



# *The 3S to Success:*

*Tata Steel Netherlands and Microsoft's collaboration  
for sustainable steel production*

*Pixel Consulting*



# Executive Summary

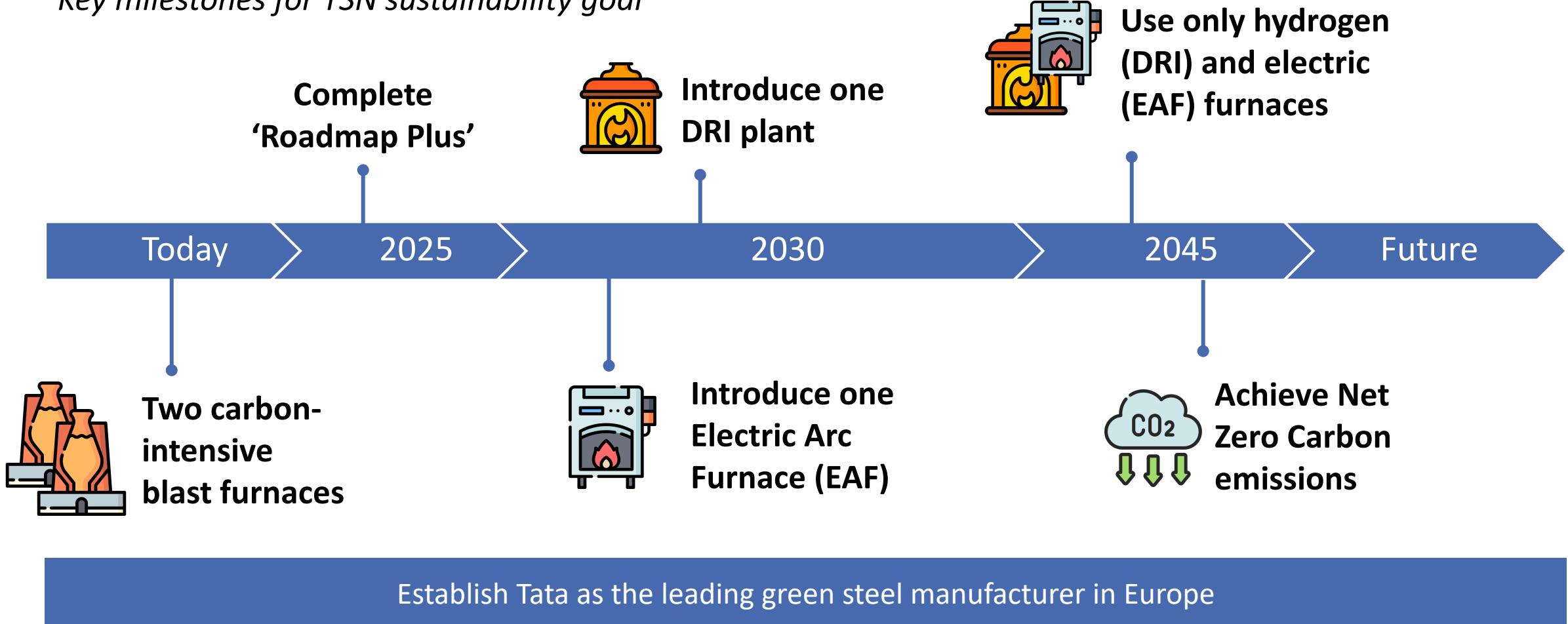


Situation	Key Question	“3S” Strategy for Collaboration	Impact
Tata Steel Netherlands' <b>roadmap</b> to achieve green steel production	<i>How can Tata Steel Netherlands leverage Microsoft's technology to achieve its 2045 sustainability transition goals?</i>	<b>Scrap</b> <i>Estimating steel scrap supply using AI analytics</i>	
Roadblocks exist in achieving the 2045 goals		<b>Simulate</b> <i>Simulating innovation with Digital Twin</i>	<b>30.4 MT CO2</b> Emissions Saved by 2045 in the rollout of <i>Scrap, Simulate and Shape</i>
Leveraging Microsoft's <b>digital capabilities</b> through partnership		<b>Shape</b> <i>Upskilling Tata's workforce for digital transformation</i>	

# Tata Steel Netherlands' (TSN) roadmap for green steel production

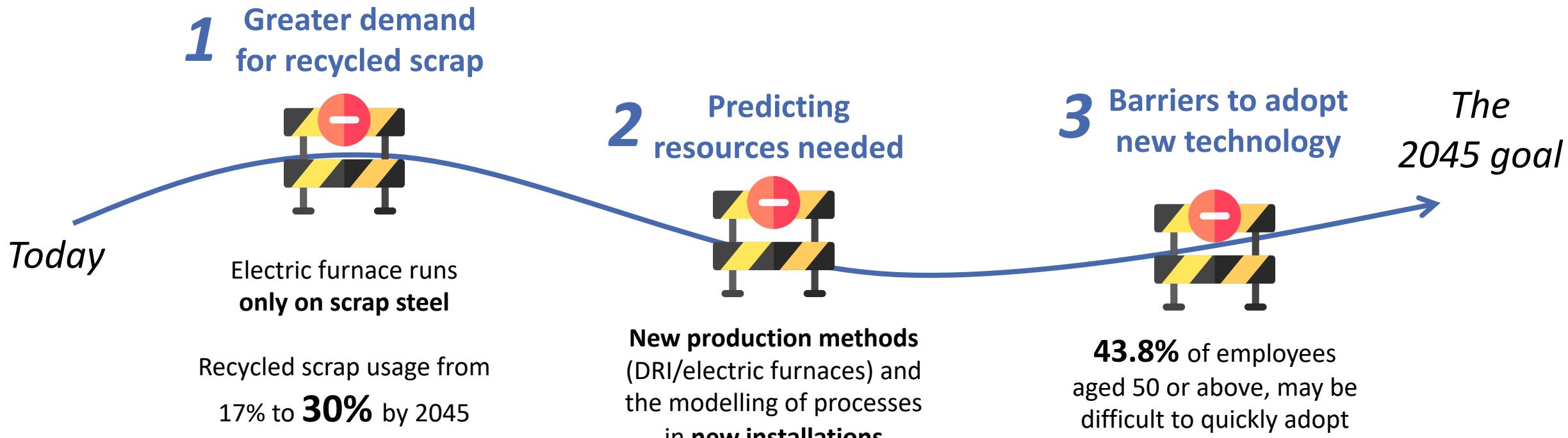


*Key milestones for TSN sustainability goal*



Source: Tata Steel Netherlands Roadmap Plus, 2023 Sustainability Report

# Three roadblocks ahead of Tata in achieving its sustainability goal



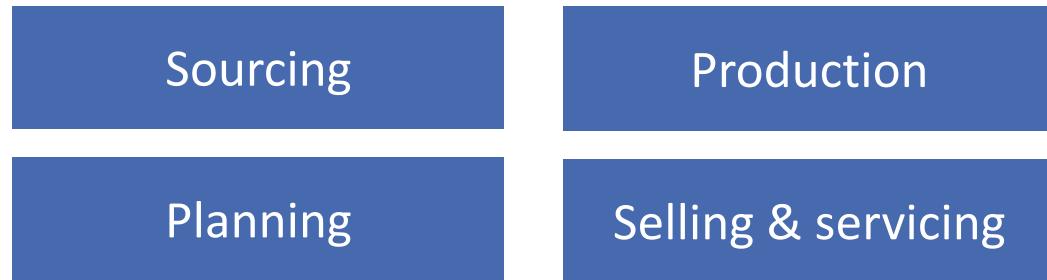
Roadblocks hinder Tata's progress in achieving its sustainability goal

Source: 2023 Sustainability Report, Tata Steel Netherlands

# A mutually beneficial partnership between Tata and Microsoft



## TSN focus areas of digitalisation



## Tata currently utilizes Microsoft's digital capabilities

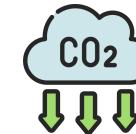


Internet of Things (IoT) sensors  
for factory machines



Cognitive AI to detect fine dust  
and activate water sprinklers

The current use cases are much focused on the **shorter-term**



Net zero



DRI



EAF

## Key criteria for a digital partnership going ahead

- 1** More efficient usage of **resources**
- 2** Achieve TSN's 2045 sustainability goals
- 3** **Mutually beneficial** to both TSN and Microsoft
- 4** TSN can maintain its **competitiveness**

Source: Case document, Tata Steel Netherlands

## TSN focus areas of digitalisation

Sourcing

Production

Planning

Selling & service

The current use cases are much focused on the shorter-term



Net zero



DRI



EAF

## Key Question:

Key criteria for a digital partnership going ahead

How can Tata Steel Netherlands leverage Microsoft's technology to achieve its 2045 sustainability transition goals?

