How Big Data can help you to improve Manufacturing Performance?

data analytics

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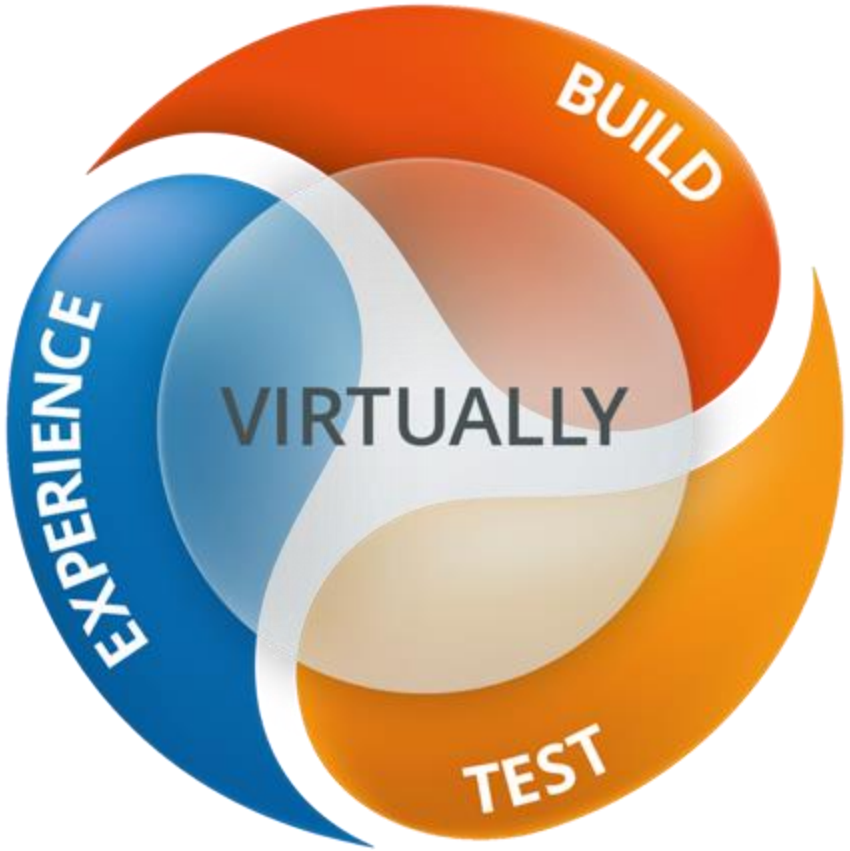
Mission & Vision



ESI's Mission

Deliver Virtual Prototyping solutions that improve industrial product development

ESI's Vision

Be the leader in Virtual Product Engineering thanks to a unique knowledge in material physics

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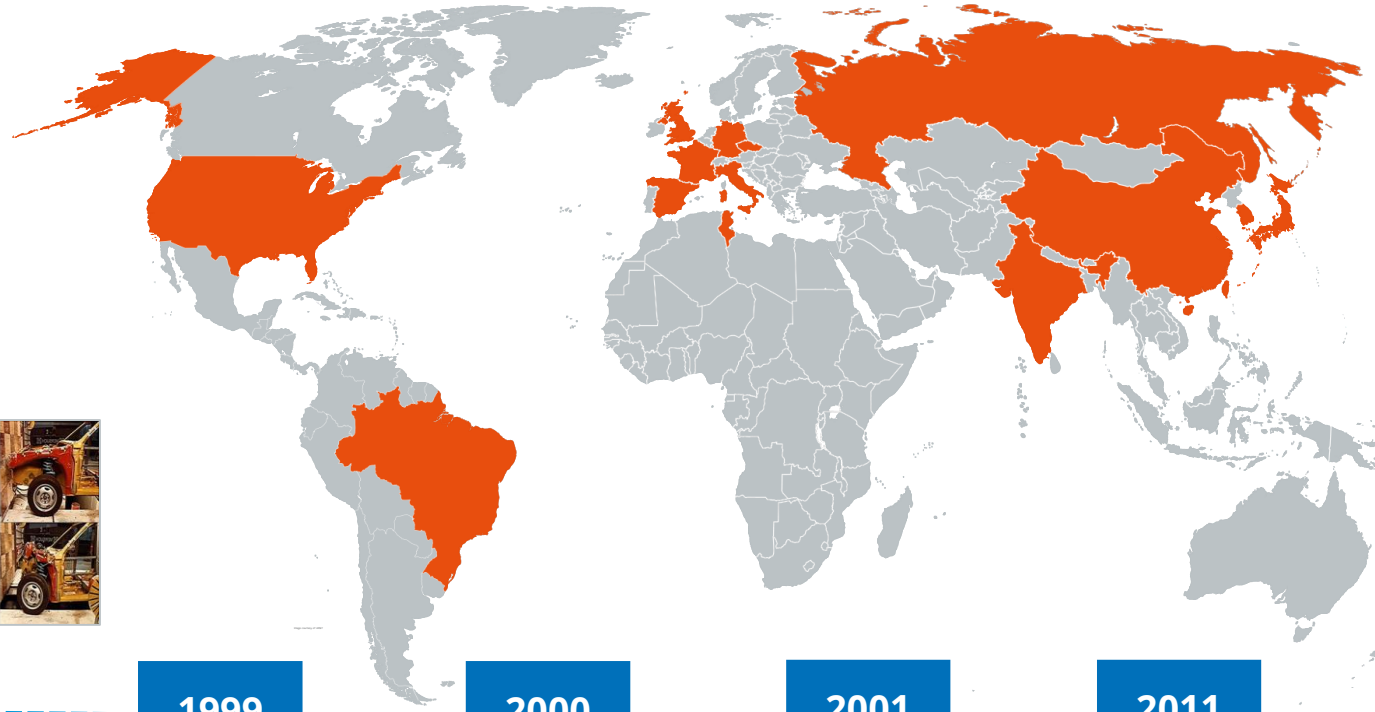
The Story of ESI



