



Technology Innovations Driving Transformation in Mining Industry

August 2017, SAP India

Need to innovate is becoming indispensable in Mining industry

Productivity is
28% less today
than in the last
decade

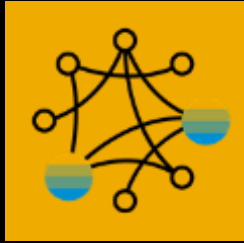
Capital intensity
has doubled over
the last
15 years

Commodity
prices dropped
50% in the last
two years

Source: [“Productivity in Mining Operations: Reversing the Downward Trend,”](#) McKinsey & Company, May 2015.

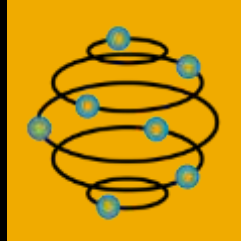
Source: [“Industrial Internet of Things Fulfilling the Vision of the Connected Mine,”](#) ARC Advisory Group, May 2015.

New technology trends are driving change in Mining industry



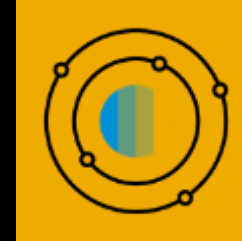
IoT

Connecting things with people and business



Big Data

Manage vast amounts of big data



Data Network

Data put into business context



Analytics

Insights that enable transformative actions



Machine Learning

Intelligence enabled by learnings from data



Cloud Platform

Simplifying the IT landscape



3D Printing

Improving productivity and business processes



Blockchain

Blockchain services embedded into business applications

Machine Learning or Artificial Intelligence – ‘Uberizing’ the Mining industry

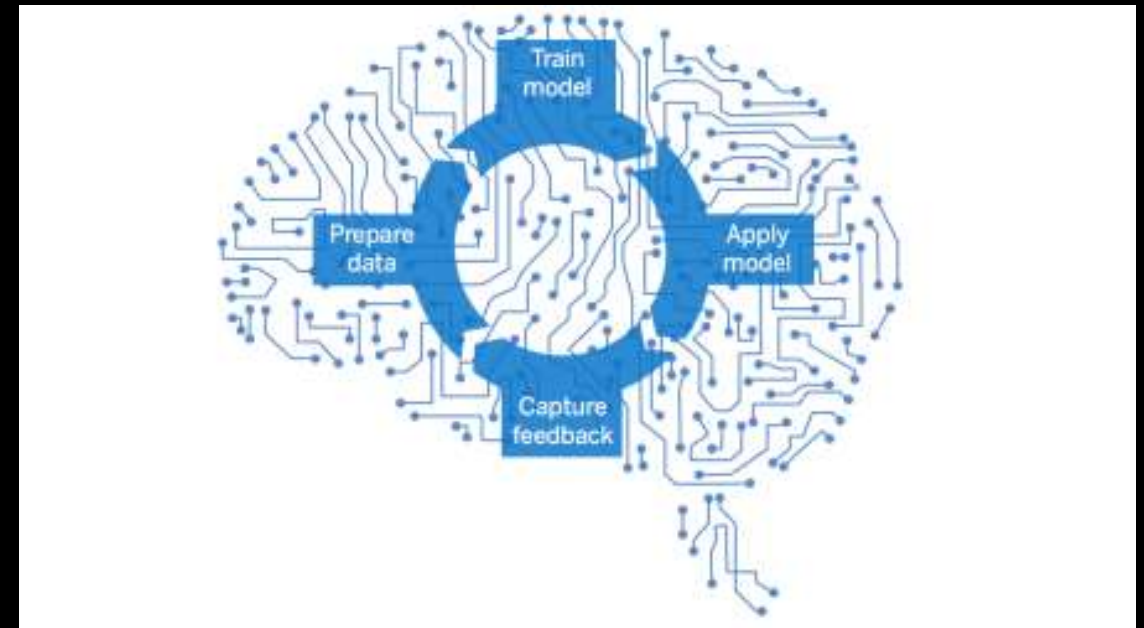
AI or Machine learning algorithms are considered today as the next step of digital mine transformation