Tata currently utilizes Microsoft's digital capabilities



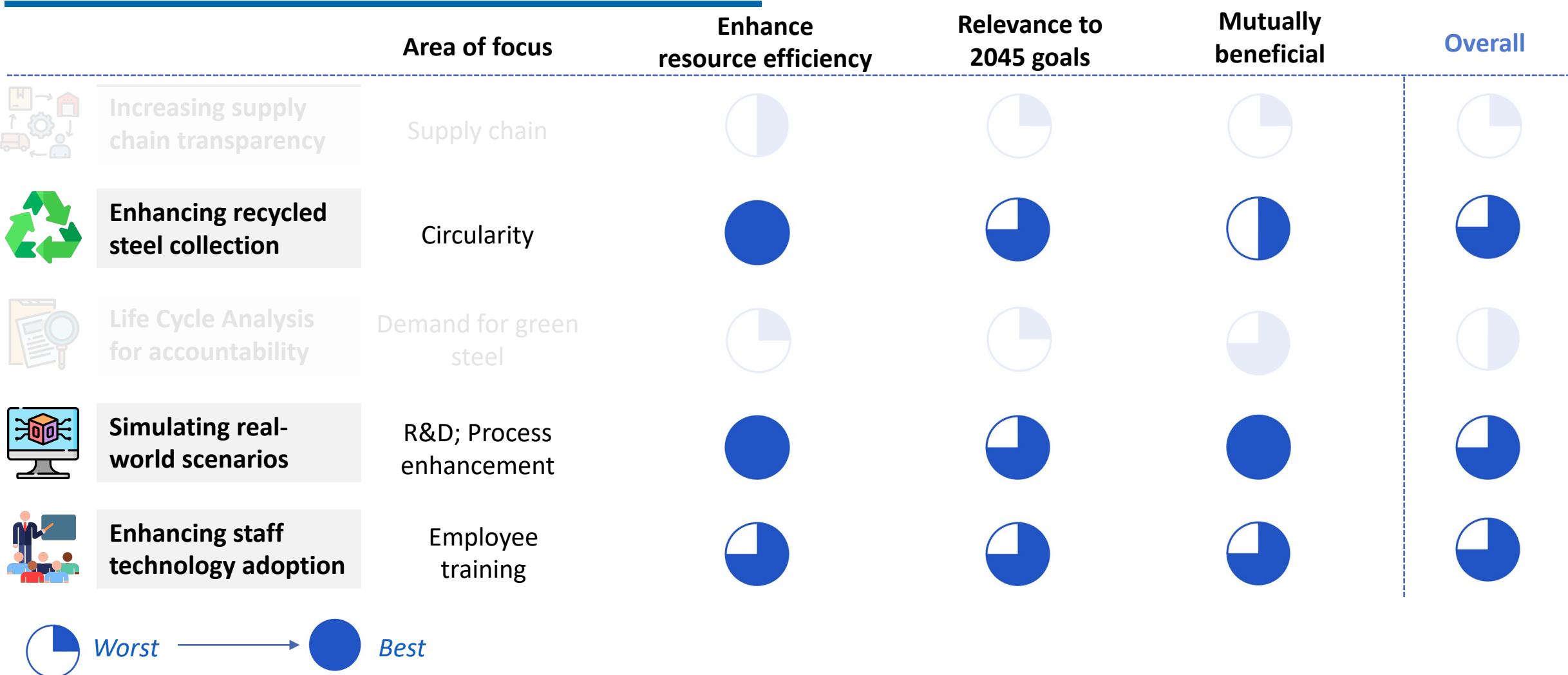
Internet of Things  
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Cognitive AI to detect fine dust  
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- 1 More efficient usage of resources
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- 3 Mutually beneficial to both TSN and Microsoft
- 4 TSN can maintain its competitiveness

We target a **combination** of digital strategies that best fit TSN

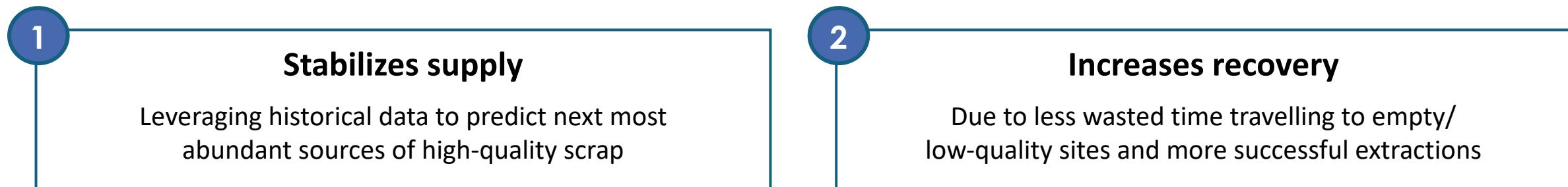


*Pixel Consulting analysis*

# Scrap: Estimating steel scrap supply and recovery using AI analytics



**Identify where, when, and how many  
steel scraps using Microsoft AI**



Microsoft can tailor their predictive analytics model to improve resource management with the sourcing of steel scrap



## Case Study: BHP Group x Microsoft Azure



*Mining company with a Chile plant*

Collect data from mine's concentrator circuit, responsible for extracting/ collecting copper mineral

**10% OpEx reduction**

Use Azure predictive analytics to locate optimal copper recovery sites

**5% increased copper recovery**

MICROSOFT Azure Machine Learning can assist with predictive analytics for stable source of steel scrap supply for the electric arc furnace (EAF)

Source: CRN "[Azure AI aids copper extraction](#)"

Source: McKinsey "[AI-driven operations forecasting](#)" Technology Record "[BHP deploys Azure](#)"

With Azure, TSN can stabilize steel supply while establishing Microsoft as a leader in the manufacturing industry



## Outcomes

1

### Stable steel supply

Transitioning from 17 → 30% recycled steel input requires stable source

2

### Increased scrap recovery

Based on historical data and predictive analytics on optimal recovery sites

3

### Less wasted time and fuel

Up to 30% decreased fuel wastage with optimized route software

## Synergies

### Tata Steel

Decreased operational cost/ carbon emissions, and increased energy efficiency

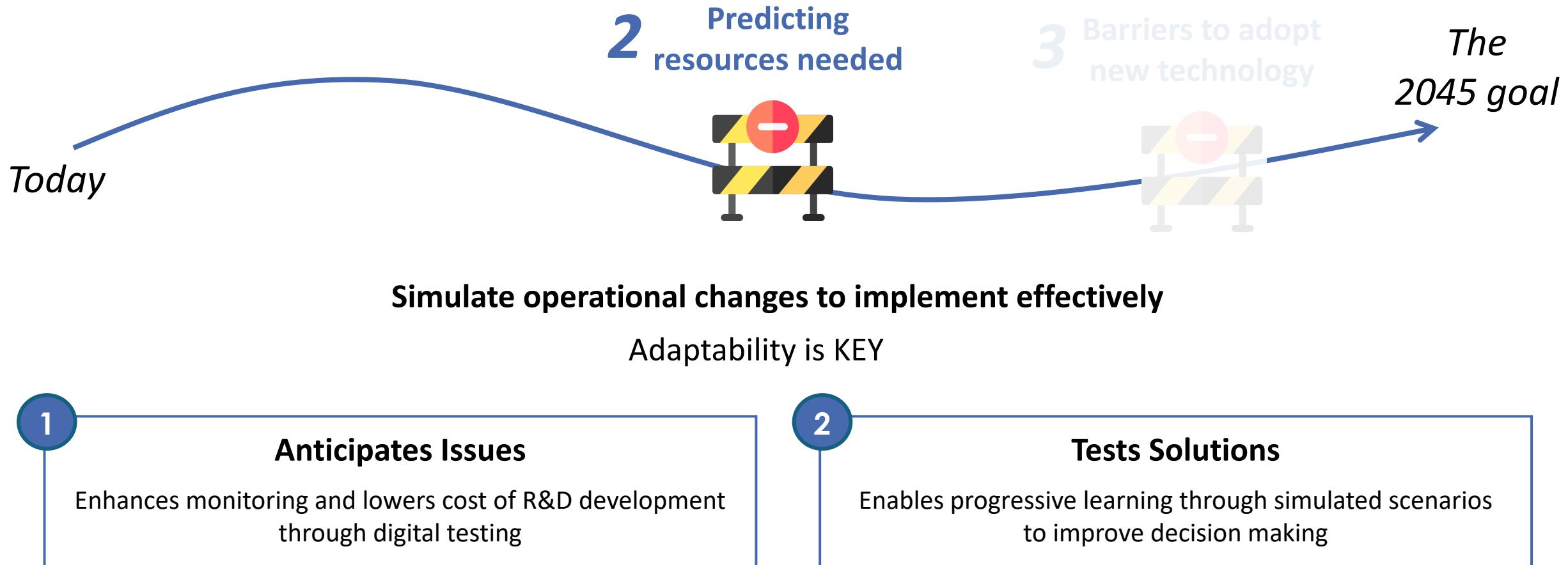


### Microsoft

Market leader and case study for other steel/metals producers

Source: GSM Tasks "Route Optimization impact on Fuel and Time"