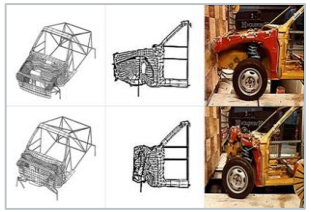


Image courtesy of Volkswagen AG

1973

THE STORY BEGINS

ESI founded; expert in physics of materials

1985

FIRST CRASH TEST ON FULL CAR

First Volkswagen Polo

1999

VIRTUAL MANUFACTURING

Added to the ESI portfolio
- Casting
- Sheet Metal Forming
- Welding

2000

NYSE EURONEXT

ESI LISTED NYSE EURONEXT

ESI enters the NYSE Euronext Paris stock market

ISO 9001-2000 CERTIFICATION

2001

EXPANSION INTO MULTI-DOMAIN SIMULATION

- NVH
- Durability
- Vibro-Acoustics
- Comfort

2011

ENTRY INTO VIRTUAL REALITYv

ESI acquires IC.IDO

Image courtesy of Mitsubishi Hitachi Power Systems Europe

2012

EMBRACING OPEN SOURCE

ESI acquires OpenCFD, the makers of OpenFOAM

2016

MAKE IT SMART

ESI makes prototypes smart by integrating acquisitions in Systems Engineering, Cloud Computing, Data Analytics and Machine Learning