Classifying the rock and soil classes using remote sensing data

Predict mineral prospectivity or the locations of potential ores

Warn operators of **impending failure** in equipment or vehicle

Mitigate environmental risk associated with mining operations



Application of AI based Robotics in Mining

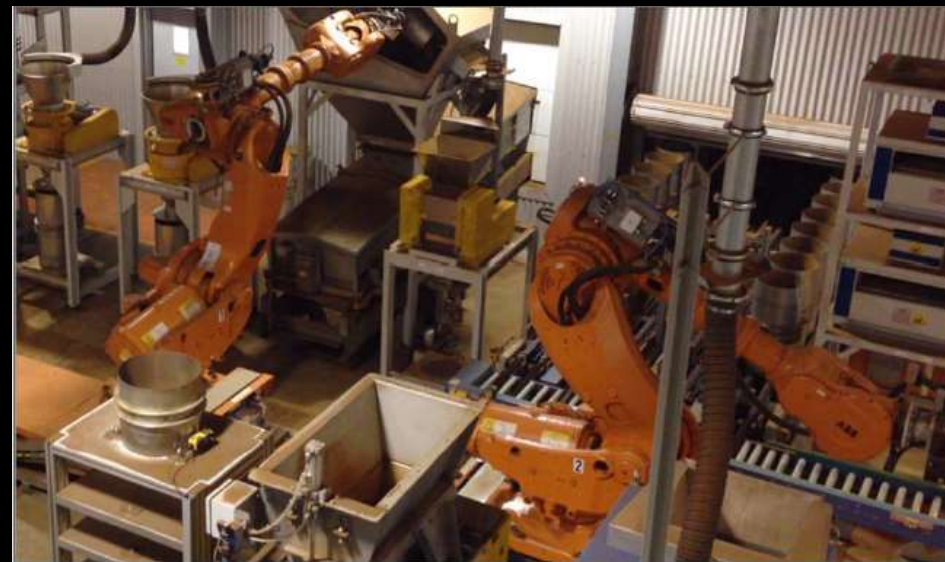


Autonomous drill rig at BHP Billiton's gold mines in Canada



Newcrest mining in Australia exploiting machine learning for use in autoclaves

At Rio Tinto's Cape Lambert port, robots are used for iron ore sampling



Cybersecurity – a threat in Mining industry

Mining Sector Has Faced **17 Major Cyber-Incidents** in the Past Six Years

- Security firm Trend Micro Report

Mining ranks Number 1 among industries when it comes to receiving **spam email**

- Symantec Internet Security Report

The logo for Rio Tinto, featuring the company name in a bold, red, serif font.The logo for BHP Billiton, consisting of three stylized orange spheres above the text "bhpbilliton" in a lowercase, sans-serif font.The logo for Fortescue, featuring a blue map of Australia with "FMG" written inside, and the text "Fortescue The New Force In Iron Ore" to the right.The logo for Anglo American, featuring a blue stylized 'A' icon and the text "ANGLO AMERICAN" in a bold, blue, sans-serif font.The logo for Detour Gold, featuring a gold bar icon and the text "DETOUR GOLD" in a bold, gold, sans-serif font.

Blockchain – greater security and improved processes

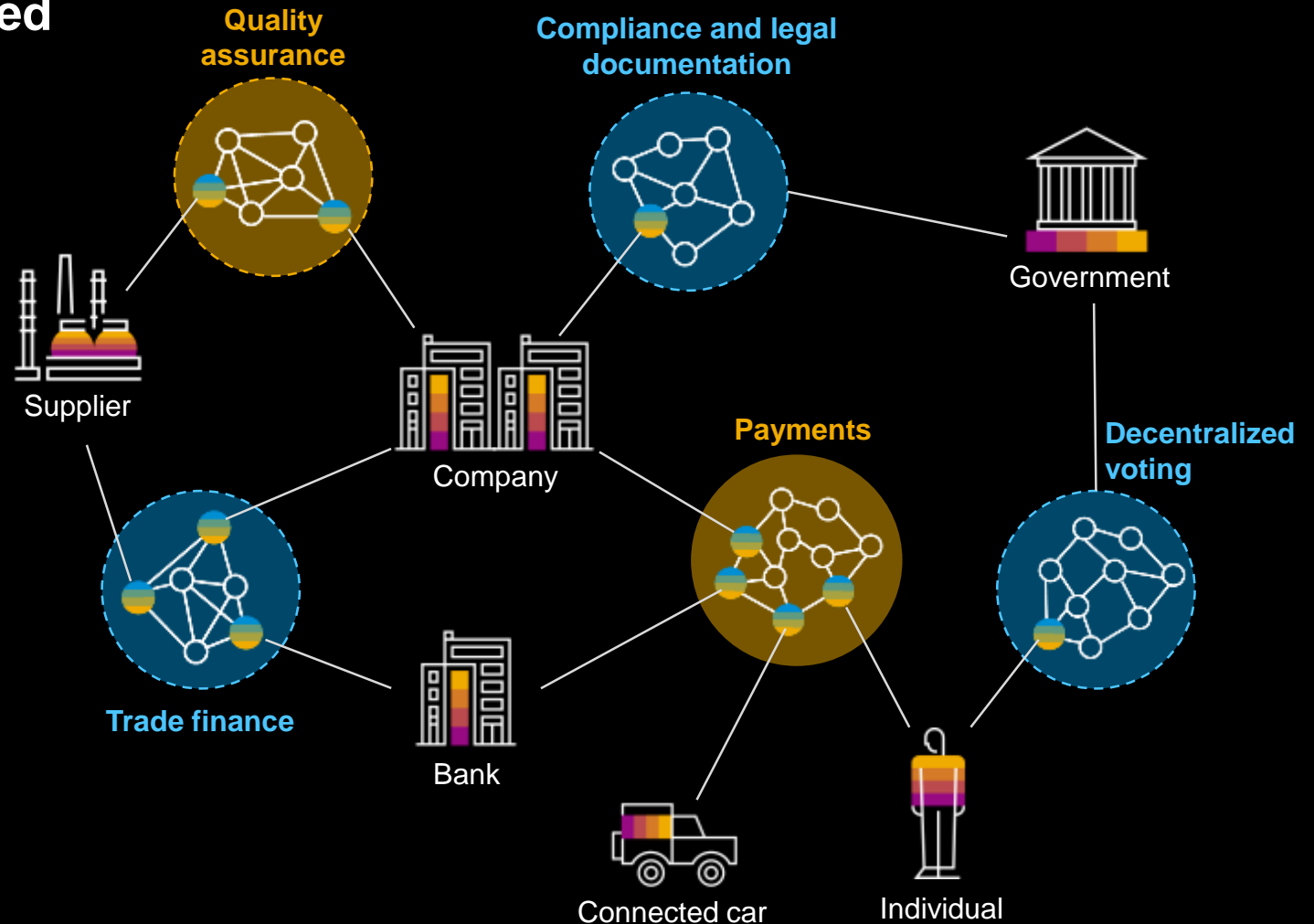
Blockchain is a new protocol for **distributed ledgers** in multiparty business processes