# Simulate: Simulating innovation with **digital twin** to manage resources in a cost-effective and timely manner



Source: Accenture "[How Digital Twins Enable Manufacturing Advancements](#)," McKinsey "[What is Digital Twin Technology](#)"

# The transition to EAF presents a need for digital twin technology, uncovering potential issues to implementation



Uses natural gas by 2030, green hydrogen by 2045

Consider challenges in electrification and scaling EAF

## Without Simulate



2-3 years of testing



Risk averse industry

## With Simulate – Azure Digital Twin



2 weeks

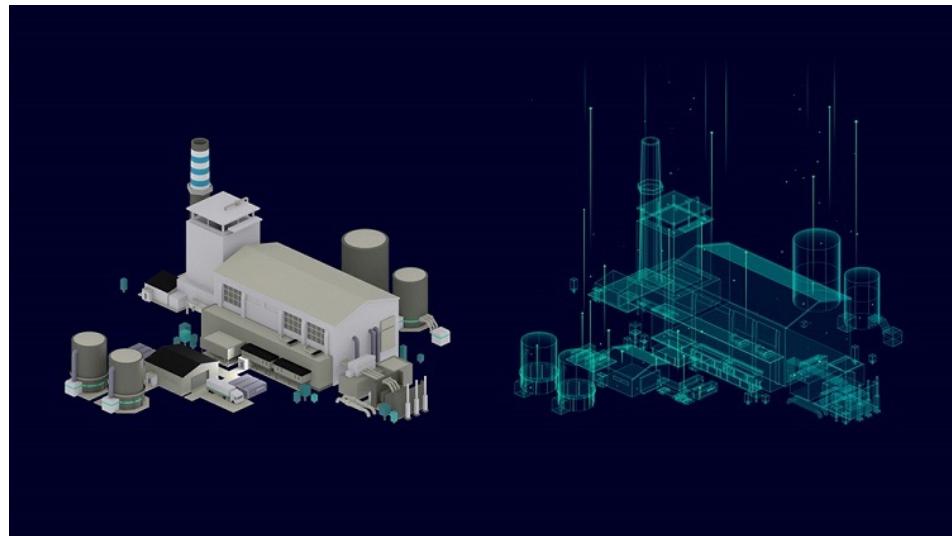
New testing time



35%

Improvement in maintenance and operations costs

Source: McKinsey "The DRI Dilemma," BCG "Creating Value With Digital Twins in Oil and Gas," EY "Metaverse and Sustainability"



## Case Study: Siemens' Power Plant

### *Virtual Power Plant*

Tests new turbines and energy storage before implementing

10%  
downtime reduction

Used Nvidia Digital Twin to improve efficiency and innovation

€1.7b  
saved in R&D and downtime

Source: Nvidia "[Siemens Industrial Digital Twin](#)"

# Simulate provides industry exposure and impact for Microsoft and efficiency



## Microsoft

### Tool Development

Digital platform is low-touch, high impact

### Industry Insight

Generating data and analytics benefits industry knowledge

### Develop Scale

Prove industrial application and greater ESG impact with steel

## Tata Steel

### Connective

Azure Digital Twins is compatible with IoT, query API, and Data services

### Accessible

Has templates and support to set up

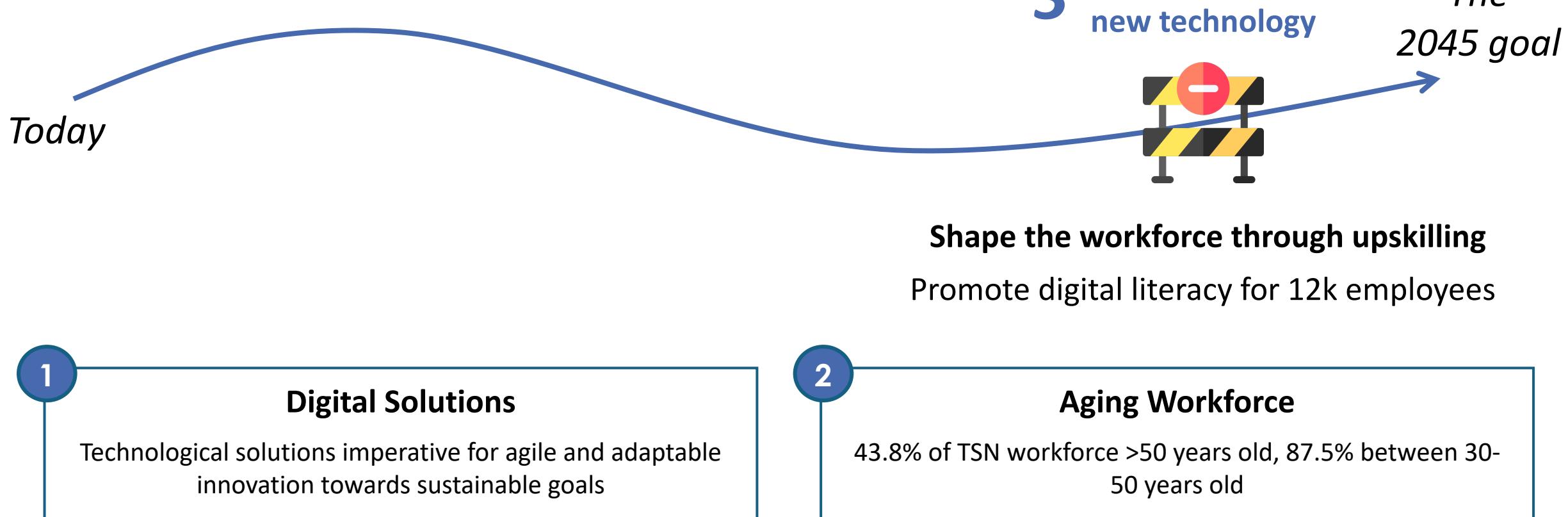
### Effective R&D

Iterative testing lowers risk and time to test, lowering barrier to new tech



Source: Microsoft "Azure Digital Twin," Accenture "How Digital Twins Enable Manufacturing Advancements,"

# **Shape:** Upskilling Tata's workforce to the digital transformation is key to shaping both Tata's and its employees' futures



Source: Tata "Sustainability Report 2023"

## Shape Platform: AI Digital Literacy Upskilling

Personalizes learning in engaging and effective way utilizing Microsoft 365 Copilot and Learning Accelerator platform to track learning and update curriculum



### Digital Solutions

Technological solutions imperative for agile and adaptable innovation towards sustainable goals



### Aging Workforce

43.8% of TSN workforce >50 years old, 87.5% between 30-50 years old

Source: Tata "Sustainability Report 2023"