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ESI Around The World

More than **40** countries

34 subsidiaries

1200 people

MILPITAS, CA
USA

DETROIT, MI
USA

SÃO PAULO
BRAZIL

PARIS
FRANCE

FRANKFURT
GERMANY

EKATERINBURG
RUSSIA

BANGALORE
INDIA

BEIJING
CHINA

TOKYO
JAPAN

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Key Figures - 2016

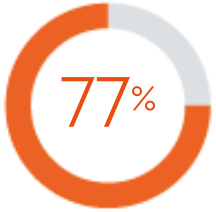
141

Million Euros

2016 annual revenues

Licenses

Growth & Recurrence

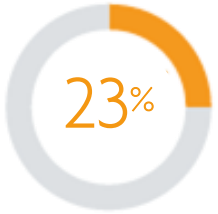


30%

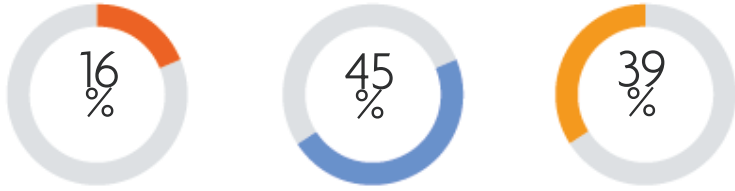
R&D investments/ Licensing revenue

Services

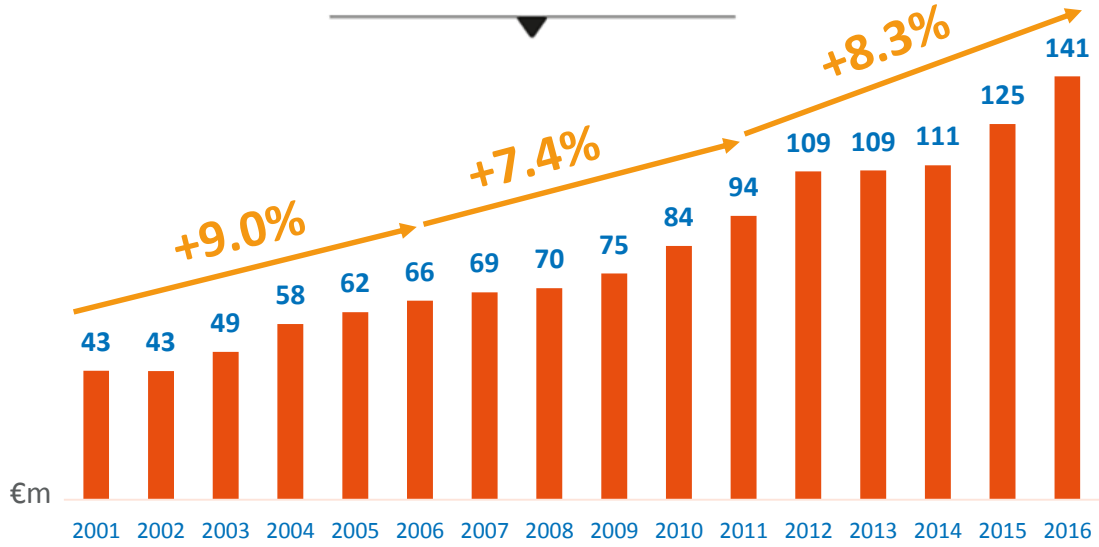
Innovation & Co-creation



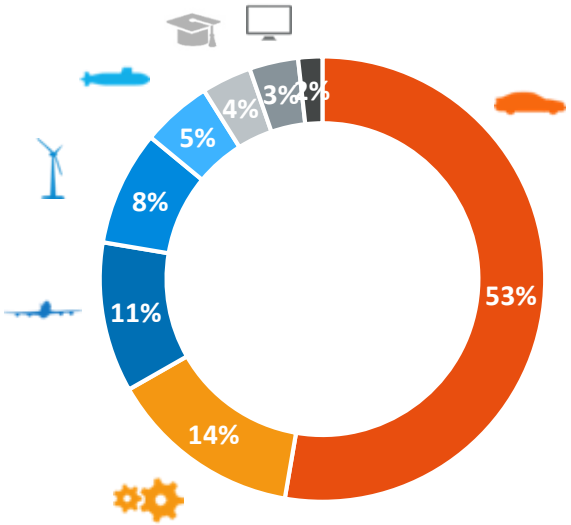
Revenue distribution per geographic area



Continuous growth



Sample Customer References



Total Revenue per Industry Sector (FY15)

GROUND TRANSPORTATION

ALSTOM Transport
AUTOLIV
BMW GROUP
BOMBARDIER
CATERPILLAR
FAW VOLKSWAGEN
CONTINENTAL
DAIMLER AG
FAURECIA
FIAT / CHRYSLER
FORD
GENERAL MOTORS
GESTAMP
HONDA
HYUNDAI GROUP
ISUZU
JAGUAR LAND ROVER
MAN
MAZDA
MITSUBISHI MOTOR
PSA PEUGEOT CITROEN
RENAULT NISSAN
SIEMENS
SHANGHAI VOLKSWAGEN
TAKATA
TATA GROUP
TOYOTA MOTORS CORP.
VISTEON
VOLKSWAGEN GROUP
VOLVO GROUP

HEAVY INDUSTRY & MACHINERY

AP&T
ARCELOR MITAL
HONEYWELL
JOHN DEERE
NASA
UNITED TECHNOLOGIES

AEROSPACE

AIRBUS
ALCOA
AVIC
BOEING
BOMBARDIER
DASSAULT GROUP
EUROPEAN SPACE AGENCY
GENERAL DYNAMICS
GENERAL ELECTRIC
HONEYWELL
LOCKHEED MARTIN
NASA
NORTHROP GRUMMAN
PCC CORPORATE
ROLLS ROYCE
SAFRAN
TEXTRON AVIATION
THALES

ENERGY & POWER

ALFA LAVAL
AREVA
CEA
COMEX GROUP
DAHER
DOOSAN SKODA POWER
EDF GROUP
EPRI
GE POWER
IHI
ONET
SHELL

GOVENMENT & DEFENCE

BAE SYSTEMS
BOEING
CEA
DCNS
DGA
FRENCH MINISTRY OF RESEARCH
GENERAL DYNAMICS
HUNTINGTON INGALLS INDUSTRIES
LOCKHEED MARTIN
OAKRIDGE NATIONAL LABS
RAYTHEON
U.S. NAVY
U.S AIRFORCE
U.S.ARMY

