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MAKING SCOTLAND A WORLD LEADER IN ROBOTICS

National Robotarium Policy Discussion Paper

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Deputy Principal for Business and Enterprise
Heriot-Watt University

As the senior leader of the National Robotarium, I'm proud to share our latest position paper. It outlines the practical steps needed to establish Scotland as a global leader in robotics, AI and other smart technologies. This ambition sits at the heart of our vision to anchor the innovation clusters of the future here in Scotland.

The National Robotarium is a joint initiative between Heriot-Watt University and the University of Edinburgh, built on a shared legacy of research excellence. For Heriot- Watt, it is a vital global research institute and a cornerstone of our strategy to thrive as an entrepreneurial university and as an engine of economic growth. This strategy brings together our strengths in engineering, data and applied research, and reflects our commitment to turning academic discovery into entrepreneurial success and lasting societal impact.

Together with our other global research institutes, in areas such as health and care technologies, earth and marine sciences, net zero and our frontier research areas including photonics and quantum sciences, we are working closely with industry to deliver practical solutions, create new businesses and jobs, while building long-term capability across the country.

The next step is scale. With the support of the incoming Scottish Government, we can grow – and retain – our talent base, deepen collaboration, and anchor more emerging firms here in Scotland. This is how we build momentum, create and connect innovation clusters, and secure Scotland's place as an Innovation Nation. We are ready to work with government, investors and civic leaders to help turn that ambition into reality.

Stewart Miller
Chief Executive Officer
The National Robotarium, Heriot-Watt University

Scotland's Robotics Revolution: The Time for Action is Now

Throughout history, technological revolutions have transformed and reshaped economies. The steam engine, electricity, the internet – each fundamentally changed how we live and work. Today, we stand at the dawn of the robotics revolution, a transformation that will be just as profound.

The numbers tell a compelling story. The global robotics market is projected to reach $218 billion by 2030. Countries that position themselves as producers of robotics technology – not just consumers – will reap enormous economic rewards: high-skilled jobs, increased productivity, and export growth.

But the UK is starting from far behind. We rank just 24th globally for robots per manufacturing worker. To put this in perspective, Germany installed nearly eight times more robots than the entire UK in 2023. Asia dominates the global market with 72% of all robot installations.

There are encouraging signs that UK adoption is accelerating, but we're still playing catch-up from an extremely low base. The robotics revolution is happening now, and the window of opportunity won't stay open forever. Scotland has the chance to lead the UK's transformation from robotics buyer to robotics producer.

We already possess world-class research capabilities, engineering excellence, and entrepreneurial spirit. The National Robotarium, which I'm proud to lead, demonstrates what's possible. In less than three years, we've supported over 100 jobs and housed 14 innovative robotics companies. These aren't just tech startups – they're developing solutions to real-world challenges across healthcare, manufacturing, energy, and more.

The pace of innovation is accelerating dramatically. The emergence of embodied AI has sparked a global race, with over 200 companies worldwide receiving billions of investment to develop machines intelligent and physically capable enough to perform multiple roles and tasks. Today's robots are no longer confined to manufacturing floors or limited to single functions - they are becoming genuinely human-capable. This rapid evolution makes Scotland's participation in the robotics revolution not just an opportunity, but an imperative.

Imagine robots transforming NHS healthcare delivery - making it more cost-effective while reducing waiting lists. Picture stroke patients regaining movement through robotic rehabilitation, with these breakthrough treatments developed and manufactured right here in Scotland. Imagine too autonomous systems maintaining critical offshore wind farms, and collaborative robots boosting productivity in Scottish SMEs. This isn't science fiction - it's happening now.

The question isn't whether robotics will transform our economy - that's a given. It's whether Scotland will be at the forefront of this transformation or scrambling to catch up. Will we create the high-value jobs of the future, or watch them go elsewhere? Will we export robotics solutions to the world, or spend billions importing them?

