POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 38th cycle

Research Area n. 3 - Engineering Design and Manufacturing for the Industry of the Future

PARTENARIATO PNRR Research Field: DEVELOPMENT OF PATENT TECHNOLOGY TRANSFER PREDICTION MODEL IN THE MECHANICAL ENGINEERING FIELD

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
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	As mechanical engineering concerns the conception, design, development, and manufacturing of products, as well as the development of processes and power, the Department of Mechanical Engineering (DMEC) of the Politecnico di Milano has a strong synergy with the industrial world. In particular, in recent years, thanks to the activity of the Technology Transfer Office, the Politecnico has provided researchers and students with specific tools and support for the economical exploitation of scientific results, through the protection of Intellectual Property, the licensing of patents, and the creation of spin-off companies. However, despite the excellent results achieved both in terms of number of patents and licensing agreements, some inventions rising from the DMEC struggle (and even fail) to reach the industrial world. For example, issues relating to the timing of a patent application, the TRL of the invention, or the inability of companies to evaluate the real innovative potential of new patented technologies, often arise. Given the above, with the general objective of better understanding the characteristics that facilitate the acquisition of newly patented technologies by the industrial world, the project aims to provide a systematic analysis of the success factors that lead to an efficient technology transfer process. The analysis will focus on inventions patented at

	the DMEC in the last 5 years. Once the critical success factors have been identified, a novel assessment and forecasting method will be developed to predict the suitability of a patented invention to get exploited in industry and thus its market expected value, thus strengthening researchers in their partnership with industrial players, increasing the innovative potential of their research and augmenting their impact on society. The research activity is financed and developed within the Ecosystem for Innovation MUSA (Multilayered Urban Sustainability Action) - Spoke 3 (Deep Tech: Entrepreneurship &Technology Transfer), in the framework of the National Plan for Recovery and Resilience (*Piano Nazionale di Ripresa e Resilienza - PNRR, Missione 4 Istruzione e Ricerca - Componente 2 Dalla ricerca all'impresa - Investimento 1.5*), funded by the European Union - Next GenerationEU. Norms of Reference: CUP: D43C22001410007 - D.D. 1055 del 23/06/2022 D.D. 3277 del 30/12/2021 - Avviso pubblico per la presentazione di Proposte di intervento per la creazione di 12 Ecosistemi dell'innovazione sul territorio nazionale da finanziare nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Componente 2 Investimento 1.5 - Creazione e rafforzamento di "ecosistemi dell'innovazione", costruzione di "leader territoriali di R&S" - finanziato dall'Unione europea - NextGenerationEU.
Methods and techniques that will be developed and used to carry out the research	The research shall be conducted as a sequence of descriptive and prescriptive studies that could be adapted based on the specific gaps and findings that will emerge along the development of the activities. The research project is divided into the following milestones:

	1) A review of the current methods used to evaluate the quantitative and qualitative impact of a patented invention on the market (Descriptive Study I-a). The review shall be carried out following the PRISMA guidelines. 2) Activities on inventions patented at the DMEC: an analysis of technologies (from autonomous and from commissioned research) licensed in the last 5 years and their common elements: e.g., .: i) TRL of the invention at the time of the of the patent filing vs. timing of the license; ii) degree of innovation; iii) environmental sustainability and global impact; iv) patent landscape; v) characteristics of the market; vi) characteristics of the licensee. (Descriptive Study I-b). At this step, the Ph.D. candidate will work closely both with the Technology Transfer Manager at the DMEC and the research groups. Based on the case studies analyzed in the previous phase, the Ph.D. candidate is asked to develop a Patent Technology Transfer Prediction Model (Prescriptive Study I) in order to evaluate the innovative potential of the new technologies, and support their implementation in an industrial context. In order to validate the model at a more general level, the Patent Technology Transfer Prediction Model will be applied to case studies relating to sectors outside of mechanical engineering (Descriptive Study II).
Educational objectives	The educational objective of the research is to train the candidate in the quantitative and qualitative analysis of inventions and technologies, combining deep-level knowledge about their technical features with the characterization of the context of their potential applications. In turn, this involves among the others system modelling, functional modelling, information extraction from structured documents, pattern recognition in innovation dynamics, trend analysis and trend extrapolation.
Job opportunities	Job and career opportunities include professional outlets in all sectors, both public and private, related to technology transfer and business development. For example: Technology Transfer Manager, Business Development Engineer, Process &Technology Transfer Engineer, R&D Engineer. The PhD experience also

	prepares for a research career in academia or research centers. Our last survey on MeccPhD Doctorates highlighted a **100% employment rate** within the first year and a **35% higher salary,** compared to Master of Science holders in the same field.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 3 PhD Students
Name of the research directors	Prof. Gaetano Cascini

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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	700.0 €
By number of months	6

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

Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops and conferences) for a total amount of euro 5.707,13.

Our candidates are strongly encouraged to spend a research period abroad, joining high-level research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 700 euro/month- net amount).

Teaching assistantship: availability of funding in recognition of supporting teaching activities by

the PhD candidate. 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.