



KPMG AI RESEARCH · A GLOBAL INDUSTRY VIEW

Industrial AI in Mining

Where it is being adopted, which majors are capturing the impact, and how they are organized to do it

KPMG AI Research · October 2026

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Contents

INDUSTRIAL AI IN MINING / REPORT INDEX

00	Questions and context	03	04	What to expect between now and 2030	28
01	AI across the mine	06	05	Making AI operational	32
02	Value in production	12	06	KPMG AI Research	36
03	Who is capturing the impact	17		Research function	40

Industrial AI in Mining

- 01** Where is industrial AI being adopted in mining, and on what themes?

- 02** Which mining majors are emerging as leaders through AI impact capture?

- 03** What trends, expectations and operating models should shape AI deployment in mining?

Strong balance sheets, weak AI fitness

Output per worker in mining has fallen since 2020, and 39% of mining employers expect talent shortfalls to hinder their transformation. The money is there; the capability is not.

US\$909B

Revenue of the world's top 40 miners in 2025, up 3.3%; net profit US\$120B

Lowest

Mining's AI-fitness score in a study of 1,200+ companies: the lowest of any sector

7.2x

The AI-driven performance boost of the most AI-fit companies versus their peers

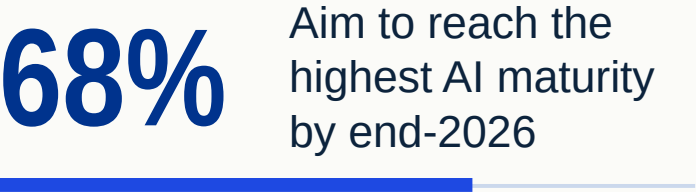
40%

Mining CEOs who say their company's technology performance is below expectations

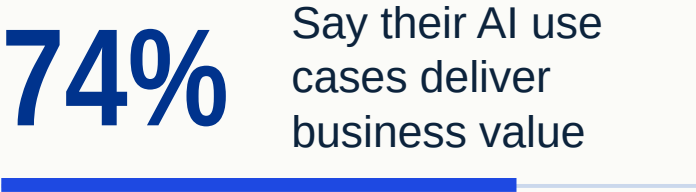
Ambition versus reality, cross-industry

KPMG Global Tech Report 2026, share of organizations surveyed (%)

AI MATURITY



BUSINESS VALUE



INVESTMENT AND TALENT

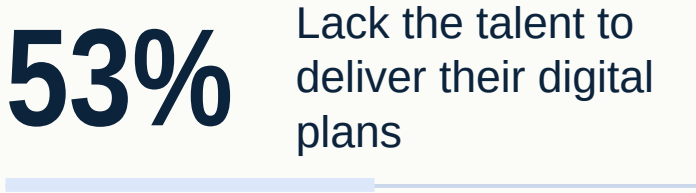
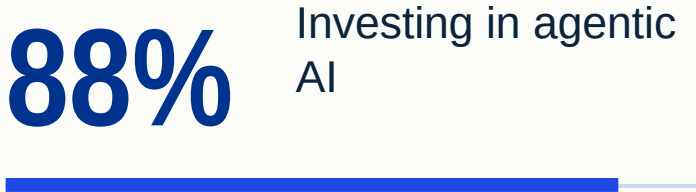


Chart: KPMG Global Tech Report 2026.

AI across the mine

Conceptual illustration

Eight themes where industrial AI is being adopted

01

Exploration and geoscience

Machine learning on integrated geological, geochemical and geophysical data to target drilling and shorten discovery cycles.

KoBold Metals, BHP Xplor

02

Mine planning, drill and blast

AI-designed blast patterns, short-interval scheduling and grade control that lift fragmentation and cut dilution.

Teck

Eight themes where industrial AI is being adopted

03

Autonomous haulage, drilling and rail

Fleet-scale autonomy run from remote operations centres; mixed fleets coordinated by one fleet management system.

Rio Tinto, Fortescue, Komatsu, Caterpillar

04

Processing plant control

Models that set flotation, grinding and leach parameters in real time against changing ore. The largest single value pool.

Vale, BHP, Freeport-McMoRan, Teck

Eight themes where industrial AI is being adopted

05

Asset health and maintenance

Failure prediction from telemetry on trucks, mills and conveyors; maintenance planned on condition rather than calendar.

