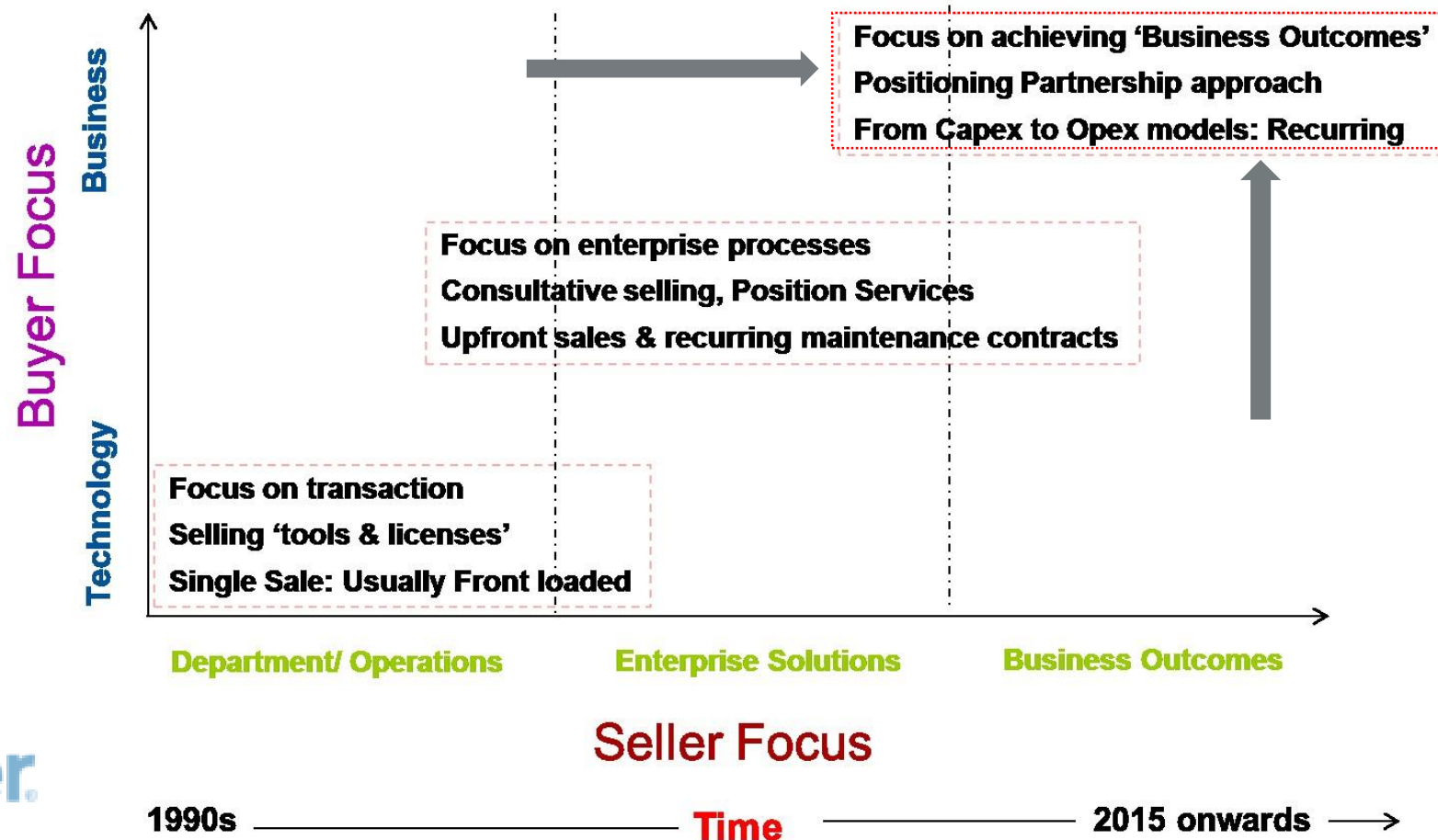


MANUFACTURING ANALYTICS

DAL DATO AL VALORE PER IL BUSINESS

17 Giugno 2016 - #FUTUREFACTORYTV
beanTech

IT moves your business





IT
INFRASTRUCTURE

SOFTWARE
APPLICATIONS

BUSINESS
ANALYTICS

CRM



2001
Foundation Year



45
People



33
Average Age



>300
Clients



>15
Countries



4,5M
Turnover



PartnerDirect
Premier

Microsoft Partner

Gold Data Analytics
Gold Data Platform
Gold Midmarket Solution Provider





PRODUCT MANAGER

- Knowledge of the offering, of possible applications and of R&D investments
- Ability to deal with different businesses



INFRASTRUCTURE ARCHITECT

- Responsible for software and hardware choices and for infrastructure dimensions



DATA ANALYST

- Advanced technical and consulting skills
- Developing and testing ETL processes and data models

PROJECT MANAGER

- Expertise in consulting and in applied technologies
- Responsible of the project

SOFTWARE ARCHITECT

- Responsible for software development and maintenance

DATA SCIENTIST

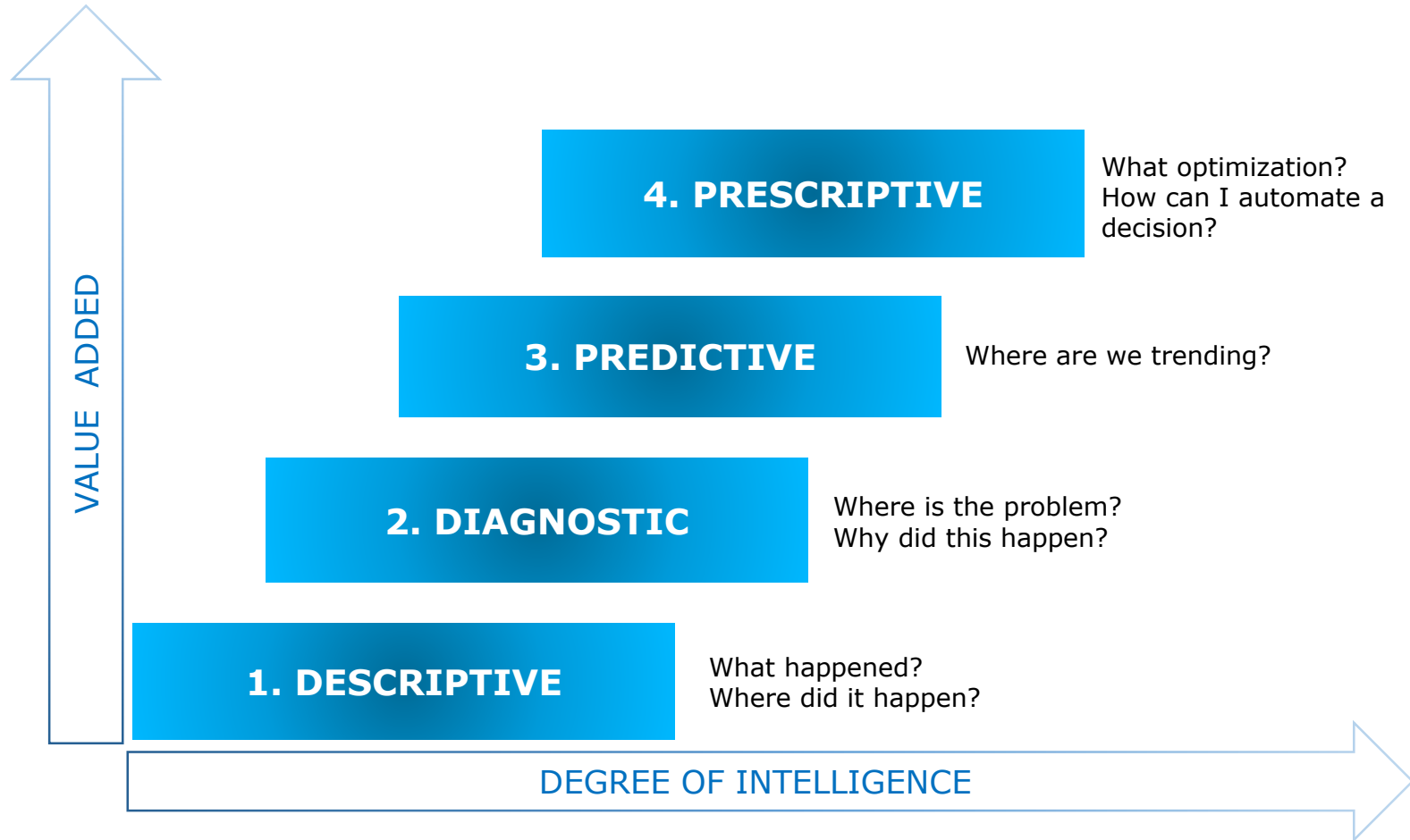
- Highly qualified and specialized profile
- Cooperates with Full Professors and Researchers in innovative projects

