CENAM
CENTRO NACIONAL DE METROLOGÍA

A strategy for the implementation of industry 4.0 through digital transformation”

11th M4DT Day – Metrology for Industry 4.0

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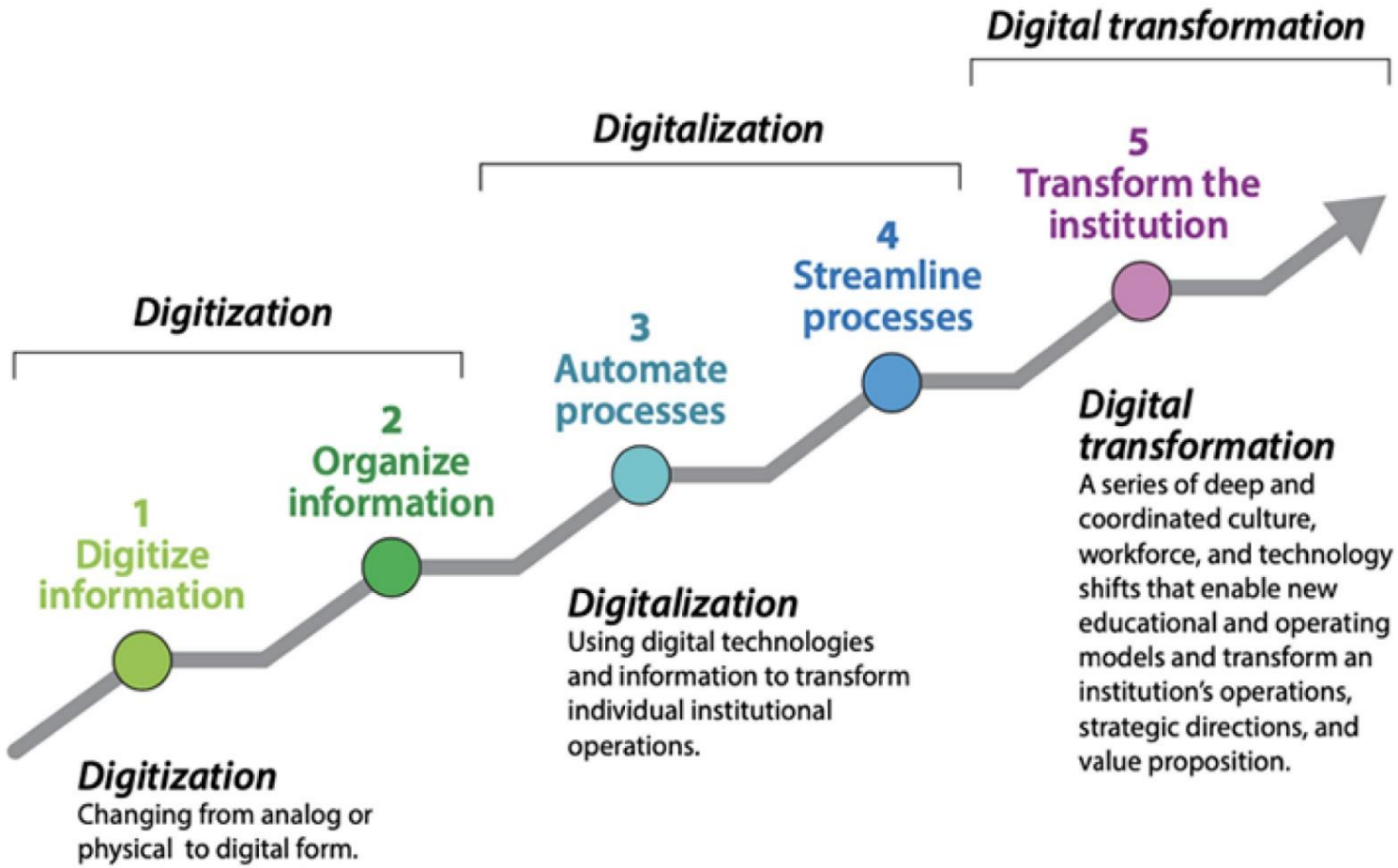
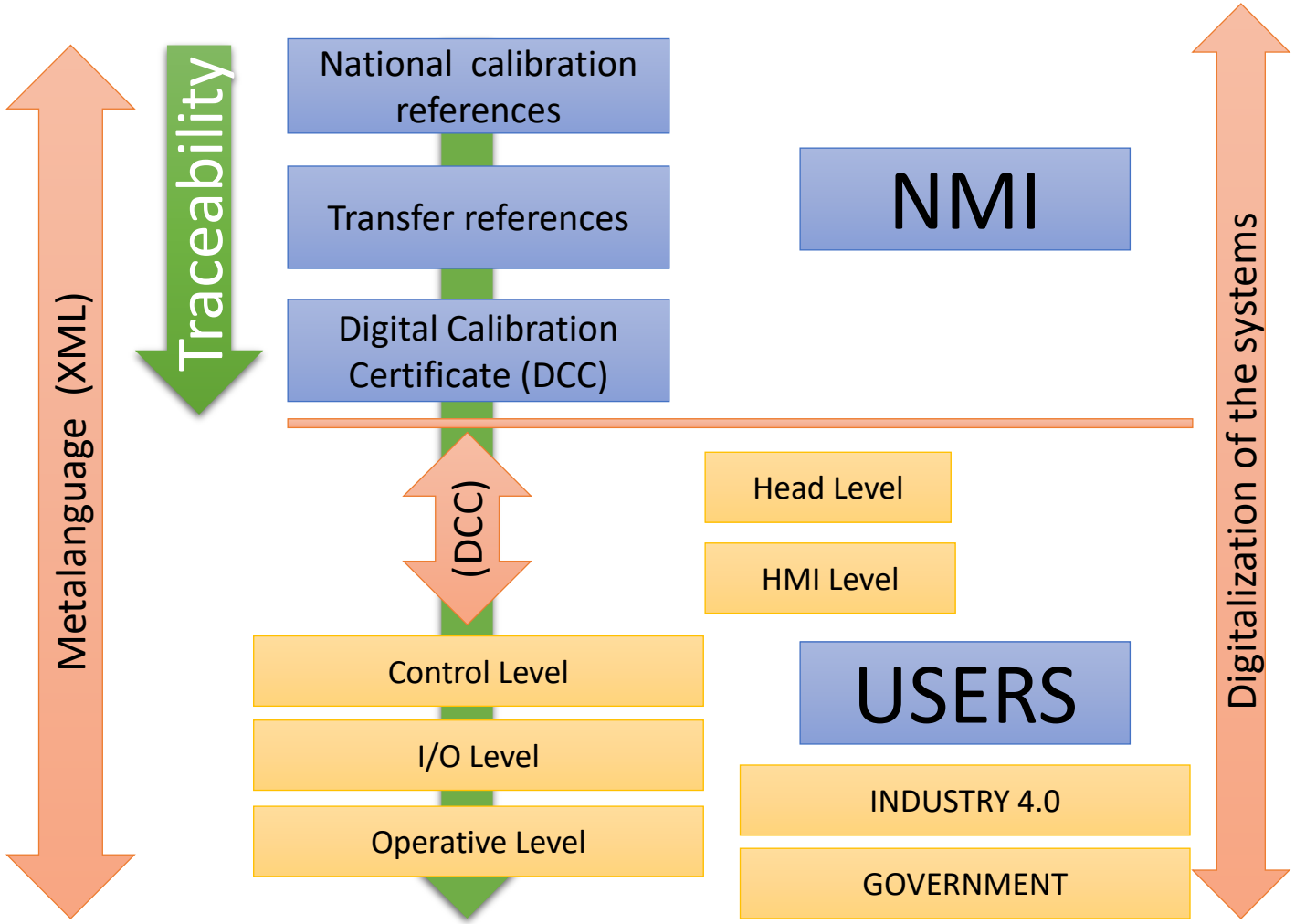
UNDERSTANDING THE PROCESS TO DT