This paper sets out a vision for how Scotland can seize this opportunity. By creating Robotics Scotland as a national coordinating body, establishing sector-specific initiatives in healthcare and marine robotics, investing in skills development, and establishing new robotic manufacturers, we can position Scotland as a robotics powerhouse.

The window of opportunity won't stay open forever. Other nations are moving rapidly, investing significantly in robotics capabilities. Scotland must act with similar urgency and ambition.

The future is being shaped by those who embrace robotics. Scotland has every reason to be among them. Let's not just watch the robotics revolution – let's lead it.

EXECUTIVE SUMMARY

Scotland stands at a critical juncture in the global robotics revolution. The National Robotarium has proven that strategic investment in robotics delivers real economic returns, establishing a foundation for broader transformation across Scotland's economy.

Three key sectors present immediate opportunities:

Manufacturing

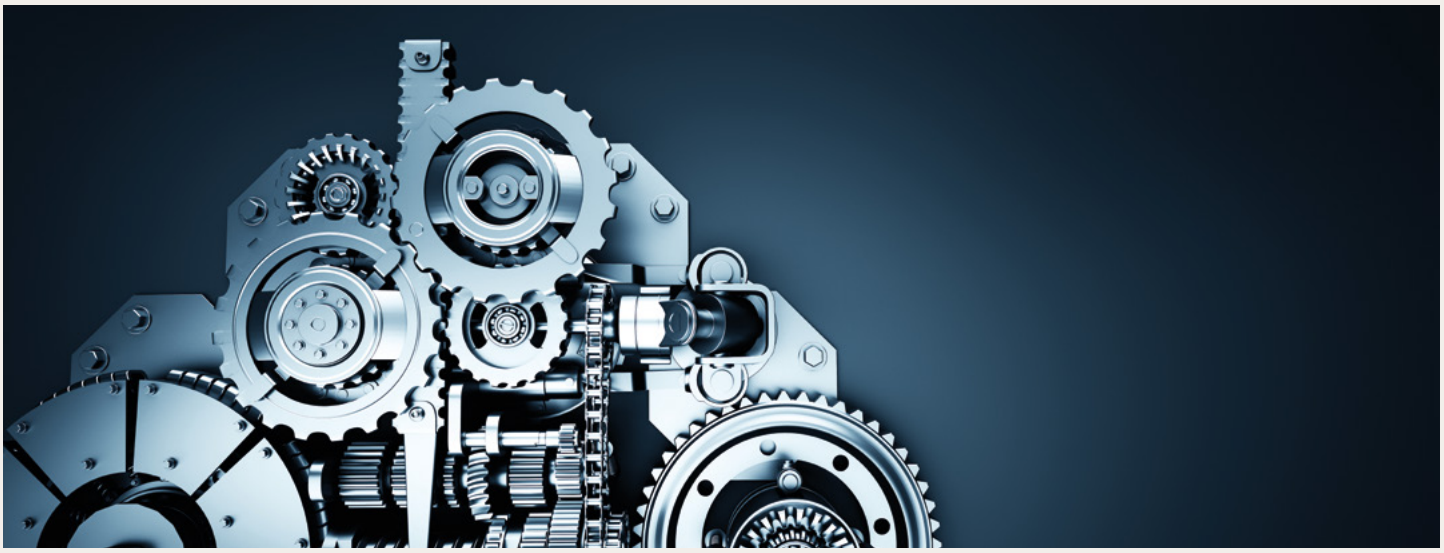
With potential to contribute £184 billion to the UK economy over the next decade, robotics can address Scotland's productivity challenges and labour shortages.

Health and social care

The global healthcare robotics market is expected to grow to £3.4 billion by 2028, offering opportunities for Scottish innovation while delivering efficiency savings within NHS Scotland.

Offshore and Renewables

Robotics in offshore wind operations and maintenance represents a £341 million annual market by 2030, aligning with Scotland's renewable energy leadership.



