POLITECNICO DI MILANO

PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 40th cycle

PARTENARIATO PNRR Research Field: ANALYSIS AND MODELING OF AUTOMATED INTRALOGISTICS SOLUTIONS: TOWARDS MORE INTERCONNECTED AND SUSTAINABLE SYSTEMS

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0 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	Modern logistics systems are characterized by increasingly demanding customer requirements and competition, calling for rapid and efficient delivery systems able to manage the wide range of products offered, as well as the variety of available channels according to an omni-channel approach. The deriving complexity for warehousing and transportation, coupled with the ever more common shortage of labor and transportation capacity, increases the frequency and impact of uncertainties, undermining logistics systems performance. In this context, the adoption of automated intralogistics solutions promise to improve systems' efficiency, enhance their rapidity and reactivity, synchronize logistics flow, as well as to act on economic, environmental, social sustainability dimensions. Boosted by Industry 4.0, the advancements and the diffusion of automated intralogistics solutions have rapidly increased. The more recent technologies do not only allow increasing the productivity and shortening lead times for individual warehousing activities, but also allow for a real-time data collection and elaboration, a further integration among different systems, better capabilities to manage demand variability, increased energy efficiency, as well as an advanced support to human activities. Therefore, the modeling and the analysis of new automated intralogistics solutions is a key aspect to make a significant lead forward to advance traditional management of logistics

	activities towards more interconnected, responsive and sustainable systems. Academic literature has mainly focused either on the technological perspective, or on a single activity of the entire logistics process. Other aspects such as the intertwined implications of evaluating technologies considering not only productivity and costs but different perspectives have captured rising interest from both academia and industry but are still underexamined. The PhD research project has a twofold aim. First, to develop and validate new methodologies and tools to support the design and management of new technologies and the related benefits. Second, the objective is to understand how automated intralogistics technologies can enable the development of new logistics models and managerial approaches to couple with the above-mentioned challenges. Sustainability performance assessment and energy-efficiency related implications of such systems will be also taken into account.
Methods and techniques that will be developed and used to carry out the research	The thesis will require an initial phase of literature review and exploratory case studies on the new technologies available to support intra-logistics systems and practices. The second phase will involve the development of new models and managerial approaches for automated intralogistics solutions, and then methodologies and tools to support the design, management, and control of such systems. Tools can involve qualitative frameworks, empirical analysis, as well as optimization and simulation models. Collaborative projects with companies may be planned.
Educational objectives	The PhD student is supposed to become a researcher with a specific capability to design and manage logistics system. The PhD student should become able to: •Develop new methodologies and tools to support the design and management of the new automated intralogistics technologies; •Understand the promises of new automated intralogistics technologies from a scientific perspective and in terms of

	technologies from a scientific perspective and in terms of industrial applicability; •Identify new logistics paradigms based on the new automated intralogistics technologies.
Job opportunities	Logistics engineer in logistics facilities Logistics director Logistics manager in logistics services providers and shippers
Composition of the research group	1 Full Professors 2 Associated Professors 0 Assistant Professors 0 PhD Students
Name of the research directors	Marco Melacini

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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	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities, Teaching assistantship, Computer availability, Desk availability. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. •Involvement in projects: "For the overall development of their capabilities, PhD candidates will work on sinergical projects to favour empiral data collection and network development for their

career. Projects will give candidates the opportunity to work in group (peers and other senior professors)".

- Teaching and tutoring: "If coherent with the development of their doctoral program, the PhD candidate will have the opportunity to be involved in: teaching activities, tutoring to master students, tutoring to PhD candidates for administrative processes".
- Italian knowledge (e.g. borsa co-finanziata da ente italiano): "The interaction with key stakeholders requires a fluent knowledge of the Italian language".

Funding for educational activities: 6.100,00 Euros for three years.