Risk reduction without intermediaries

Operational **simplification** of collaborative scenarios

Increased **transparency**, auditability, and regulatory compliance

Real-time **value transfers**



Blockchain in Mining industry

Blockchain use cases

- Simplify cross border payments with greater speed and transparency
- Tracking mineral and metals across the value chain
- Driving 'smart contracts' across multiple jurisdictions
- Automating the Internet of Things

BHP Billiton – improving the supply chain processes using block chain



“There are so many financial use cases and this is one of the first instances where we’re using it for a non-financial scenario”

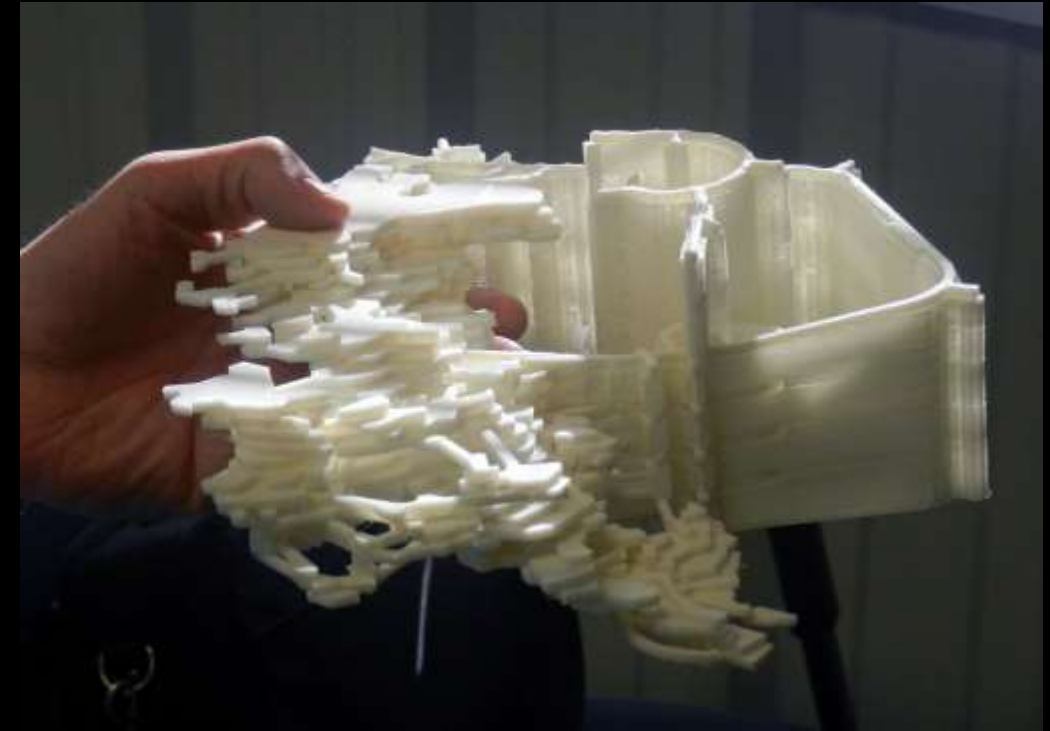
3D Printing – improving mining uptime and productivity