Teck, Newmont

06

Safety, geotechnical and tailings

Computer vision, fibre-optic and satellite sensing; exposure removed by tele-remote and autonomous operation.

Rio Tinto, Anglo American, Boliden

Eight themes where industrial AI is being adopted

07

Energy, water and emissions

AI-optimized concentrators and desalination; fleet electrification designed around autonomy.

BHP Escondida, Fortescue

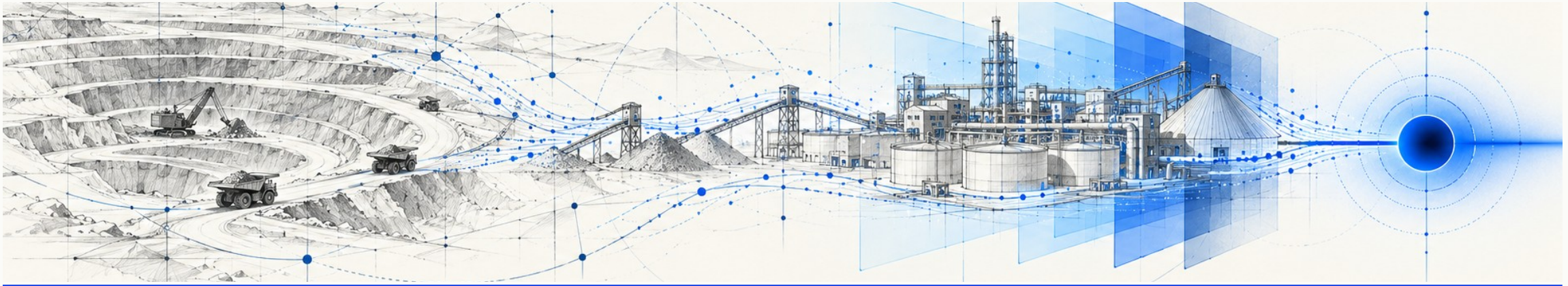
08

Enterprise and knowledge AI

Copilots and agents for geoscience records, procurement, forecasting and critical processes.

Codelco, BHP, Anglo American

AI across the mining value chain



VALUE CHAIN

01 Exploration and geoscience

02 Mine planning, drill and blast

03 Autonomous haulage, drilling and rail

04 Processing plant control

CROSS-CUTTING LAYERS

05 Asset health and maintenance

06 Safety, geotechnical and tailings

07 Energy, water and emissions

08 Enterprise and knowledge AI

Value in production

Conceptual illustration

Documented impact, from the public record

Theme / Company and program

Processing control

**Vale · Conceição II model plant,
Itabira**

Impact captured

Productivity +25% in under two years; capacity 9 to 11.2 Mt/yr; iron in waste down 26%; about R\$200M spent

Processing control

BHP · Escondida concentrators

Recovery +0.3%, worth about US\$19M; 118 GWh of energy and 3.5 GL of water saved since FY22

Documented impact, from the public record

Theme / Company and program

Processing and leach analytics

Freeport-McMoRan · Americas

Impact captured

Bagdad: output +5%, throughput +10%, recovery +1 percentage point; leach initiatives at about 240 Mlb/yr, 300 Mlb/yr targeted by end-2026

Mine and plant optimization

Teck · RACE21

C\$450M from mine optimization, C\$300M from processing; throughput up to +9%, recovery up to +3% at certain sites

Documented impact, from the public record

05 Autonomous haulage

Fortescue · Pilbara hubs

Productivity +30%; 200+ autonomous trucks;
3,000 people trained under a no-displacement
commitment

06 Autonomy and rail

Rio Tinto · Pilbara

Haulage cost about 15% lower, about 700 extra
operating hours per truck per year; AutoHaul
carried 326 Mt in 2025

Documented impact, from the public record

EXPLORATION

KoBold Metals · Mingomba, Zambia

247 Mt

at 3.64% Cu

~5 years

discovery to construction

300 kt/yr

planned from a US\$2.3B build

Units in this section: Mlb = million pounds of copper; GL = gigalitres; Mt = million tonnes.