La passione è la nostra forza



La passione è la nostra forza



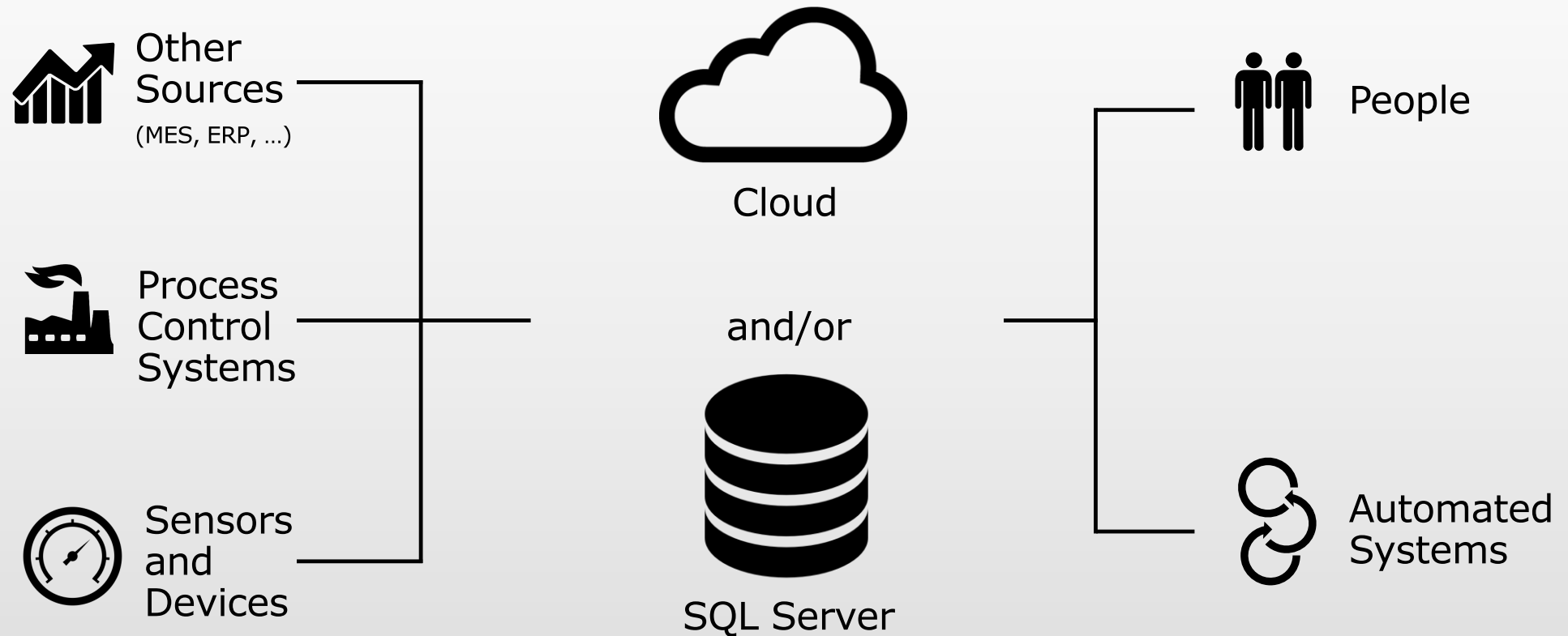


**INFORMATION IS THE OIL OF THE
21[°] CENTURY, AND ANALYTICS IS
THE COMBUSTION ENGINE.**

**Peter Sondergaard
SVP, Head of Research, Gartner Inc.**

DATA, INTELLIGENCE, ACTION

Manufacturing Analytics



DATA → **INTELLIGENCE** → **ACTION**



Part of **DANIELI GROUP**, it is a leading automation and software company, focused on providing value added automation, MES and BI software solutions



3Q Concept



1.137

Level 1
Automation
Systems



650

Level 2
Automation
Systems



35

Level 3
Automation
Systems

Danieli Automation & Beantech

Different Know Hows

One Solution

- 10 years Partnership
- 40+ Successful Projects
- 20+ Covered Countries



Q3Intelligence

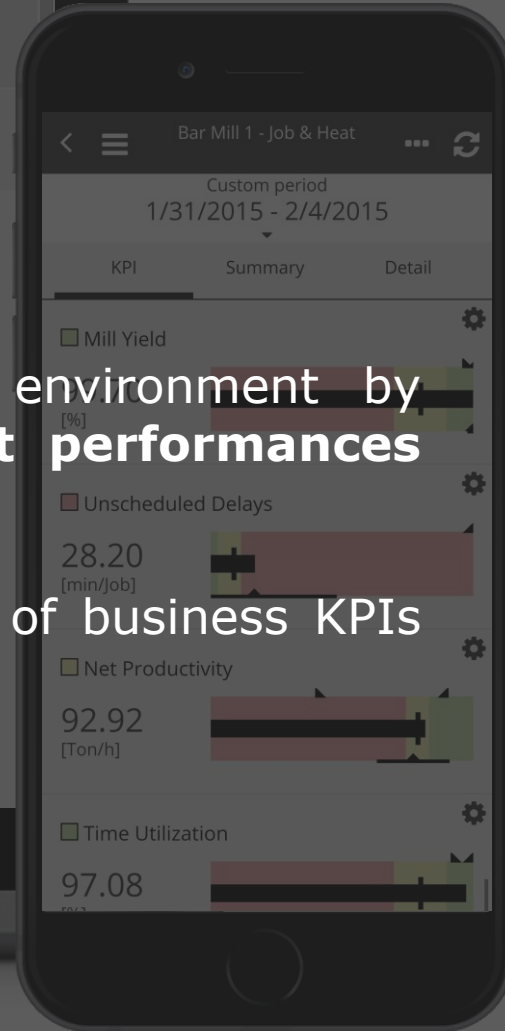


<https://www.youtube.com/watch?v=0pHZngyANAQ>

MONITORING

Our monitoring solutions offer a customizable and device-independent environment by comparing the actual status with set targets, allowing to keep the **plant performances always under control.**

The design reflects a **“top-down” approach.** It starts with the monitoring of business KPIs and tracks production down to single product details.





