

Cullen Scholarship: The use of Maritime Autonomous Surface Ships (MASS) in coastal waters and the implications for the future of the maritime industry, particularly from a Maritime Education and Training (MET) perspective - PhD Award

Introduction

The addition of remote and autonomous systems into maritime systems and operations may introduce new and significant risks, particularly if the relationship between humans and technology is not managed. The introduction of such systems will require new methods and operating models for supporting the interface between technology and human-machine decision makers.

Maritime autonomous surface ships (MASS) are defined as ships that can operate independently of seafarers with the assistance of artificial intelligence, to various degrees. The level of dependency on seafarers and artificial intelligence varies with different levels of autonomy¹. Countries with a high dependence on maritime transport are investigating the potential impacts of MASS², which range from safety issues to cost reductions for shipping services.

The use of remote technologies in developing and supporting MASS will cause a paradigm shift in how future Maritime Education and Training (MET) programmes are designed and developed. MASS will provide qualified mariners with an opportunity to work from Remote Operating Centres (ROC's) in the delivery of maritime services. Research into the skills challenges of MASS has commenced internationally, but requires further development³.

To realise the full potential of MASS, the maritime sector must upskill, scale, and adopt the use of both new and existing technology by becoming champions of human centred digital transformation. In addition, the implications of MASS on the maritime workforce may result in the loss of seafaring jobs⁴, and understanding changes in the size and structure of the maritime industry workforce will inform the development of maritime policy in Ireland in future years.

The scholar will examine the implication of MASS on future MET and explore the implications for training programmes. This will be achieved by working with national and international institutions and academic centres of excellence in exploring the opportunities that may exist. In addition to the delivery of research outputs that will inform policy development in Ireland, the impact of funding a research scholar will address the capacity

¹ IMO, J. "IMO takes first steps to address autonomous ships." (2018).

² Munim, Z.H., Haralambides, H. Advances in maritime autonomous surface ships (MASS) in merchant shipping. *Marit Econ Logist* 24, 181–188 (2022).

³ Bhardwaj, S. (2023). Skilling the Maritime Sector in the World of Digitalization. *IIRE Journal of Maritime Research and Development*, 7(2).

⁴ Sohyun Jo, Enrico D'agostini, "Disrupting technologies in the shipping industry: How will MASS development affect the maritime workforce in Korea", *Marine Policy*, Volume 120, 2020, 104139, ISSN 0308-597X.

deficit in maritime transport research in Ireland identified in the National Marine Research and Innovation Strategy⁵

Proposal

We propose a structured four-year PhD on a full-time basis to assess and quantify the implications of MASS on the future of Ireland's maritime industry. The research will identify how MASS will affect the maritime industry along a range of dimensions that will include, but will not be limited to, operational, technological, safety and human resource implications. The research will address future skills and training needs. By developing the requisite skills and capabilities in Ireland's maritime industry to take advantage of the expected paradigm shift that MASS will bring about, the competitiveness of Ireland's maritime industry can be enhanced and new opportunities for job creation identified.

The project will aim to:

1. Identify the implications of MASS for Ireland's maritime industry.
2. Develop a methodology to assess how MASS can be operated safely and efficiently in maritime environments.
3. Assess the implications for MASS on the International Convention of Standards on Training, Certification and Watchkeeping for Seafarers (STCW).
4. Identify the training and skills that will be needed in Ireland's maritime industry to compete and thrive in a competitive global environment in which Maritime Autonomous Surface Ships are common place.
5. Identify the opportunities that exist for Ireland to develop new skills and capabilities in the changing maritime industry that will enhance competitiveness and support job creation.
6. Investigate the link between the research and the need to bring about a digital transformation in Ireland's maritime industry.

Outcomes

The expected outcomes from the project will be:

1. A taxonomy of the implications of the MASS on the maritime industry.
2. A methodology to assess how MASS can be operated safely and efficiently in maritime environments.
3. An evaluation of future skills and training needs arising from the adoption of MASS across the maritime industry.
4. An evaluation of the benefits and advantages that planning Ireland's response to the emergence of MASS can yield in strategic, economic and social terms.
5. A roadmap that describes key milestones to be achieved and challenges to be overcome if the Ireland is to prosper in a new maritime industry that is re-shaped by MASS and related technologies.

Marine Institute Corporate Strategy 2023-2027

The proposal supports four of the strategic priorities set out in the Marine Institute's Strategic Plan:

1. Transforming Our Knowledge, Advice and Services
2. Delivering Impact Through Research and Innovation

⁵ National Marine Research & Innovation Strategy 2017-2021

3. Leading the Digital Ocean Transformation
4. Supporting Ireland's Blue Economy

Through the development of an evidence base relating to MASS and MET, which will inform government and policy makers on the optimum model for introducing MASS to Ireland's maritime industry, the proposal supports the strategic priority relating to **Transforming Our Knowledge, Advice and Services**. The proposed research will provide scientific evidence to enable appropriate MASS and MET policies to be formulated, integrated and implemented in this way will be **Delivering Impact Through Research and Innovation**. The project also links to **Leading the Digital Ocean Transformation** as MASS embraces digital technology, supported by artificial intelligence, thereby enhancing the development of mariners' digital skills and creating a reservoir of digital talent within the maritime industry. It will also contribute to **Supporting Ireland's Blue Economy** by providing national ports and the shipping industry with research that can create real and sustainable competitive advantages for these strategically important sectors and guide the development of the policy framework at a national and EU level.

Specific Requirements

The scholar should have a primary degree in a maritime or business discipline and should have a background in the maritime sector, maritime operations or maritime engineering, with strong analytical skills and experience in report writing. Good people and communication skills would be advantageous in this scholarship, given the span of engagement that is involved at national and international level (Government Departments, industry, maritime professionals, personnel from research centres, etc.).

Financial Details

Scholarships will be up to €34,000 per annum (maximum funding PhD of €136,000 over four years or €68,000 over two years MSc). This amount comprises a maintenance award of €25,000 (rate effective 1-Jan-24) to the student as well as payment of fees to the host higher education institution (HEI). The maximum fees payable to the HEI will be €6,000 per annum. The scholarship award also includes a budget of up to €3,000 per annum for eligible research costs (travel & subsistence, publication costs, consumables and other costs, such as minor kit purchase e.g. camera) for the sole use of the student, and are payable on a reimbursement basis direct to the host institution where the postgraduate student (scholar) is registered. There are no overheads payable on the scholarship.

Publication costs are intended to cover publications on which the scholar is listed as first author and are published under Open Access.

Scholars can also supplement this funding by applying to the Marine Institute's Networking & Marine Research Communication Awards annual call.

In addition, the cost of a laptop will be covered by the Marine Institute (purchased via the Research Funding Office).

Location of Scholar

The scholar will be based within a third level institution or research centre, with access to office facilities in the Irish Maritime Development Office at 3 Park Place, Upper Hatch Street, Dublin 2, as required.

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