ELECTRONICS & CONSUMER GOODS

3M
APPLIED MATERIALS
BERTRANDT
HITACHI
LAM
LTD
HONDA
LG
NEC
SAMSUNG

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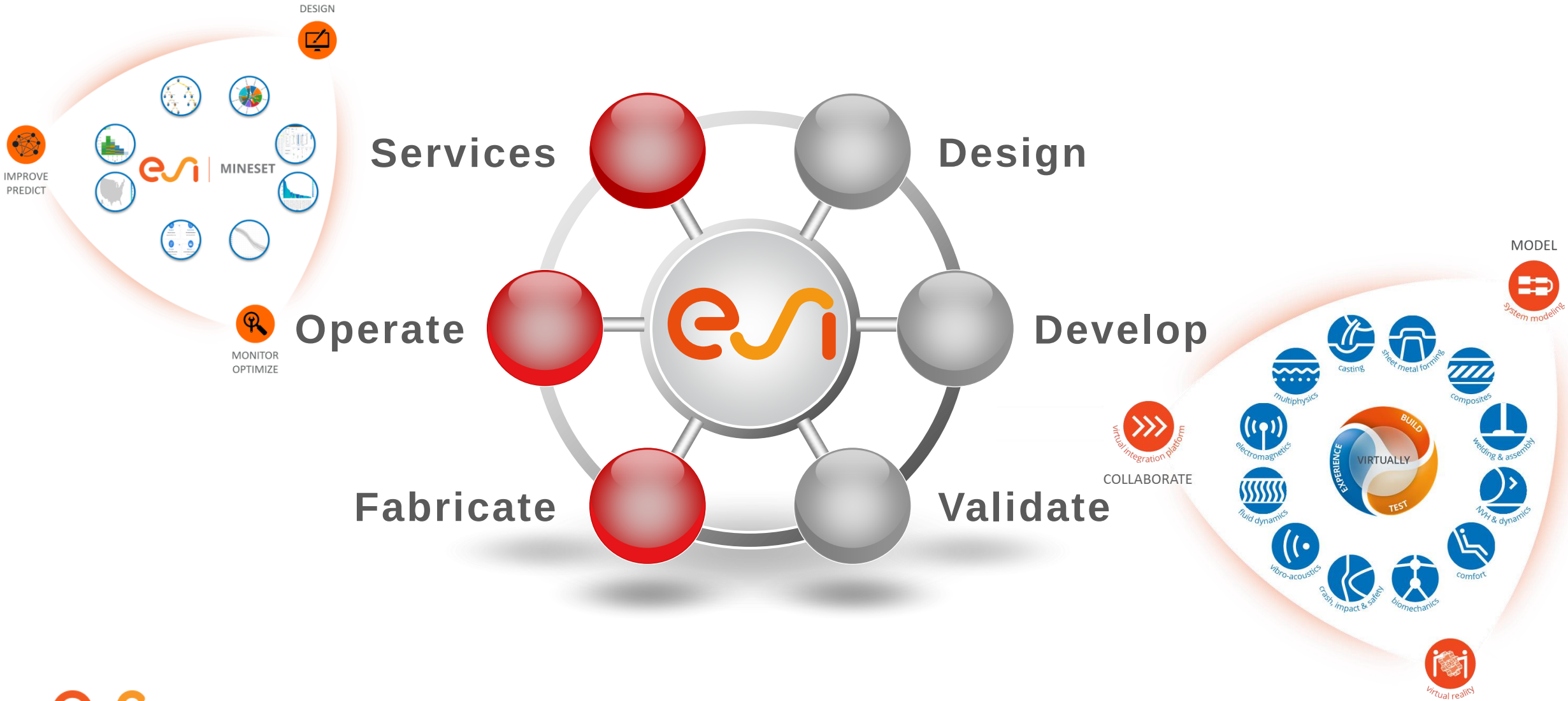
The Product Performance Lifecycle



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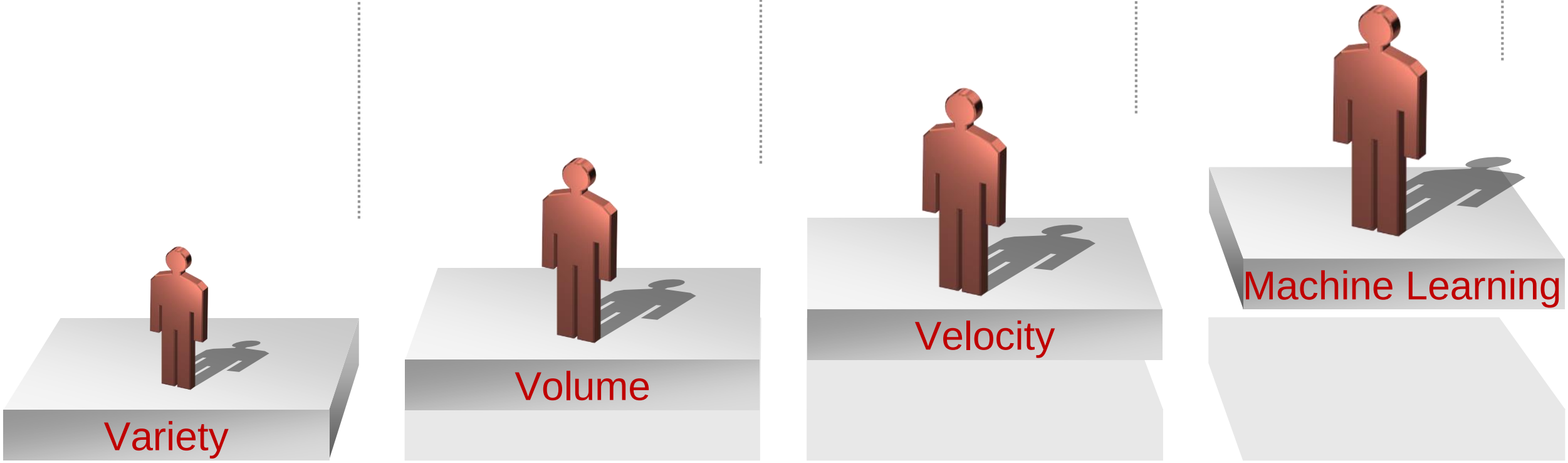
What “Big Data” means in a simple way …