Period
Selection

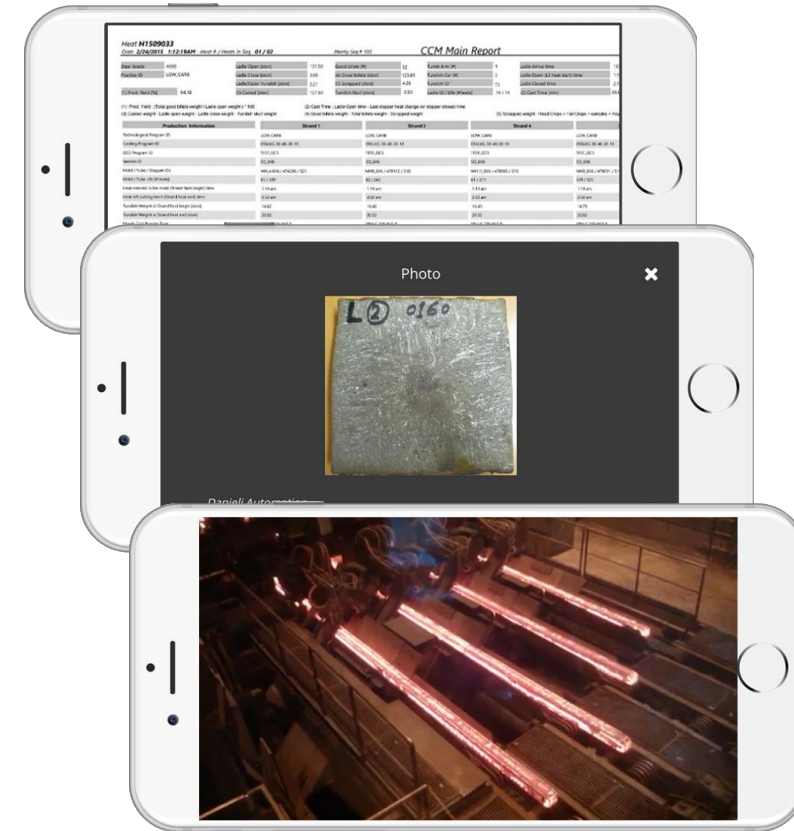
Plant KPIs

Extra
Contents

Product
Details

Detail KPI
Section

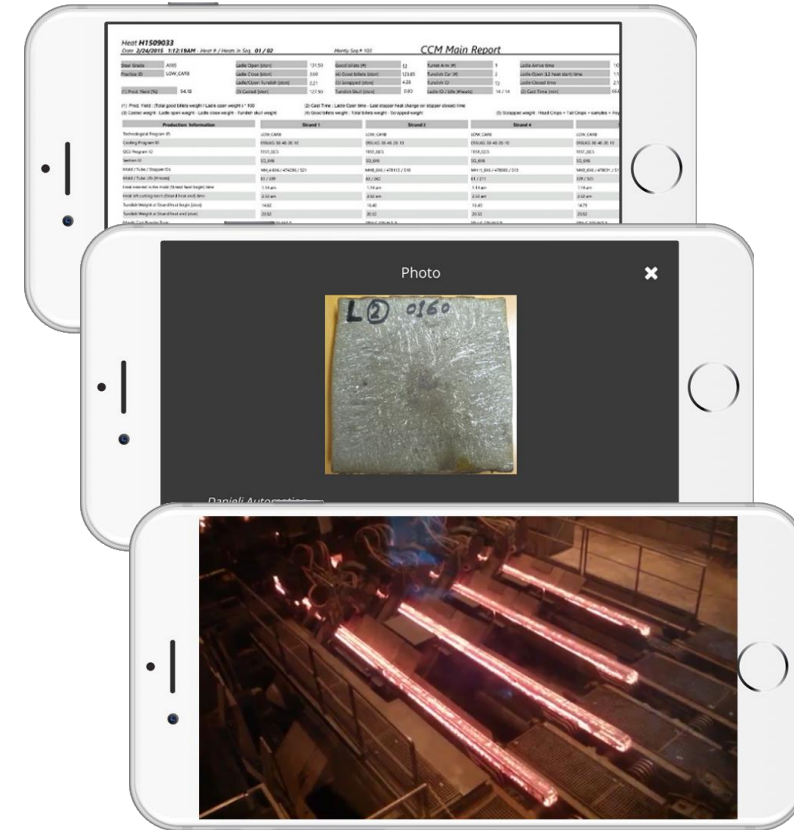




Responsive
Design

Multi-Device

Multimedia
Integration





LIVE DEMO

ANALYTICS

Our Analytics solutions for the Process Control System allows to access the historical information to support strategic decisions, **increasing efficiency & productivity.**

This lets you make **proactive actions** through comparisons and correlations, between different plant areas' performances and quality results, in order to **continuously drive the process towards the desired goals.**

Year: 2015 | Quarter: Quarter 2, 2015 | Month: June 2015 | July 2015 | August 2015 | September 2015 | October 2015 | November 2015

Week: Week 27, 2015 | Week 28, 2015 | Week 29, 2015 | Week 30, 2015

Date: 07/08/2015 | 08/08/2015 | 09/08/2015 | 10/08/2015 | 11/08/2015 | 12/08/2015 | 13/08/2015 | 14/08/2015 | 15/08/2015 | 16/08/2015

Stockyard: Stockyard 1 | Stockyard 2 | Stockyard 6 | Stockyard 9 | Stockyard 12 | Stockyard 0

Area: Sty 1 - Area 2 | Sty 1 - Area 3 | Sty 1 - Area 4 | Sty 1 - Area 5 | Sty 1 - Area 6 | Sty 1 - Area 7

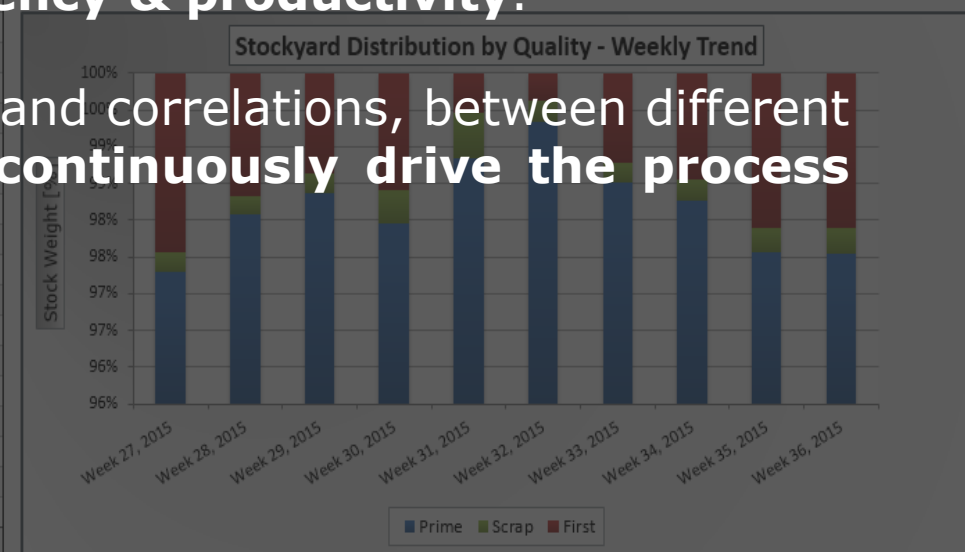
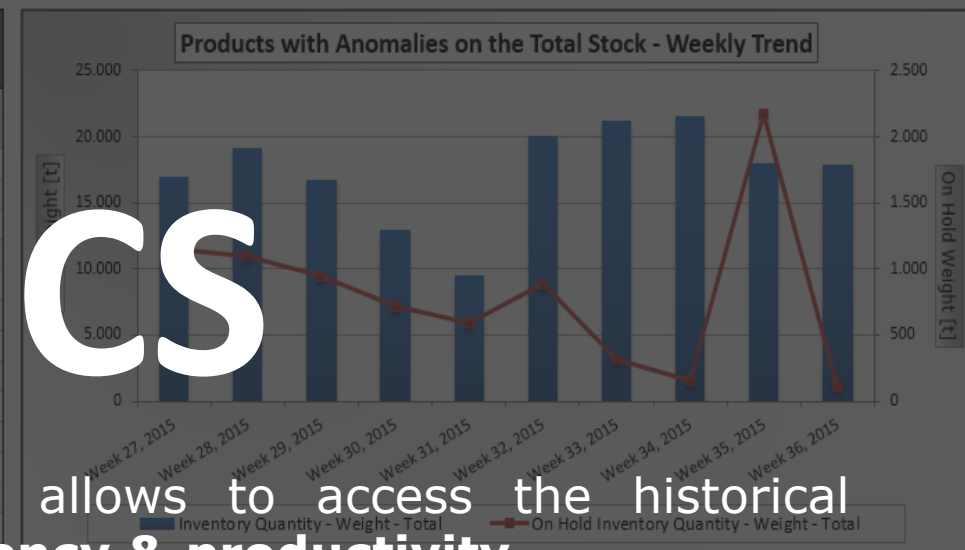
Grade: A0004 | A0015 | A0018 | A0020 | A0027 | A0029 | A0034 | A006

Section: 250X1020 | 250X1080 | 250X1100 | 250X1180 | 250X1250 | 250X1320 | 250X1380 | 250X1450

Product Quality: Prime |

Product Type: Casted Slab | Flame scarfed slab

Month/Day	Inventory Quantity - Weight - Total	On Hold Inventory Quantity - Weight - Total	Downgraded Inventory Quantity - Weight - Total	Obsolete Inventory Quantity - Weight - Total	Inventory Material Downgrade Ratio	Inventory To Obsolete Slab Ratio
+ July 2015	8.918,717	625,353	3.332,285	2.389,337	37,36%	26,75%
- August 2015	17.930,339	105,649	10.266,365	4.257,915	57,26%	21,50%
01/08/2015	10.554,452	625,353	3.081,881	2.006,485	29,20%	19,88%
02/08/2015	9.546,592	594,265	2.470,980	1.840,328	25,88%	19,90%
03/08/2015	12.987,781	664,014	2.843,311	1.791,899	28,89%	14,44%
04/08/2015	15.643,448	1.198,693	3.628,831	1.841,009	24,09%	12,89%
05/08/2015	15.768,293	554,242	3.866,001	1.412,203	24,09%	12,89%
06/08/2015	17.836,466	947,357	4.106,601	712,711	29,11%	13,11%
07/08/2015	17.410,372	682,306	3.717,711	2.49,592	37,36%	13,11%
08/08/2015	19.433,929	578,742	7.468,614	2.249,592	38,42%	11,29%
09/08/2015	20.091,182	888,026	7.054,302	2.195,849	35,11%	10,90%
10/08/2015	21.012,259	445,727	6.255,969	2.359,135	29,77%	11,71%
11/08/2015	19.971,195	69,140	5.920,570	2.354,688	29,65%	12,89%
12/08/2015	19.971,195	69,140	7.431,638	2.354,688	30,84%	13,19%
13/08/2015	19.447,434	69,140	5.997,165	2.377,711	30,84%	13,19%
14/08/2015	22.759,194	1.198,693	7.054,302	2.412,203	25,19%	11,76%
15/08/2015	22.759,194	1.198,693	5.732,332	2.450,956	25,19%	11,76%
16/08/2015	21.240,825	7.123,311	2.412,239	33,54%	12,57%	
17/08/2015	19.952,991	355,073	7.793,136	2.451,102	39,06%	13,25%
18/08/2015	20.617,820	1.198,693	6.441,333	2.564,969	31,27%	13,15%
19/08/2015	20.617,820	1.198,693	6.441,333	2.564,969	31,27%	13,15%
20/08/2015	20.617,820	1.198,693	6.441,333	2.564,969	31,27%	13,15%
21/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
22/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
23/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
24/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
25/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
26/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
27/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
28/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
29/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
30/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
31/08/2015	21.584,770	151,984	7.969,580	2.793,438	36,95%	13,63%
End of Period	17.930,339	105,649	10.266,365	4.257,915	57,26%	21,50%



