ALCHIMIA WEBINAR

I5.0: AI role in shaping the future of metallurgical processes

PERSPECTIVES OF GROWTH OF DIGITAL TECHNOLOGIES IN THE TWIN TRANSITION OF THE EUROPEAN STEEL

Author
Costanzo Pietrosanti
DANIELI AUTOMATION S.p.A.
Senior Consultant

Webinar
February 13, 2024

DANIELI AUTOMATION

DIG&MET

Measuring the Transition through Digital Readiness and Maturity applications

DANIELI AUTOMATION

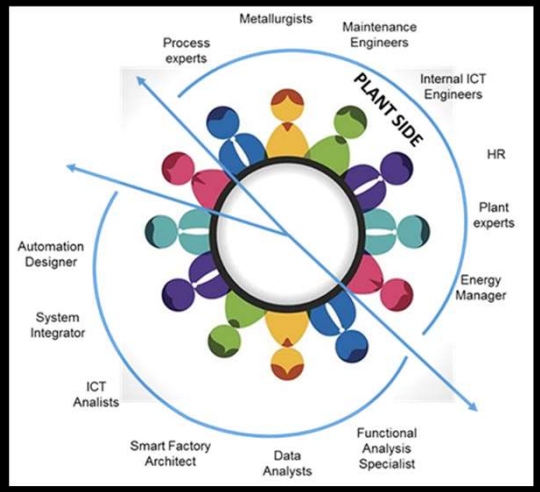
MATURITY → READINESS

PROGRESS OF DIGITALIZATION DEGREE

MATURITY
Is the Degree of Compliance to the Smart Factory (I5.0) paradigm.

READINESS
Is the ability of Measuring business processes. It is based on the global degree capabilities enabled by the Digitalization of Manufacturing Systems.

THE DIGITAL MATURITY & READINESS ASSESSMENT NEEDS THE DEVELOPMENT OF APPROPRIATE METRICS



The DA Qs-SCAN tool was developed to support the assessment.

ENGAGE. ACCELERATE. ACHIEVE.

Basic of the Methodology
Digitalization Maturity Matrix and Metrics

1. The **Digitalization Maturity Matrix** is a tool for calculating the **Basic Digital Index** which defines the status of Digitalization of manufacturing systems (assets, manufacturing areas, Plants etc.).
2. The Basic Digital Index is calculated by attributing scores (for ex. between 0 - 10 or 0 – 5) dependent on the level of capability enabled by given Digital Technologies. Scores are attributed during Consensus Meetings among experts and managing figures of Manufacturing Areas etc.
3. The BASIC DIGITAL INDEX is the *sum of scores normalized by the sum of the max achievable value of scores* for each considered digital technology (120 in example 1).
4. Based on the outcome sof the Consensus Meeting, an Update Plan is decided by analysing the weak points and the needed degree of capabilities to increase the adherence to the Smart Factory paradigm.

DIG&MET

Example 1: update of a Melt Shop – Plant 1 Digitalization Maturity Matrix and Metrics

DANIELI AUTOMATION

As-Is

Basic Digital Index	Connectivity & Data Sharing			Data Processing		Human In The Loop			Modelling			Autonomous and Robotic Systems			BASIC DIGITAL INDEX
Melt Shop 1	LAN	WEB Based	Wi-Fi	Data Auto Check	Business Analytics	Virtual & Augmented Reality	Portable & Wearable	Digital Pulpit	Integrated Modelling (L2 - L3)	Technological Packages (L1 - L2)	Optimization	Autonomous Systems	Remotely Controlled Systems	Cyber Physical Systems	31,67%
Input Value															38
Total per Category	18			12		4			4			0			38
Warnings	WARNING			12		WARNING			WARNING			0			
Max Achievable Value	10	10	10	10	10	5	10	10	10	10	10	5	5	5	120
Active Thresholds	20			10		5			10			/			

