

# Innovation in Digital Engineering Call for Proposals

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## Summary

The Hartree National Centre for Digital Innovation (HNCDI) partners, STFC and IBM Research, in cooperation with NAFEMS solicit proposals for HNCDI projects through this call programme from engineering and related businesses supplying the engineering sector. HNCDI is a collaborative programme between STFC Hartree Centre and IBM Research which will enable businesses to acquire the skills, knowledge, and technical capability required to adopt emerging digital technologies including supercomputing, data analytics, artificial intelligence (AI), and quantum computing. HNCDI will provide your organisation with a safe and supportive environment to explore the latest digital technologies and skills, develop proofs-of-concept, and create roadmaps to apply them to industry and public sector challenges effectively. The Innovation in Digital Engineering call seeks, in collaboration with engineering and related engineering sector suppliers, to create HNCDI projects that apply these emerging digital technologies of AI, hybrid and multi-cloud, high performance computing (HPC), and quantum computing to advance the engineering sector's digital capabilities, accelerate scientific and engineering discovery, and enable productivity growth and global competitiveness of the UK engineering sector.

## Call outline

As part of HNCDI, STFC and IBM Research are working closely with NAFEMS to develop the Innovation in Digital Engineering, a programme of coordinated digital engineering sector projects on the themes of sustainable productivity for design, testing and manufacturing, and scale and efficiency using modelling and simulation and data management.

The aim is to apply new methods and tools, and de-risk the uptake of new technologies in the engineering industry. The projects will validate the new technologies capabilities as applied to key engineering sector challenges. Through these projects new avenues for additional research and development of these and other new technologies may be uncovered.

As a result, we are seeking proposals from the industry to turn into a series of projects, which demonstrate primary use of new digital technologies required to address a specific challenge in the engineering sector.

The Innovation in Digital Engineering competition is offering up to **72 months of staff time** (combined from STFC and IBM resources) and **compute resources** to enable the initiation of up to **8 projects** (minimum 4 projects) to commence between April 2025 to June 2025 (and conclude by March 2026). This corresponds to an allocation of approximately **£2-3 M** of the total HNCDI budget (£210m) that will fund STFC and IBM staff time and cloud/computing access. No direct funding is available to organisations outside of the HNCDI partners.

## Scope

The Innovation in Digital Engineering programme is intended for UK industries working in or with the engineering sector, through access to advanced digital technologies and supporting expertise, to

help apply next generation digital methods and tools to overcome challenges in engineering, manufacturing, or operation which have a high impact on UK industry productivity.

We are seeking project proposals that will combine newly researched and developed digital technologies and existing digital technologies, improving speed, accuracy, and efficiency of solutions within logistics, engineering, manufacturing, and end-of-life.

The Innovation in Digital Engineering focus is on the following themes:

- **Design, testing and manufacturing**
- **Scale and efficiency using modelling and simulation**

After choosing one of the above themes, the applicable technology areas for consideration can include the following. However, exact specification of digital technologies applied to solve the application challenge will be decided in collaboration in Stage 2.

- **AI ENHANCED MODELLING & SIMULATION** | accelerating discovery and innovation through AI enriched large-scale, multi-disciplinary, coupled computational modelling & simulation. Providing targeted and faster results through the application of AI techniques to modelling & simulation applications.
- **AI ENHANCED DATA ANALYTICS** | exploration of engineering and processes through automated data interpretation, identification of insights discoverable only through advanced AI analytics, and making increasingly valuable predictions based on the data. Enabling concepts that push boundaries of what is possible to develop safer, more efficient, and more innovative products and processes.
- **SCALABLE ARTIFICIAL INTELLIGENCE** | enabling the application of AI algorithms and solutions to operate at the size, speed, and complexity required to deliver effective operational capabilities. Providing the user with advanced insights from a wealth of knowledge.
- **HIGH PERFORMANCE COMPUTING and EXASCALE ready** | empowering the capability to tackle challenges in scientific discovery, manufacturing research and development, physical simulations, and aerodynamics at levels of complexity and performance that previously were out of reach.
- **QUANTUM COMPUTING** | exploiting the laws of quantum mechanics to solve problems that are too complex for classical computing and exploring how emerging digital technologies can offer next generation of competitive advantages. Developing quantum computing approaches to in-depth simulations, complex multi-dimensional optimization challenges, and enabling material discovery.