PLANT DATA MODEL



**CUSTOMER
REQUIREMENTS**



**PLANNING &
SCHEDULING**



1010001101011
1010110101000
101000111
101000111



$\Sigma \sigma$



**PROCESS
VARIABLES**



**PRODUCTION
TIMES**



**KPI
LIBRARY**



CONSUMPTION



**QUALITY
INSPECTION**



**CHEMICAL
ANALYSIS**



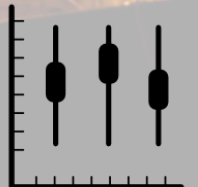
**FINAL
PRODUCTS**



STOCKYARD



SHIPPING





Connect & Analyze:

Excel: The mostly used data analysis tool

- The #1 data analysis tool on the planet
- Available on every device
- Flexible ad-hoc analysis
- Drill to and through
- Rich visualization
- Lot of data sources
- Used also for sharing

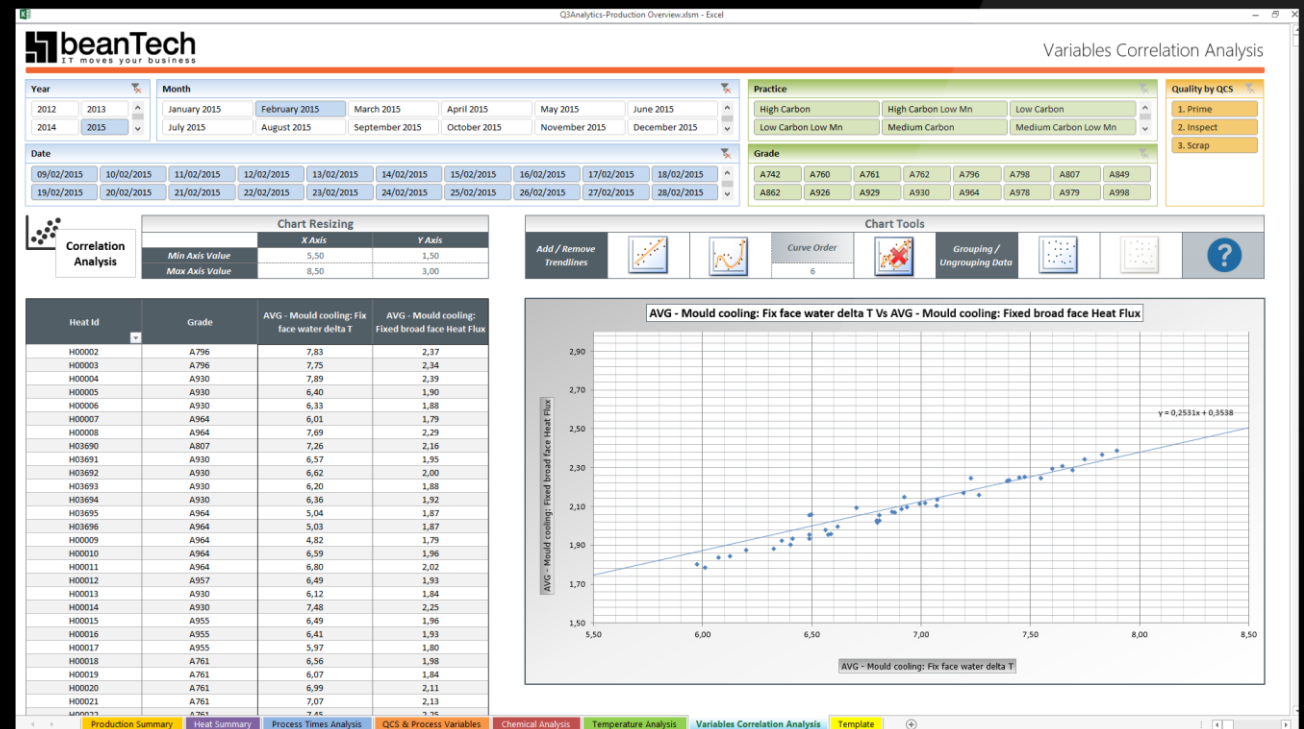
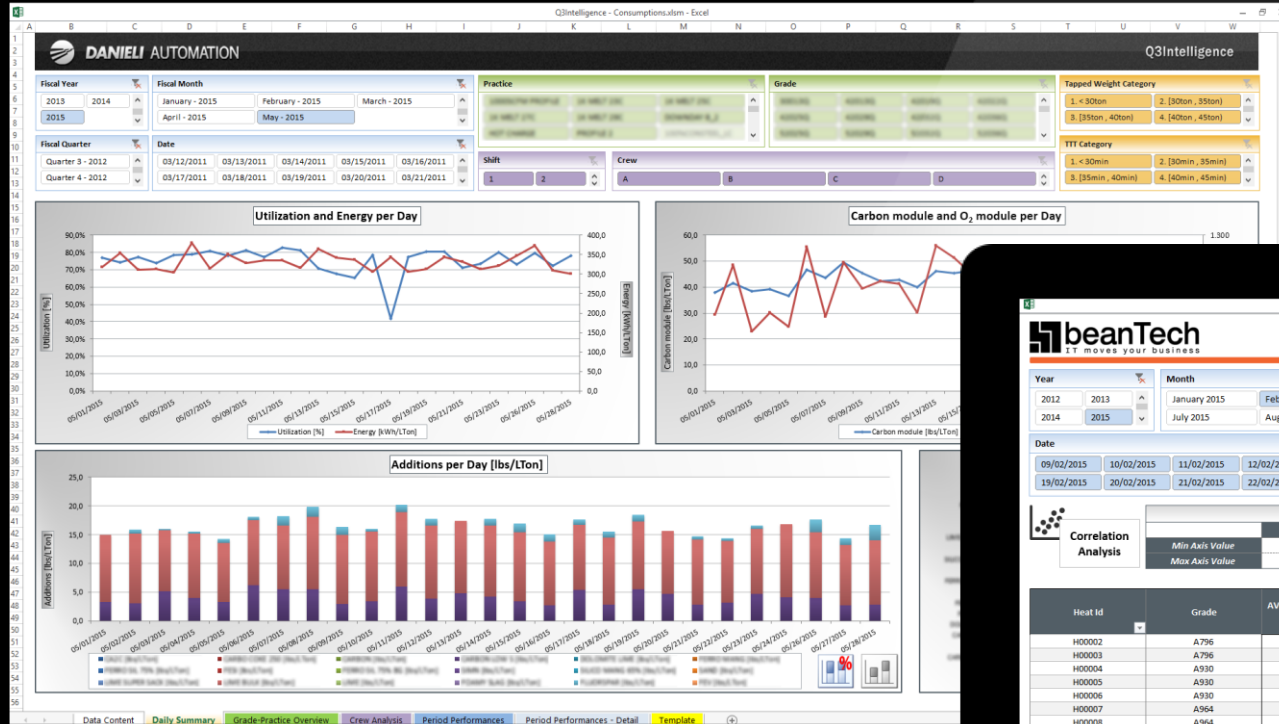


Share & Consume:

Power BI: Your data, every time, everywhere

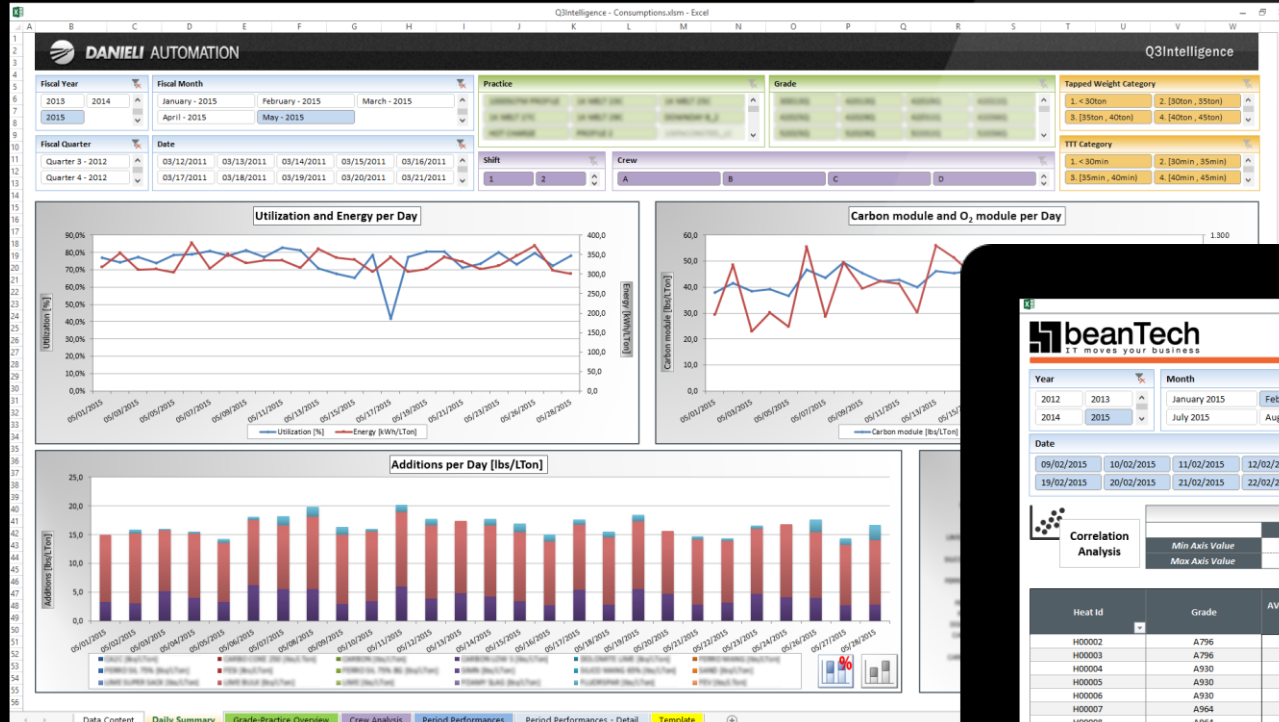
- Get data from cloud and on-premises sources
- Live dashboards
- Native apps for iOS, Android and Windows
- Share and collaborate with colleagues through O365 groups
- Natural language query