# Integrating digital literacy into Tata's existing models through Microsoft Learning Accelerator and AI



## Current Programs



Safety trainings



Engineering



Technical knowledge

## Learning Accelerator

**Centralized** platform

**Measurable** progress

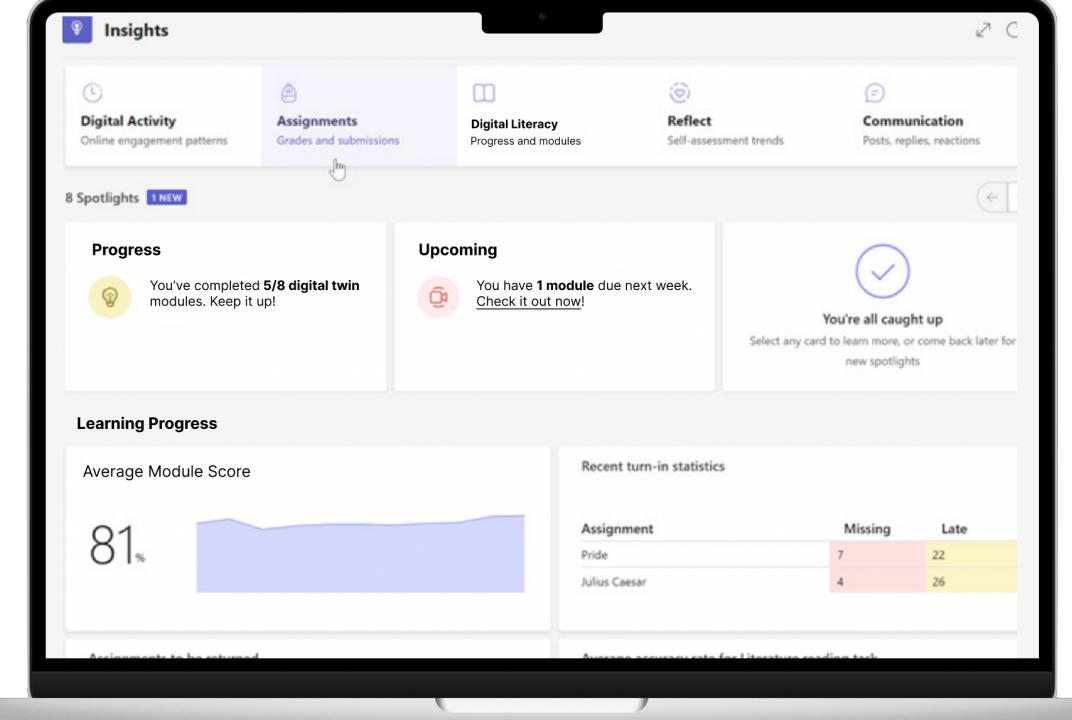
Interactive & **scalable**

## Copilot AI

**Customizable** learning

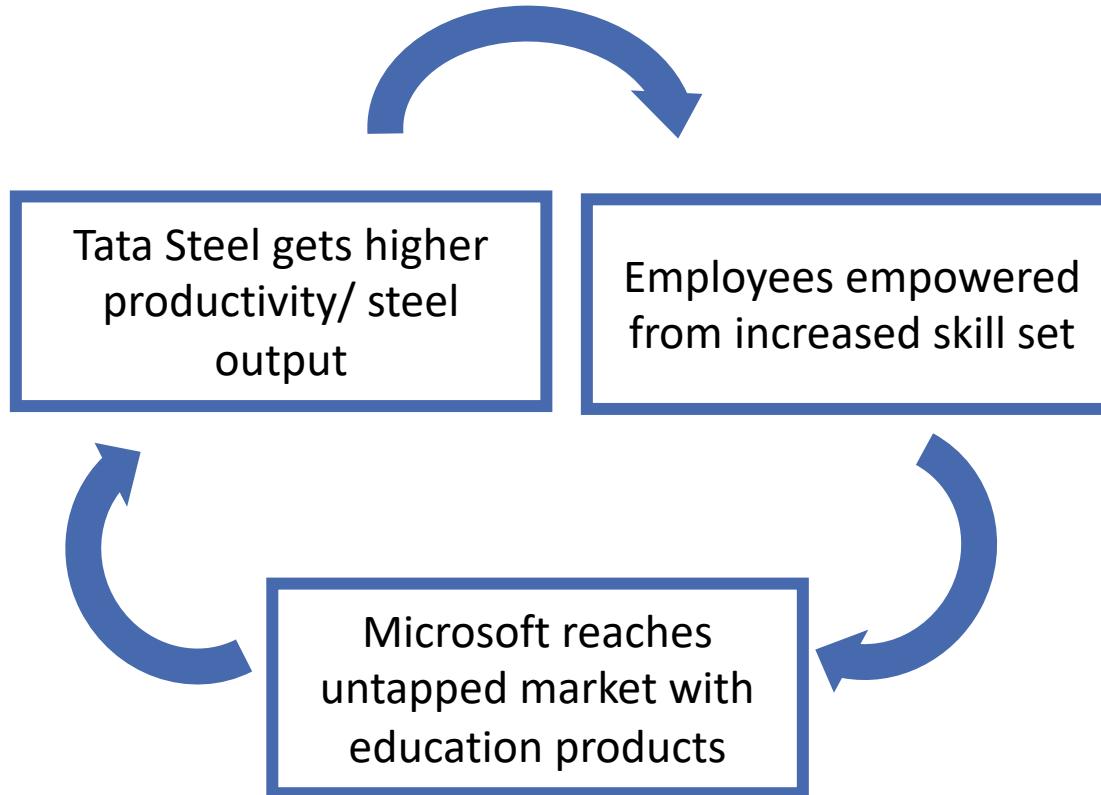
Continuous **feedback**

**Adaptive** tutoring



**Empower** digital literacy through **personalized** learning

# Tata Steel & Microsoft receive economic benefits via upskilling while empowering older employees to increase their skill set



## Outcomes

1

### Increased output

Greater understanding of technological products enables more effective use

2

### Larger customer base

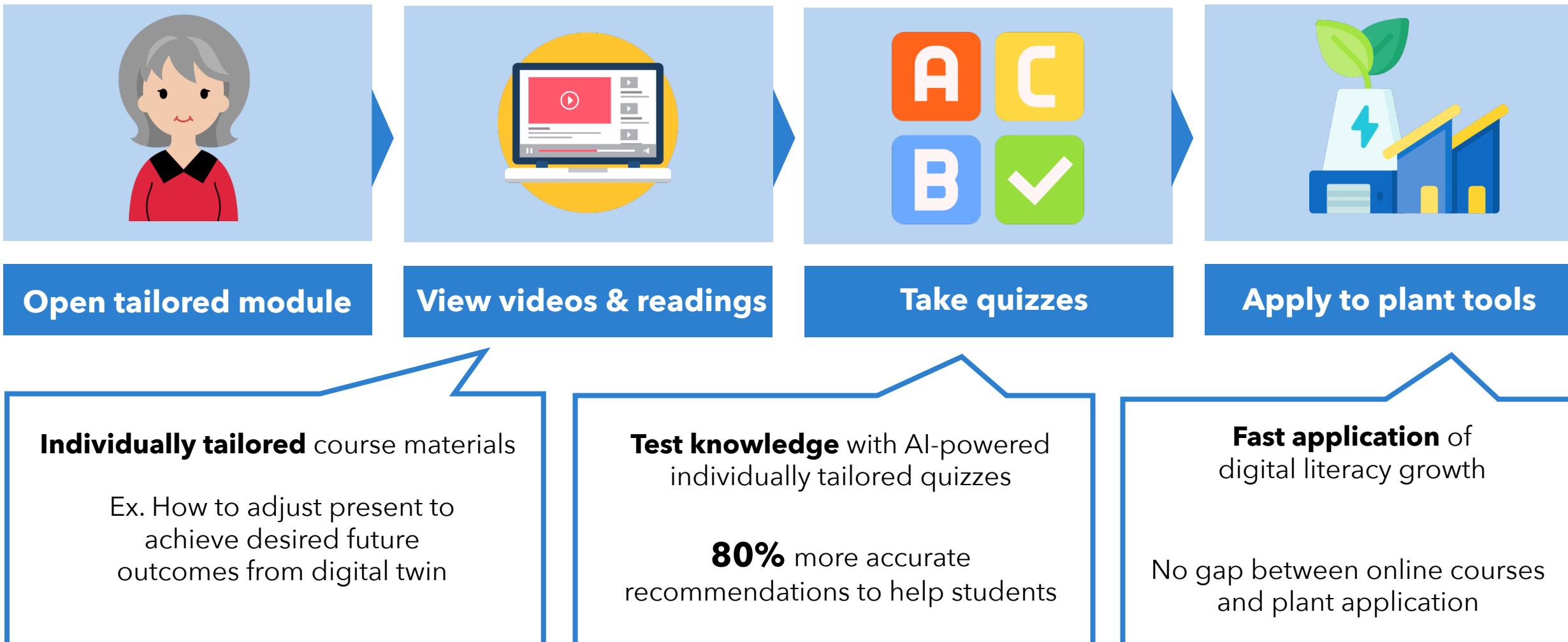
Education solutions typically tailored towards children, new market opportunity

3

### Sense of empowerment

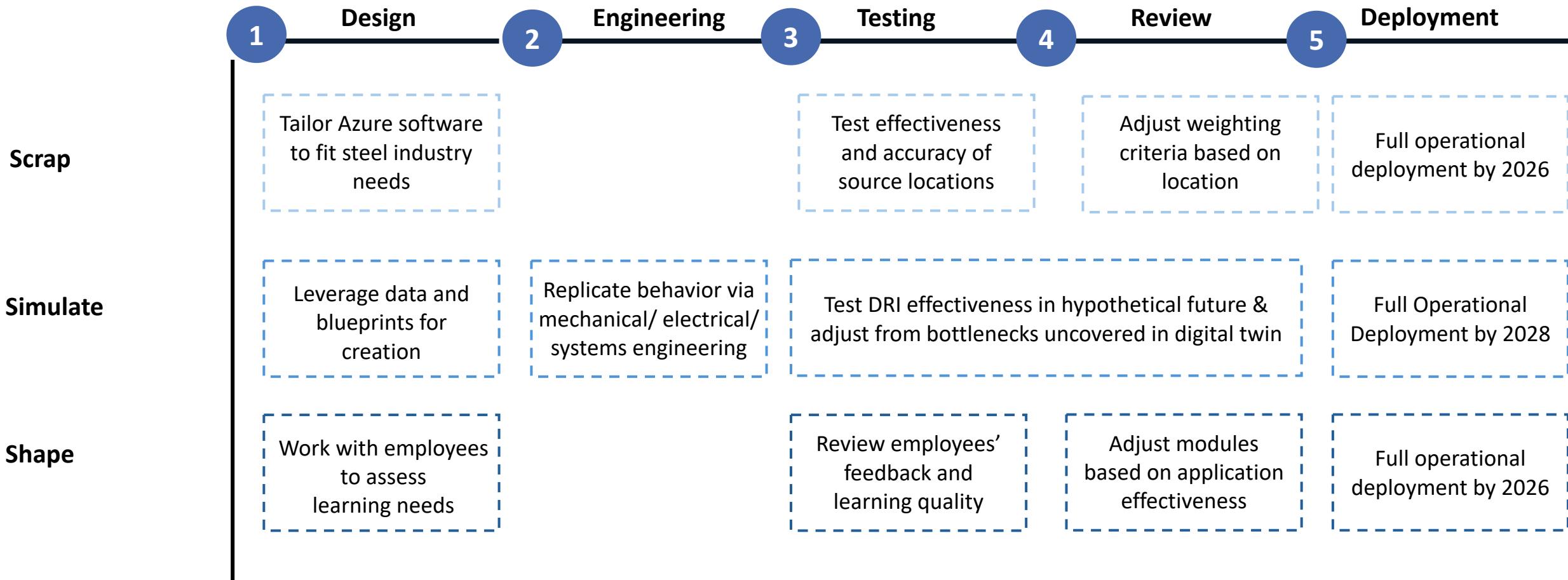
Employees typically suffer from lower digital literacy rates

