

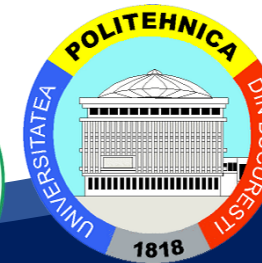


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Workshop - Exploring the dimensions of the Industry 4.0 maturity model

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Curriculum Development
of Master's Degree Program in
Industrial Engineering for Thailand Sustainable Smart Industry



Industry 4.0 Attributes



- **Interoperability** or the ability to achieve results by different means, to perform the same functions, despite possible exchange of equipment and manufacturers.
- **Decentralization**, which corresponds to the ability to make decisions without dependence on a data processing center or a decision-making body of human resources.
- **Virtualization**, reproduction resource or simulation of the real world in virtual mode.
- **Modularity**, capacity for change, to make processes more comfortable and adherent depending on environmental configurations and the need for variations in product design.
- **Real-time** reaction through analysis of large volumes of data that allow the identification of profiles and even subtle changes in scenarios.
- **Orientation to services** made possible by the integration of processes, since they present themselves as adequate means to mediate the relationship of the consumer market with the companies, as an opportunity for improvements in the final use of the product.





Business Model



- **Technology**
 - Internet of Things (IoT)
 - Cloud Computing
 - Data Science
 - Big Data Analytics
 - Artificial Intelligence
 - Machine learning
 - Virtualization
 - Prototype and simulation
 - Augmented reality
 - 3D Printing
 - Robotics systems
- **Process and project based management**
 - Human-computer collaboration
 - Equipment integration
 - Collective Intelligence
- **Sustainability**
 - Economic
 - Security
 - Environmental



- **Readiness assessments** are evaluation and analysis tools that aim to determine the level of preparedness of an organization in terms of conditions, attitudes and resources.
- **Frameworks** are collections of procedures, methods and tools focused on the design of an organizational architecture or a system.
- **Roadmaps** are "plans that match short-term and long-term goals with specific technology solutions to help to meet those goals".
- **Maturity models** are models that help organizations achieve expected skills in specific dimensions such as culture, processes, resources, etc., through continuous improvement processes.

MSE 1.0 Scope

- **Generic Model**
 - They are generic and their application depends on consulting and external evaluations of the processes to identify the level of maturity.
- **Specific Model**
 - Another way to address the demand for maturity assessment is by choosing to build a model to meet a specific condition. It is common in such cases to use an existing model as a reference. In any case, the identification of success factors that should be considered is a fundamental element.



Maturity levels (Acatech)



- **Computerization** - use of information technology;
- **Connectivity** - integration of IT tools;
- **Visibility** - sensors allow processes to be monitored from end to end;
- **Transparency** - digital shadow indicates the current situation;
- **Predictive capacity** - ability to simulate scenarios;
- **Adaptability** - ability to adapt continuously.



Maturity levels (Acatech)