From heterogeneous sources

Collect, Store and/or compute large amount of data

In (nearly) Real Time

Applying “new” technologies (Data Viz, Machine Learning, AI, etc)



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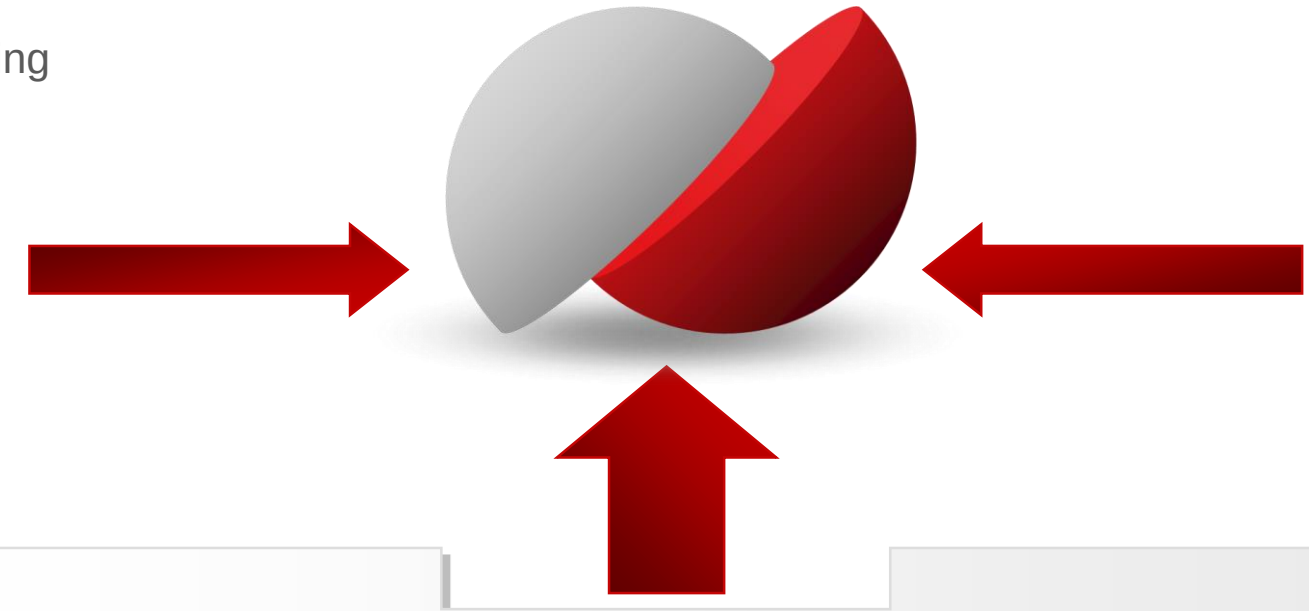
… For Industrials

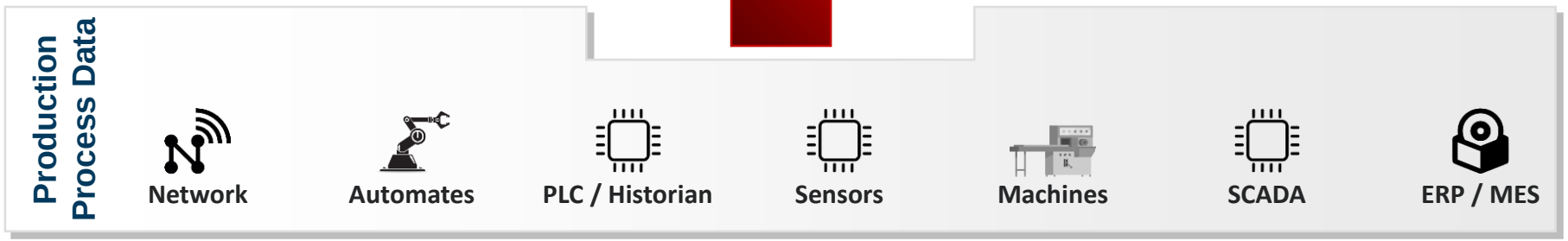
Technologies

- Data Visualizations
- Un-Supervised Machine Learning Algorithms
- Edge Analytics (streaming analytics)
- Deep Learning
- Neuronal Network
- Data Base and Datalake
- Hadoop / Spark
- …



Industrial Challenges

- Optimize Resources Consumption (incl. energy)
- Prevent Machine Downtime (OEE) with Predictive Maintenance
- Statistical Process Control
- Decrease Defect Rate
- Multi Dimensional Root Cause Analysis
- Reduce Stocks Costs (Supply Chain)



“Make it Simple, Start with the available”

Scope Definition

- Well-know issues (quality, machine downtime, …)
- In a particular place (process, plant, …)
- **Easily measures success and ROI**