The following is a list of example projects that are suitable for this funding call:

- **Design, testing and manufacturing**
  - Material discovery for battery and fuel cell applications
  - Material discovery for lightweighting

- Life cycle analysis and optimisation
- Modelling and simulation for design optimisation
- In-silico testing and validation
- Digital twin for product
  
- **Scale & efficiency using modelling and simulation**
  - Condition monitoring
  - Energy optimisation
  - Recyclable materials
  - Digital twin for supply chain and manufacturing
  - Process optimisation – reduction of cycle time and waste material, quality control, defect detection
  - Logistics modelling
  - In-service monitoring

## Support type and expected outcomes

The Innovation in Digital Engineering programme will fund all STFC and IBM staff and compute resources. No direct funding is available to organisations outside of the HNCDI partners.

Most projects are anticipated to fall in the **3-12-month** timeframe, with maximum project duration being fixed at 12 months.

We are looking for committed partners and as such in-kind contribution is expected but no fixed amount is specified. In-kind covers data, staff effort, materials to test the new technologies, and time taken in testing the developed solution and providing continuous feedback.

During projects, we expect to use the digital technologies being researched and developed by STFC and IBM Research. Within the projects new areas of research and development may be required to address the engineering sector challenges. It is hoped that any digital tools or platforms either developed or applied within a project should demonstrate a **technology readiness level of 3 to 7 by the end of the project.**

For successful proposals in the Innovation in Digital Engineering call, you will receive:

1. Dedicated resource from the HNCDI partners for projects aiming to collectively address your challenge.
2. The ability to collaborate with the STFC Hartree Centre and IBM Research – home to world-leading science facilities and knowledge, supported by the sector knowledge embedded in NAFEMS.
3. De-risking innovation by providing access to a supportive environment and the ability to test new digital concepts and technologies.

Training in digital technologies is offered under HNCDI and you will be advised which of our available training courses would be suitable for you to enable the most effective understanding and use of the technologies employed in the projects.

Due to the nature of the support, the digital assets solely generated by either STFC or IBM during the project will be owned by HNCDI. Any jointly created (non-separable) foreground IP generated during the project will be jointly owned, and each owner may use freely without accounting to the other owner(s). Industry participants can expect to receive outputs from the projects including reports on the work carried out and associated results, models, algorithms and a software evaluation to **trial the developed methods/technologies** (the evaluation period term is negotiable and formalized in a legal agreement, for further details please contact the HNCDI team).

## Eligibility

To be eligible for participation to the submission and project delivery phases, your organisation **must**:

- Be a UK based business of any size registered at Companies House;
- Have an engineering or manufacturing base for the relevant product in the UK or provide the relevant product or service from or in the UK;
- If “in-kind contribution” is provided, carry out its project work in the UK;
- Intend to exploit the results from or in the UK;
- Start the project in the window between 1<sup>st</sup> April 2025 to 1<sup>st</sup> June 2025.
- End the project no later than 31<sup>st</sup> March 2026.

## Application process

The application process for this call has **two stages**.

- i) **Stage 1. Expression of Interest (EOI) | DEADLINE 15<sup>th</sup> NOVEMBER 2024**  
The initial application process requires companies to submit a concise EOI through a ‘Expression of Interest’ Form (shown in Appendix D), describing the area of focus.

Companies are not required to describe the project they want to do; instead, they will need to describe the challenge, its nature, any techniques already tried and the value of solving it.

In addition, the application should include some assessment of how solving the challenge would benefit sales and other business outcomes, as well as the contribution that the company would like to provide (in-kind).

This application will be assessed by a board comprising members from STFC, IBM, and NAFEMS against the selection criteria.

The submission of an EOI is a pre-requisite for participation in the full project proposal, but it does not guarantee that a future proposal derived from it will be chosen.

