Impact of DfT funding for MarRI-UK

DfT Maritime Analysis, November 2023

Executive summary

The DfT has supported a range of research and development funding for innovation in the maritime sector, including investing £5.3m in projects overseen by Maritime Research and Innovation UK (MarRI-UK). These projects have led to a range of positive outcomes, including leveraging further public and private investment, commercial services deployment and the spin-out of a private company to further develop the technology. Projects will continue to monitor and evaluate impacts and a full impact and evaluation note will be produced when the last projects are completed.

Introduction

This note reviews and evaluates the research and development (R&D) funding the DfT has given to maritime technology projects via Maritime Research and Innovation UK (MarRI-UK). After making the case for government spending on R&D, it provides an overview of the money spent on MarRI-UK. To illustrate and demonstrate the benefits the MarRI-UK funding has delivered, it describes in more detail three specific projects developed with the funding.

MarRI-UK (www.marri-uk.org/) is an industry-led membership organisation. It brings together industry, academia and government to identify, develop and leverage emerging technologies in the maritime sector. In the past three years, MarRI-UK has overseen 23 research projects funded by the Department for Transport (DfT). The impacts of these projects are the focus of this note.

The maritime sector is vital to our economy, being responsible for 95% of goods (by volume) transported in and out of the UK[1]. Investment in technology and innovation, including environmental technologies, is vital to the future development and health of the maritime sector.

Research and development spending

There is an established rationale for government spending on research and development (R&D):

- Knowledge spillovers: knowledge has features of a public good, being non-rivalrous and in some cases non-excludable. There are also features of positive externalities, as one agent's investment in increased knowledge can benefit agents across the economy (as a new technology can be put to wider use). This suggests that private agents will under-invest in R&D, as they do not account for the wider social benefits of successful innovation. Government investment in R&D can increase provision, securing more of these benefits.
- De-risking investment: R&D spend may be considered risky for private enterprises because returns are uncertain and may be many years into the future. This may deter private investors or mean capital markets are unwilling to lend. By providing funding, government can share or reduce this risk, stimulating private investment and increasing innovation.

The UK government's innovation strategy reports that research and innovation funding (via Innovate UK) delivers £7 of economic benefit for every £1 of public investment[2]. This demonstrates a strong case for government spending on research and development in a range of contexts across the

[1] See DfT statistics on international freight at https://www.gov.uk/government/statistics/transport-statistics-great-britain-2022/transport-statistics-great-britain-2022-international-travel-and-freight.
[2] See the UK government's innovation strategy at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf (p10).

economy. No similar estimates exist for the maritime sector specifically; however, given strong positive returns to R&D investment, government investment in innovation has a strong role to play in developing technology for the future of the maritime sector.

Overview

Inputs

MarRI-UK funded 23 projects, with 69 project partners. Total funding was £9.0m, of which DfT provided £5.3m (59%) and the remaining £3.7m (41%) came from other sources. These were across three theme areas: clean maritime, technology and innovation, and smart maritime land operations (SMLO). The number and location of partners and level of funding is summarised below:

Table 1: Projects funding

Theme	Number of projects	Number of project partners	DfT funding (£m)	Other funding (£m)	Total funding (£m)
Clean maritime	10	31	1.36	1.53	2.90
Technology and innovation	11	21	1.54	0.74	2.29
Smart maritime land operations	2	17	2.44	1.42	3.86
TOTAL	**23**	**69**	**5.34**	**3.70**	**9.04**

The map illustrates the geographic spread of project partners. Partners are located in every region of England, plus Scotland and Wales. Locations with multiple partners include London, Southampton, Plymouth, Liverpool and Edinburgh:

Figure 1: Projects geographic distribution

The funding was evenly spread between different types of organisation: of the £5.3m total DfT funding, about £2.1m went to small and medium enterprises; £2.0m went to educational institutes or research organisations; and £1.3m went to large companies. The proportion of project costs

covered by DfT funding varied significantly: the median proportion of funding provided by DfT was 62%, but in some cases the DfT contribution was as low as 23% of total project funding.

Outputs

To deliver the projects, many projects employed individuals, including a range of post-graduate (and post-doctoral) research students, engineers, and managers. The total number of jobs created by projects is estimated at 58.5 FTE (excluding staff already employed by the organisations, who were tasked to deliver the projects). In addition, the projects leveraged further investment to expand or develop the ideas and technologies developed, with funding both from public sources (largely through DfT maritime funding competitions such as those run by UK-SHORE) and private investors. The total amount of further investment attracted is estimated at £19.9m public funding and £48.4m in private investment, for a total of £68.3m in further funding across the clean maritime and technology and innovation themes (figures not available for SMLO). Every £1 of initial funding (private and public) led to further investment of £13.20 (private and public), while every £1 of DfT initial funding leveraged a further £16.70 in private investment.

