
Organizational efficiency & effectiveness	Massive increase in environmental pollution and impact on climate change
Organizational agility	Socio-technical implications
Delightful customer experience	Workforce insecurity

And 5IR is redefining how technology interacts with humans

Evolution of a global society with open minded and well skilled forward-thinking employees who would support technology adoption

Focus on waste reduction and waste prevention

Increasing productivity, agility and profitability, change-readiness, a responsive working environment and overall cost reduction

Mass Customization

Increased Collaboration between humans and smart systems (cyber-physical).

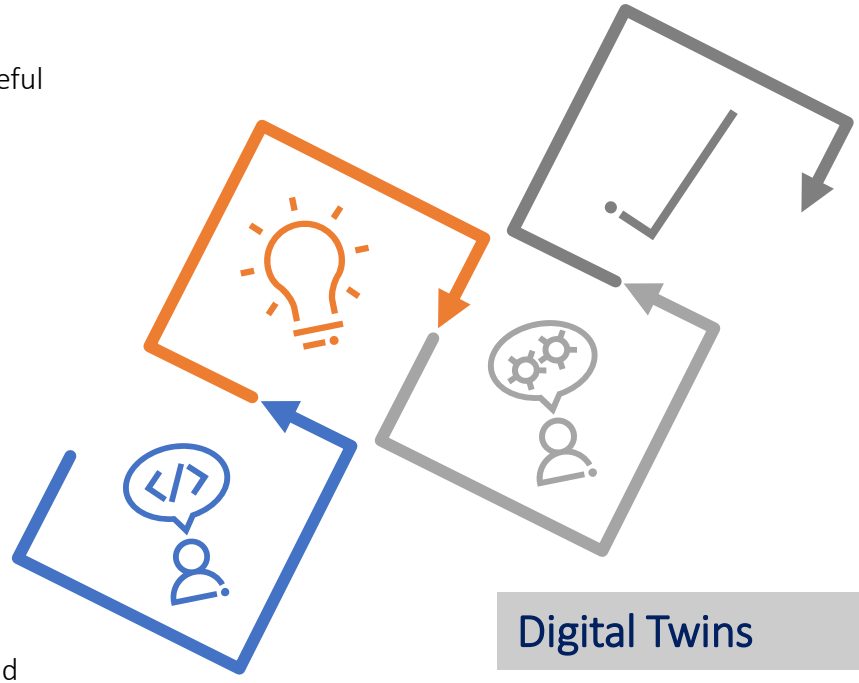
Technology Shifts in 5IR

Automation to Autonomy

- Autonomy in 5IR is that which would perform useful functions and would be driven by AI.
- AI techniques empowered by deep learning strategies would result in intelligent systems and solutions that would make decisions under unforeseen circumstances.
- *Potential benefits: Transfer learning which is a critical aspect of implementation and personalization of 5IR*

Distributed Intelligence in the Network

- Network of sensors with low-level intelligence and processing power
- Local preprocessing of data which would create a level of "distributed intelligence" in the network.
- *Potential benefits: The networked sensors will open the possibility for unprecedented customization in manufacturing processes.*



Emergence of Cobots

- In 5IR, it is anticipated that Cobots will have greater combined capabilities in advanced perception, localization, vision, and cognition abilities, along with improvement in computation power in embedded platforms.
- Deep learning methods will provide robots (including Cobots) and intelligent machines with reliable cognition and visualization capability, which is necessary in autonomous applications.
- *Potential benefits: Highly adaptive and intelligent autonomous systems which can demonstrate anticipatory behavior.*

Digital Twins

- A virtual model of a process, product or service.
- Digital twins provide manufacturing units with the ability to analyze data, monitor the production process, manage risk prior to its occurrence, reduce downtime, and further develop by simulations.
- *Potential benefits: Reducing wastage in the process flow and system design. Increase the productivity of all sectors in any industry when coupled with state-of-the-art visualization and modelling techniques.*

HOW IS THE RISK LANDSCAPE CHANGING WITH ADVENT OF 5IR

The Changing context of Risk categories…

Artificial Intelligence Risks

Ethics and Compliance Frameworks

Security and Resilience

Data Governance and Protection

Humanizing Workforce

Artificial Intelligence

Changing risks

Potential unethical use

- ✓ AI programmed to do something dangerous, (e.g., autonomous weapons)
- ✓ Possible AI driven global autonomous weapons race
- ✓ Potential Human rights violation
- ✓ Intentional bias built into AI algorithms
- ✓ 'Dual-use' of AI Technologies.

Misalignment of Goals

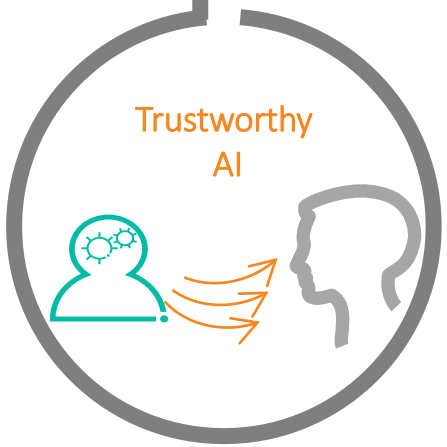
- ✓ Lack of clarity with the goals we set for AI machines could be dangerous
- ✓ The AI-powered machines may lose their efficiency and effectiveness and may also lead to significant dangers for the people managing it.

