“INNOVATING TO ZERO”

INNOVATION FROM THE OTHER SIDE:
Collaboration, Technology Platforms and Roadmaps in Aerospace
Our purpose

“Dassault Systèmes provides business & people with 3DEXPERIENCE universes to imagine sustainable innovations capable of harmonizing product, nature and life.”
Experience Thinking is a Framework for Innovation

Intelligent Objects

Digital Business

Digital Consumer

Platform for modeling and simulating the customer experience

Usage experience

Validating the experience

Delivering the experience
Unique attributes of 3DEXPERIENCE

- Digitally Connected
- Data Driven
- Model Based
- Virtual + Reality
from electronic...

Static

to digitally connected.

Live

Unite all functions
Sales, marketing, merchandizing, design, engineering, manufacturing, retail, service and supply chain

Establish digital connectivity

Eliminate silos with a digital platform
Become **data driven and model based**

**Model based configuration management**

- Model based systems engineering
- Model based optimization
- Model based manufacturing and service

*Sustainable innovation through virtualization*
From Product to **Experience Innovation**

80% of a product’s value characteristics are committed during the design and development stage.

...increase value to the customer and preserve margins

**function** drives fit and form

Crafting and simulating the holistic consumer experience increases the value created.

**Target Zero Product Failures**
Generational Changes
From file-based ➔ data-driven architecture
From static designs ➔ model-based enterprise

Business Themes to drive Higher Margins
- Strategic Customer Relationships
- Global Product Development
- Product Planning & Programs
- Quality & Compliance
- Strategic Supplier Relationships
- IP Classification & Security

Target Outcomes
- ZERO Product Failures
- ZERO BOM Errors
- ZERO Prototypes
- ZERO Delays
- ZERO Rework
- ZERO Latency
- ZERO Exceptions
What does it mean for Mining?
THE FACTS

LOWER GRADES, LOWER PRICES, AND DECLINING PRODUCTIVITY

- Copper Mine Grade: 1900-2010
- Iron Price Per Ton: 2011-2016

MINING AUTOMOTIVE

- Productivity Decline: 2000-2016

INDUSTRIAL INTERNET GAINS IN MANUFACTURING INDUSTRY

- 70% Power Breakdowns
- 30% Reduction in Maintenance Costs
- 12% Reduced Scrap and Rejected Parts

STEPS TAKEN BY MANUFACTURING INDUSTRIES TO INCREASE PRODUCTIVITY

- Improving Production Mgmt
- Digitalization Acceleration

ACCELERATED IMPROVEMENT FROM DIGITALIZATION IN 21ST CENTURY
THE INDUSTRIAL INTERNET OF THINGS

OPERATIONAL EFFICIENCY
Operational cost reduction

AUTONOMOUS DEVICES
End-to-end automation

NEAR-TERM

Integrate and leverage data from across the mine to drive productivity

LONG-TERM

Autonomous shoveling and hauling based on a virtual version of the mine site

HOW WILL IIoT IMPLEMENTATION CHANGE WORKING PROCESSES?

1. Review previous losses. Choose preventive actions
2. Identify most risks. Decide next actions
3. Minimize preventative

LAST SIC | NOW | NEXT SIC
LOST BACK | WORK ROOM | IMPROVEMENT ACTIONS
IMPEDMENT ACTIONS | IMPROVEMENTS

SHORT INTERVAL CONTROL
BUSINESS AS USUAL

How will it work?