Digital transformation in metrology

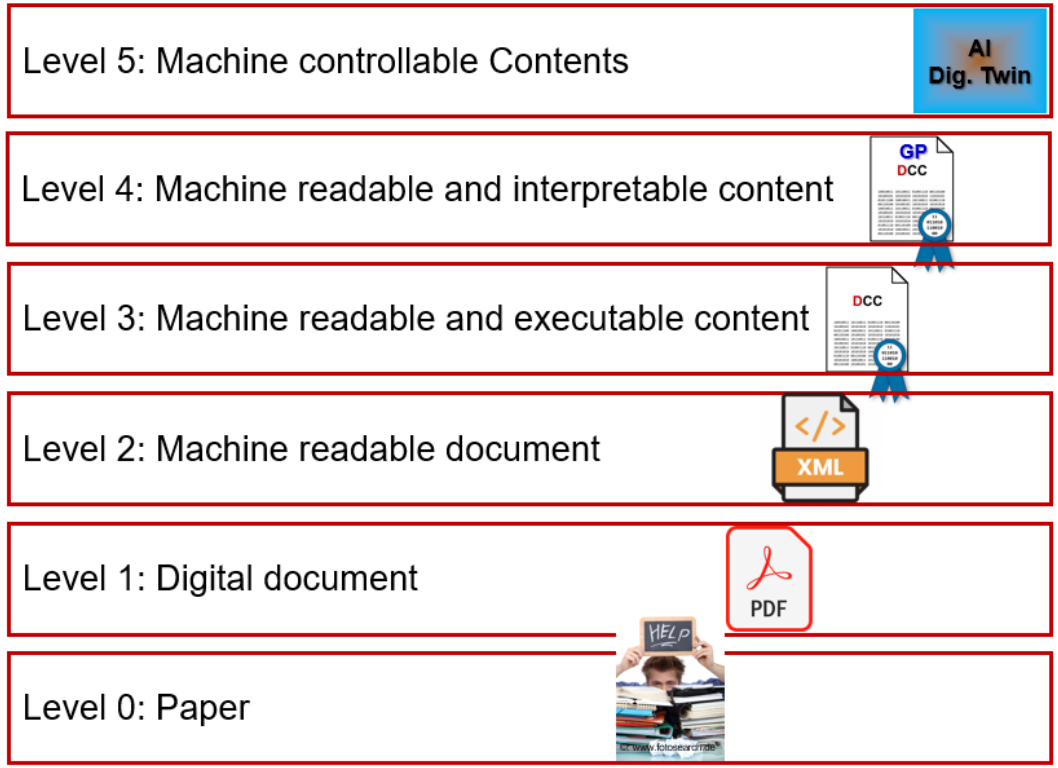
In a few words….

"The usage of computers, instruments, IT technologies to automate and optimize a process though the exchange of standardized data between machines in order to give traceability among the metrology value chain "



Defining the Strategy

The Utility-Model



From: „IDiS – Initiative Digitale Standards“. [Online]. see: https://www.dke.de/idis