# Meet Julia, a 56 year old Dutch employee in Tata Steel's Ijmuiden plant



Source: Axon Park "[AI Effectiveness in Education](#)"

# Scrap, Simulate and Shape can be launched with the following steps



1

## Incremental Scrap Steel Collected

**0.78 MT**

Tata Steel optimizes steel recovery by up to **5% annually**, allowing it to use **~23-28%** recycled scrap steel for production by 2030

2

## Costs Savings

**€900 M**

Costs savings generated by saving up to **35% through digital twin** utilization and reduction in operation costs by **10% in scrap steel recycling** optimization

3

## No. of Employees Upskilled

**4,100**

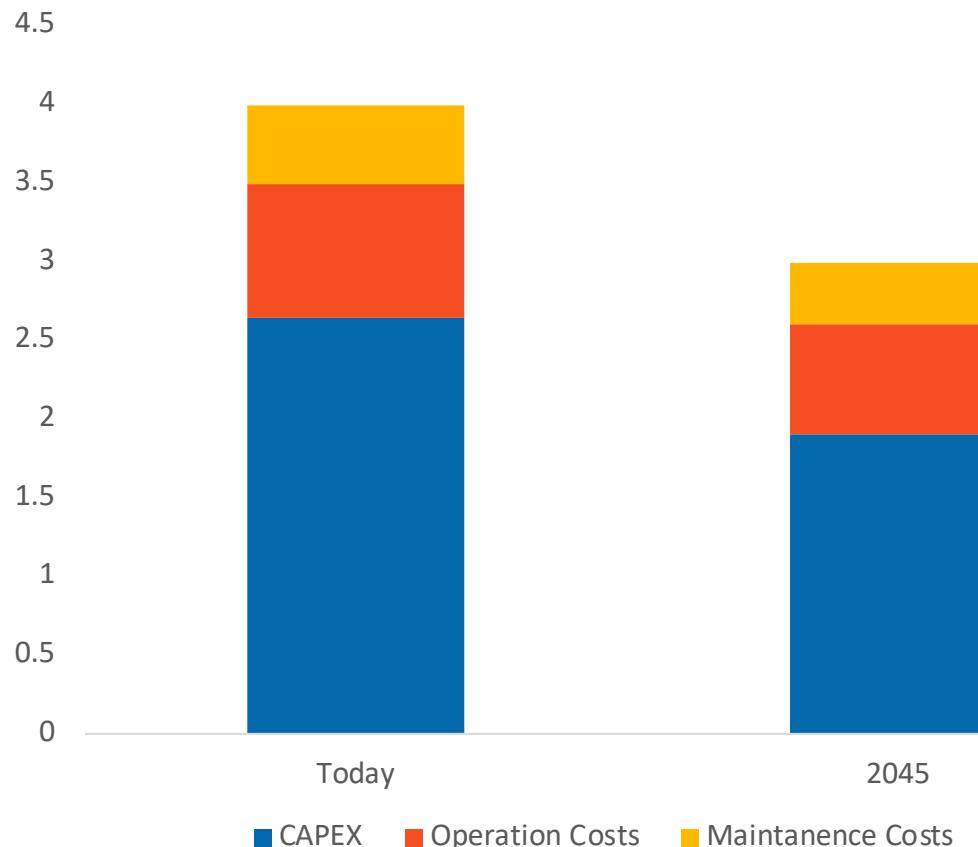
Empowering **digital literacy** to facilitate the green transformation of Tata Steel, representing 31% of the workforce.

**30.4 MT CO<sub>2</sub> Emissions Saved by 2045 in the rollout of Scrap, Simulate and Shape**

# Costs savings will increase by €0.9 B by 2045



## CAPEX and Operating Costs (€B)



## Commentary

**€ 528 M**

Reduction in CAPEX costs derived by more optimized simulation of building furnaces

**€ 122 M**

Reduction in Operation Costs based on 20% more optimal sourcing of steel scraps

**€ 211 M**

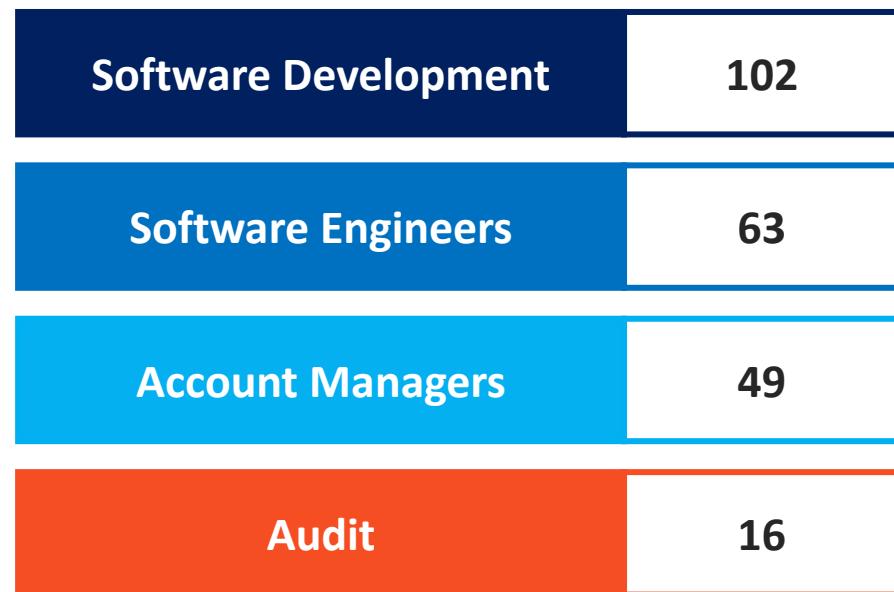
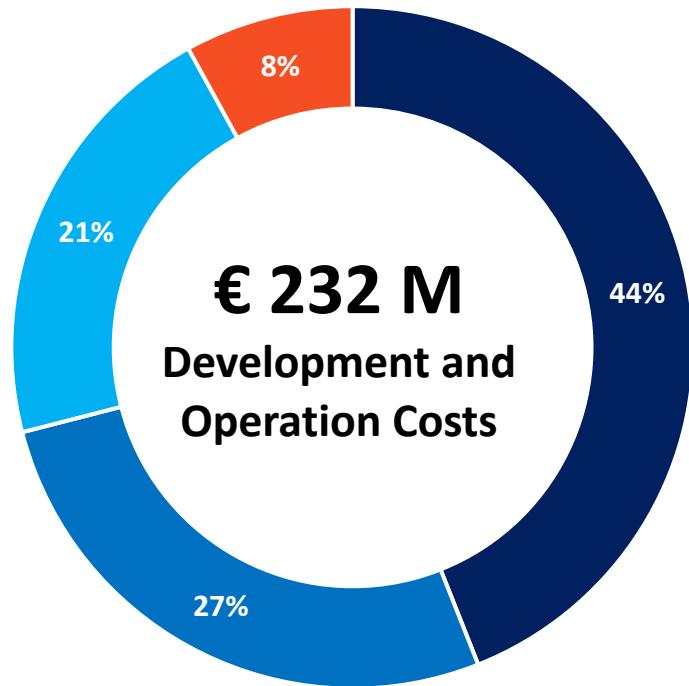
Reduction in maintenance costs based on up to 35% costs from utilizing digital twins

Source: McKinsey & Company, EY

Tata Steel will be able to develop and operate our strategy with an investment of € 232 M