Existing Analysis Scenarios

- OEE, SPC, Domain Analytics, …
- Enabled by Big Data
- **Facilitates going further (prediction)**

Trust the data

- Even when it disagrees with previous assumptions
- But **always be able to understand** the way the results / prediction have been made

Keys for a Successful Manufacturing Big Data Project

Data / Process Experts Identification

- People who OWN the problem
- **Easier to teach process Experts about Big Data** rather than the opposite

Data sources available / accessible

- PLCs, Historian, MES / FIS, scheduling systems, ERP, etc
- **Manufacturing already owns & controls the sources**

Be ready to take action

- It will take you to the cause of the problem but it cannot solve it
- **Analytics system would be used to confirm the resolution of the problem**

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Tips and Tricks

The “unsung hero” of Big Data

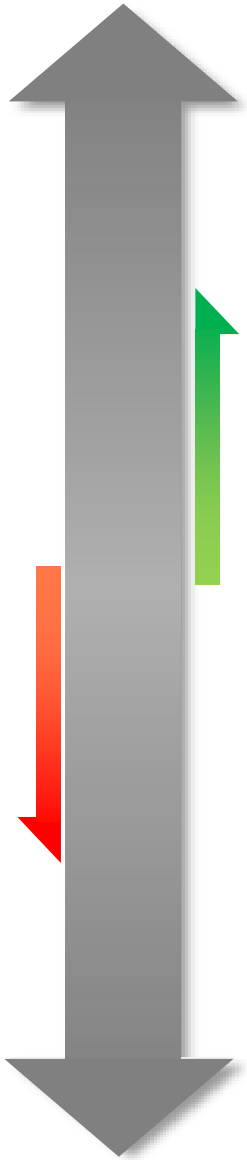
Cleanness, relevancy, representativeness integrity of the data are Key Success Factors
The last 2 “V”: Value and Veracity

It’s a Technology Project

The project should be focused on industrial operational data and results
It is crucial to have IT as a key team member

Big Data is Magic

Generic tools end-up with generic results
These technologies empowered industrial expertise, don’t replace them



The Sky is the Limit

Data available vs industrials targets is a dynamics questioning.
A bottom up approach brings to Predictive Models

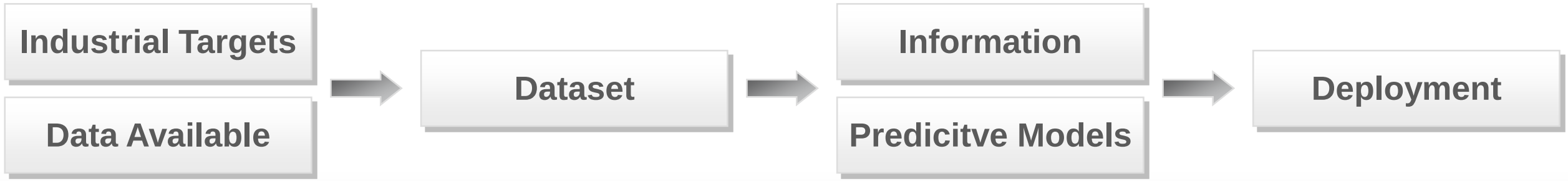
Avoiding “analytics paralytics”

A progressive roll out based on success instead of a Big Bang deployment
A balance between trepidation and maturity

Manufacturing is leading the way

Manufacturers are collecting and analyzing data since many years
This pragmatism make the adoption more easy