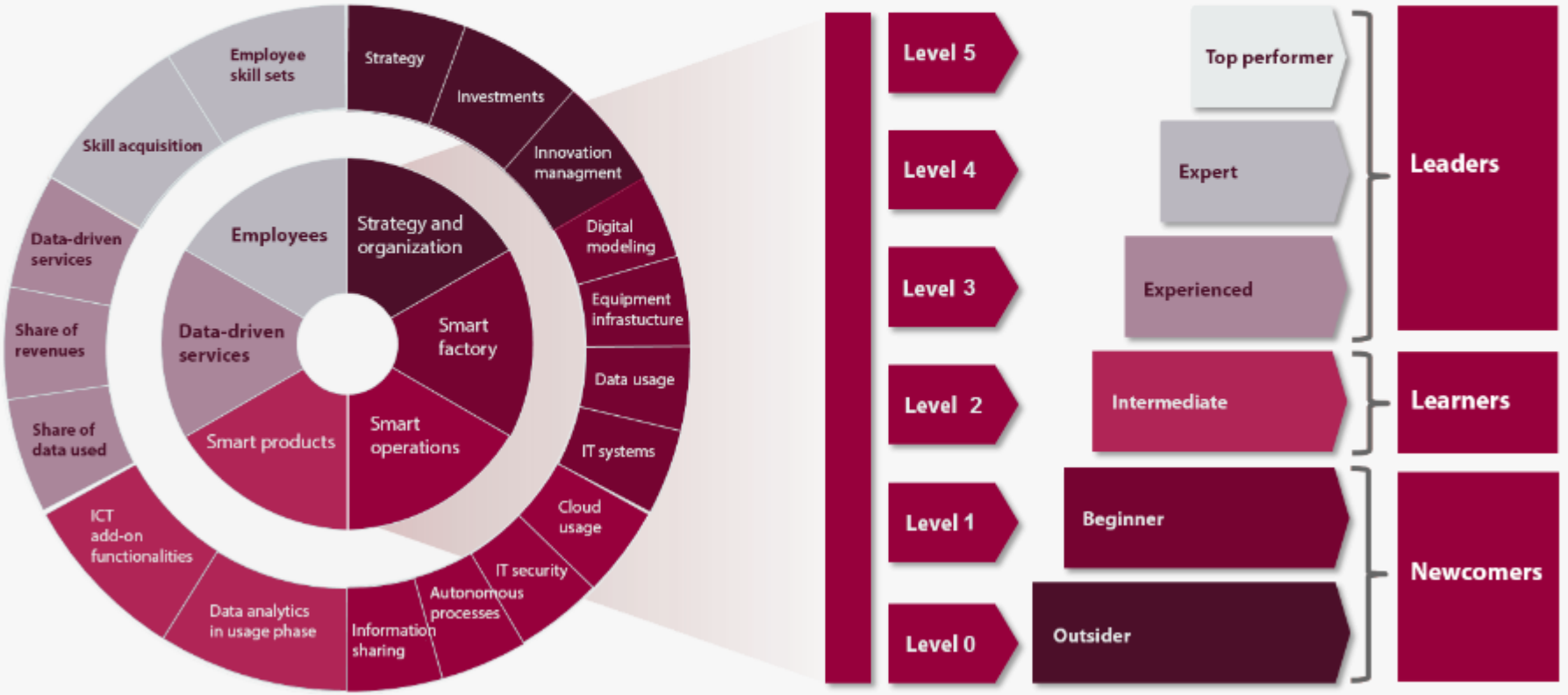
Digital transformation readiness models for I 4.0

https://www.industrie40-readiness.de/?lang=en

Industry 4.0 Readiness
Online Self-Check for Businesses

Where does your business stand? Check your readiness for Industry 4.0!

This self-check lets you calculate your very own Industry 4.0 scorecard. Find out where you are already well prepared for Industry 4.0 and where you still have room for improvement.