### Projected Total Cost for Tata Steel and Microsoft (€M)



### Key Assumptions



Software developed on Microsoft Azure



~5 Engineers hired and maintained by Tata Steel to operate systems

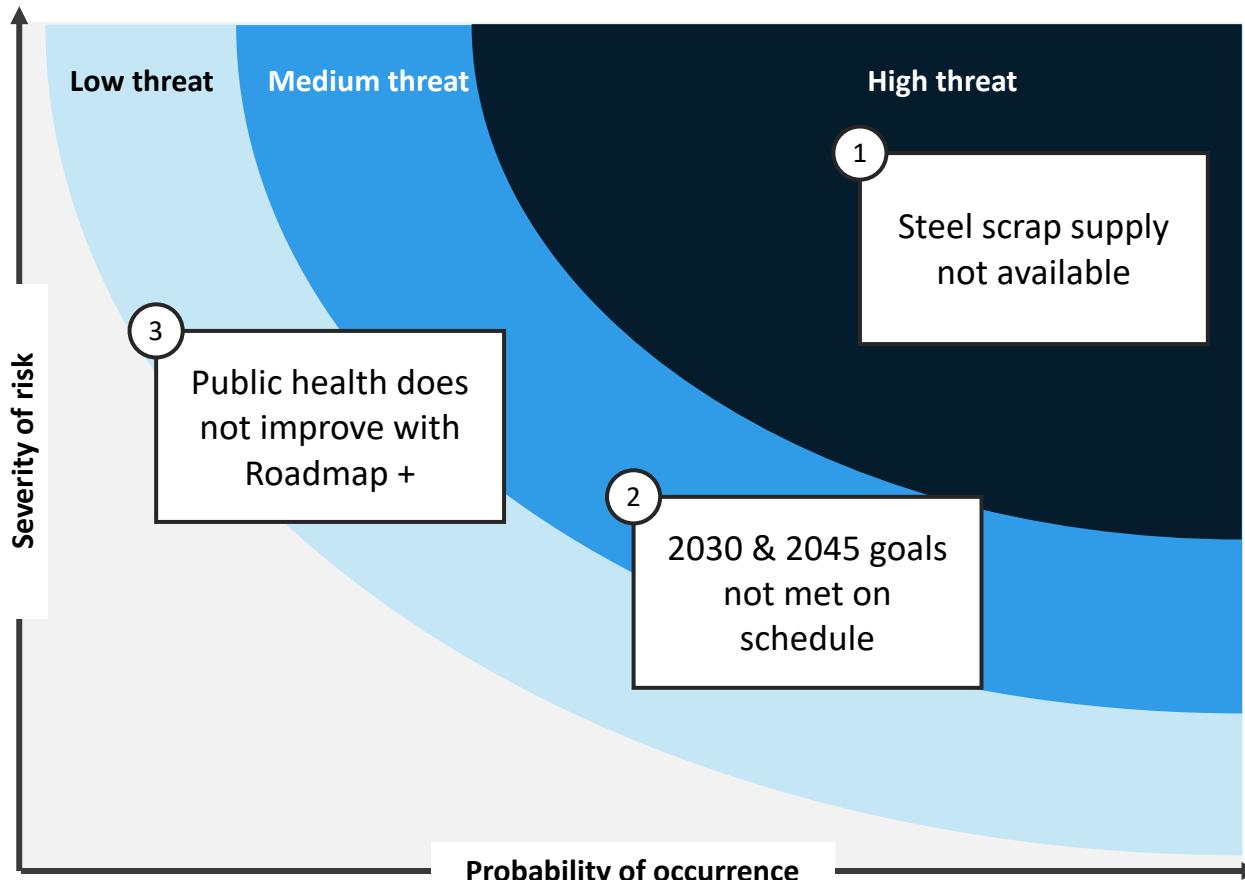


~3 Account managers hired to operate optimal sourcing of scrap steel

# Possible risks can be mitigated with cross-functional applications



## Risk Ranking



## Mitigation

- 1 Import EU steel with automotive partnerships**  
Look to external steel sources from large users and hedge by accelerating DRI investment
- 2 Accelerate testing with Simulate in other areas**  
Use digital twins in fuel and material testing, seek energy partnerships to boost green hydrogen availability earlier
- 3 Begin double EAF strategy earlier**  
Transition immediately to clean fuels, use by-products to do community projects ex. heating and slag housing

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# Appendix

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## SA

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[Alternatives Considered](#)

## Scrap

[Need for Scrap](#)

[Case Study: BHP](#)

[Outcomes and Synergies](#)

## Simulate

[Need for Simulate](#)

[Benefits via DRI Example](#)

[Case Study: Siemens](#)

[Mutual Benefit](#)

## Shape

[Need for Shape](#)

[Learning Platform](#)

[Outcomes for All Parties](#)

[Employee Example](#)

## Impact

[5 Step Implementation](#)

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## Appendix

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[BHP Group x Microsoft Azure cont'd](#)

[Predictive Analytics](#)

[Unstable Scrap Recovery](#)

[DRI Details vs. Blast Furnace](#)

[Microsoft Azure Digital Twin](#)

[Use of IoT data to Simulate](#)

[Upskilling Case Study](#)

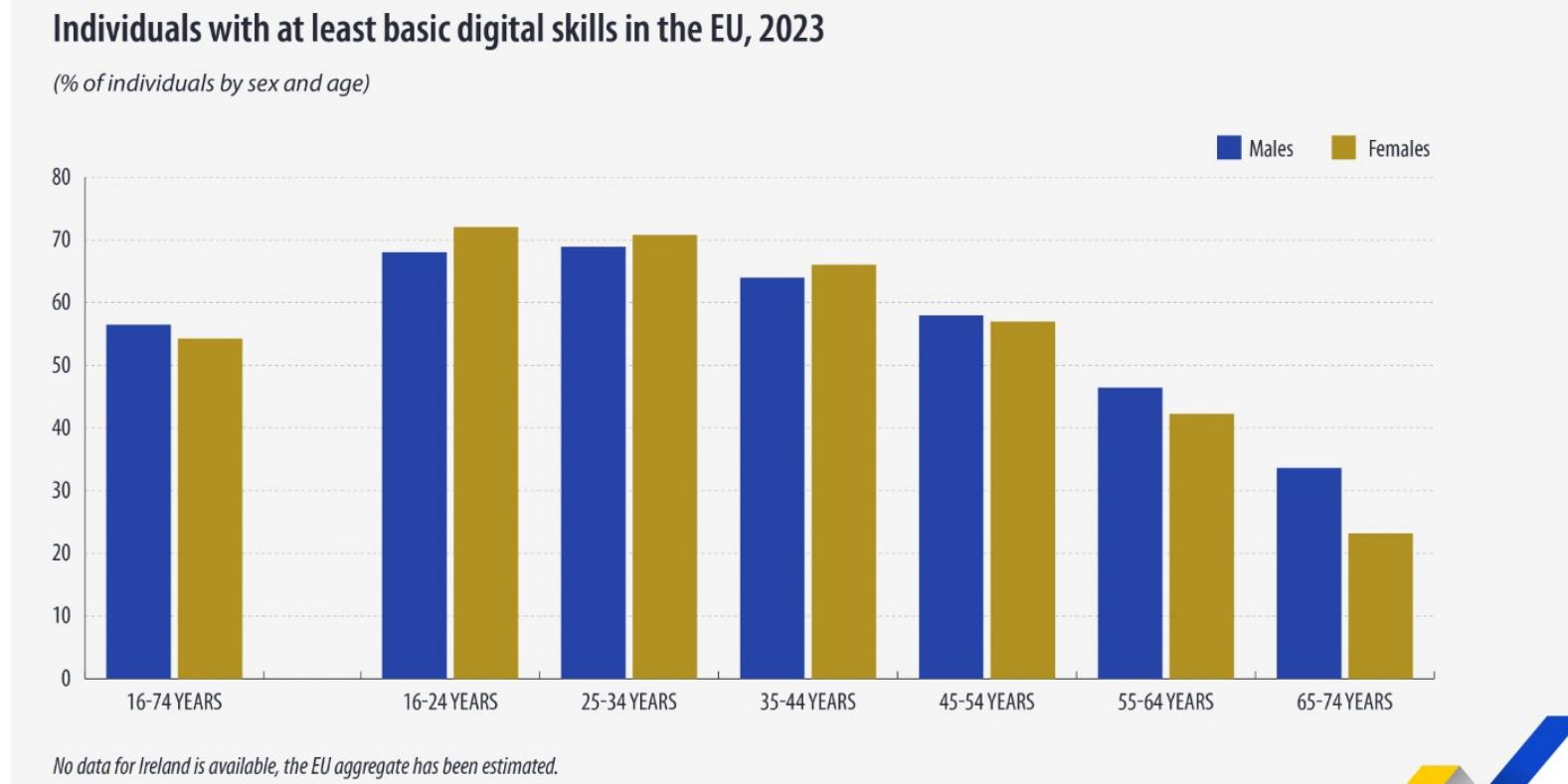
[Relevant Courses for Upskilling](#)

[Digital Literacy Rate](#)

[Incremental Scrap Steel Collected](#)