To Be

Basic Digital Index	Connectivity & Data Sharing			Data Processing		Human In The Loop			Modelling			Autonomous and Robotic Systems			BASIC DIGITAL INDEX
Melt Shop 1	LAN	WEB Based	Wi-Fi	Data Auto Check	Business Analytics	Virtual & Augmented Reality	Portable & Wearable	Digital Pulpit	Integrated Modelling (L2 - L3)	Technological Packages (L1 - L2)	Optimization	Autonomous Systems	Remotely Controlled Systems	Cyber Physical Systems	47,50%
Input Value															57
Total per Category	26			14		5			8			4			57
Warnings	26			14		5			WARNING			4			
Max Achievable Value	10	10	10	10	10	5	10	10	10	10	10	5	5	5	120
Active Thresholds	20			10		5			10			/			

DIG&MET

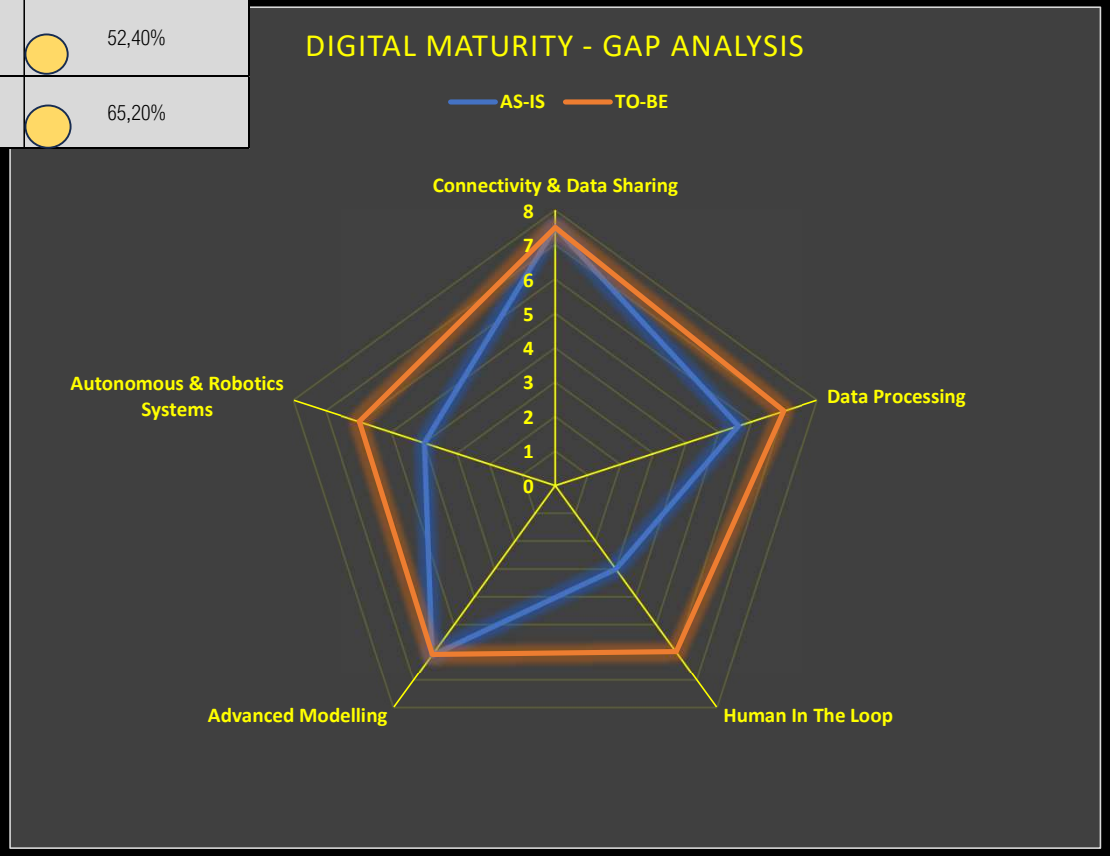
DANIELI AUTOMATION

Example 2

Digital Maturity of Melting Shop of Plant 2 – Gap Analysis

Type of Analysis	Connectivity & Data Sharing	Data Processing	Human In The Loop	Advanced Modelling	Autonomous & Robotics Systems	Basic Digital Index Normalized
AS-IS	7,5	5,6	3	6,1	4	52,40%
TO-BE	7,5	7	6	6,1	6	65,20%

AREAS OF INVESTMENTS
DIGITAL PULPIT - VIRTUALIZATION OF LOCAL CONTROL STATION
AI & ML APPLICATIONS
CONNECTIVITY & DATA PROCESSING
ENERGY MANAGEMENT
EQUIPMENT PHYSICAL & LIFE TRACKING



ENGAGE. ACCELERATE. ACHIEVE.

