DIG PhD scholarship

Title	**Methods and Tools for monitoring sustainability indicators in manufacturing**
Theme	Industry 4.0 has provided new tools and methodologies for monitoring of machines parameters in manufacturing industries. These tools and methodologies enable new opportunities to analyse data for a large variety of operations management purposes and for sustainability management of production systems. Digital technologies provide several opportunities for the development of an intelligent and sustainable manufacturing. Manufacturing process generates indeed massive amounts of sustainability data from production process at unprecedented speed. Mining these data, even with advanced technologies, is sometimes challenging. A new way to mine complex data, find the hidden mechanisms, and root causes is through the data-driven method. For this reason, real time monitoring of energy, water and material consumption, track and trace of the products along the production phases, monitoring of use of natural resources are some of the activities enabled by Industry 4.0 technologies like Cyber Physical Systems (CPS), Industrial Internet of Things (IIoT) and Artificial Intelligence (AI). Moreover, specific monitoring of data related with the use of resources and materials, like waste generation, water consumption and material reusage, can be linked to Circular Economy and Industrial Symbiosis paradigms. In this context, digital tools are clearly playing a key role for the Green Transition.
	The recent research objective is to facilitate the Green Transition through better understanding of tools and methods to monitor manufacturing processes, defining proper sustainability indicators in order to deploy the real time monitoring and the tasks above mentioned.
	To this regard, the research focuses on the analysis of existing and upcoming digital tools and on the development of methods and methodologies for the definition of proper Sustainability indicators. Literature has already partially faced this topic and the research activity can focus now on the industrial engineering aspect of tailoring methods and tools for the specificity of the manufacturing industry. The final objective of the research is also to contribute to the practical deployment of industrial case studies with the approach of action research. Cases in some manufacturing sector has been already identified, meaning cases in cosmetic sector, food machinery sector, avionic sector.
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