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ECOMONDO THE GREEN TECHNOLOGY EXPO

ITALIAN EXHIBITION GROUP Providing the future

Future needs research!

Available tools and methodologies for the sustainability assessment in production

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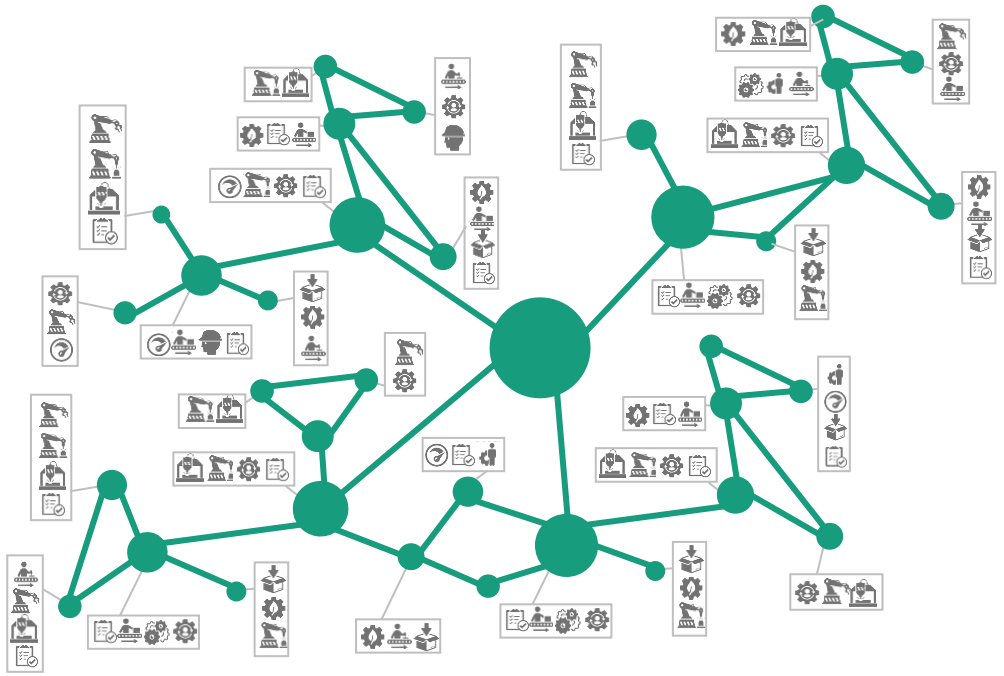
ERDF 1135 SMART-Pro [CUP: B52F20001530009] European Regional Development Fund (ERDF) of the Autonomous Province of Bolzano – South Tyrol - Investments in Employment and Growth 2014 – 2020.

SMART PRO CONCEPT AND FRAMEWORK

SMART-Pro

Sustainable **M**anufacturing through **A**pplication of **R**econfigurable and in**T**elligent systems in **Pro**duction processes

Foreseen project duration: 01/07/2020 – 30/06/2022
Lead partner: Fraunhofer Italia Research s.c.a.r.l.



The overarching purpose of Smart-Pro is to improve the overall performance of production processes in terms of efficiency, flexibility, and sustainability.

PROCESS OPTIMIZATION

Process optimisation can be thought as the set of measures and actions aimed at improving the process efficiency against several aspects

- Kaizen/continuous improvement method
- JIT (Just In Time)
- Material Flows Analysis
- Bottlenect Tree Analysis (BOTA)
- Lean & Green Manufacture
- Different types of mathematical modeling and optimisation algorithms (Multi-Criteria Decision Method MCDs, Cluster Analysis, Principal Component Analysis, Fuzzy Logic, TOPSIS Analysis, etc.)