To capitalise on these opportunities, we recommend four strategic priorities for the next Scottish Government:

1. Create **Robotics Scotland** as a national agency to coordinate strategy and drive manufacturing growth
2. Establish a **National Healthcare Robotics Initiative** to accelerate adoption across NHS Scotland
3. Launch a **Marine Robotics Innovation Programme** building on the International Blue Economy Robotarium, announced with partners in Orkney in May 2025
4. Develop a **National Robotics Skills Strategy** to build Scotland's talent pipeline

By embracing these recommendations, Scotland can position itself at the forefront of the global robotics revolution, creating thousands of high-skilled jobs and establishing leadership in technologies that will define the future economy.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THE NATIONAL ROBOTARIUM: FOUNDATION FOR GROWTH

The National Robotarium has rapidly established itself as Scotland and the UK's centre of excellence for robotics and artificial intelligence, delivering significant economic impact since launching in 2022. Heriot-Watt University's world-class facility brings together academic expertise, innovative businesses, and industry partners to develop robotics solutions with real-world applications.

Since launching in September 2022, our achievements include:

- Supporting over 100 direct and indirect jobs across Scotland
- Housing 14 startup and spinout robotics companies
- Extensive partnerships with Scottish businesses across multiple sectors
- Building a team of 35+ full-time staff delivering industrial projects
- Engaging approximately 27,000+ young people in robotics education

The National Robotarium operates as a 'triple helix' model, fostering collaboration between academia, industry, and government. This approach accelerates innovation by combining academic research with commercial know-how and strategic policy support.

Our partnership with the Smart Things Accelerator Centre (STAC) demonstrates the economic potential of coordinated action. By connecting resources in both Glasgow and Edinburgh, this collaboration enables robotics businesses to access product development labs and engineering expertise across central Scotland.

The National Robotarium has been recognised internationally, with our approach cited by the Tony Blair Institute for Global Change in its October 2024 report on robotics leadership. With relatively modest public investment of £22.4 million in capital funding, we have created a facility delivering substantial economic returns.

This proven model can be replicated across Scotland, creating regional hubs of expertise - like the International Blue Economy Robotarium (IBER) being established with industry partners and leading scientists at Heriot-Watt Orkney - while addressing sector-specific challenges, like health and social care. By building on this foundation, Scotland can position itself at the forefront of the global robotics revolution, creating thousands of high-skilled jobs while developing technologies that will shape our economic future.

MANUFACTURING: DRIVING PRODUCTIVITY THROUGH AUTOMATION

The Challenge: Manufacturing is vital to Scotland's economy but faces significant productivity challenges. The UK ranks just 24th globally in automation levels - with far fewer robots in our factories than competitor nations. Currently, across the UK, approximately 20,000 of 27,000 manufacturing SMEs operate without robots, representing a massive untapped opportunity for productivity improvement and economic growth.

The Opportunity: If UK automation levels matched the world's most automated countries, productivity could increase by 22%. Over the next decade, robotics and automation technologies could contribute £184 billion to the UK economy, transforming our nation's manufacturing capabilities.

Robotics offers manufacturing businesses significant benefits:

- Automation of repetitive and time-intensive tasks boosts efficiency and output
- Robots provide consistent precision, reducing waste and improving product reliability
- Automation allows employees to focus on higher-value, more rewarding tasks
- Robotics enables better use of space and energy, with extended production hours
- Automated systems directly address critical labour shortages across Scottish manufacturing

These benefits directly tackle the sector's pressing challenges, including the 58,000 vacancies facing UK manufacturing and the need to improve global competitiveness.

While we rely on UK-level metrics due to the absence of Scotland-specific robotics data, this gap highlights the urgent need for a comprehensive Scottish robotics strategy. Developing our own robotics intelligence and metrics must be a priority as we build national capabilities.

Case Study: Leap.AI - Transforming Scottish Food Manufacturing

Aberdeen-based Leap AI demonstrates Scotland's robotics potential in action. Founded in 2020, the company has developed intelligent powered robotic systems that address critical labour shortages costing the UK food industry over £1.4 billion annually.