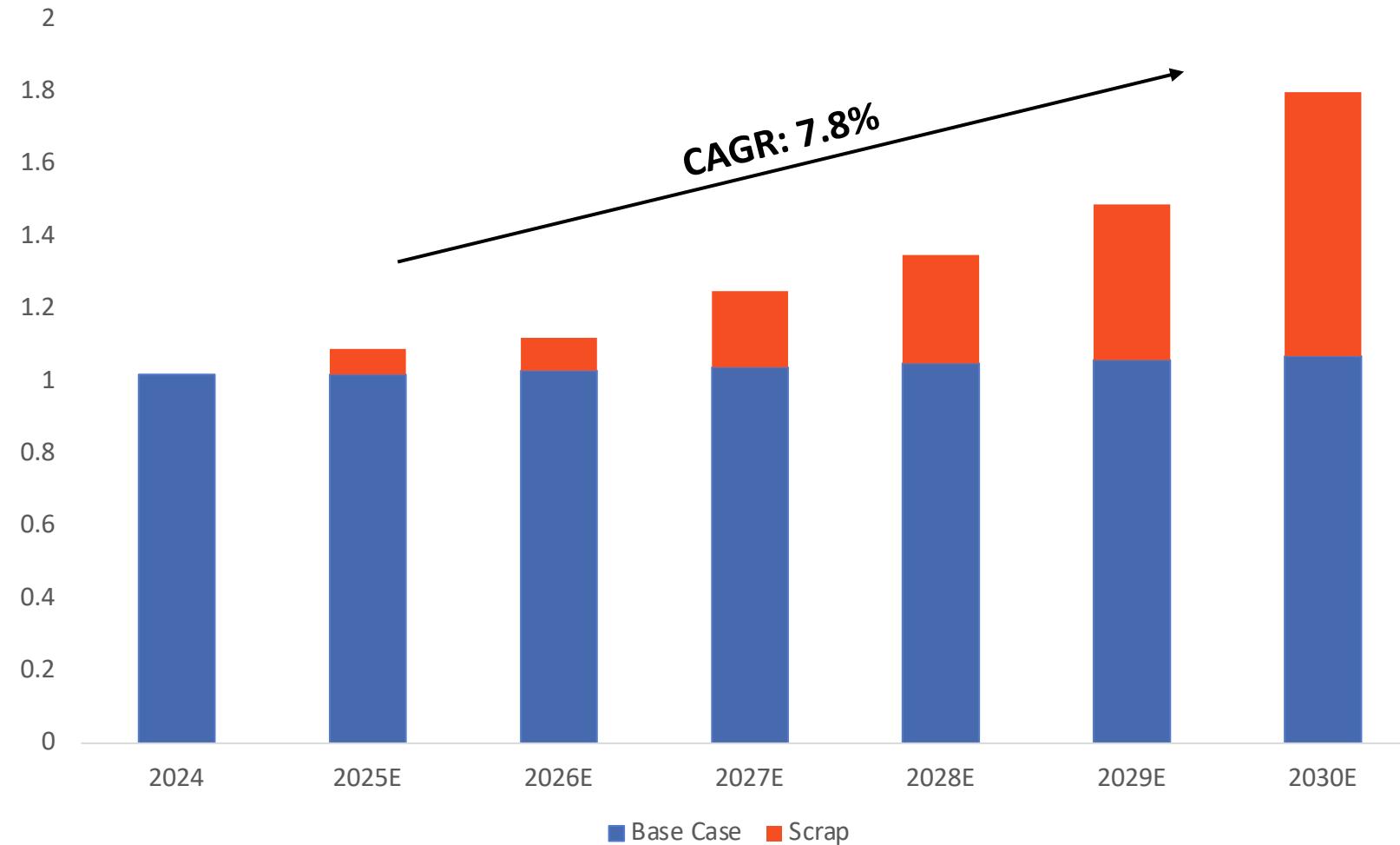
[What to do Tomorrow](#)

# Digital Literacy Rate



eurostat

# Incremental Scrap Steel Collected (MT)



## CO2 (MT) Emissions Saved

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**14 MT**

Reduction in CO2 Emissions  
arising from Scrap



**16.4 MT**

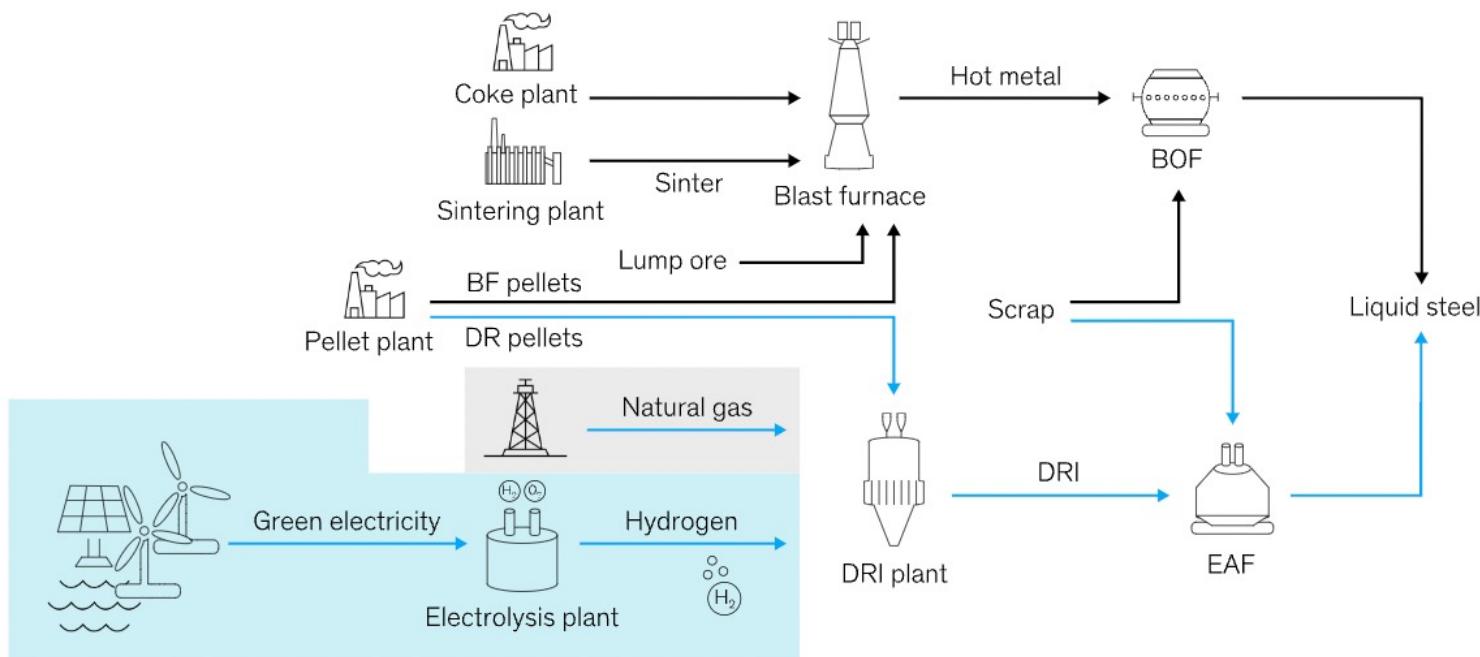
Reduction in CO2 Emissions  
arising from Simulate

Source: Pixel Consultants

**DRI is typically used in electric arc furnaces (EAFs), while blast furnace pig iron is consumed in basic oxygen furnaces (BOFs).**

— Conventional BF-BOF route   — DRI-EAF route   ■ Current DRI practice—natural gas as reduction agent   ■ Hydrogen-based alternative to natural gas<sup>1</sup>

Blast furnace (BF) and DRI steelmaking routes



## Blast Furnace:

- Energy-intensive, uses coke derived from coal, leading to significant CO<sub>2</sub> emissions.
- Produces molten "pig iron" high carbon content, requiring further refining to remove impurities and adjust carbon content for steelmaking.