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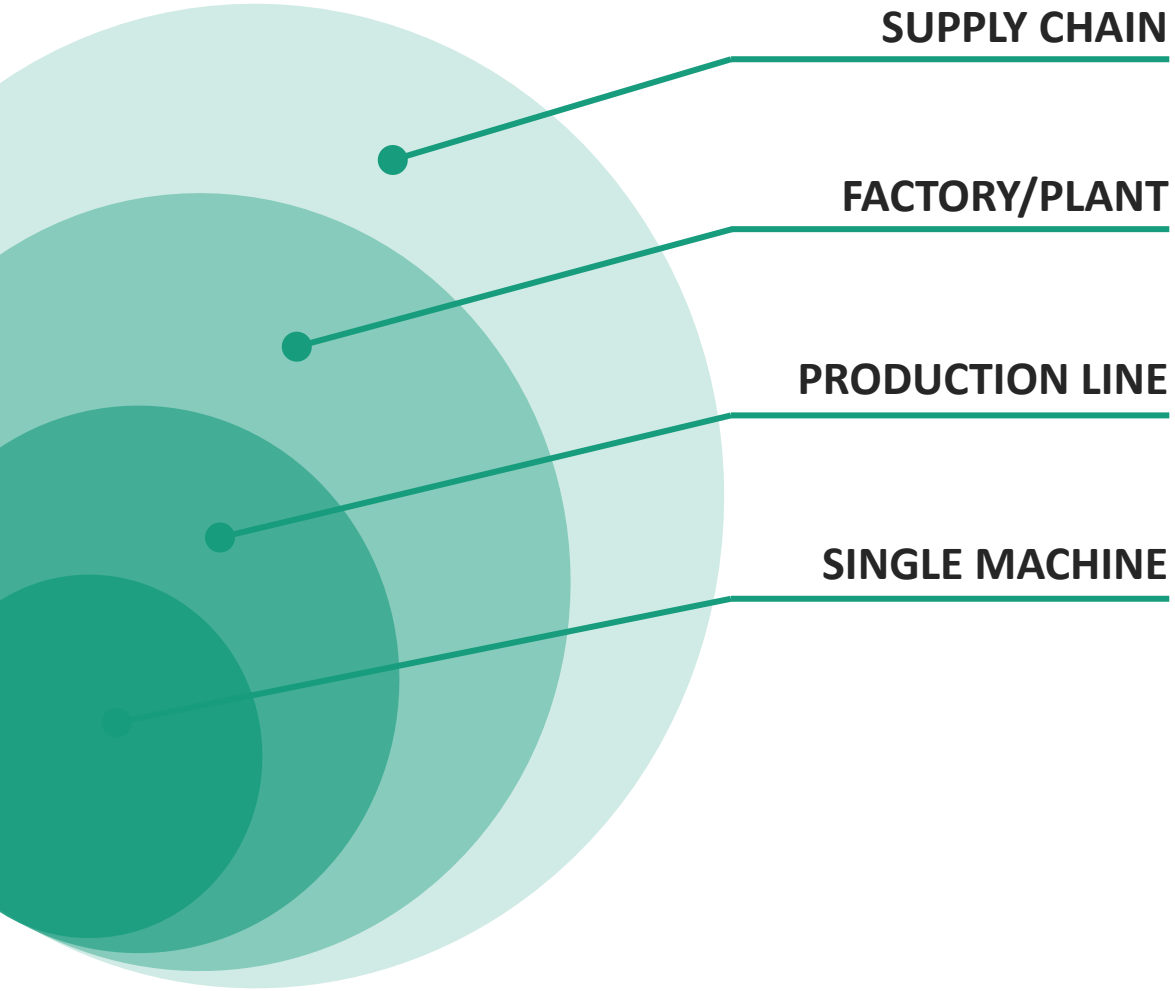
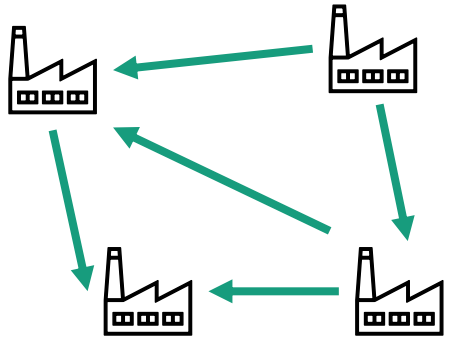
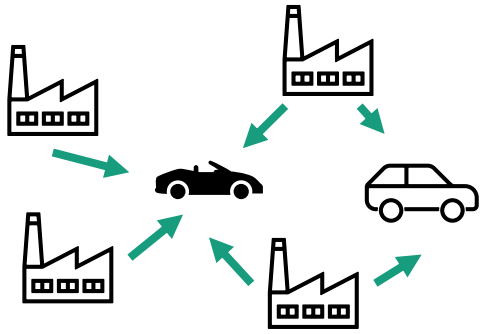
PROCESS OPTIMIZATION

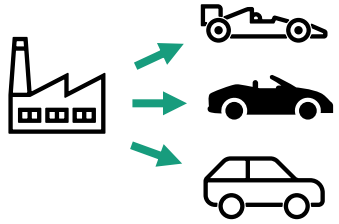




Industrial Symbiosis (Connected realities where more production lines can coexist and cooperate)



Multi-product and multi-site manufacturing (Decentralized scheduling decisions)



Single-site manufacturing (Centralized scheduling decision in a multi-agent system)

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RESILIENCE AND RISK MANAGEMENT

In materials science, resilience is defined as:

“the tendency of a material to return to its original shape after the removal of a stress that has produced elastic strain”

With regards to ecosystems, resilience of the supply chain is intended as:

"the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function”

Furthermore, it should be noted that adaptability is very important for resilient value chains, as in many cases the desired state after a disruption is different from the initial state.