3D-printing can help operators gain greater control over the supply chain

On-demand and on-site - enabling 'insourcing' manufacturing strategies for equipment and parts

Customisable and replicable - designing components tailored to the ore body/site that is being exploited

Leaner and greener - material and energy-efficient approach throughout a product's entire life cycle



A 3-D printed model of Barrick Gold's Turquoise Ridge mine in Nevada, US

3D Printing – use cases and new developments

3D printing use cases

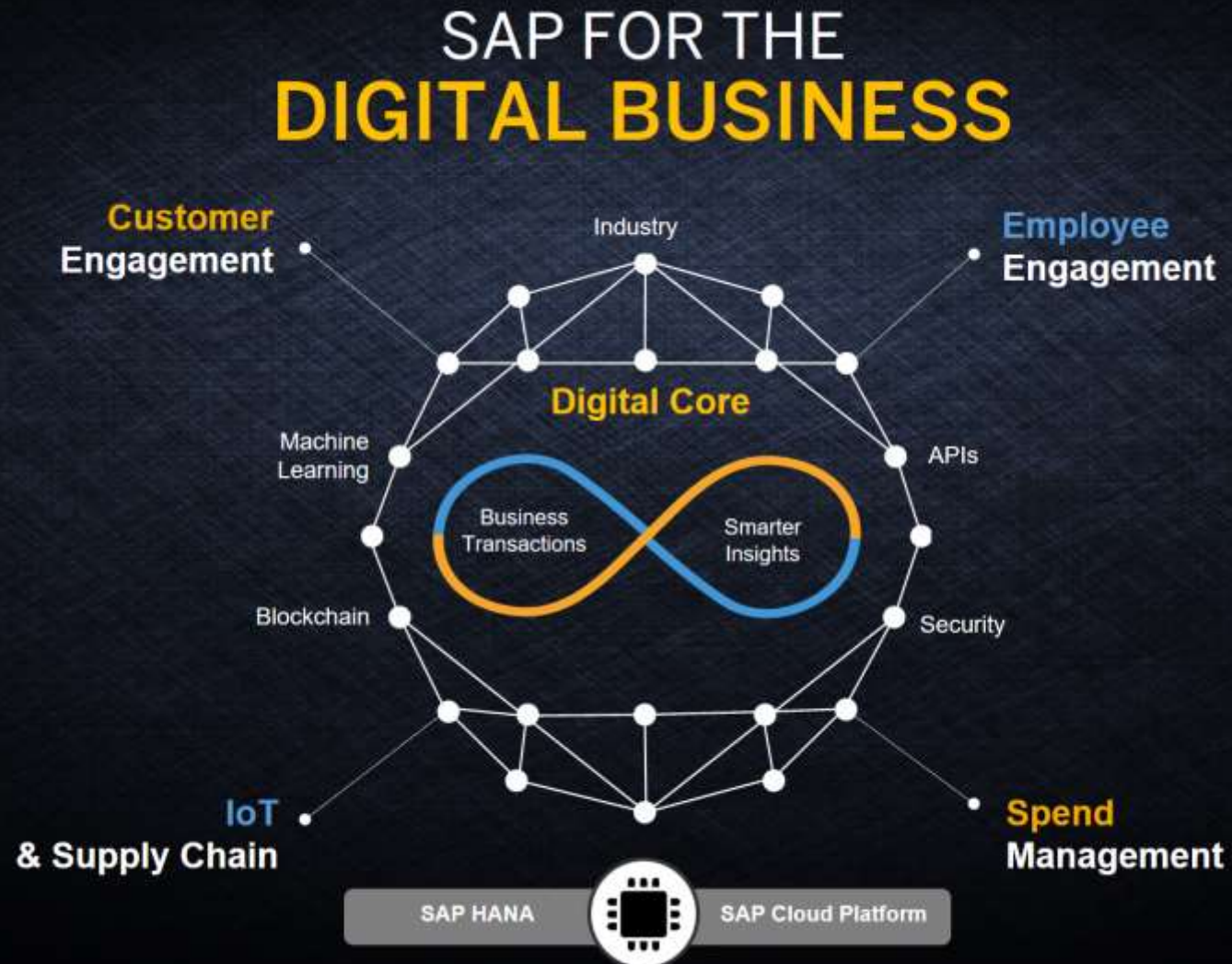
- **On-demand printing** of critical spares to reduce costly equipment downtime
- **Digital storage** to bring down warehousing and transportation costs
- 3D mine topographic model to aid in the **visualization of mining sites**

Alcoa – developing advanced 3D printing materials and processes



“Alcoa is investing in the next generation of 3D printing for aerospace and beyond”

SAP's Digital business framework



Digital is Here and Now

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