



PhD in DESIGN - 39th cycle

PNRR 117 Research Field: DIGITAL TECHNOLOGIES AS SUSTAINABLE YACHTING ENABLERS

Monthly net income of PhDscholarship (max 36 months)

€ 1195.5

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

The circular and clean economy, sustainability, digitalization and servitization are increasingly important issues for the productivity, stability and resilience of the industrial eco-system. The demand for more sustainable practices in water mobility is currently sweeping across all submarkets globally, becoming a major challenge from policy makers, Institutions, industrials, and academics. The triggers of this changes in perspective, design practices and shipyard manufacturing are the introduction of new regulation to prevent harmful shipping impact, and the promotion of innovative strategies to meet global social and environmental challenges and EU 2030 sustainability agenda. In particular, in the nautical industry and in the luxury sector to which it belongs, recent joint research by the Departments of Design and Management Engineering on the digitalisation of the sector, have highlighted the lack of adequate tools for understanding and managing the digital transition underway to support the implementation of a sustainable model. The company partner of this research, Sanlorenzo S.p.A., already promoted a large number of research and development in the field of digital modelling, digital twin management and green-propulsion system. Furthermore, it starts experimenting sustainable practices not only at product (yacht) dimension but also in production processes. As a result, they have accumulated a significant body of industrial knowledge mainly addressing specific technologies for emission reduction and performance control, digital drafting, and alternative materials with less environmental impact in



	manufacturing. This focus deemed low-impact at first glance with uncertainties on the end of life recycle/reuse strategies, highlights a urgent need of formalizing and systematizing the knowledge already existing in a set of guidelines and actions for the practical industrial application of novel green digital technologies. The research aims in formalizing the existing achievements to propose a step ahead in digital technologies for sustainable management and stakeholder communication able in leverage the recent research result in an ecosystem of practices and digital tools. The innovative methodological approach promoted by digital technologies is not only disruptive with respect to the practices of the nautical sector, which is still tied to traditional models of entrepreneurship, design and production, but is also aa critical field for the transition towards a circular and clean product system
Methods and techniques that will be developed and used to carry out the research	The research methodology envisages reference to yacht design and design engineering practices based on models of process circularity, design for disassembly, and end-of-life management contextualized in the search for new efficient engineering and production paradigms for the nautical sector (lean, continuous improvement, total quality management). The co-designing of the methodology with the industrial partner will be instrumental in achieving the long-term objectives of transition towards a clean and efficient boat product and shipbuilding industry. Analysis, comparison and evaluation activities, also with consolidated industrial practices and emerging R&D activities are critical elements of this research plan, as well as the involvement of relevant stakeholders on the design and supplier's scene (design studios, shipyards, subcontracting companies, capitaines and crew and maintenance/service managers). The research activity will follow the following phases: (i) understanding of the state of the art and the state of practice, (ii) definition of an analysis model of nautical design for the circular, clean and efficient industry, (iii) comparison with other existing models/methods in the most advanced industrial realities, (iv) identification of one or more possible strategies, (iv)



	validation of the model with company projects.
Educational objectives	The candidate will develop theoretical and practical skills on design research in the context of yacht design, engineering and production involving academic and industrial experts. The candidate will be able to manage the research in autonomy as well as member of international and interdisciplinary groups, exploring and testing qualitative and qualitative research methodology. Thanks to the industrial partnership in this research, the candidate will develop skills in setting, managing and evaluating results in testing activities with prototypes and digital tools across the different phases of a product lifecycle taking into account research's objectives, actors, risks, deadlines, and cost constraints. At last, the candidate will also develop the ability to produce qualified scientific publications suitable for publication in international design research journals and congresses, reporting the theoretical and experimental results of the research, and thus contributing to the dissemination of the outcomes. As the education program will include a period of at least six months abroad at a research center with a high reputation, the candidate will be able to interact and manage multi-stakeholders research, also.
Job opportunities	Both academic and shipyards are increasing their interest in and investments on digital transformation for sustainability and are looking with special interest at hybrid profiles capable of combining design and engineering perspectives with new and disruptive technologies. The connection with international stakeholders will open up job opportunities related to yacht design and production, design-led innovation research, project management, both in the public and in the private sectors: Yacht design studios, Shipyards, Academic positions, Government positions, Non-profit and Institutional positions. Specifically, the Polimi research group in Yacht and vessel design and the industrial partner of this research are interested in growing their experience in R&D in the field of technology for sustainability (emission reduction and performance control, digital drafting, alternative materials and



	production technology with less environmental impact in manufacturing and/or sailing).
Composition of the research group	0 Full Professors 1 Associated Professors 2 Assistant Professors 2 PhD Students
Name of the research directors	Arianna Bionda; Andrea Ratti

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	597.75 €
By number of months	0

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	SANLORENZO S.p.A.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	VTT Technical Research Centre of Finland (VTT),
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student per year max 4.872,90 euros per student (total for 3 years) Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD student there are various forms of financial aid both for research and teaching activities. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. Computer availability: 1st year, 2nd year and 3rd year: Each research group will supply PhD student with a computer, if necessary. Desk availability: 1st year, 2nd year and 3rd year: Each research group will supply phd



student with a desk.