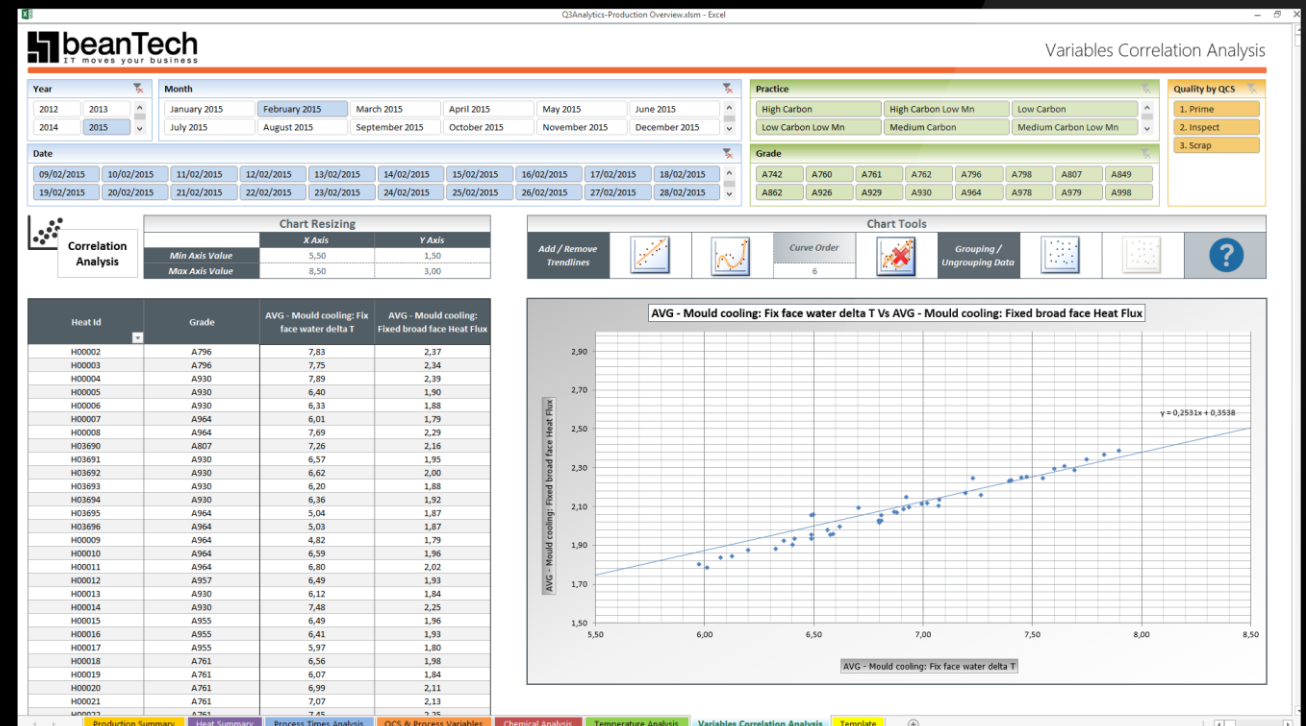
Business
Monitoring

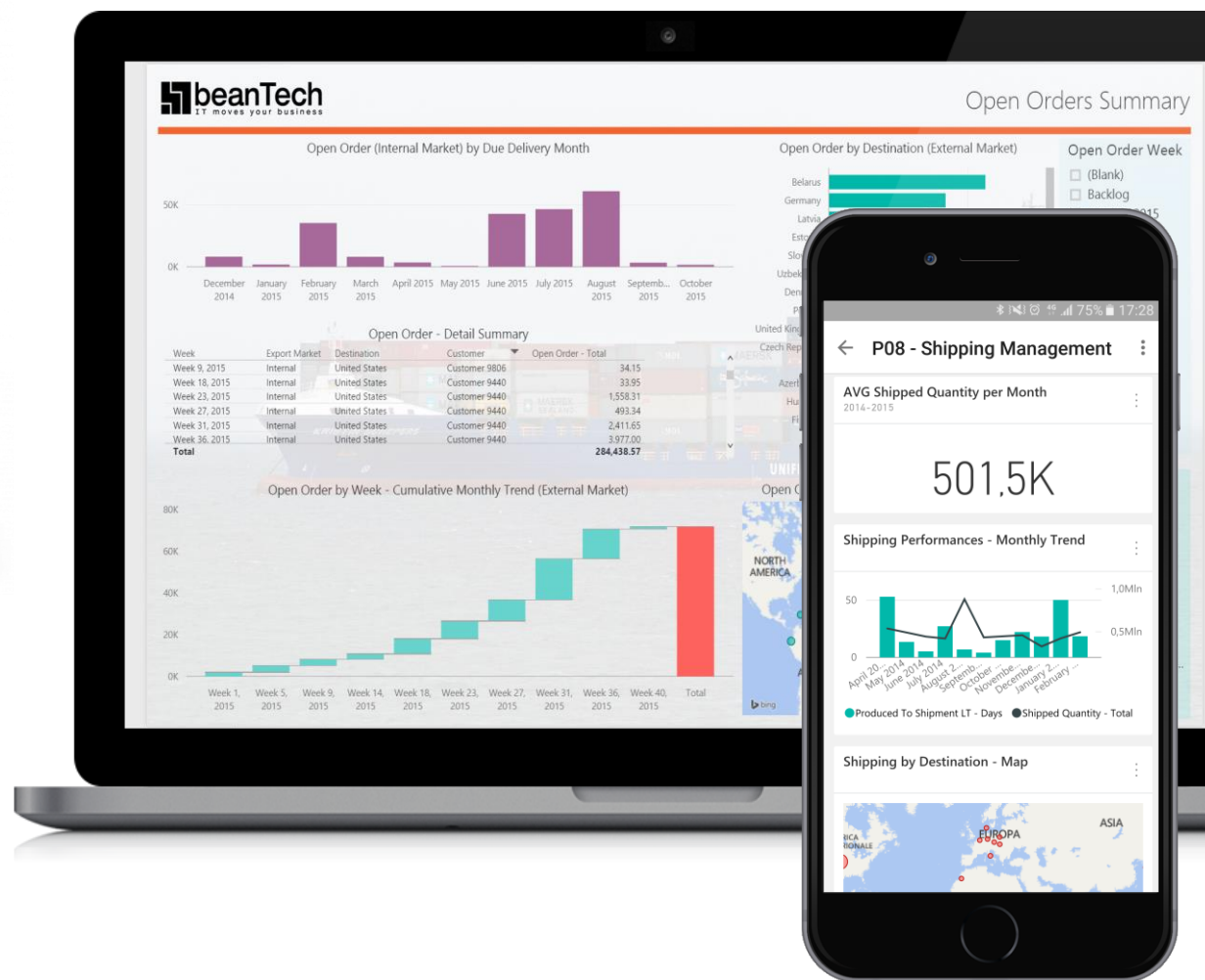
Unified Data
Models



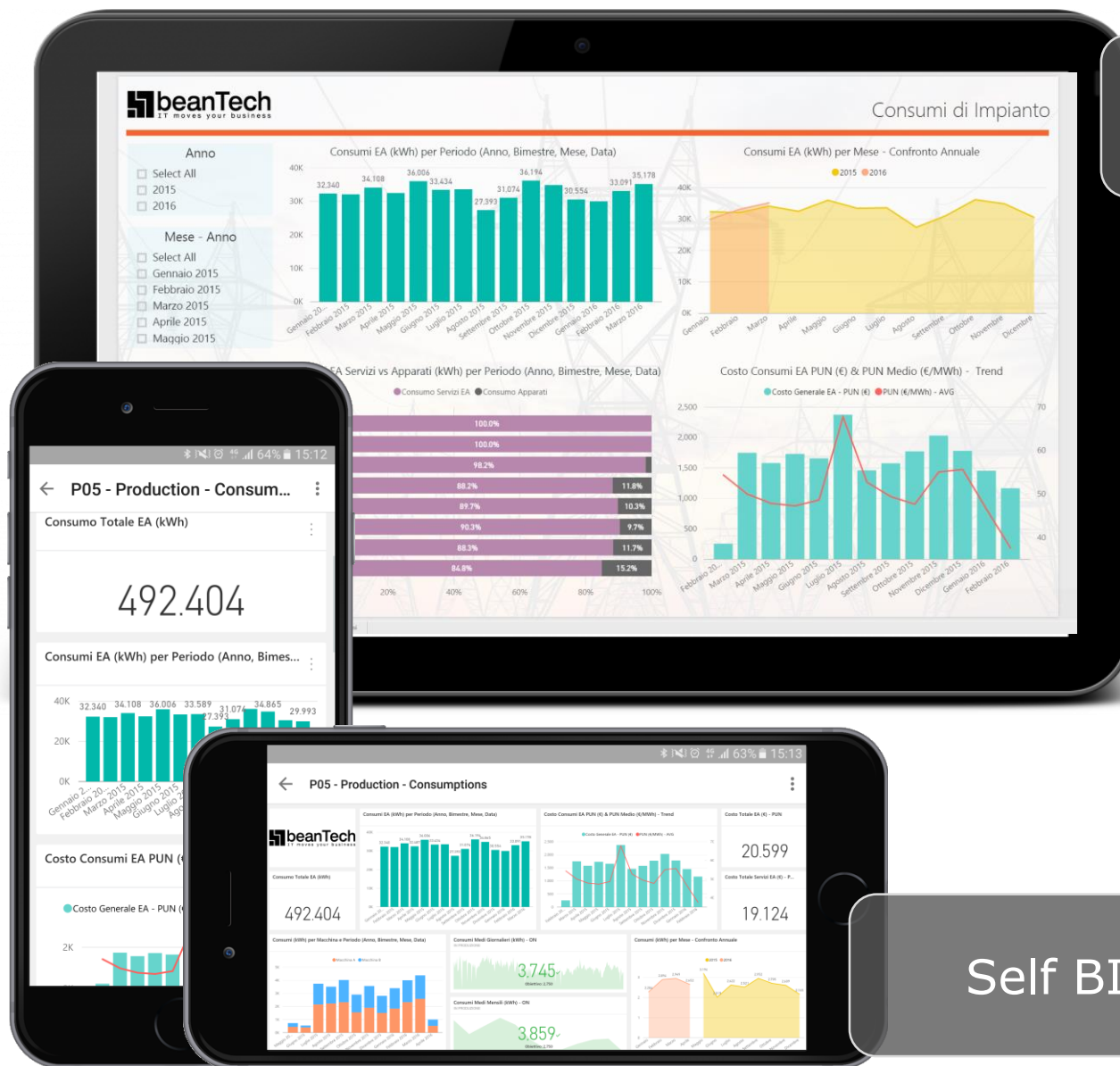
Analysis
Templates

Interactivity &
Customization

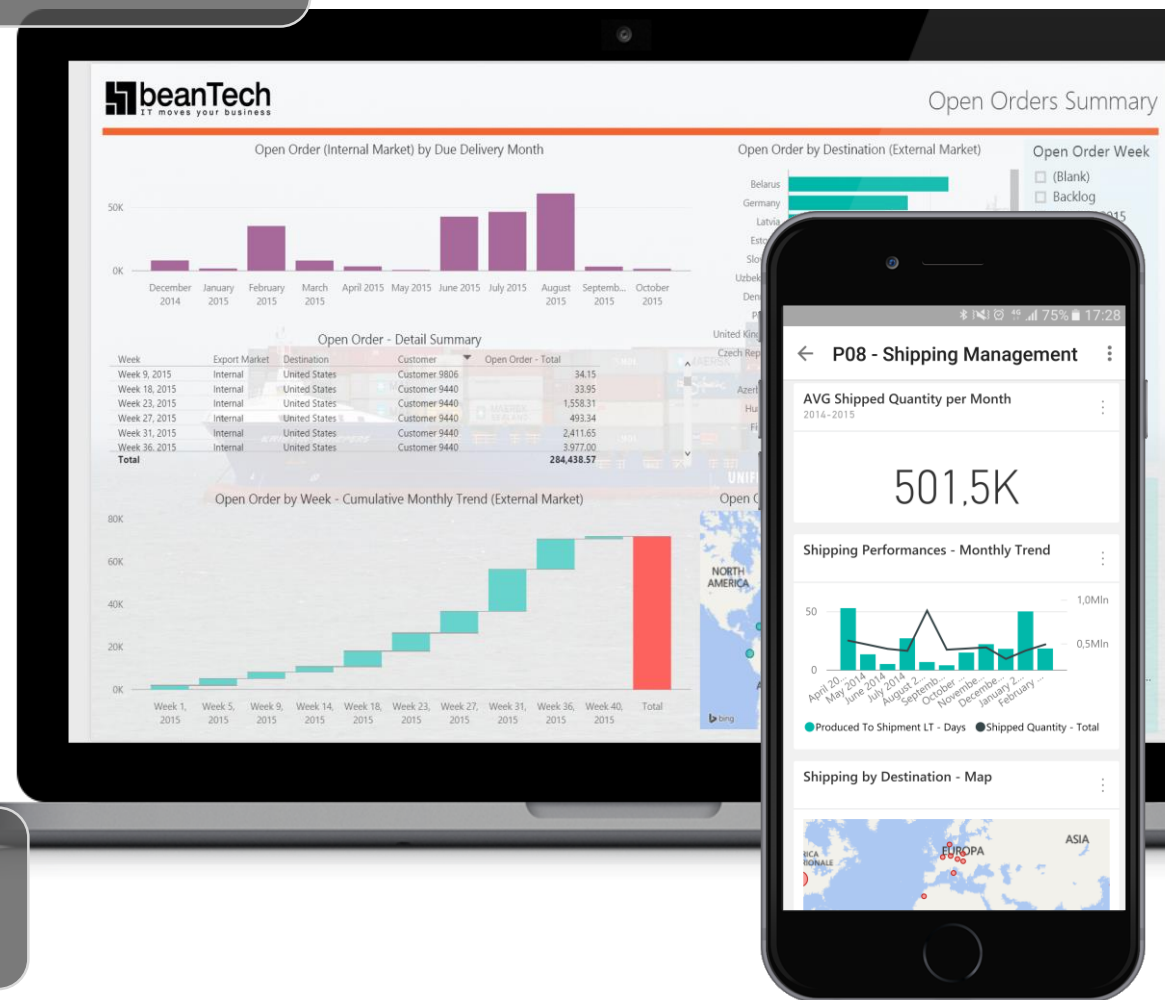




Your Data,
Everywhere



Self BI





PREDICTIVE

With the **state-of-the-art statistical tools**, users can do advanced mining of plant data, including multivariate regressions as well as clustering and classification analyses.

Thanks with our consulting services, basing also on complex machine learning algorithms, we provide **valuable insights into plant operations and performances**.

TECHNOLOGIES: OUR CHOICES



- **R** is an environment for advanced statistical computing and graphics
- R is widely used in both **academic** and **industry communities**
- R relies on an active community of developers and algorithm experts, getting **available**:
 - Standard statistical techniques
 - Machine learning and in general more complex analysis packages/tools



- **Machine learning** is a scientific discipline that explores the construction and study of algorithms that can learn from data
- In industrial contexts, machine learning methods may be referred to as **predictive analytics** or **predictive modelling**
- **Azure ML** is a fully-managed cloud service that enables to efficiently embed predictive analytics into applications, helping organizations benefit from massive data sets
- It is **where** data science, predictive analytics, cloud resources, and your data meet
- Azure ML supports **R** and **Python** custom code

PREDICTIVE SLA COMPLIANCE

WHAT?

