Disruptive Innovation in Mining Cloud & the 3DEXPERIENCE Platform

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Digital Transformation in Mining

Mining companies, albeit in an historically laggard industry, must embrace digital transformation or risk relegation to the stockpile of missed opportunity.

► As a last bastion of conservatism, mining is ripe for disruption
► New mining will overtake old mining if the industry resists the technologies required to cross the digital divide

Source: Ernst & Young, The digital disconnect: problem or pathway?, 2017
Our Vision for Digital Transformation in Mining

Autonomous Mining
Monitor pit wall stability and pit shape using aerial drone survey.

Track operator productivity and vehicle asset health.

Better control of dump location redirect based on real-time grade data.

Optimise grind settings using fragmentation image analytics & blast drill hardness data.

Automatically control blending to optimise mill input.

Monitor mill feed grade and production.

Automated resource modelling based on new geological data.

Rapid implicit geological modeling.

Measure while drilling using downhole probes.

Monitor equipment health & performance and predict asset failure.

Autonomous underground load-haul-dump, removing humans and increasing safety.

Blast design simulation.

Apply machine learning analysis to drilling data to guide exploration drill programs.
Mining Internet of Things.

- Digitally connected
- Data driven
- Model based
- Virtual + Real

RAPID CORRECTIVE ACTIONS - PHASED IMPROVEMENT PLANS
Semantic data technology adds meaning to big data to expose knowledge and allow processing by machines.

EXAMPLE Semantic triples

<Da Vinci> <is a> <person>
<Michelangelo> <is a friend of> <Da Vinci>
<Da Vinci> <is from> <Italy>
<Da Vinci> <is born on> <April 15, 1452>
<Da Vinci> <died on> <May 2, 1519>
<Mona Lisa> <was created by> <Da Vinci>
Creating interactive and realistic 3DEXPERIENCES using Dassault Systèmes 3DEXPERIENCE City Technology.

Church of Saint-Philippe-de-Roule

Built: 1764-1772  
Address: 9 Rue de Courcelles  
Size: 9,672 m²
Unified experience, ubiquitous & interoperable. Necessary to fully exploit emerging technologies. Delivered on SaaS.

- Unify data across all sites
- Semantically linked data across the end-to-end mining chain
- Collaboration across and outside the enterprise via the cloud
Challenges facing Digital Transformation.

- Internet & cloud connectivity
- Intra-mine connectivity
- Instrumented machines
- Cybersecurity
- Change management

These challenges must be overcome to take full advantage of emerging technologies.
Parametric Connectivity - Integrated Mine Planning

**Traditional Method**
- Manual digitisation and sectioning of geology
- Manual generation of the mine plan
- Little automation between stages of the mine planning process

**Parametric Modeling**
- Automated propagation of effect as the model inputs changes
- New input data can be re-run to produce a new design & schedule
- Fully integrated geology, design, planning and scheduling applications

**Stochastic Modeling**
- Simulate end-to-end uncertainty
- Parametric Modeling with automated simulation analysis
- Review the entire result set instead of just one automated result output
- Generative design methods

This is where mining software is today

This is what mining companies are asking software vendors to provide

This is Dassault Systèmes' vision
Dassault Systèmes 3DEXPERIENCE Platform
A History of Dassault Systèmes Innovation

3D Design

3D DMU
Digital Mock-up

3D PLM
Product Lifecycle Management

3DEXPERIENCE®
Business Experience
**Business Experience Platform**

**Social & Collaborative**
Connect business users with social and collaborative apps

**3D Modeling**
Design, build and simulate the virtual product

**Simulation**
Simulate and optimize the virtual and real

**Information Intelligence**
Analyze, predict and develop insights from data

**Real-time 3DEXPERIENCE**
Play the customer experience

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Design, build and simulate the virtual product

Simulate and optimize the virtual and real

Play the customer experience

Analyze, predict and develop insights from data

Connect business users with social and collaborative apps
3DEXPERIENCE®

Powers our Brand Applications
3D MODELING APPLICATIONS

Shaping ideas into reality
Virtual+Real SIMULATION APPLICATIONS

Where virtual worlds meet reality
INFORMATION INTELLIGENCE APPLICATIONS

Revealing and dashboarding BIG DATA using semantic technologies
SOCIAL & COLLABORATIVE APPLICATIONS

Unifying information and processes across the enterprise
Dassault Systèmes 3DEXPERIENCE Mine

Next Generation Mining Technologies
Dassault Systèmes: The 3DEXPERIENCE Mine

Next Generation Mining Solution for digital transformation

Our Vision for the 3DEXPERIENCE Mine:

► Digitally connected mine
► Autonomous software
► Machine learning
► Decision support systems
► Hybrid cloud/on-premises
3DEXPERIENCE Mine – Next Generation Mining Technologies

- Geoscience Modeling
- Single Source of the Truth
- Enterprise Collaboration
- Image Analytics
- Parametric Design
- Big Data Analytics
- Geospatial Data
- Semantic Modeling
- Stochastic Mine Planning
- Scenario Analysis
- Geomechanical Simulation
Dassault Systèmes: Mining & ISA-95

Level 4
Corporate Back-office

Level 3
Operations Management & Process Execution

Level 2
Real-time Control

Level 1
Sensing & Instrumentation

Level 0
Physical Processes

Immersive Visualisation – Virtual Mine

Geology

Mine Planning

ERP
Analytics
EAM

Mining Operations Management (mining execution system)

Process Workflow
Stockpile Management
Schedule Optimisation
Production Management
FMS

Production Control
FMS Mobile Onboard
GPS Location Tracking

3DS solutions
Your journey to the **3DEXPERIENCE**

**Connect to 3DEXPERIENCE**
- 3DDashboard
- 3DPlay
- 3DSwym
- 3DDrive
- 3DSearch
- 6WTags

**Digitalize** and connect new users

**Transform** with Industry Solution Experiences

Digitalize the mining value chain

Transformative Business Experience

**Social Collaboration**

**Enterprise Collaboration**

**Industry Solution Experiences**

- GEOVIA
- ENOVIA
- CATIA
- SIMULIA
- EXALEAD
- SOLIDWORKS