Question 3: AI is perceived as the biggest disruption emerged in the Digital Transition. Is this true?

To answer, “follow the *money*”

DIG&MET

DANIELI AUTOMATION

BA Step 2: Let's introduce the KPIs

1. The *Global Market Size of Expenditures* (GMS, $ billions)

   GMS is defined as the total expenditures on each technology in a given time span (up to 2030 in our case).

2. The Compound Annual Growth Rate (CAGR, percentage).

   CAGR is the rate of return (RoR) that would be required for an investment to grow from its beginning balance to its ending balance, assuming the generated profits were reinvested at the end of each year of the investment's life span (Investopedia, https://www.investopedia.com/terms/c/cagr.asp)

2. The Compound Economic Factor of Digitalisation (CEFD, percentage).

   CEFD, is the multiplication and normalisation of GMS ands CAGR. It captures both the static size of expenditures and the relative dynamics of each digital technology selected into the set through a dimensionless Formula

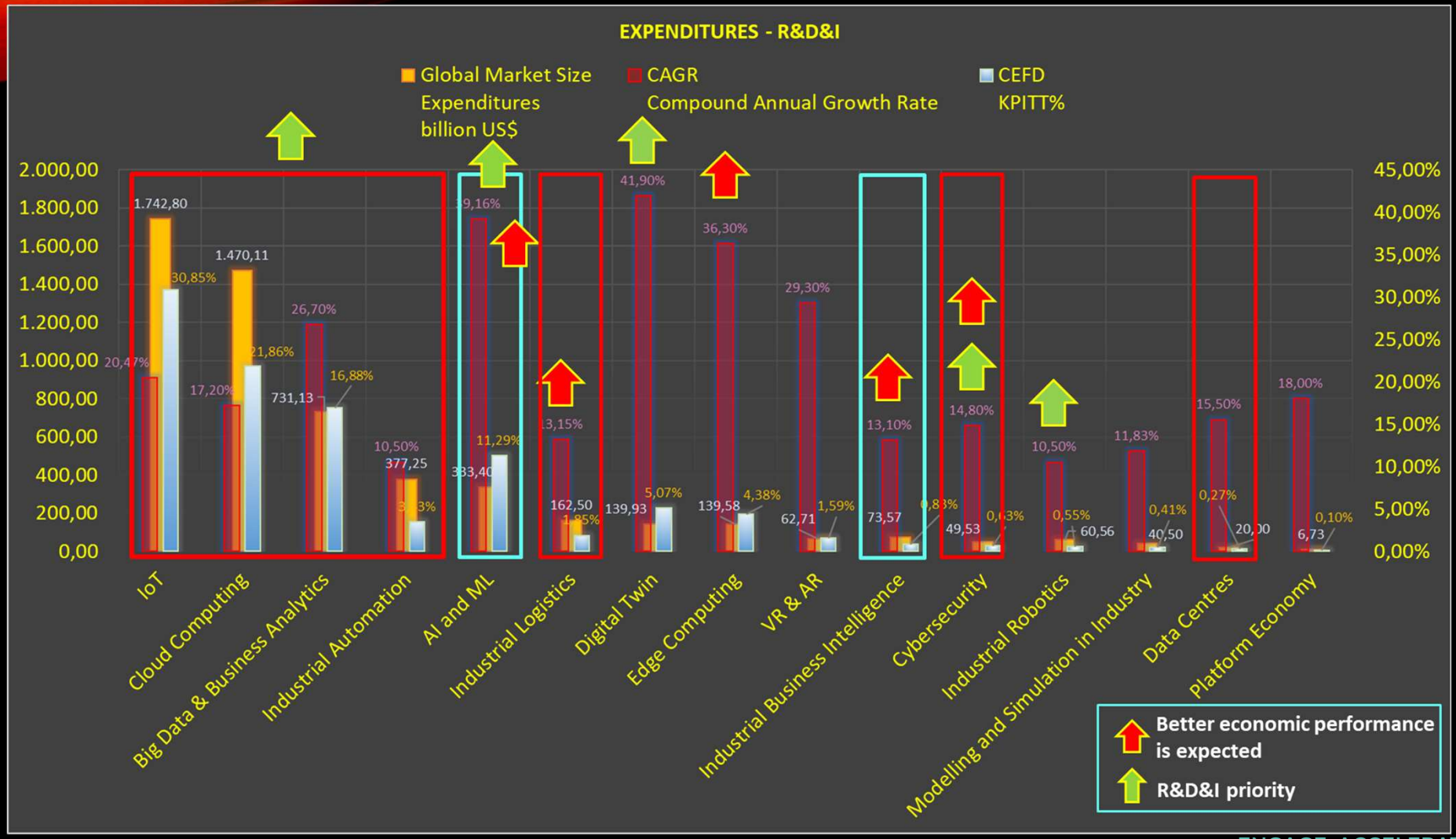
DIG&MET

Step 3.1: Ranking at 2030 – Technology by Technology

DANIELI AUTOMATION

n°	Digital Technology Ranking 1	CEFD $KPI_{TT\%}$	n°	Digital Technology Ranking 2	Global Market Size Expenditures billion US$	n°	Digital Technology Ranking 3	CAGR Compound Annual Growth Rate
1	IoT	30,85%	1	IoT	1.742,80	1	Digital Twin	41,90%
2	Cloud Computing	21,86%	2	Cloud Computing	1.470,11	2	AI and ML	39,16%
3	Big Data & Business Analytics	16,88%	3	Big Data & Business Analytics	731,13	3	Edge Computing	36,30%
4	AI and ML	11,29%	4	Industrial Automation	377,25	4	VR & AR	29,30%
5	Digital Twin	5,07%	5	AI and ML	333,4	5	Big Data & Business Analytics	26,70%
6	Edge Computing	4,38%	6	Industrial Logistics	162,50	6	IoT	20,47%
7	Industrial Automation	3,43%	7	Digital Twin	139,93	7	Platform Economy	18,00%