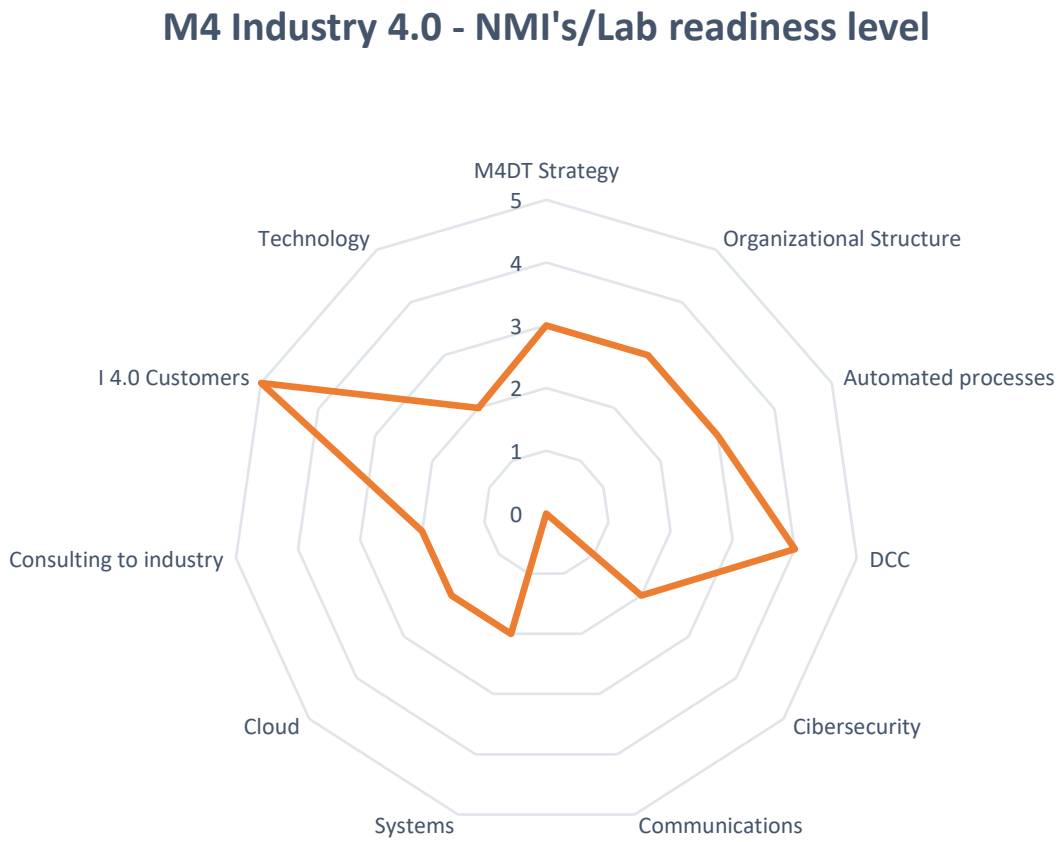


The Readiness Model is the foundation for a self-assessment and comparison. The Online Self-Check developed for this purpose gives companies the ability to check their own Industry 4.0 readiness.

Where is our NMI on the road to metrology for industry 4.0?

Autodiagnosis about the level of maturity or readiness to M4 I 4.0

No.	Reflection questions	Key elements
1	Do you have a Strategy for Metrology for Digital Transformation that includes Industry 4.0?	M4DT Strategy
2	Do you have a department or group of people responsible for M4 Industry 4.0?	Organizational Structure
3	Do you have automated processes for calibrations/measurements/tests?	Automated processes
4	Do you have Digital Calibrations Certificates? (e.g. pdf, xml, etc.)	DCC
5	Do you have cryptographic or information encryption protocols?	Cibersecurity
6	Are you available to perform remote calibrations?	Communications
7	Do you use programming or engineering languages/software like Phyton, Java, C, LabVIEW, Ansys, etc.?	Systems
8	Do you use cloud computing for metrology services?	Cloud
9	Do you have consulting services to the Industry?	Consulting to industry
10	Do you have customers/users that use Industry 4.0 technologies?	I 4.0 Customers
11	Have you developed technology for Industry 4.0?	Technology



TRL+TD to Metrology for Industry 4.0

TRL 0
First Principles
A stage for greenfield research.

TRL 1
Goal-oriented Research
Moving from basic principles to practical use.

TRL 2
Proof of Principle (PoP) Development
Active R&D is initiated.

TRL 3
Systems Development
Sound software engineering.

TRL 4
Proof of Concept (PoC) Development
Demonstration in a real scenario.

