POLITECNICO DI MILANO

PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 38th cycle

PNRR_352 Research Field: TOWARD NET ZERO: PROJECT APPRAISAL OF BUILDING RETROFITTING

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	In Italy the reference for calculating the energy perfomence of bulding is the “Uni 16247”. From this calculation it is derived the A.P.E., the key document that summarises the energy performance of buildings with a scale from A4 to G (10-letter scale). A.P.E is mandatory for buying or renting a property, providing essential information about energy consumption. According to the 2020 CTI - ENEA report "Annual Report on the Energy Performance Certification of Buildings" over 60% of the Italian real estate stock falls in the less efficient energy classes (F-G). A key reason is that most of Italing building was built between 1945 and 1972. New buildings are only 3.4% of APE, and over 90% have high energy performance (A4-B). The non-residential sector, which accounts for 15% of the total APE, falls over 50% in the intermediate energy classes (C-D-E) and over 10% in the most efficient ones (A4-B). As confirmed by the Minister of Economic Development Stefano Patuanelli "The energy requalification of public and private buildings in our country is one of the strategic priorities indicated in the National Integrated Energy and Climate Plan for 2030, to promote an energy consumption and CO2 emissions cut, as well as development and integration of energy production based on renewable sources.". Energy requalification interventions have generated about 39 billion euros of investments and 270 thousand jobs in the last 10 years each year, which reach over 400 thousand considering also related activities. This trend is expected

	to continue. From a scientific perspective, the retrofitting of a building to improve its energy performance is a project. Therefore, this PhD bursary deals with project management, particularly project appraisal. Against this background, the PhD bursary has 3 objectives 1- Create a framework to estimate building retrofitting costs. 2- Create a framework to estimate the value increase of a building once it has been retrofitted 3- Create a framework to identify, in the context of the Italian building environment, buildings where the difference between the value created and retrofitting cost is maximised
Methods and techniques that will be developed and used to carry out the research	Objective (1) is a classic project management problem of cost estimation. Despite cost estimation being a classic topic, no specific cost estimation framework exists in the literature about building retrofitting. The PhD candidate will start from a literature review of the existing cost estimation framework to build a novel framework to estimate building retrofitting costs. The framework will be tested, improved and validated by leveraging one or more case studies. Objective (2) is a modern problem of value management in projects. In Project Management, it has become increasingly common to hear academics and practitioners talking about the choice of "delivery model" to create and capture value throughout the project's life cycle from execution to operational handover. The classic value perspective is focused on monetary aspects; however, there is more than this when projects such as building retrofitting are considered. In this case, value is composed not only of tangible benefits, such as increasing revenues or saving costs and time but also of intangible benefits, such as improving quality, improving corporate competencies, cultivating personnel, improving the satisfaction of the stakeholders and protecting the environment. The candidate will review the literature on value creation, interview relevant stakeholders, and identify market trends for energy-efficient buildings. Considering this background, the candidate will develop a framework capturing monetary and not monetary value

	creation. The framework will be tested, improved and validated by leveraging one or more case studies. Objective (3) is a problem of project identification. Selecting the right project is one of the most important elements warranting success in Project Management.This selection takes place in the early phases of the project, and it has to include financial and numerical values (e.g. NPV, Capital Employed) as well as other non-financial aspects (e.g. capabilities development), both intrinsically uncertain. The non-financial aspects become relevant when the consequences of the selection impact many stakeholders. The candidate will review the literature on the most important criteria and process for project selection. The candidate will then develop a framework that will be tested using a database of Italian buildings.
Educational objectives	•To discover, interpret and communicate new project studies knowledge through original research of publishable quality which satisfies peer review •To present and defend original research outcomes which extend the forefront of project studies •To demonstrate systematic and extensive knowledge of project studies •To take a proactive and self-reflective role in working and to develop professional relationships with others •Independently and proactively formulate ideas and hypotheses •To critically and creatively evaluate current issues, research and advanced scholarship in project studies •To demonstrate systematic knowledge of and be able to critically assess, analyse and engage with the ethical and legal context of projects and temporary organisations.
Job opportunities	At the end of the PhD the candidate will be equipped with skills and knowledge that will ideally position him/her to: • Working in organisations involved in retrofitting building • Working in consultancy companies • Working with infrastructure owners and client

	Working in academia
Composition of the research group	1 Full Professors 0 Associated Professors 0 Assistant Professors 1 PhD Students
Name of the research directors	Professor Giorgio Locatelli

Contacts
Giorgio.locatelli@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	0

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

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Candidates with a background in Management Engineering, Mechanical Engineering, Built Environment Engineering, Supply Chain Management Studies, Architecture. 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.
Funding for educational activities: 4.900,00 Euros for three years.
Teaching assistantship: 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.
Desk availability**:** shared use
Computer availability**:** individual use