8	Industrial Logistics	1,85%	8	Edge Computing	139,58	8	Cloud Computing	17,20%
9	VR & AR	1,59%	9	Industrial Business Intelligence	73,57	9	Data Centres	15,50%
10	Industrial Business Intelligence	0,83%	10	VR & AR	62,71	10	Cybersecurity	14,80%
11	Cybersecurity	0,63%	11	Industrial Robotics	60,56	11	Industrial Logistics	13,15%
12	Industrial Robotics	0,55%	12	Cybersecurity	49,53	12	Industrial Business Intelligence	13,10%
13	Modelling and Simulation in Industry	0,41%	13	Modelling and Simulation in Industry	40,50	13	Modelling and Simulation in Industry	11,83%
14	Data Centres	0,27%	14	Data Centres	20,00	14	Industrial Automation	10,50%
15	Platform Economy	0,10%	15	Platform Economy	6,73	15	Industrial Robotics	10,50%
TOT		100,00%	TOT.		5.410,30	TOT.		318,41%

The Business Analysis at a glance



CONCLUSIONS

- ✓ The I5.0 Reference Model is characterized by Predictivity, Integration of Systems, Robustness and seamless flow of data. Compliance to this model requires flexible ICT architectures to enable the full potential of the digital technology evolution, in particular AI and ML (XL = DL, RL, etc.).
- ✓ The AI technological technology domain and the set of ICTs is joint with the concept of Data-Driven Management representing the dusrupotive technological cluster of the next five years and more.
- ✓ However, the Data Driven Factory needs infrastructural expenditure including Computation Power higher than the direct expenditures on the AI itself so, it is necessary to plan the transition considering Infrastructure the enabler of AI in one expenditure basket.

ALCHIMIA WEBINAR

I5.0: AI role in shaping the future of metallurgical processes

THANK YOU FOR LISTENING

PERSPECTIVES OF GROWTH OF DIGITAL TECHNOLOGIES IN THE TWIN TRANSITION OF THE EUROPEAN STEEL

DANIELI AUTOMATION