SECTION 03 / LEADERS

Who is capturing the impact

03

Which majors lead through impact capture

Company

Vale

Stage · Industrial scale

Where it leads

Plant-wide AI control

Impact captured

+25% productivity at the Itabira model plant; replication across Brazil under a Vale-ABB alliance (Aug 2026)

Operating signature

Model site first, then copy with an OEM partner

Company

Freeport-McMoRan

Stage · Industrial scale

Where it leads

Yield from existing assets

Impact captured

Bagdad +5% with minimal capital; leach initiatives at about 240 Mlb/yr run rate, 300 targeted

Operating signature

Analytics on sunk assets, central data, no new mine

Which majors lead through impact capture

Company

BHP

Stage · Industrial scale

Where it leads

Enterprise AI ecosystem

Impact captured

+0.3% recovery (about US\$19M), 118 GWh and 3.5 GL at Escondida; 500,000 leach molecules screened with Microsoft

Operating signature

Industry AI Hub in Singapore; partners: Microsoft, KoBold, AI Singapore

Company

Rio Tinto

Stage · Industrial scale

Where it leads

Autonomy at scale

Impact captured

About 15% lower haulage cost; AutoHaul 326 Mt in 2025; highest first-half Pilbara output since 2018

Operating signature

Two decades of incremental investment; Perth operations centre

Which majors lead through impact capture

Company

Fortescue

Stage · Industrial scale

Where it leads

Fleet autonomy, OEM-agnostic control

Impact captured

+30% productivity; 200+ autonomous trucks; zero-emission autonomous fleet with Liebherr

Operating signature

Co-develop with the OEM; train the workforce first

Company

Teck

Stage · Industrial scale

Where it leads

Analytics across mine and plant

Impact captured

RACE21: C\$450M mine, C\$300M plant; up to +9% throughput, +3% recovery

Operating signature

One enterprise program with a named dollar target

Which majors lead through impact capture

Company

Anglo American

Stage · Building

Where it leads

Governance and generative AI

Impact captured

AI Centre of Excellence; emerging-technology team on ROI use cases; remote operations removed 22,500 exposure hours

Operating signature

The CoE sets the standard, sites deploy

Company

Codelco

Stage · Building

Where it leads

Enterprise adoption at scale

Impact captured

5,500 Copilot licences, 600 digital promoters, agents on critical processes; Microsoft MOU (Mar 2026)

Operating signature

Ethics framework first, then scale; joint governance with the partner

Where mining leaders focus

INDUSTRIAL SCALE

Vale

Plant-wide AI control

BHP

Enterprise AI ecosystem

Fortescue

Fleet autonomy, OEM-agnostic control

Freeport-McMoRan

Yield from existing assets

Rio Tinto

Autonomy at scale

Teck

Analytics across mine and plant

BUILDING

Anglo American

Governance and generative AI

Codelco

Enterprise adoption at scale

Stages reflect the published company programs and outcomes summarized in this report.

Three leaders, three routes to captured value

VALE · THE MODEL PLANT

+25%

productivity at Conceição II in under two years



Conceptual illustration

What they did

Modernized one ordinary plant in Itabira for about R\$200M over 18 months.
An AI layer supervises 400+ variables and adjusts the process in real time to the ore.
7,300 instruments automated, 100+ cameras, remote operation; iron in waste down 26%.

Why it worked

One site, full instrumentation, process governance, then an OEM alliance with ABB to replicate.

Three leaders, three routes to captured value



Conceptual illustration

FREEPORT · SUNK-ASSET YIELD

~240 Mlb

of copper per year from leach and analytics initiatives, heading to 300

What they did

Machine learning on sensor data at Bagdad lifted output 5% with almost no capital. The method was rolled across the Americas concentrators. Additives, heat and data-driven recovery now pull copper from existing leach stockpiles.

Why it worked

They aimed AI at sunk assets, where a point of recovery costs nothing to build.

Three leaders, three routes to captured value

BHP · THE ENTERPRISE ECOSYSTEM

118 GWh

of energy and 3.5 GL of water saved at Escondida since FY22, plus 0.3 points of recovery



Conceptual illustration

What they did

A central Industry AI Hub in Singapore (May 2025) with AI Singapore and Enterprise Singapore.

A partner network: Microsoft for plant control and molecular discovery, KoBold for exploration.

AI now in day-to-day operation across copper, iron ore and rail.

Why it worked

One enterprise capability, many sites, and partners for what they will not build.

Six habits of the miners that capture impact

01

Processing first

The plant is where the money is. Recovery points compound; haul trucks are visible, concentrators pay.