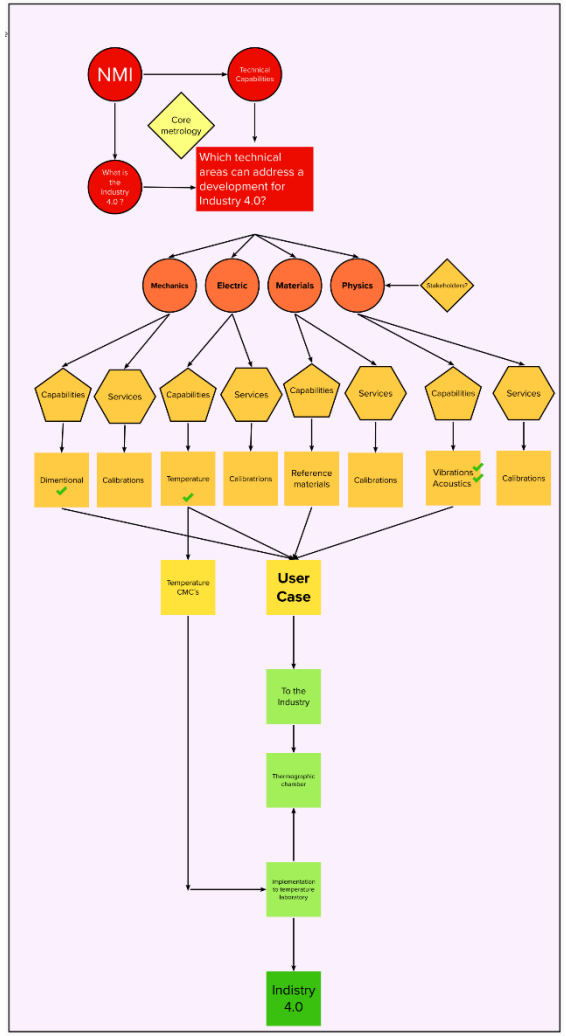
TRL 5
"Capability"
The R&D to product transition.

TRL 6
Application Development
Robustification of modules, specifically towards one or more use-cases

TRL 7
Integrations
infrastructure, product platform, data pipes, security protocols

TRL 8
Flight-ready
The end of system development.

TRL 9
Deployment
Monitoring the current version, improving the next.



Reference: Technology Readiness Levels for Machine Learning Systems
January 2021
DOI: 10.21203/rs.3.rs-133138/v1

A pathway to implement M4 I 4.0:

a) Definition of the working group within the NMI.
b) Definition of the concept Industry 4.0 for the NMI and its scope and relevance.
c) Identification of technological areas interested in I4.0
d) Identification of capabilities, related services and technical asistance for Industrie.
e) Select those that can venture into the metrological solution for industry 4.0
f) Industry 4.0 Use Case Definition
g) Integration of the digital transformation to the traceability process through the digitization of data, e.g. the DCC.
h) Follow-up of metrological confirmation.

Approaching to Industry 4.0

NMI's expertise, capabilities and offer:

- Digitization
- Digitalization
- Automation
- Measurement sensors
- Optical measurements
- DCC
- Remote calibrations
- Digital twins
- Cloud computing
- Big data
- Cybersecurity
- Machine learning
- Augmented reality
- Quantum digital technologies

How to meet the DIGITAL needs and challenges?

- Services to industry
- Technical assistance (e.g. MESURA 2.0 (CENAM), EVI (LCM))
- Strategic alliances
- Projects and close collaboration win to win / learn to learn (e.g. DCC-VW)
- ...

Push and Pull

Industry 4.0:

- Automation / SCADAs
- Sensor's networks
- 3D manufacturing
- Ro/cobots
- Digital twins
- Advanced and sustainable manufacturing
- IIoT
- Cyber security
- Big data
- Machine learning
- Augemented reality

SOME CONCLUDING REMARKS

- Share NMI's experiences, capabilities and learnings in I 4.0
- is a multidisciplinary development.
- focus on developments that can be replicated to more services and not just one.
- focus on services that can impact users.
- Explore different types of industry, e.g. Agro, food, pharma, energy, etc.
- Close collaboration with communications and information technologies developers and SME's

Questions, comments and suggestions