## Direct Reduction:

- Lower carbon content
- More energy-efficient, especially with cleaner reducing agents like hydrogen

## Key Features



Platform as a Service



Pre-built templates



Spatial intelligence



Predictive Analytics

## Compatibility



**REST API**



## Key Benefits

Optimize production

Monitor equipment performance

Scenario Planning

1

## Aggregate data from collection sites

Build analytical model

2

## Sync IoT

Create real world inputs to simulation

3

## Assess digital gap to implement other strategies

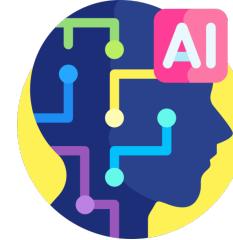
Work with Microsoft to develop platform





## Reason for Partnership

Declining new deposit discoveries  
= need increased recovery from  
existing depositories

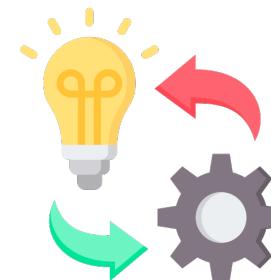


**Technology Specifics**  
AI and ML from Azure  
Machine Learning



## Microsoft Use

- Real-time data → hourly predictions
1. Optimize machine performance
  2. Remove inefficiencies
  3. Identify hazards



## Outcomes

Reduced operational expenditure  
and increased metal recovery

Simulate will turn real time IoT data into **actionable insights and implementation** for innovation



### Blueprint Development

*Build base blueprint with IoT linkage to get base case data in present*

### Testing and Validating

*Test new DRI plant and model various risks with real time updates*

### Optimize and Monitor

*Process optimization and troubleshooting in low cost, low risk environment*



Digital twin uses real time data and information to simulate and optimize innovation

1

### Lecture Video

"Azure IoT Hub and  
Digital Twins for  
Steel Industry Applications"

20 minute video

2

### Quiz

1. Imagine you're implementing  
a digital twin solution for a steel  
manufacturing plant.

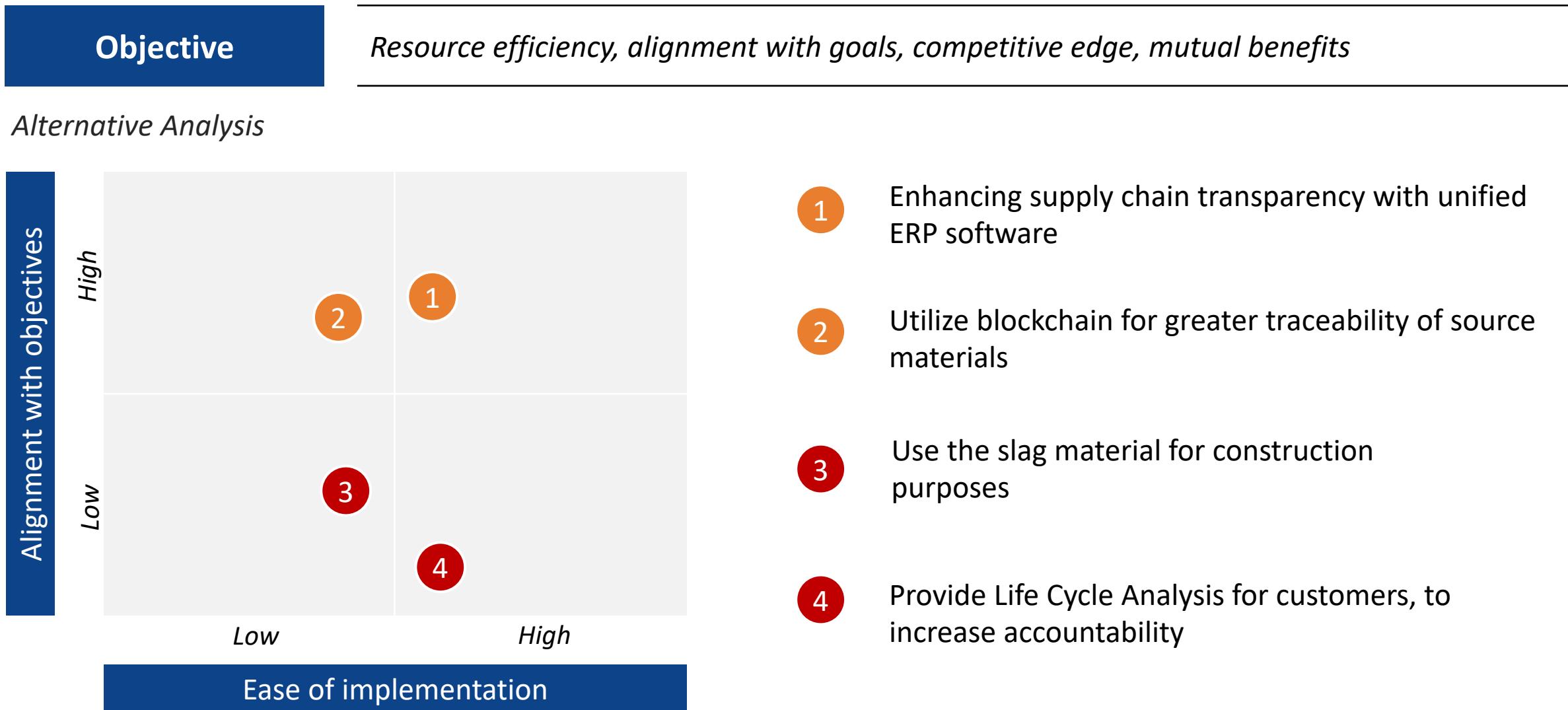
Which of the following  
applications would benefit the  
most from this technology?

3

### Case Reading

"Digital Twins: Transforming  
Steel Manufacturing  
Processes" from Harvard  
Business School 6 pages

# Alternatives Matrix / other solutions considered



## Objective

Upskill employees to empower them to nurture innovation and sustainable transformation

# Henkel

Digital upskilling program for targeted learning and flexibility

## Key Features

1

### 272% higher engagement

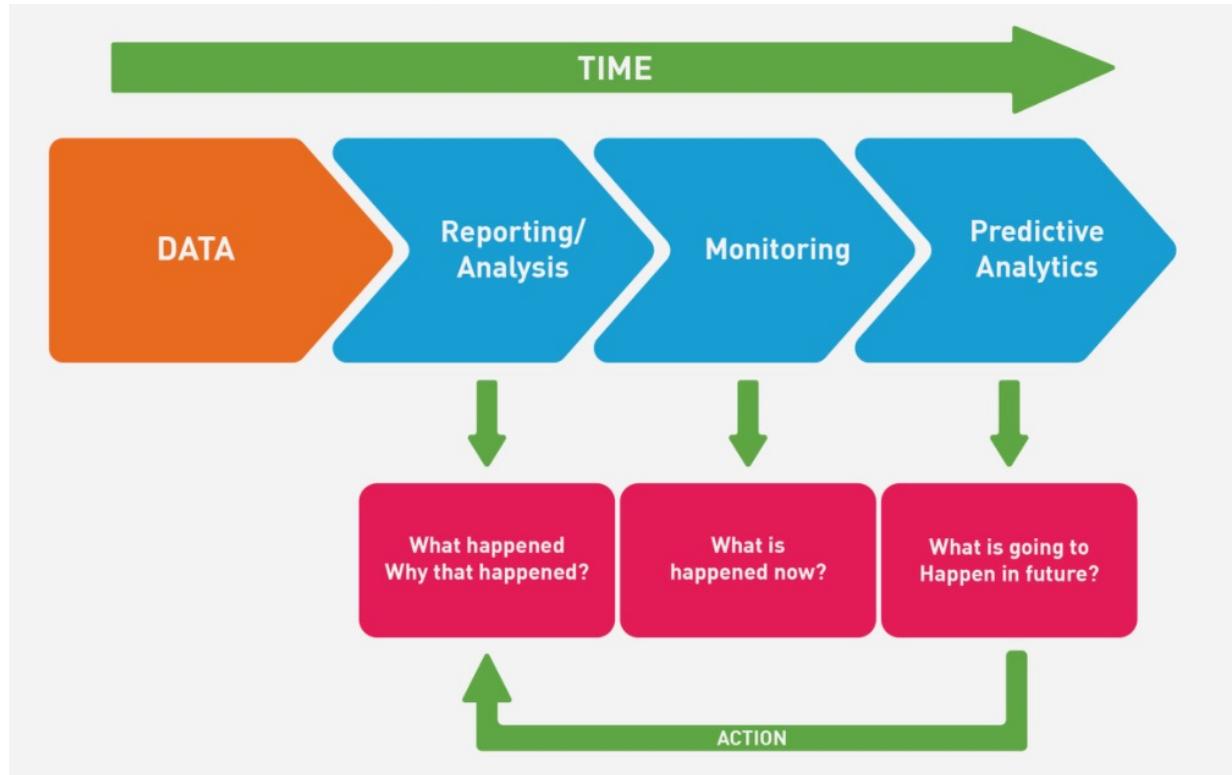
*Personalized learning empowered employees to learn*

2

### Enables digital transformation

*Powers digitalization through skill building*

# How does predictive analytics work?



Look at historical data from past collection sites in logbooks

Monitor current collection sites and feed data into Azure

Launch Azure program to make future decisions regarding steel scrap sourcing

# Why is steel scrap recovery unstable?

**Exhibit 1 - Scrap Demand Is Projected to Grow ~3.3% Through 2030; However, Scrap Supply Is Likely to Lag Demand**



**Scrap demand will outpace supply**

**By 2030, today's 9 million metric ton steel surplus will become a 15m deficit**

**Global scrap trade will fall by 15% by 2030, important to become self-reliant**

Source: BCG "Shortfalls in Steel Scrap"