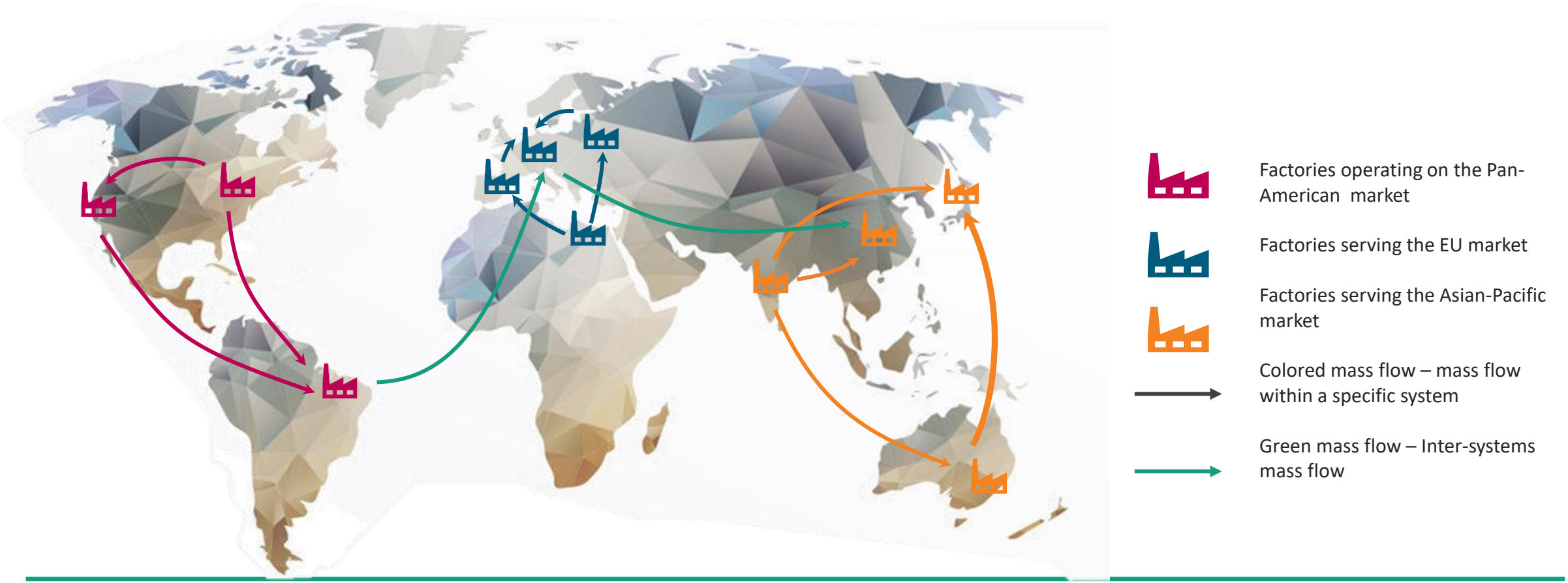
RISK MANAGEMENT

Risk = **P**robability **x** **D**amage

→ **RISK HANDLING**

DISTRIBUTED SYSTEMS AND BUSINESS MODELS

Distributed production systems are flexible and represent a possible approach to achieving a more sustainable production and resilient production as they even enable to compensate to specific district inconveniences.



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SUSTAINABILE PRODUCTION AND BUSINESS MODELS

Sustainability works at a higher level compared to resilient manufacturing and process optimisation practices in general.

Sustainable production means incorporating the environmental, social, and economic dimensions aside from the operational one, and these aspects can be expressed through various measures and archetypes, mainly grouped in:

- **TECHNOLOGICAL:**
  - Maximize material and energy efficiency
  - Create value from waste
  - Substitute with renewables and natural processes
- **SOCIAL:**
  - Deliver functionality rather than ownership
  - Adopt a stewardship role
  - Encourage sufficiency
- **OPERATIONAL:**
  - Repurpose for society/environment
  - Develop scale-up solution

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SUSTAINABILE PRODUCTION AND BUSINESS MODELS

Some noteworthy examples of why sustainable production is a preferable choice to established focussed methods:

- Lean and Green manufacturing practices work better together both for environmental performances and operational performances
- People-related barriers like attitude and poor communication
- Organizational barriers like the culture, lack of resources for implementation, or a weak alignment between improvement programs and the defined strategy
- The context: JIT has more impact on large enterprises while other lean principles, including waste minimization, work better for small and medium-size enterprises' operational performances

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KEY TAKEAWAYS

- No "one measure fits all" solution
- Incorporating sustainability from the design phase helps
- Businesses need resilience to be better at "risk handling" and restoring the efficiency of key functionalities
- Flexible production as valid tool/approach for better sustainability, business efficiency and resilience
- Digitalization tools are changing the business models of manufacturing firms. Therefore, digitalization is an enabler to more optimized and sustainable processes

Thank you for your attention

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