- **Predict quality conformity** of final products (in terms of mechanical properties) using production process variables as classifiers
- Use the prediction model to support operational activities:
 - **Offline:** product type and process analysis
 - **Online:** fine tuning of the manufacturing process piece by piece

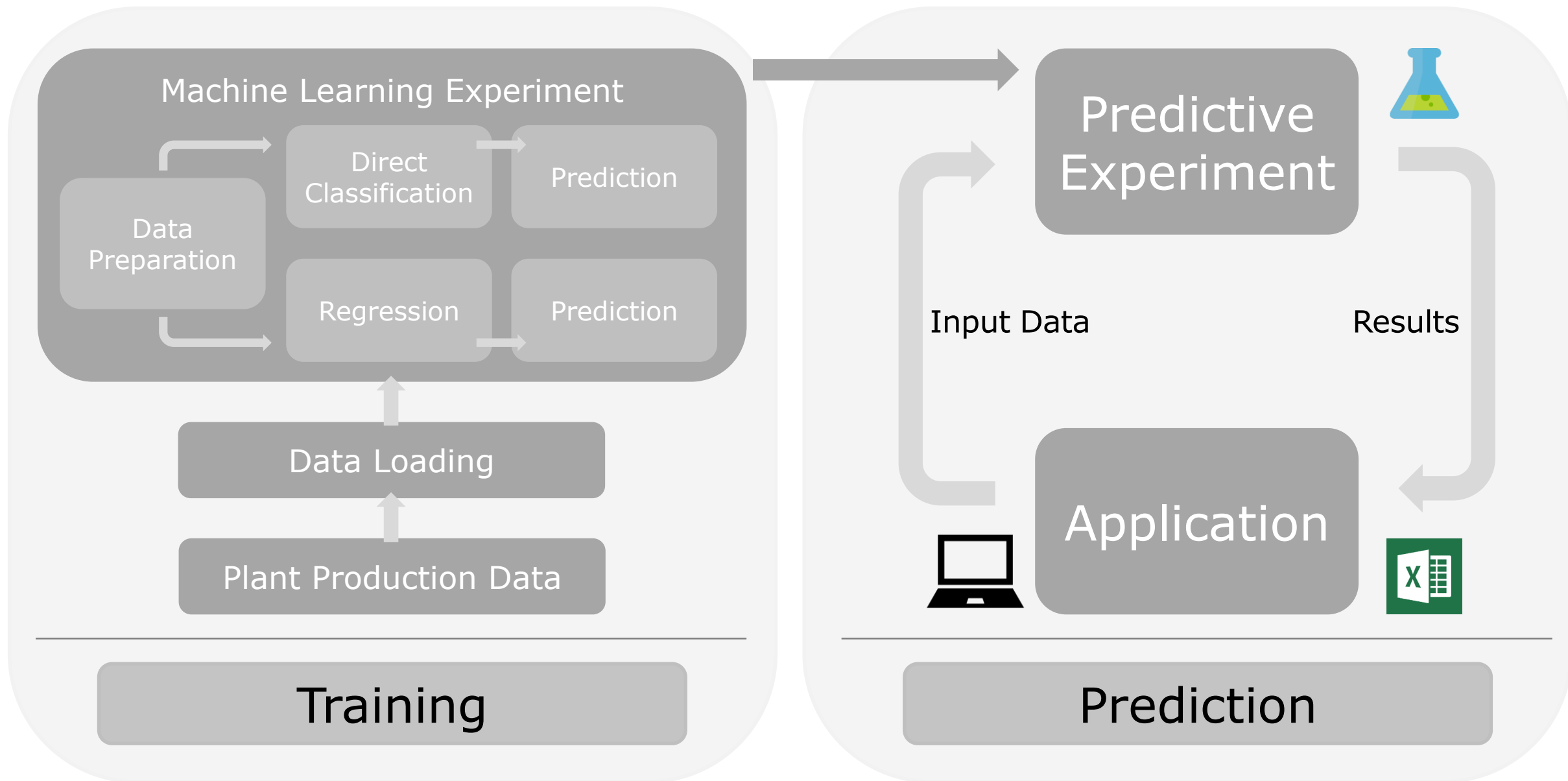
HOW?

- Analysis of **historical** production data collected by Q3Intelligence
- Integration of **Microsoft Azure Machine Learning** resources (services and algorithms) for setting up an advanced and cloud-based analytics framework
- **Ready-to-use prediction service**

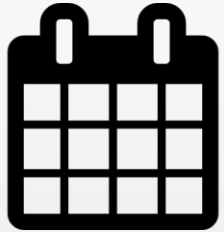
WHY?

- To **reduce** the amount of products to be tested
- To **reduce** the percentage of out-of-spec final products thanks to a better knowledge of the machine/operation under analysis (e.g: adjusting the set-up according to results)
- To fine tune process variables in real-time and make products that are in line **with specifications**

