



PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 38th cycle

**THEMATIC Research Field: DEVELOPMENT OF EAWS 2.0 - THE DIGITAL ERGONOMIC
RISK ASSESSMENT FOR MANUAL CYCLICAL TASKS IN THE INDUSTRIAL
MANUFACTURING SECTORS**

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 the labour-intensive industrial manufacturing sectors (e.g. Automotive, Aerospace, Domestic Appliances, Rolling Stock) human work is mostly organized in cyclical tasks. What differs from sector to sector is the mix of influencing factors of work measurement and ergonomics; what equals is the relevance and importance of a good product and process design to attain competitive productivity levels and workers' well-being. Furthermore, in the advanced production systems, manual work will be limited on value-adding tasks (harder to automate), the ergonomic constraints will become stricter (aging of the workers? population) and control systems more severe (data availability) to ensure worker's safety and well-being. For these reasons, it is strategically relevant for industrial companies to develop systems and capabilities to simulate and pre-calculate workload and labour costs from the earliest stages of product development and avoid costs (non-value adding activities and Work-related MusculoSkeletal Disorders - WMSDs) in the production phase. This means that preventive ergonomics should be integrated with digitization in different ways:

- design for assembly and ergonomics
- digital twin and simulation in the product/process design phase
- integration of ergonomic assessment with work measurement and cycle time definition

The industrial sector is one of the sectors with the highest



	<p>global employment rate; despite this, the most recent research efforts about the definition of a fair day's work dates back to the 80's. In the last 20 years a lot of research has been carried out on the biomechanical load and many new standards were created. The Ergonomic Assessment WorkSheet (EAWS) is probably the best of breed among the ergonomic analysis tools in the industrial sectors, in which manual work is finely determined and measured by industrial engineers.</p> <p>For this reason, the proposed research aims to develop a recognized ergonomic analysis tool (starting from the EAWS structure) to reduce the ergonomic risk due to biomechanical overload during the entire product life cycle, from product/process design to phase-out with the following features:</p> <ul style="list-style-type: none"> •designed for Digitization and simulation •structure based on Body Segments •connected with Methods-Time Measurement (MTM) systems (MTM-HWD®, MTM-UAS® and MTM-SD®/ MTM-2®) to guarantee a fair trade-off between productivity and workers health <p>As a corollary objective, the project aims to publish a new ISO TR on EAWS 2.0 (first and second level analysis tool). The output of the project is relevant because it will affect and have impact on the industrial sustainability in many ways:</p> <ul style="list-style-type: none"> •ensuring responsible manufacturing, including human rights, integrity and compliance •ensuring employees well-being and build trust •supporting competitive manufacturing through continuous improvement of working methods
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research will require (and develop) a deep knowledge in quantitative analyses to develop calculation models and run lab tests. The adopted methodologies will stem from a set of different disciplines, such as management engineering, biomedical engineering, mathematics, standards and legislation, and occupational medicine. In very close collaboration with a project manager and a set</p>



	of partners, the researcher will be directly involved in restructuring the EAWS tool from a section-based structure to a body segment structure (dosimetric model). During the project 3D simulation, motion capturing system and EMG will be used. The researcher will be trained to become familiar with the software TiCon (time analysis and ergo-characterization) and HWD (Human Work Design software).
Educational objectives	The research is multidisciplinary in nature: the candidate will develop advanced research skills in the areas of occupational health, industrial work organization, standard and legislation, biomechanics, assessment risk analysis, ergonomics, and management. She/he will learn how to design and conduct a research project, adopting the proper methodologies for data collection and analysis, and to present and publish results in both academic/scientific and managerial outlets. Tight interaction with companies (Volkswagen and Leonardo) and organizations (International Network ONE-MTM specialized in work organization, productivity and industrial ergonomics and ergonomic specialized laboratories and biomechanical experts) of different nature is a key ingredient of the project.
Job opportunities	The successful completion of the program will open several job opportunities in both academia and companies, organizations of different nature, in research, consulting and managerial roles.
Composition of the research group	3 Full Professors 2 Associated Professors 1 Assistant Professors 5 PhD Students
Name of the research directors	Proff. Guido Micheli e Emilia Ambrosini

Contacts

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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	725.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>The candidate will be based at the Department of Management, Economics and Industrial Engineering and attend the PhD Courses and all the educational activities of the PhD Program in Management Engineering, in a joint agreement with the sponsor of the scholarship (Fondazione Ergo) and the two supervisors. She/he will be granted a research budget for notebook, travels, conferences, as per the PhD Program regulations</p>