02

One data foundation, tied to enterprise KPIs

Vale governs 400 variables from one platform. That common data foundation ties plant decisions to enterprise KPIs.

03

Central control, site ownership

Remote operations centres run fleets and plants from Perth; the site still owns the number.

Six habits of the miners that capture impact

04

Partner, do not build alone

Vale and ABB. BHP and Microsoft. Fortescue and Liebherr. Codelco and Microsoft. Freeport and its analytics partner.

05

Model site, then replicate

Itabira before all of Brazil. Bagdad before the Americas. One proof under process governance, then the copy.

06

Count it in finance's units, train people before trucks

Teck named the dollars. BHP reported US\$19M. Fortescue trained 3,000 people before the fleet went driverless.

What to expect between now and 2030

04

What to expect between now and 2030

01

From advice to action

Routine, high-frequency decisions get made by the system without a meeting: closed-loop plant control, automated scheduling.

Productivity rises fastest where AI makes routine decisions unaided. Vale's AI layer already adjusts the plant in real time.

02

Agents enter the operation

OEM agents run equipment, enterprise agents run processes, and workforces are redrawn around humans plus agents.

Sandvik's Sandi agent; Codelco's process agents; 88% of organizations are investing in agentic AI (KPMG Global Tech Report 2026).

What to expect between now and 2030

03

Autonomy becomes standard, and electric

Autonomous fleets ship as OEM product and electrification is designed around them, not bolted on later.

Komatsu FrontRunner: 1,000 trucks, 11.5 Bt moved. BHP, Rio Tinto and Caterpillar battery-electric trial (Jun 2026). About 4,000 autonomous mining vehicles already run in China.

04

AI-native exploration and metallurgy

Discovery in years rather than decades; reagents and leach chemistry found by simulation before the lab.

Mingomba: discovery to construction in about five years. BHP and Microsoft screened 500,000 molecules for copper leaching.

What to expect between now and 2030

05

Data quality becomes an asset-value lever

Assets with transparent, high-quality data are easier to value, integrate and transact in a consolidating sector.

Buyers, lenders and the market pay for assets they can read. Data quality matters when mines change ownership or enter joint ventures.

KPMG Global Tech Report 2026 for the cross-industry figures.

06

The expectation reset

Boards want returns across several use cases and governance before scale. Pilots no longer count as progress.

Only 24% achieve ROI across multiple use cases (KPMG Global Tech Report 2026). Anglo American's AI Centre of Excellence; Codelco's ethics framework before rollout.

Making AI operational

Conceptual illustration

How the leaders organize for AI

01 Central hub, site deployment

A group AI capability sets standards, builds shared platforms and holds the partnerships; sites deploy and own the outcomes.

BHP Industry AI Hub · Anglo American AI CoE

02 Model site, then replicate

One fully instrumented plant or mine proves the method under process governance, then an OEM alliance copies it.

Vale Conceição II with ABB · Freeport Bagdad to the Americas

03 OEM-integrated autonomy

Fleet autonomy bought or co-developed with the OEM, run from a remote operations centre, workforce retrained into controllers.