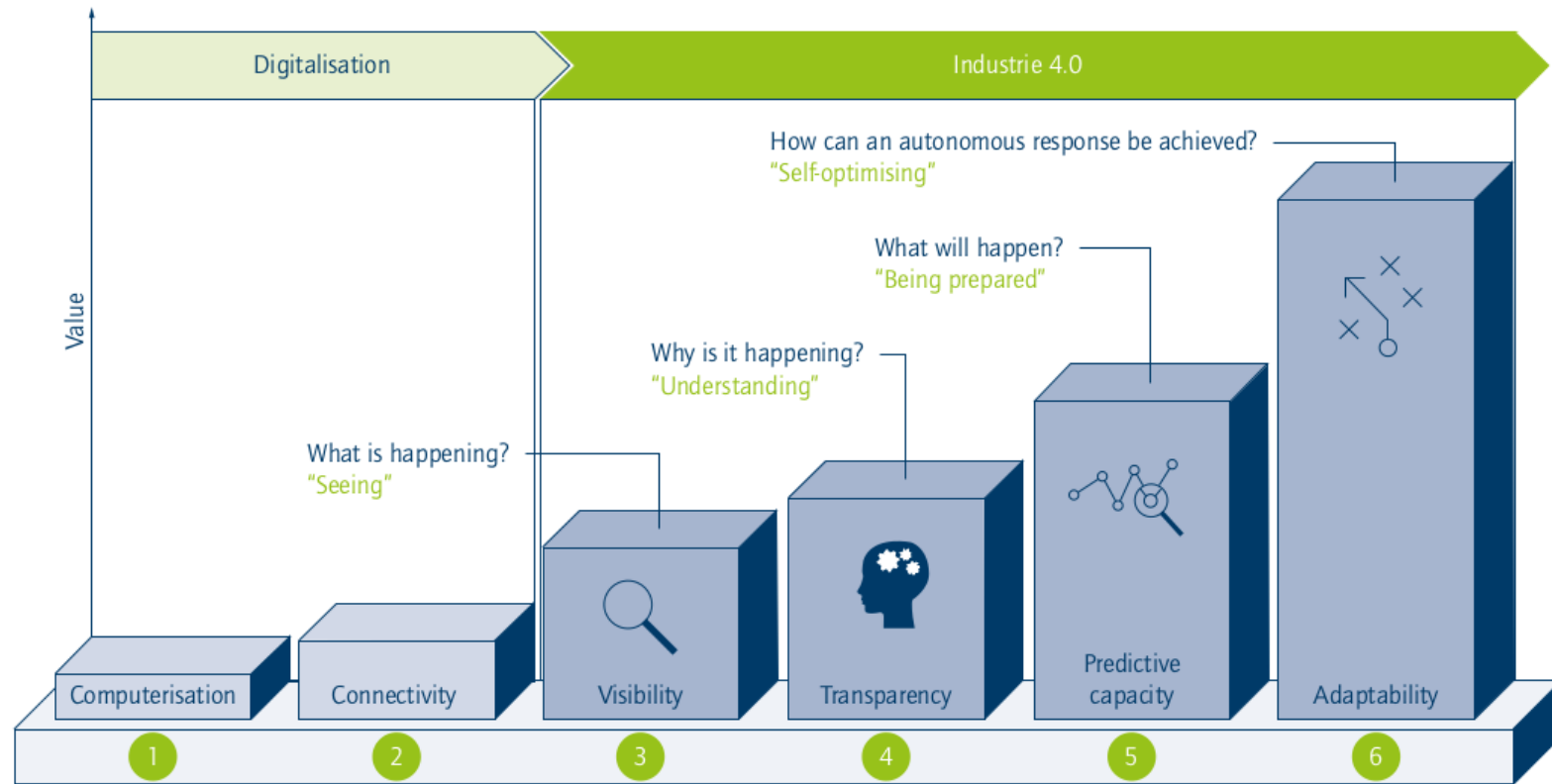
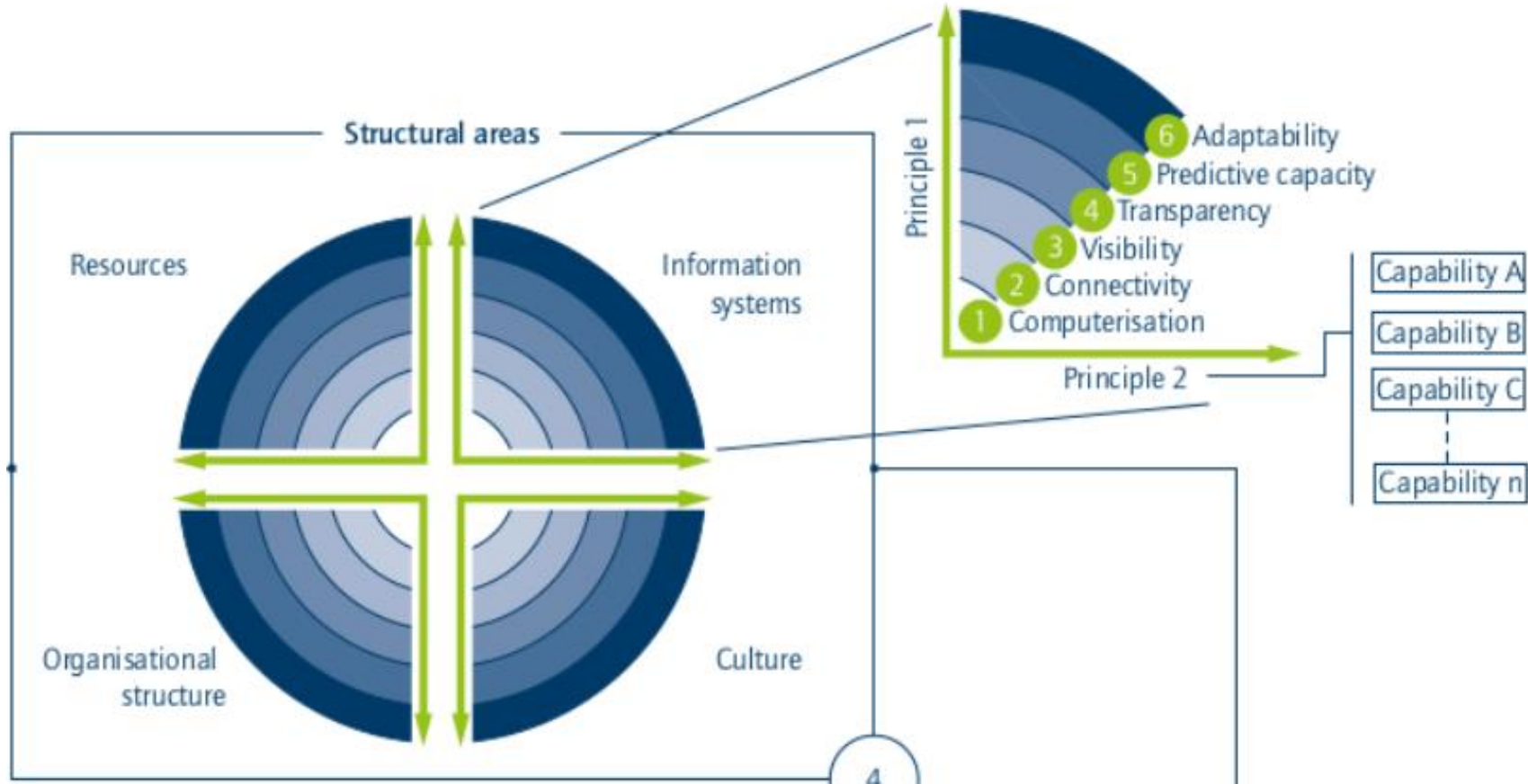
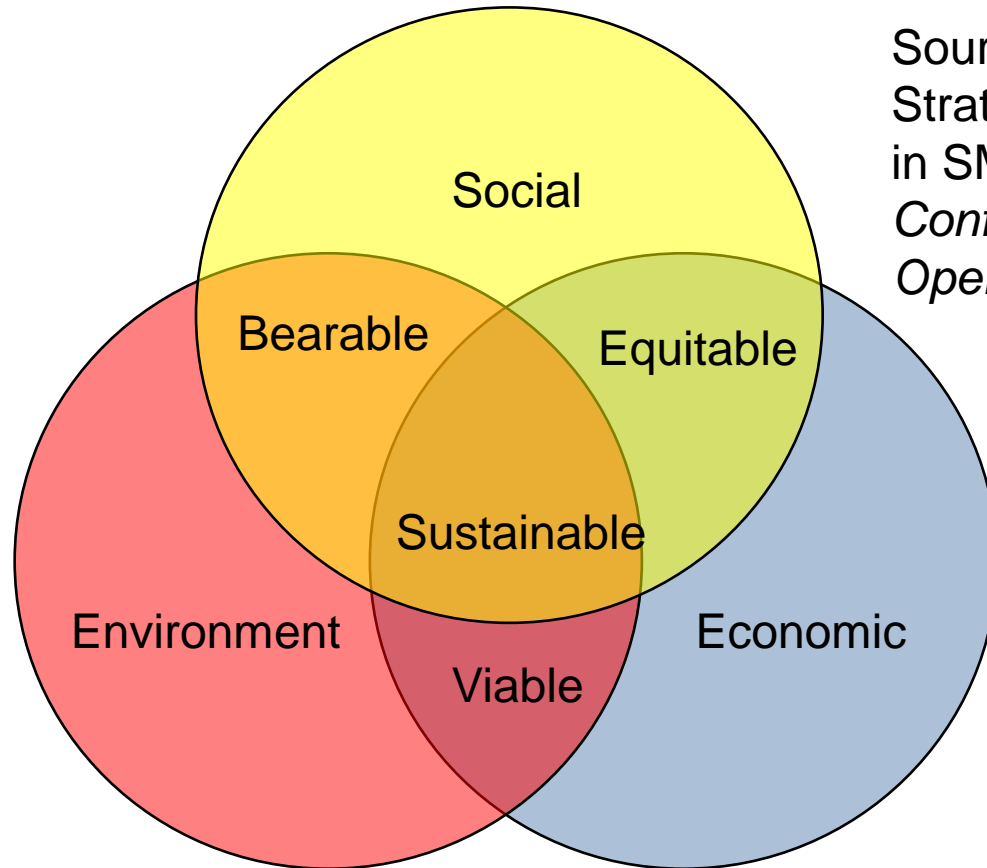


Figure 5: Stages in the Industrie 4.0 development path (source: FIR e. V. at RWTH Aachen University)

Maturity index (Acatech)





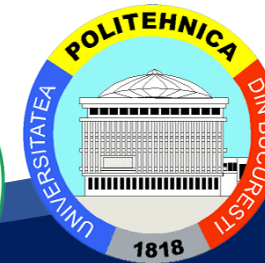
Source: Bakkari, M., & Khatory, A. (2017). Industry 4.0: Strategy for More Sustainable Industrial Development in SMEs. *Proceedings of the IEOM 7th International Conference on Industrial Engineering and Operations Management*, (Rabat, Morocco), 11–13.



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