Table 2: Projects impact on jobs and investment

Theme	Jobs	Further investment: public (£m)	Further investment: private (£m)	Total leverage ratio *(total further investment / total input funding)*	Private leverage ratio *(private further investment / DfT input funding)*
Clean maritime	27	15.92	35.08	17.6	25.7
Technology and innovation	30	3.93	13.34	7.5	8.6
Smart maritime land operations	2	n/a	n/a	n/a	n/a
TOTAL	**58.5**	**19.85**	**48.42**	**13.2**	**16.7**

The majority of the further investment comes from two successful projects:

- a ZEVI project following on from the "WaveMaster Zero C" project (clean maritime theme) is estimated to have attracted £10m in public funding and £32m in private investment.
- developments from the "Re-charge LOHC @ Sea" project (technology and innovation theme) include successful bids for public money, including from CMDC2, CMDC3 and Horizon Europe (total public funding £1.6m alongside £0.7m private investment), plus £10m investment from a private partner in a newbuild ship based on the technology the project trialled.

Funding across the 19 other projects across the two themes totalled £8.3m in public funding and £5.7m in private investment. The pattern exhibited, where a small number of projects create significant and valuable success, whereas other projects do not "take off" to the same extent.

In addition to these quantified metrics of impact, the projects also had a significant (but non-tangible) impact in improving relationships between organisations in the sector. The projects stimulated collaboration between industry and academia; large and small companies; established companies and start-ups. This is likely to lead to further progress and co-operation in future.

Case studies

This section provides case study examples from some of the projects DfT has funded through MarRI-UK. It is characteristic of scientific research that only a proportion of projects lead to outcomes which can be scaled and applied more widely; the more projects are funded, the greater the chance that some projects will lead to this success. This section takes three projects funded by MarRI-UK to

describe and illustrate some examples of the success the programme has had. These examples provide a cross-section of the themes funding was given under, and a range of successful outcomes from further public funding to a private spin-out to commercial deployment.

WaveMaster Zero C (WMZC)

The WMZC project led by Bibby Marine aimed to test low emission fuels for use by Service Operation Vessels (SOVs). It tested five alternative fuels, producing design concepts and analysing feasibility by simulating a two-week operating cycle. The project concluded that a battery methanol hybrid solution is the most suitable for immediate application. Using a battery as the primary solution reflects the only way to be truly "zero emission" in the short term, while methanol is a suitable secondary fuel because of its potential to become fully carbon neutral.

The project became the basis for a demonstrator vessel and led to a successful application for more public funding from ZEVI to develop the concept further. As above, this project has secured £10m in public funding and £32m in private investment to develop the world's first electric SOV.

Maritime Cyber Risk Assessment Tooling (MaCRA)

The University of Plymouth led a project to develop software to counteract the growing cyber-security risks associated with increased connectivity and digitalisation of maritime technology. The software developed by the project now offers a range of services to identify risks associated with maritime digital operations. This includes characterising risks and their severity, and identifying systems that may benefits from additional security.

The project led to commercial development by the spin-out company Riskocity, which is currently raising seed funding to further develop the software as a commercial product.

Portonomy

Led by MSE International, the Portonomy project ("integrating autonomous vessel activity with port operations") developed a process to allow port authorities to safely permit testing and operation of autonomous (uncrewed) vessels. The project allowed Newhaven port to allow uncrewed vessels to operate without a guard vessel, removing one of the largest barriers to the widespread adoption of autonomous shipping technologies. The demonstration also allowed the port to develop understanding of the key risk control measures necessary to underpin the deployment of the technology.

The process developed by the project has been used commercially by the port of Portsmouth, and in the River Thames. The process underpinned the DfT-funded Shipping and Port Interfaces in the New Era (SPINE) project, which further explored the interface between ships, ports and infrastructure.

Challenges

Through the projects, partners uncovered a range of challenges and lessons learned. Areas identified as challenges include supply chains, fuel uncertainty, health and safety, regulation, and skills. This points to a need for the UK to continue to develop its approach to regulating and investing in the maritime sector, including emerging technologies. Factors that would underpin the future development of technology in the maritime sector may include availability of resilient supply chains, effective regulations and skilled professionals.

Projects will continue to monitor and learn from their activities, with a view to producing a more comprehensive summary/evaluation of impacts when all projects are complete by December 2024.

Conclusion

The £5.3m investment by DfT in research and development through MarRI-UK has been an instrumental catalyst, facilitating a range of innovation projects across the maritime sector. Many of these projects have led to further successes, including further public and private investment, commercial deployment, and a private company being spun off. While only a few projects produced immediate financial impact, the overall impact is significant. The more projects are funded, the greater the chance that some projects will lead to this success.