Benefit: Less waste

IMPROVEMENT BY IMPLEMENTING SHORT INTERVAL CONTROL

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IIoT IMPLEMENTATION

GATHERING SENSOR INFORMATION AND PROCESSING THE DATA FOR RAPID ACTION
THE BENEFITS

MINING OPERATIONAL EXCELLENCE

END-TO-END SHORT INTERVAL CONTROL INFORMATION VISIBILITY

- Virtual version of the real world mine
- Short interval scheduling
- Mine cell factor
- Process is optimized based on variations
- Optimized blended ore input
- Stockpile grade locations shared
- Quality measure
  - Volume measure
- Material-destination optimized transport

ACCRUATE AND PRECISE INFORMATION • SITE MANAGEMENT END-TO-END • RAPID ACTION
What are other industries doing?
Supply Chain has become a dominant business process for Innovation…

Suppliers innovation outpace OEMs
High Added Value services for the extended enterprise

Supply Chain Management
- Forecasts, Purchase Orders
- Deliveries
- Inventory Management

Remote Project Teamwork
- Remote project-team workspace
- Industrial documents distribution
- Online Project reporting

Multi-Tier Engineering
- Technical Data Exchange
- PLM Collaboration
- Product Configurations updates and synchronisations

AirSupply®
AirCollab®
AirDesign®
What is the Automotive Supplier Innovation Program? (ASIP)

The Automotive Supplier Innovation Program (ASIP) is a five year, $100 million program that provides non-repayable contributions to support technology demonstration and prototyping activities of Canadian-based suppliers developing innovative products and/or processes in the automotive sector.

Automotive

The Automotive industry owns the third position among most innovative industries and comprises around 12% of patents’ stake. Today’s automobile represents the most sophisticated technology owned by most consumers, and automakers continuously offer new high-tech content in their products. From the early stages planning, automakers design innovations into new vehicles, recognizing that technology provides many solutions to meet consumer needs. Automakers spend close to $102 billion annually on R&D. Since 1999, patents awarded to all manufacturing industry sectors have increased in number by only 3 percent. Patents awarded to the auto industry have increased by 10 percent in the same period.
CRIAQ is a unique model of collaborative industry-led research involving universities and research centres.

The Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ) is a non-profit organization established in 2002 with the financial support of the Quebec government. Its mission is to increase the competitiveness of the aerospace industry, and enhance the collective knowledge base in aerospace through improved education and training of students.

5 strategic pillars

1. **Collaborative Research**
   To perform focused industry driven collaborative research projects;

2. **Innovation**
   To create new concepts and processes that can be applied to future products in the aerospace industry; a particular emphasis is placed on management of intellectual property;

3. **Training of a highly qualified workforce**
   To enhance the technical and professional skills for future aerospace research specialists;

4. **Promotion**
   To improve the visibility of aerospace product development and research challenges to the scientific community and students;

5. **National and International Collaborations**
   Develop international collaborative research projects by partnering with Canadian, US, European and other programs.
Lessons learned
Supply Chain Trend and Evolution

From hierarchical structures….

….thru OEM-Suppliers network….

… to Embedded Supplier Engagement

1990-2000

2000-2010

2010-2020

Suppliers

Suppliers & Partners

Specialized Suppliers & Partners
Open Innovation Based on a Collaborative Platform

More Ideas, better accuracy

Technological partners, agencies, startups, suppliers

Reports, Trends

Ideas

Focus groups, consumers

Feedback

Market Analysis

Competitive Assessment

Idea Gathering

Requirements Generation & Validation (Iterative Process)

Concept Creative Design (Form, Fit, Function)

Requirements & Design Validation

Project Management

Digital Continuity

Social Platform

Accelerated Innovation

Leverage external ecosystem to increase innovation relevancy

INTERNAL ECOSYSTEM

EXTERNAL ECOSYSTEM

INTERNAL ECOSYSTEM

EXTERNAL ECOSYSTEM
Concept of Digital Twin for Innovation

Key Elements

- Ideation
- Model
- Simulate
- Test
- Produce
- Enhance

- Digitally Connected
- Data Driven
- Model Based
- Virtual + Reality
• ADOPT successful Innovation programs from outside Mining industry

• Change the “status quo” in Innovation and Research

• Group Canadian Mining leaders into an new National Innovation Mining Consortium (Mining, Universities, Suppliers, Governments)

• Develop a National Mining Competency Center