From Theory to Practice, Crossing the Chasm



Occam's razor approach to data capture and analysis

The lightest, simplest way to achieve your (data analysis) goals is the best one

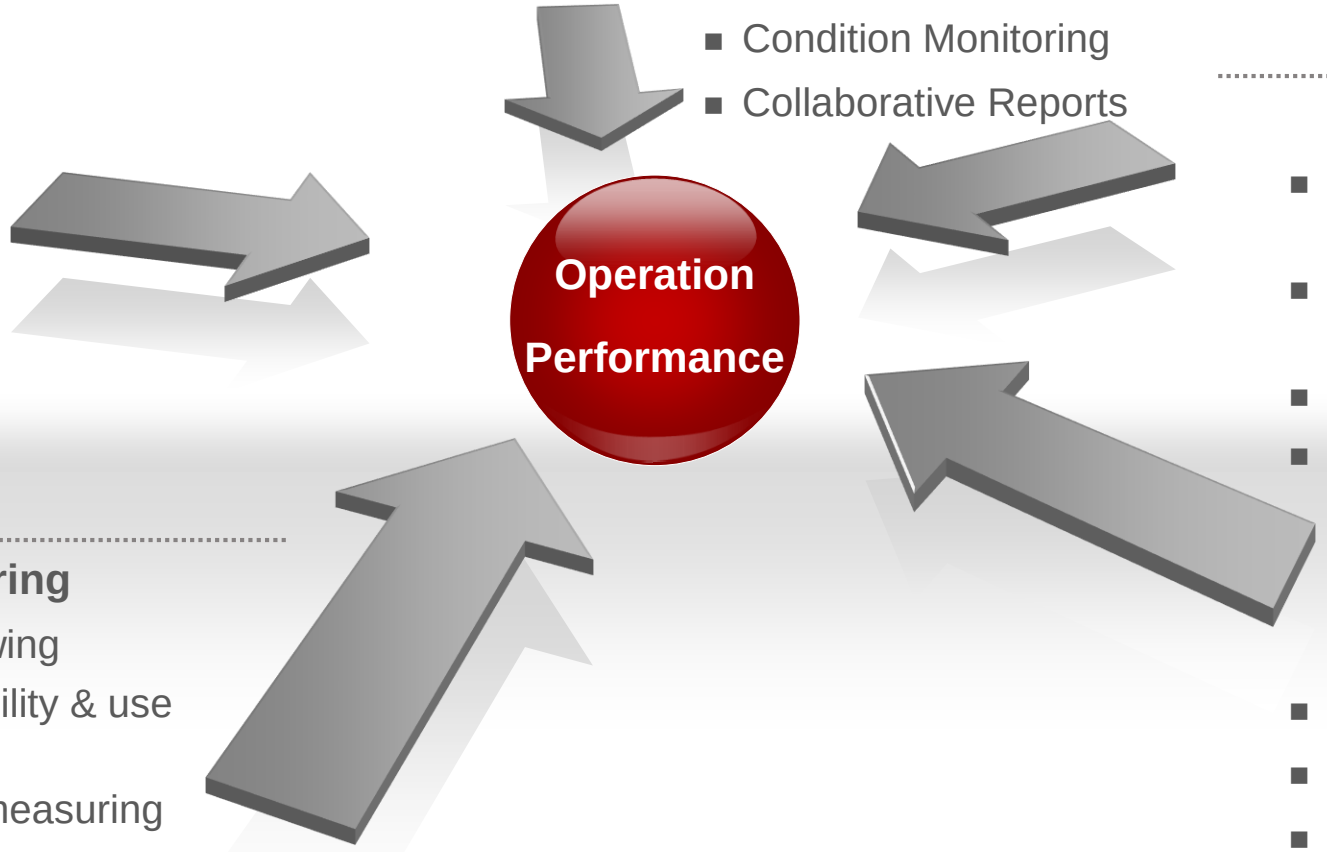
MINESET Performance for Industrial Operations

Production Processes Design

- Impact Studies for new projects
- Forward Programs
- New Process Design and fine tuning
- Resources needs evaluation and supply strategy

KPIs and Supervision

- Industrial KPIs
- Condition Monitoring
- Collaborative Reports



Operations Optimization

- Analyze process step by step to improve efficiency and reliability
- Fault analysis and remedial actions
- From Prevent to Predict
- Resources consumption optimization

Production Monitoring

- Key Metrics Following
- Equipment availability & use optimization
- Quality incidents measuring and processing
- Production rate control

Continuous Improvement

- Failure Points identification
- Root Cause Analysis
- Impact Chain discovery
- Processes Retro Feedback

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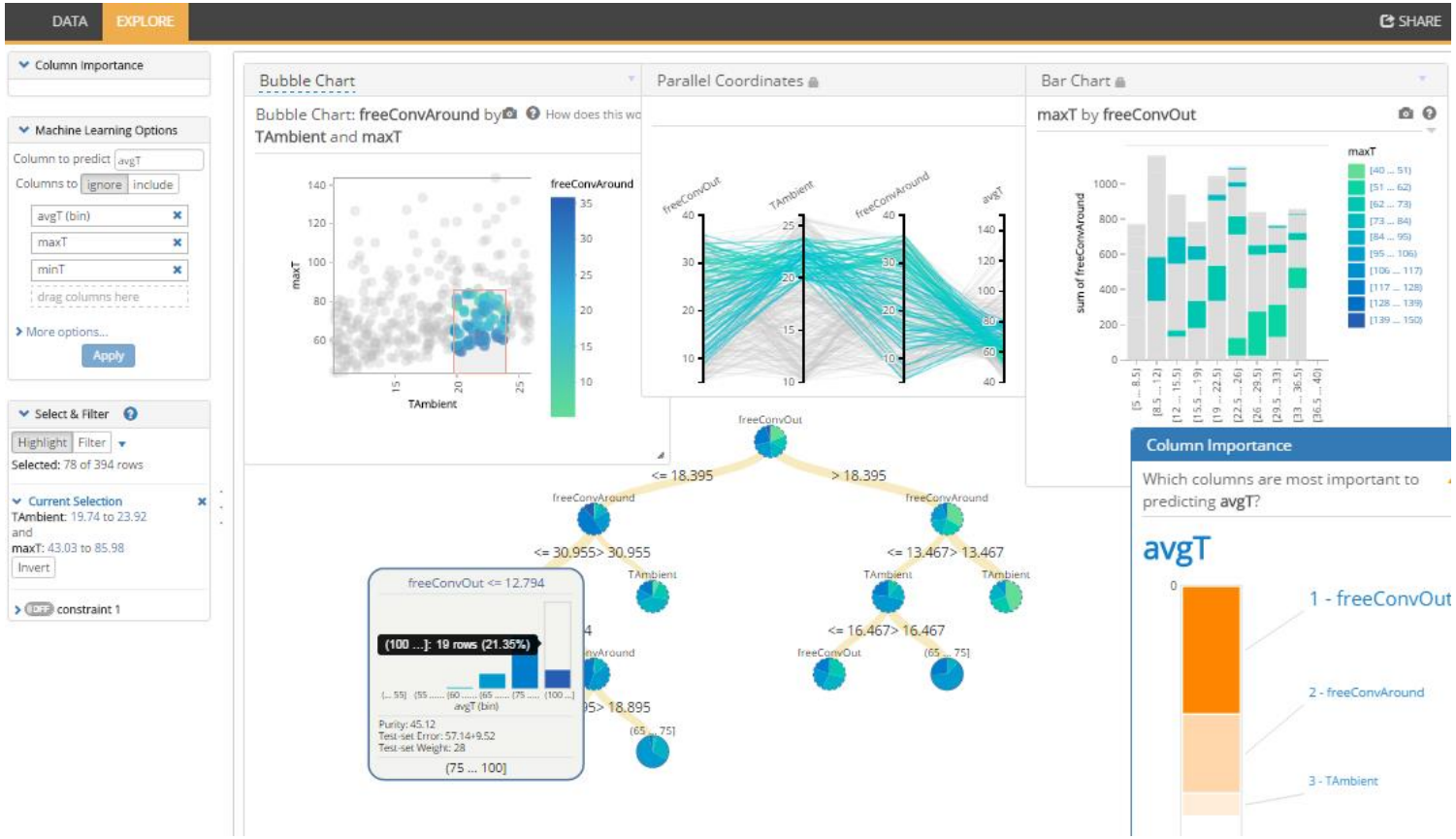
MINESET Simple By Default, Power On Demand