Rio Tinto with Komatsu and Caterpillar · Fortescue with Liebherr

Four accountabilities every model needs

01

Evaluation: who decides a model is good enough, and against what standard

02

Approval: who signs off before it informs a real decision

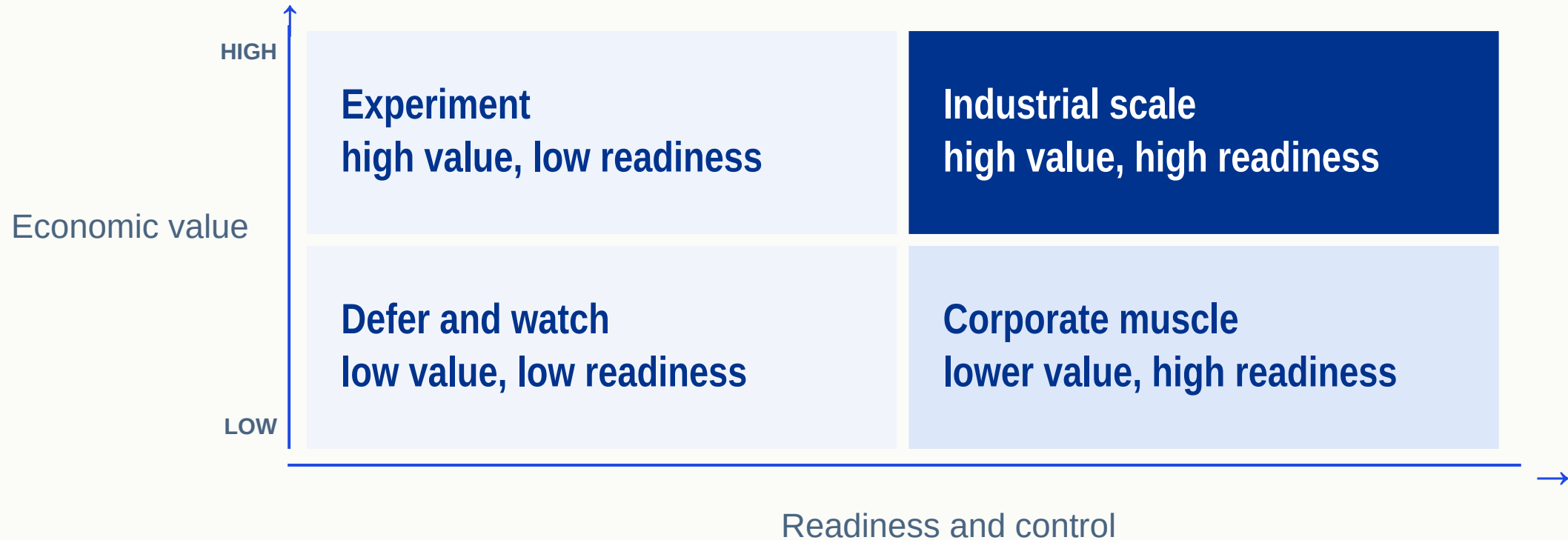
03

Deployment: who is accountable once it is live in the workflow

04

Governance: who audits the decisions it touches, and how often

The KPMG portfolio lens



Portfolio lens and the four accountabilities: KPMG AI Research.

KPMG AI Research in mining and heavy industry

KPMG AI RESEARCH

The firm's research function on how AI should be built, governed and trusted: what is real, what is hype, and what it is worth.

01 RESEARCH RELATIONSHIPS

Research collaboration with the National Research Council of Canada; working relationships with the Vector Institute and the University of Toronto.

02 VALUE-DRIVEN AI FRAMEWORK

Author of KPMG's Value-Driven AI Framework (VAIF): strategy and value alignment, then platform, data and delivery, then AI experiences and outcomes, ending in Trusted AI-enabled enterprise value.

03 GLOBAL EVIDENCE

KPMG Global Tech Report 2026, and the KPMG Global Mining Network across the major mining jurisdictions.

KPMG AI Research in mining and heavy industry

01

From Orebody to Enterprise Intelligence

Executive strategy session for the leadership of a Latin American integrated mining and metals group: where AI changes decisions from orebody to enterprise, and the governance that keeps it safe.

02

Exploration data in the aggregate

Research with a top-three diversified miner's exploration group and the National Research Council of Canada: a common exploration-data schema, an aggregate-value study and a data-democratization policy paper.

KPMG AI Research in mining and heavy industry

03

AI Foundations

AI maturity assessment, governance and operating model review, and platform blueprint for a North American energy distributor: the groundwork that makes the second use case cheaper than the first.

04

Engineering value, measured

AI impact measurement for a global automotive electronics manufacturer: baseline, KPI set, data dictionary and sprint-based proof of value before the next tranche is approved.

KPMG AI Research in mining and heavy industry

05

Board AI governance

A four-tier board AI governance portfolio and a director certificate program designed with the Institute of Corporate Directors, for directors and senior leaders asked to sign off on AI decisions.

06

Board and executive AI sessions

AI education and strategy sessions for boards and leadership teams across energy, health, insurance, engineering and industrial groups, built on the same evidence base as this report.

Client names withheld in this version; further detail is available on request and with permission.

KPMG AI Research

The firm's research function on how AI should be built, governed and trusted: what is real, what is hype, and what it is worth.

■ 01 EVIDENCE Industrial evidence Exploration-data research with the National Research Council of Canada.	■ 02 VALUE Value in practice KPMG's Value-Driven AI Framework; impact baselines, KPIs and proofs of value.	■ 03 TRUST Trusted deployment Board AI governance, executive education and operating models for accountable deployment.
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