POLITECNICO
MILANO 1863

Supervisor Expression of Interest
-IF Marie Sklodowska Curie Action-Individual Fellowship 2019

Supervisor name:	Cinzia Maria Luisa Talamo
Email address: Link pagina docente:	cinzia.talamo@polimi.it
Department Name: Research topic: (https://www.polimi.it/en/scientific-research/research-at-the-politecnico/departments/)	Department of Architecture, Built environment and Construction engineering
MSCA-IF Research Area Panels	☐ CHE_Chemistry ☐ ECO_Economic Sciences ☐ **X ENG_Information Science and Engineering** ☐ ENV_Environmental and Geosciences ☐ LIF_Life Sciences ☐ MAT_Mathematics ☐ PHY_Physics ☐ SOC_Social Sciences and Humanities
Politecnico di Milano Areas:	☐ Cultural Heritage ☐ **X Smart Cities** ☐ Territorial Fragilities ☐ Health ☐ Industry 4.0
Brief description of the Department and Research Group (including URL if applicable):	**Description of the Department** The Department of Architecture, Built environment and Construction engineering is a scientific and cultural project based on extensive research and teaching experience on planning, design, production and management, in the field of architecture and civil engineering. The Department aims at facing present challenges for an overall improvement of territorial assets, urban development, and of the built environment. The Department brings together a multi-disciplinary team of researchers and professors, fully expressing the "polytechnic spirit" in teaching and research, an approach leading to a timely scientific and technical response to the complex problems posed by the transformation of the built environment, concerning both new

	interventions and redevelopment projects. **Research Group** The main and longest-term interests are in the field of planned maintenance and facility management (constructions and infrastructures), developing researches in the areas of: - Building maintenance manuals and programs (structure, application procedures, organization of information, data bases); - Urban maintenance (facility management services for urban assets and networks, organization of information); - Organizational models for building and urban facility management; - Inventory and registries for knowledge management of built assets (data bases, procedures, relation with information systems); - Information systems for Real Estate management; - BIM (Building Information Modelling) application in operations and maintenance phase of the building process; -Knowledge management for the enhancement of Real Estate; - The maintainability requirement in the design phase of the building process; - Tasks, competences, skills and training for maintenance managers; - Big Data and IoT (internet of things) for the management of built assets at the urban scale.

Brief project description: **(max 1 page)**	**Design evaluation considering the impact of future uncertainty** Constructions and infrastructures are designed to satisfy the requirements of all involved stakeholders. Considerable resources are invested to guarantee this condition, i.e. the implementation of a construction process is often the most expensive operation in which a person or a company is involved through his life. To ensure that stakeholders' requirements are satisfied by a design solution, the project is validated before the construction. The validation is an important action as it serves to assess the degree of compliance of the proposed solutions to the requirements expressed in the brief. Despite the fact that constructions and infrastructures are built to provide a service over years, often decades, validation focuses only on the compliance of the level of service on the as built. This is mainly due to the assumptions that: (i) performance will be

	kept in line with these of the as built through diligent maintenance, and (ii) requirements are fixed. Both these assumptions are unrealistic in any real-world situations, i.e. both performances and requires changes, sometimes substantially, over the course of a construction lifetime, and a proper design solution should be able to cope with this uncertainty. For this reason a new design validation tool needs to be developed that ensures minimizing the risk on the level of service of construction and infrastructures over time considering future uncertainty, i.e. including the uncertainty on both the performance and the requirements. Starting from these premises, in this project an innovative design validation process is to be developed, assuming and developing some research questions dealing with levels of service (LOS) of constructions and infrastructures, such as: – How to simulate the changes in the LOS over the entire lifetime of constructions and infrastructures? – How to reduce the short-term uncertainty of provided LOS through sensing and responding systems? – How to plan flexibility in order to meet the needs for future adaptations? – How to assess the maintainability of the entities? – How to assess and manage the risks of unsatisfactory LOS over time? – How to develop future-proof design indications to improve the control of uncertainty related to the LOS?