- **Embrace the all scope of Big Data**
  - Interactive Data Visualizations
  - Analytics features with embedded Machine Learning
- **Built for Industrial Domain Experts**
  - Intuitive User Interfaces
  - Zero programming
  - Step by Step support
- **Easy Access to** Predictive Approaches
  - A Predictive Journey by “drag and drop”
  - 12 patterns (SGI - HP, Stanford)
- **Collaboration** Functionalities
  - Share “Stories” (visual lean)
  - Export Models & BYO-ML



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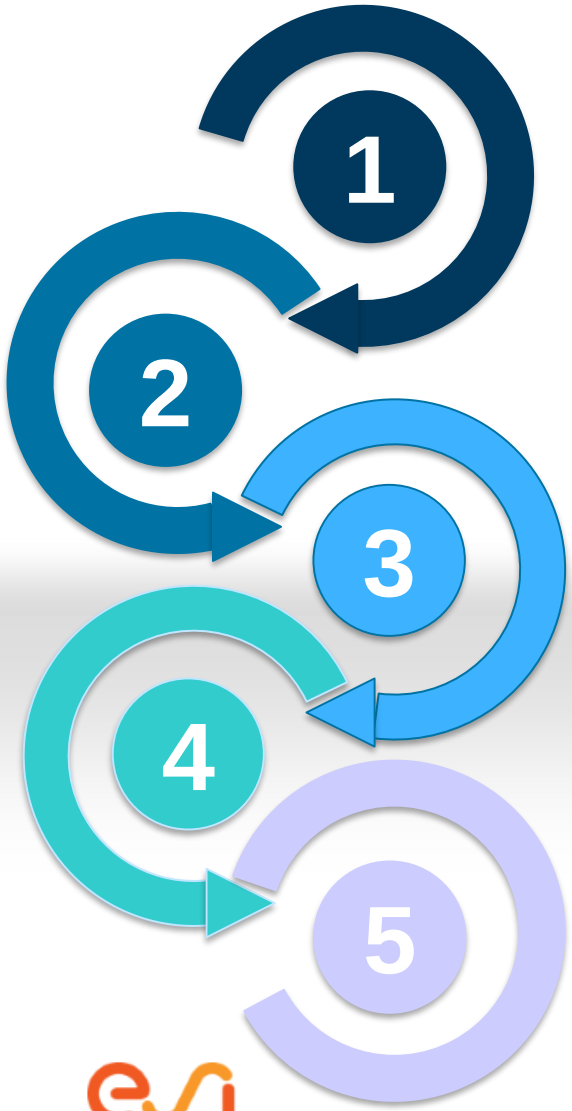
Take Away



It’s an Industrial Project

People who own the problem will define the scope and the success factors

Leverage your Legacy

All Industrials already have available Data and are already performing analysis

Integrate you specificities

Each sector / industry / plant / process is specific

Start Small

Focused on targeted business areas and roll out (avoid risky global approaches)

Lean Data Driven

This allows you building a tailor made solution (data, collection, storage, analytics, edge streaming)

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