Its PikPak solution, launched in 2022 and primarily focused on the fresh produce sector automates end of line packing - delivering rapid payback through simpler, more cost-effective automation. With £7.9 million in recent funding led by the Scottish National Investment Bank, Leap AI continues to advance the deployment of its solutions nationwide and has ambitious plans for further development.

Leap AI proves that Scottish companies can create practical robotics solutions that simultaneously solve pressing domestic challenges and build technology with global export potential - transforming productivity one production line at a time.

HEALTHCARE AND SOCIAL CARE: INNOVATION WITH ECONOMIC IMPACT

The Challenge: Scotland's healthcare system faces enormous pressures: an ageing population increasing demand, workforce shortages limiting capacity, and budget constraints restricting investment. With NHS Scotland's annual budget of £21.7 billion, there is an urgent need for solutions that improve care while controlling costs.

The Opportunity: The global healthcare robotics market is projected to grow from $1.75 billion in 2023 to $3.42 billion by 2028. This represents both a significant export opportunity for Scottish companies and a chance to transform healthcare delivery.

Even modest efficiency improvements through robotics could generate substantial savings within NHS Scotland. A conservative 0.1% efficiency improvement would yield £21.7 million annually for reinvestment, while more ambitious adoption could save hundreds of millions while improving patient outcomes.

Healthcare robotics can deliver:

- Reduced pressure on healthcare staff through automation of routine tasks
- Enhanced rehabilitation through personalised support systems
- Improved surgical precision and recovery times
- Remote monitoring capabilities for vulnerable patients
- Development of a Scottish healthcare robotics supply chain, creating high-value engineering and technology jobs

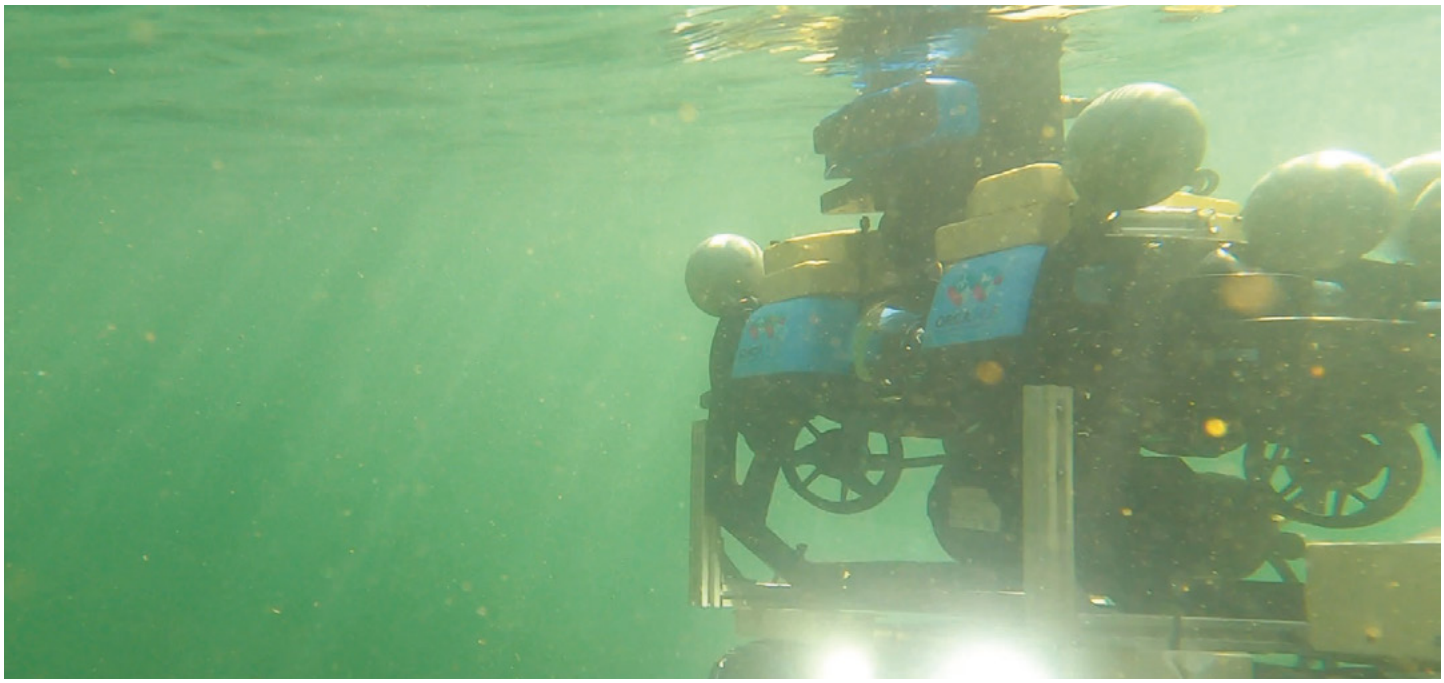
Case Study: BioLiberty - Robotic Rehabilitation