EXPERIMENT SETUP



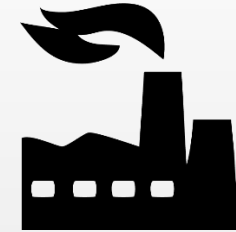
EXPERIMENT KPIs



2
Years of Data



11,5k
Products



5
Production Areas



138 Process Variables
>2B Samples



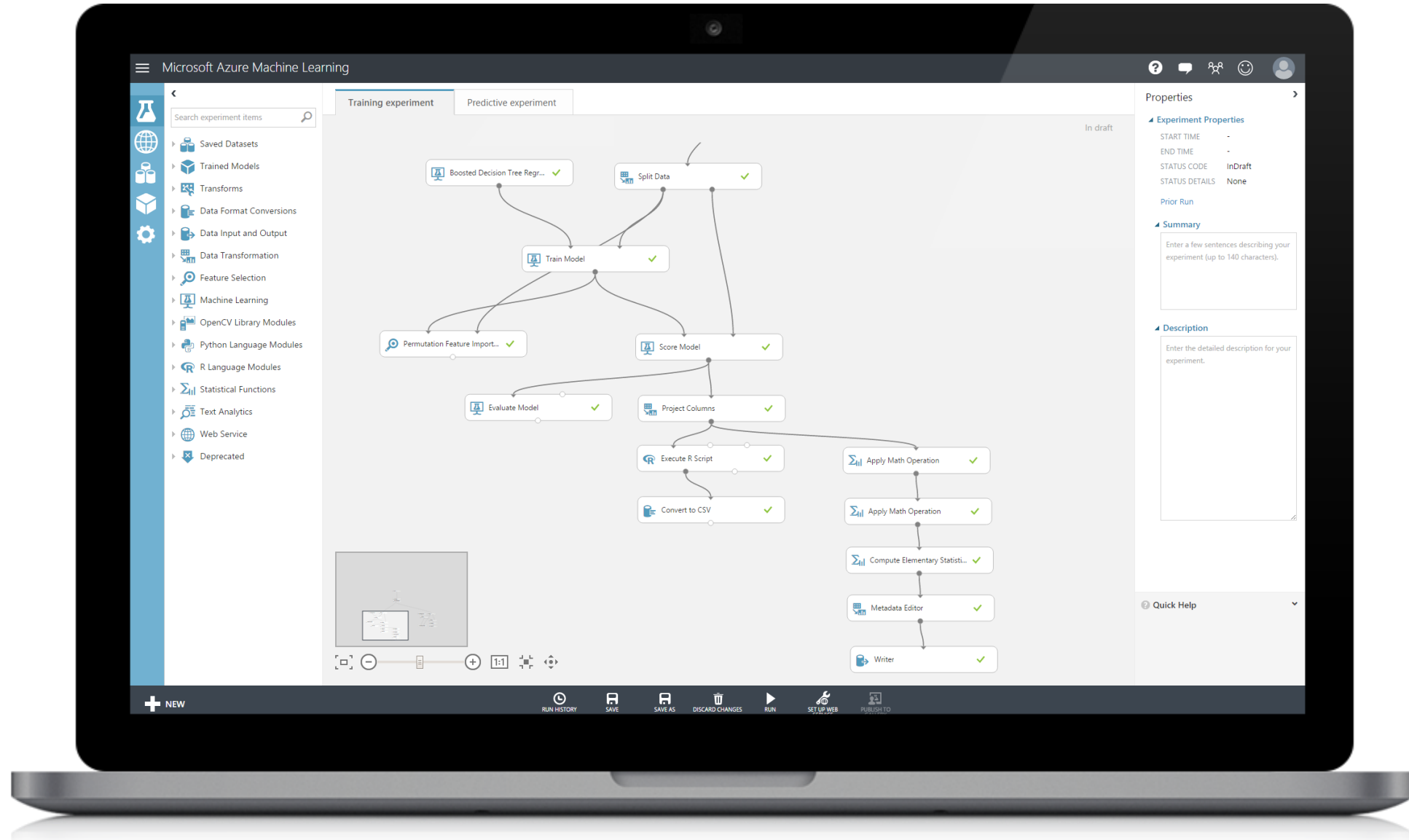
1
Multidisciplinary
Team



97,5%
Predictions
in Range

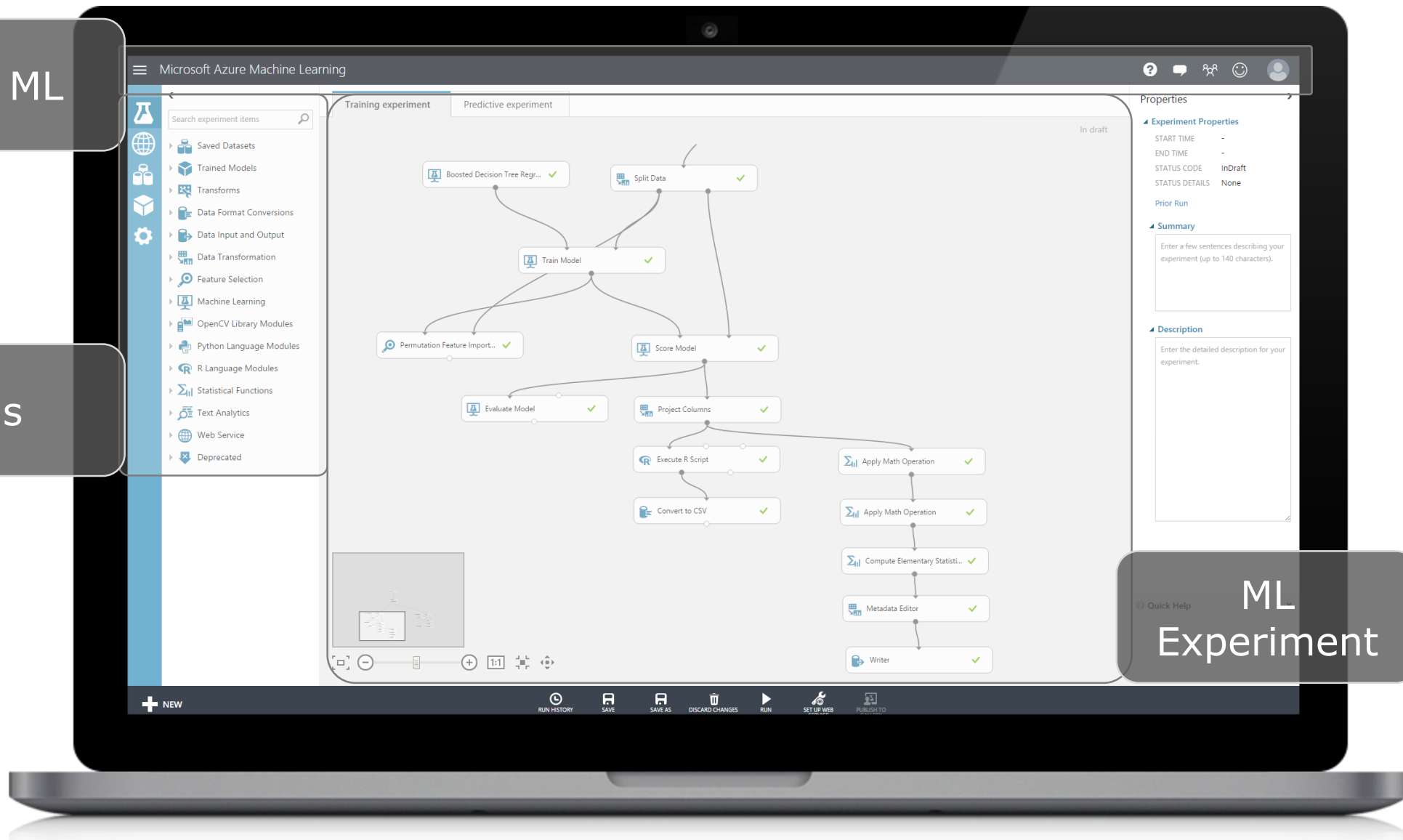


10' Training Time
<1'' Response Time

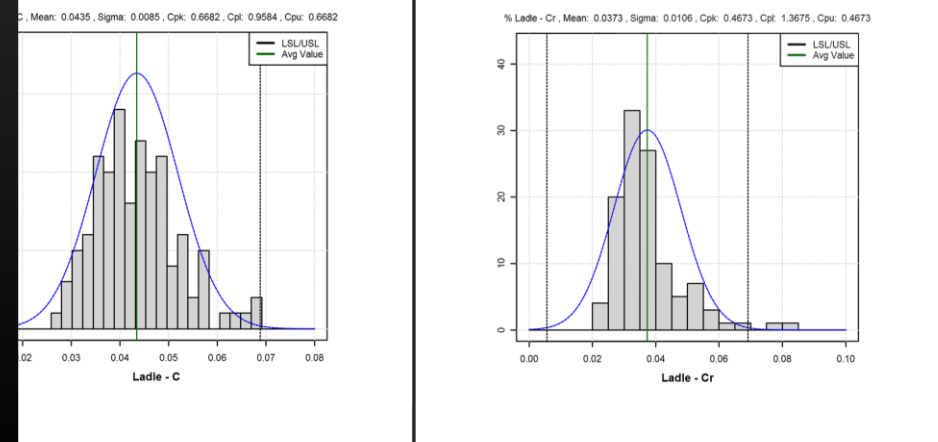
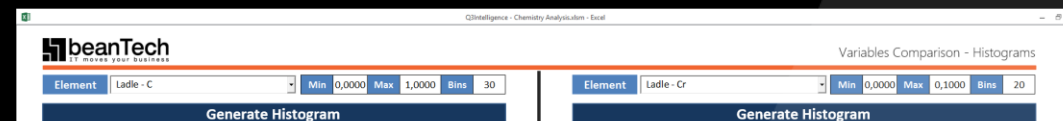


Azure ML

Tools

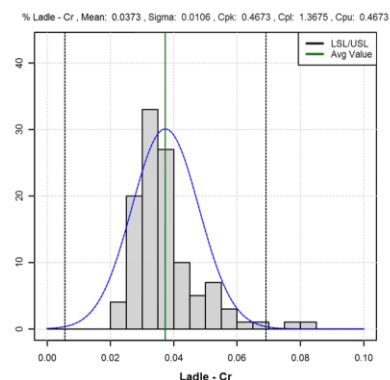
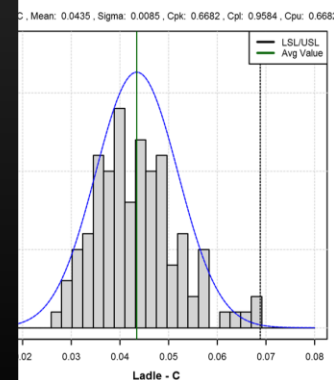
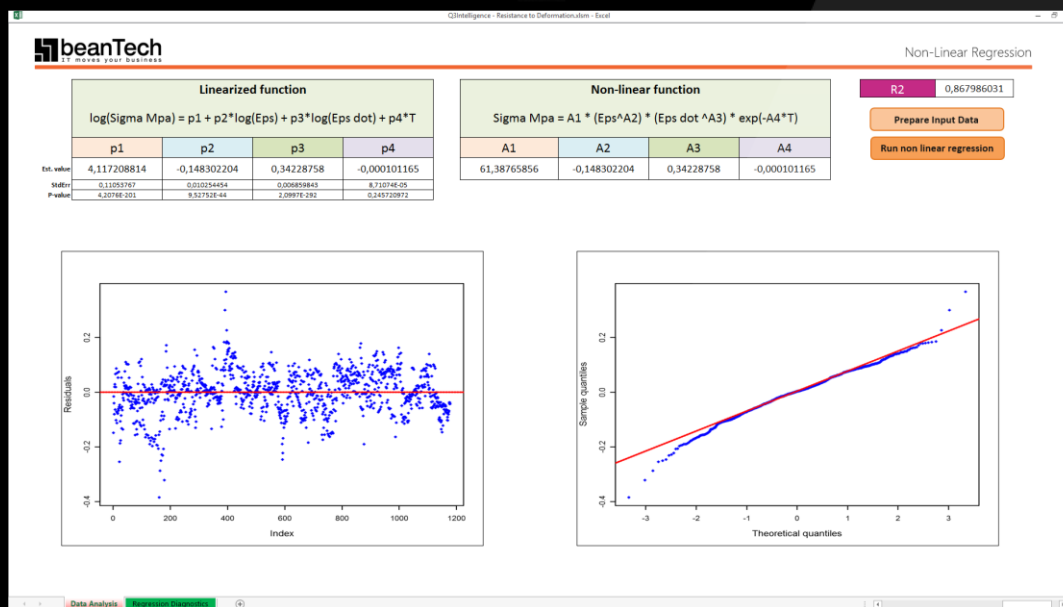
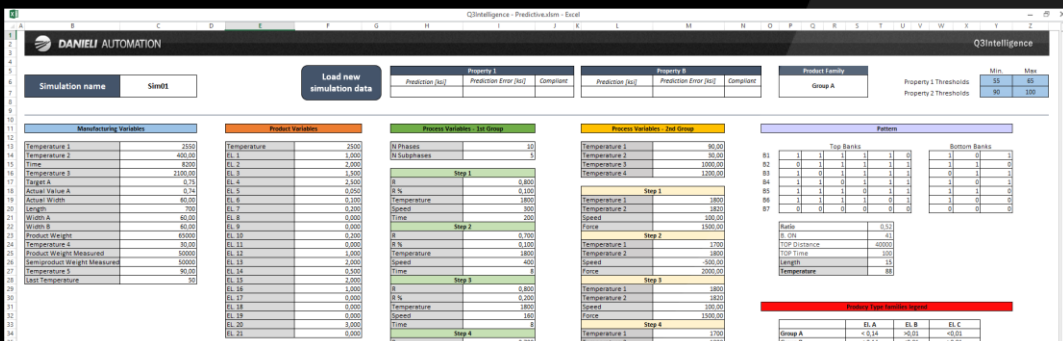


ML
Experiment



Iterative Prediction

- What-If Analysis
- Estimate Final Product Quality during Production
- Identify Process Variables most influent on Product Quality



Statistical Analysis

MANUFACTURING ANALYTICS

DAL DATO AL VALORE PER IL BUSINESS

Grazie per l'attenzione!