Social Implications

- ✓ Social media through its autonomous-powered algorithms is very effective at target marketing.
- ✓ AI can target and spread information — fact or fiction.
- ✓ Social implications where they are used to deceive or harm people and generate distrust among users and the public.

Ethics & Compliance

Emergence due to AI



- ✓ Evolving frameworks and constant adaption
- ✓ Technology to continuously monitor ethics and compliance
- ✓ Forward looking decision making

Lawful

- ✓ Emerging laws and legal frameworks relevant to the development, deployment and use of AI systems today
- ✓ Guidance for 'what cannot be done', but also to 'what should be done' and 'what may be done'

Ethical

- ✓ Adherence to ethical principles e.g., respect for human autonomy, prevention of harm, fairness and explicability.
- ✓ Special attention to vulnerable groups such as children, persons with disabilities amongst others

Robust

- ✓ AI systems should perform in a safe, secure and reliable manner, and safeguards should be foreseen to prevent any unintended adverse impacts.

Security & Resiliency

Next generation Risk management

Interconnected Supplier Network

- Intelligent, connected platforms and devices across the ecosystem capable of capturing data from across the value chain
- Data sharing and governance related risks
- Vendor access and processing risks

Autonomous Production Systems

- Vulnerability management for Data leakage / cyber risks for distributed intelligence systems
- Integrity of algorithms

All inclusive Resiliency

- Data driven resiliency programs covering people-cyber-physical layers
- Widespread security baselining across the autonomous production systems

Data Governance and Protection

Data is the new Eye

Data Protection

- Systems must guarantee privacy and data protection throughout a system's entire lifecycle
- Digital records of human behavior may allow (AI) systems to infer not only individuals' preferences, but also their age, gender, religious or political views.
- Trust must be established on the data gathering process

Quality & Integrity of Data

- The quality of the data sets used is paramount to the performance of future generation systems.
- Gathered data may contain socially constructed biases, inaccuracies, and errors.
- Integrity of the data is critical as well. Feeding malicious data into these system may change its behavior, particularly with self-learning systems.

Access to Data

- Organization's handling individuals' data (whether someone is a user of the system or not), data protocols governing data access should be put in place.
- These protocols should outline who can access data and under which circumstances.
- Only duly qualified personnel with the competence and need to access individual's data should be allowed to do so.

Humanizing Workforce

Changing mix of the workforce introducing newer risks

Evolving mix of Generations

- BY 2030, there will be a balanced mix of Gen X, Millennials and Gen Z in the workforce

Complex mix of workers

- The workforce will be a complex of traditional full-time staff, contingent workforce and gig economy workers

Complex mix of humans & robots

- Complexity of identity and access management, accountability with introduction of complex mix of humans and robots.

Operating Models

Changes in ways of working necessitates changes in the operating model across organization, governance, competencies and practices

Upskilling

Training needs of resource to replenish the talent pool with hands on knowledge of new gen technologies

Evolving New roles

New roles like Chief Robotics Officer to oversee the development and penetration of technology across the value chain

Anti-social Elements

Watchout for employees who do not fit into the organization's and societal value system

CONCLUDING REMARKS

Internal Audit Perspective – How are you taking on Digital Risks today?

Internal Audit Perspectives

"Not sure how we should audit digitalization."

"There is no digitalization program to audit." and/or *"The digitalization effort is not progressed enough for us to audit."*

"Not sure the executive team would want us looking at these types of things."

Three Applications of the Framework

- Risk Assessment
- Audit Universe
- Audit Work Program

Resilience and Performance in a Digital Age

Vision Mission Strategy	Management Employees Culture	Organization Structure Process	Communication Marketing Sales	Technology Innovation Development	Big Data Analytics Automation
Visioning	Digital Leadership	Corporate Culture	Customer Centricity	Technology Organization	Data Value Creation
Business Model Disruption	Management Culture	Structure & Hierarchy	Marketing Strategy	IT Architecture & Infrastructure	Big-Data Analytics
Strategic Planning	Employee Skills & Capabilities	Human Resources Management	Marketing Provider Management	Software Development & Delivery	Data Science Team
Governance & Risk Management	Team Performance	Innovation & Research	Cross-Channel Strategy	Third-Party Collaboration & Integration	Data Governance
Compliance	Digital Sponsorship	Knowledge Management	Media Performance	Innovation Support	Business Automation
Financial Planning	Workplace Collaboration	Operational Excellence	Budgeting Tracking & Performance	Cyber Security	Personalization

1 2 3 4 5 6 7 8 9 10

Digital Skeptic	Digital Beginner	Digital Follower	Digital Advanced	Digital Leader
• Reacts to competition • Risk averse	• Embraces change • Collection of point solutions	• Clear strategy • Agile • Effective change	• High automation • Low cost • Hyper scalable	• Innovative • Disruptive

Concluding points…

Relevance to your industry

Assess the impact of 5IR in your industry

Stay Tuned to emerging regulations

Tightening of Regulatory environment. Keep yourself tuned

Relook at your risk universe

5IR risks are evolving with AI, Ethics & data being the key

Avoiding buzzwords

Not all risks are equal – don't be swayed by buzzwords