Edinburgh-based BioLiberty, who began at The University of Edinburgh before moving into the National Robotarium, has created a soft robotic glove that assists stroke patients with hand movements. The device contains built-in sensors that customise resistance levels to individual patient needs, providing personalised rehabilitation exercises.

Despite developing its technology in Scotland with public funding, BioLiberty has launched to early adopters in North American markets due to procurement barriers in the UK. This demonstrates both Scotland's innovation potential and the critical need for creating clear pathways for Scottish healthcare robotics companies to serve domestic patients while building exportable solutions.

By establishing Scotland as a leader in healthcare robotics, we can simultaneously improve patient care, create high-value jobs, and build an export industry addressing global healthcare challenges.

OFFSHORE AND RENEWABLES: MARINE ROBOTICS FOR ECONOMIC GROWTH



The Challenge: Scotland's ambitious renewable energy targets require innovative solutions to address installation, maintenance, and operations challenges. With the UK Government targeting a three-fold increase of offshore wind power to 50GW by 2030, there is an urgent need for technologies that improve efficiency and safety while reducing costs.

The Opportunity: The market for Robotics and Autonomous Systems (RAS) in offshore wind operation and maintenance is projected to reach £341 million annually by 2030. For Scotland's offshore sector, robotics can deliver transformative benefits across both renewable energy and decommissioning activities:

- Reducing maintenance costs through predictive maintenance
- Minimising human exposure to hazardous environments
- Cutting maintenance mission fuel consumption by up to 97%
- Extending the operational life of offshore assets through more frequent monitoring
- Accelerating safe, cost-effective decommissioning of North Sea oil and gas infrastructure

THE INTERNATIONAL BLUE ECONOMY ROBOTARIUM

THENATIONALROBOTARIUM.COM

Case Study: The International Blue Economy Robotarium

A major new innovation centre is being established to address this opportunity - the International Blue Economy Robotarium (IBER) in Orkney. The National Robotarium and world-leading scientists at Heriot-Watt University Orkney are partnering with industry experts including Aquatera, EMEC, Green Marine, and Leask Marine to create a world-class centre for testing and developing marine robotics.

IBER will rapidly advance the testing and development of robotic systems for the global blue economy, with particular focus on offshore wind and tidal energy. With access to a network of 400 service specialists, it will provide enterprising companies with a one-stop shop for enhancing efficiencies and improving sustainability using robotics.

This initiative exemplifies how Scotland can leverage its natural advantages in marine engineering and renewable energy to create economic opportunities while addressing climate goals. Scotland can establish itself as the global centre for marine robotics innovation, creating high-value jobs while supporting the transition to renewable energy.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STRATEGIC RECOMMENDATIONS

Recommendation 1:
Create Robotics Scotland

Establish a national agency to coordinate robotics strategy and accelerate Scotland's transition from technology consumer to producer. Robotics Scotland would connect existing assets and capabilities, create stronger alignment between research institutions and manufacturing facilities, and transform public procurement into a strategic economic tool. This directly delivers on Scotland's Innovation Strategy, which identified creating a Robotics Cluster as a top national priority, and fulfils Programme for Government commitments to support companies transitioning from R&D to production. It would leverage the £321 million already committed in the Scottish Budget for enterprise agencies supporting emerging tech, AI and robotics.

