



# PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 39th cycle

**THEMATIC Research Field: INTEGRATED FRAMEWORK DEFINITION FOR PROJECT MANAGEMENT DIGITISATION IN CONSTRUCTION SECTOR**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1450.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<b>Motivation and objectives of the research in this field</b>	<p>The Project Management Digitalization is the new paradigm that promotes the use of technologies designed to merge (i) virtual and physical elements and (ii) machine and human capabilities in order to promote innovation in project execution.</p> <p>In particular the concept of construction 4.0 proposed for the Architecture, Engineering, Construction and Operation Industry (AECO) fits in the world of infrastructure, where both greenfield and brownfield projects can benefit from new technologies for integrated project planning, control and collaboration. Since AECO is mainly fragmented into several project phases, a high degree of interaction to achieve proper communication, coordination and collaboration among the participants is the main element for the success of the project execution in Construction sector. To facilitate the interaction, some methods and technologies have been developed or adapted to the AECO industry, such as Building Information Modelling (BIM), Lean, Agile and Enterprise Architecture (EA). Then, efforts in the academic and professional world have been focused on making these set of approaches operate harmoniously through data sharing across business processes (such as engineering, procurement, legal, financial, health, security and so on). Right now considerable challenges regards the traditional data collection and data sharing. One is the low frequency of monitoring since physical data gathering is done weekly or less frequently. Since traditional approach identifies</p>



	<p>mainly two levels of management: (i) systemic management (for portfolio and program management) and (ii) micromanagement (for daily project management), this approach does not allow the implementation of continuous corrective actions aligned with strategic goals. A second important challenge is that physical data gathering leads to low data quality since different site managers can collect and report data differently. In this sense, site managers' different backgrounds and experiences can lead to a different method of data collection for certain parameters. In this context project control and monitoring activities become difficult when the project environment is complex in terms of quantity and size, number of stakeholders, geographical dispersion and available resources.</p> <p>This complexity must be managed to accurately obtain the tracking progress data and processing for short-term (tactic) and long-term (strategic) decision-making.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The overall research program will be distributed in different stages to develop a framework on data sharing based at first on the identification of real needs of the international companies of the Construction sector, then on the comparison and state of art of academic research in the different area of investigation (from both engineering and human science point of view). Finally, a full integrated framework is developed with the purpose to consider a harmonious integration between human and machine interface in order to optimize the decision process along the different phases of the project life cycle. The first stage of the research aims to discover the current state of Project Management Control processes (PMC) of a sample of enterprises and the existing supporting methods, technologies and governance through interviews and systems mappings using tools such as Business Process Modelling and Notation (BPMN) and ArchiMate modelling language. Stage two is focused on finding improvement opportunities (eg. Based on Artificial intelligence solutions), and comparing current PMC processes with the best practices in different sectors in order to outline eventual gaps that separate the construction companies from their desired state and</p>



	<p>benefit of the development of peculiar technologies developed in other industrial fields. The third stage has the objective of redesigning the current state of art by selecting different digital technologies for field data capturing (FDCT) and communication-collaboration (CT). Finally, the fourth stage will include all the activities necessary for implementing the PMC framework and its digital prioritized solution components, through an integrated information management framework, that allows the strategic decision maker to have a real time exhausting and pragmatic vision of the state of the project and identify eventual corrective actions based on future project scenarios identified by Artificial Intelligence algorithms. The proposed stages will be supported by a continuous revision of the project governance practices (included in the framework) in order to identify new roles and functions needed inside and outside a construction company and to propose a set of skills, competences and overall knowledge that will determine the profile of the Next generation project manager and project team members in the construction sector. Particular attention will be dedicated to megaproject execution.</p>
<p><b>Educational objectives</b></p>	<p>The target of the research project is to create a knowledge base that can identify the skill set of the project manager of the coming decades with particular reference to the construction sector. The digital transition in which we are currently immersed is significantly changing the way we operate in an increasingly competitive environment and the set of knowledge and skills that decision makers must have to manage a project. To date, we are mainly developing solutions in the field of elementary artificial intelligence, i.e. those capable of handling very specific (often repetitive) requests and problems. However, in the next few years we will be faced with the development of general artificial intelligence solutions capable of supporting the human decision-maker on a variety of problems using a single interface. The collection, storage, and interpretation of project data will be the basis for fully benefiting from the development of artificial intelligence tools in the coming years, so all the skills related to the technical and technological aspects of</p>



	<p>data sharing will have to be combined with the organizational and behavioral elements. The educational objective of the project is to identify, provide and structure a learning process of the mix of new and consolidated skills that a project manager will have to have in the years to come in order to optimize the human-machine interaction within a decision making process in a context characterized by a high availability of information such as in a construction project.</p>
<b>Job opportunities</b>	<p>During the PhD project, the candidate will be able to equip her/himself with the skills to manage complex projects of the construction sector in high-tech contexts. After the PhD program, the candidate will be able to perform the roles of assistant project manager of complex projects (or project manager of simple projects), project planner and project controller, data analyst, system engineer, member of the Project Management Office, project portfolio analyst.</p>
<b>Composition of the research group</b>	<p>1 Full Professors 0 Associated Professors 1 Assistant Professors 2 PhD Students</p>
<b>Name of the research directors</b>	<p>Mauro Mancini</p>

<b>Contacts</b>	
<p>Mauro.Mancini@polimi.it</p>	

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

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	725.0 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p>The candidate will be involved in the standard academic activities by having access to all the infrastructures of the Department of Management, Economics and Industrial Engineering of the</p>



Politecnico di Milano with the progressive involvement both in teaching activities (in case of interest to the candidate) related to Project Management topics within Bachelor or Master of Science courses (in some cases also towards companies), and in research projects related to his/her PhD thesis topic.