



PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 39th cycle

**PNRR 118 TDA Research Field: PRODUCT DESIGN FOR HUMAN CENTRIC, RESILIENT AND
SUSTAINABLE SUPPLY CHAINS**

Monthly net income of PhDscholarship (max 36 months)

€ 1450.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

**Motivation and objectives of the research
in this field**

Nowadays there is the urge for resilient supply chains and sustainable end of life strategies able to face incumbent criticalities such as energy crisis and raw material shortage, and new trends, such as servitization. To thrive in this challenging environment companies need to adopt renewed strategies and methodologies for product design, and its coordination with the supply chain. For example lean product development brings agility that is fundamental to face prompt re-design of products and systems in face of raw material shortages, but it should be accompanied by human centric, sustainable and resilient approaches that guarantee product re-design and supply chain re-configurations sustainable from economic, social and environmental perspectives. In this vein, end of life strategies can contribute to the development of new approaches to product design, while supporting the design of products to assist in a servitized environment. Under a product life cycle perspective, data, information and unpredictable situations brings new input and challenges to the beginning of life phase, i.e. product design, as well as to the following ones, since re-design and re-manufacturing are required with re-configuration of the supply chains as well, under a continuous feedback-loop logic. Thus calling for the need of the ability to manage a resilient and sustainable closed-loop product life cycle. This research aims to develop and assess a methodology for resilient and sustainable closed-loop product life cycle management since the first phase of



	<p>product design. To this aim, a conceptual framework of resilient and sustainable closed-loop product life cycle should be developed, while investigating the existing methodologies and strategies to address how product design enables human centric, resilient and sustainable supply chains.</p> <p>The framework will be contextualized in the engineer-to-order (ETO) sector, such as shipbuilding and machinery, given the strong relationships among product design and engineering phase and production. Engineer-to-Order (ETO) supply chains are affected by disruptions, such as lack of electric components, while being called ? as all industries - to take environmental concerns into their agenda.</p>
Methods and techniques that will be developed and used to carry out the research	<p>To provide an answer to the research questions, the following methodologies are adequate:</p> <ul style="list-style-type: none"> -Literature Review on methodologies and strategies of product design for human centric, resilient and sustainable supply chains. -Interview study with Italian/European companies in the shipbuilding and/or machinery sectors to collect hurdles, trade-offs and solution for building resiliency and sustainability in the supply chain along product life cycle -Conceptual development of the methodology -Case study development/action research for method validation and simulation
Educational objectives	<p>The Ph.D. candidate at the end of the program will possess adequate research skills in the field of product design for resilient and sustainable supply chains and specific knowledge in the ETO sectors</p> <p>In particular, the Ph.D, candidate will:</p> <ul style="list-style-type: none"> - be able to perform a structured literature review - be able to perform qualitative research methods - be able to analyse qualitative data to develop insights and methods/tools - be able to conduct design science research - be able to present and publish her/his research results
Job opportunities	<p>Academia, international institutions, ETO companies, multinational organizations, consulting firms.</p>



Composition of the research group	0 Full Professors 2 Associated Professors 1 Assistant Professors 1 PhD Students
Name of the research directors	Margherita Pero, Monica Rossi

Contacts
Margherita.pero@polimi.it; monica.rossi@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	725.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	
By number of months at the company	0
Institution or company where the candidate will spend the period abroad (name and brief description)	
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>The candidate might be involved as research associate in additional research projects and as teaching assistant in courses in the area of Operations and Supply Chain Management. A desk will be provided in the Department of Management, Economics and Industrial Engineering.</p> <p>This research is performed in collaboration with the Production Management research group at the Norwegian University of Science and Technology (NTNU) Located in Trondheim</p>