Recommendation 2:
Establish a National Healthcare Robotics Initiative

Work hand-in-hand with NHS and care leadership to create a comprehensive programme to accelerate the adoption of robotics across NHS Scotland while supporting Scottish companies developing health and social care solutions. This initiative would streamline procurement processes for innovative robotics technologies, establish demonstration sites to introduce Scottish innovations, and create clear pathways for promising technologies to scale within the healthcare system. By addressing current procurement and adoption barriers, we can ensure Scottish patients benefit from homegrown healthcare solutions while supporting economic growth.

Recommendation 3:
Establish a Marine Robotics Innovation Programme

Build on the International Blue Economy Robotarium to position Scotland as the global leader in marine robotics for renewable energy. This programme would create a dedicated funding stream for marine robotics R&D, develop regional testing facilities across Orkney and Scotland's coastline, and establish an international certification programme that attracts global developers. By connecting Scottish robotics developers with research excellence alongside supply chain opportunities and international markets, this initiative would create high-value jobs while supporting Scotland's renewable energy ambitions.

Recommendation 4:
Develop a National Robotics Skills Strategy

Ensure Scotland has the talent pipeline needed to lead in robotics by integrating robotics education from schools through to the workplace. This strategy would expand educational opportunities in robotics design, programming, and operations while developing industry-led programmes to upskill existing workers. It would also include business leadership development to help companies effectively implement and manage robotics systems. By addressing skills challenges and educational inequalities in a fair and equitable manner, Scotland can ensure its workforce is ready to lead in the robotics revolution.

CONCLUSION: SCOTLAND'S ROBOTICS FUTURE

Scotland stands at a pivotal moment. The global robotics revolution is accelerating, creating unprecedented economic opportunities. By taking decisive action now, Scotland can position itself as a producer of robotics technology, not just a consumer – creating thousands of high-value jobs, improving productivity across sectors, and establishing leadership in technologies that will define the future economy.

The National Robotarium has demonstrated what's possible. Our success can be replicated and scaled across Scotland, driving economic growth while addressing our most pressing challenges. The recommendations in this paper provide a practical roadmap to realising this vision.

The window of opportunity is open, but it won't remain so forever. Countries around the world are investing heavily in robotics capabilities. Scotland, which has been at the heart of previous industrial revolutions, must act now to secure its place in this future.

By embracing robotics as a cornerstone of its economic strategy, Scotland can build on its strengths in research, engineering, and innovation to create lasting prosperity. The National Robotarium stands ready to support the Scottish Government in this vital mission.

MORE INFORMATION

The National Robotarium welcomes engagement from all parties interested in exploring how robotics and AI can help create a more prosperous, healthier, and more innovative Scotland.

To find out more about the National Robotarium and arrange a visit, please contact:

nationalrobotarium@hw.ac.uk

thenationalrobotarium.com

Reaping the Rewards of the Robotics Revolution - The National Robotarium produced this discussion paper as a strategic roadmap for robotics growth in the UK, which received significant attention following its Westminster launch in spring 2024.

A New National Purpose: The UK's Opportunity to Lead in Next-Wave Robotics - The National Robotarium contributed to this landmark report from the Tony Blair Institute, which outlines how next-wave robotics will unlock economic productivity, deliver public service efficiencies, and enhance citizens' daily lives. The report positions robotics as central to national competitiveness and prosperity.

Recent articles from Stewart Miller, CEO, on **the robotics manufacturing potential in Scotland** and **how robotics can tackle the perfect storm of challenges facing the public sector.**

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The National Robotarium is supported by £21 million from the UK Government and £1.4 million from the Scottish Government as part of the £1.3 billion Edinburgh and South East Scotland City Region Deal - a 15 year investment programme jointly funded by both governments and regional partners.

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