**Submissions should be sent to [hartreecentre@stfc.ac.uk](mailto:hartreecentre@stfc.ac.uk) by midnight of the 15<sup>th</sup> November 2024.**

- ii) **Stage 2. Full Project Proposal | DEADLINE 1<sup>st</sup> MARCH 2025** (although project proposals ready before this date will be evaluated and will commence earlier – at the earliest from January 2025). For approved Expression of Interest Statements, the next stage is the development of a Full Project Proposal in which the companies that have been successful in ‘Stage1. Expression of Interest’ will work with the HNCDI staff. Although input information is required from the successful company, it is expected that the HNCDI staff will be leading the ‘Full Project Proposal’ activities such as detailed scoping of work packages and project risks.

In this stage specifics of the work to be done and further technical details will be addressed.

The ‘Full Project Proposal’ will then be reviewed by the HNCDI Management Board for final approval or rejection.

During each stage, the Innovation in Digital Engineering team will be offering an interactive consultancy service on a 1:1 basis to assist participants developing their proposal.

## Selection Criteria

The ‘Stage 1. Expression of Interests’ are evaluated by the Innovation in Digital Engineering Advisory Board, which comprises a minimum of 8 members:

- Head of Technology Trends – NAFEMS or an alternative nominated by NAFEMS;
- Head of Business Development – NAFEMS or an alternative nominated by NAFEMS;
- The STFC Engineering Lead or an alternative STFC Innovation in Digital Engineering team representative;
- The STFC Engineering Business Development Manager or an alternative STFC Business Development Manager representative;
- The STFC HNCDI Explore Workstream Lead or an alternative STFC contact nominated by the STFC Management Board;
- The IBM HNCDI Explore Workstream Lead or an alternative IBM contact nominated by the IBM Management Board;
- The STFC HNCDI Excelerate Workstream Lead or an alternative STFC contact nominated by the STFC Management Board;
- The IBM HNCDI Excelerate Workstream Lead or an alternative IBM contact nominated by the IBM Management Board

The projects will be assessed through the same procedures and marking system, as per below.

The projects will be evaluated considering **two main categories**:

- **ATTRACTIVENESS** | i.e. how the project proposal is aligned to the strategic objectives of HNCDI and of the UK engineering sector.
- **ACHIEVABILITY** | i.e. how easy is to deliver the proposed project outputs in terms of complexity, capacity and risks.

Both the categories are divided in 5 subcategories as per the table below:

ATTRACTIVENESS			ACHIEVABILITY	
	Sub-category	Description	Sub-category	Description
1	STRATEGIC ALIGNMENT	<i>The project aligns well with UK government priority R&amp;D investment areas, the HNCDI strategic technology areas, and in particular with the UK engineering sector (represented by NAFEMS)</i>	SCOPE CLARITY	<i>The scope of the project is clearly defined with a logical delivery approach, output &amp; expected outcomes and impact, producing a relevant case study to industry at the end of it, i.e. answering to the question "What success looks like"</i>
2	NOVELTY	<i>The proposed solution is novel and quantifiably advances the state-of-the art in a particular field(s), generating new or improving relevant capabilities</i>	ABILITY TO DELIVER	<i>The HNCDI team, in collaboration with the proposal initiator, can deliver the project under the constraints of the Innovation in Digital Engineering call and available skills</i>
3	SECTOR IMPORTANCE AND POTENTIAL IMPACT	<i>The project is important to the sector and beyond, and its impact is measurable e.g., increasing productivity (better, faster, cheaper), return on investment</i>	TIMING OF THE PROJECT	<i>The project fits with the Innovation in Digital Engineering time window</i>
4	TRANSFERABLE SKILLS	<i>The project is generating skills that are usable by current and future workforces and could be re-deployed in other sectors for cross-pollination</i>	RISKS OF THE PROJECT	<i>There is a pro-active risk management process in place to identify and mitigate/accept risks</i>
5	LIKELIHOOD OF TRANSFER INTO INDUSTRY	<i>The project outputs are likely to be directly implemented int industry following project completion</i>	DEPENDENCIES OF THE PROJECT	<i>The internal and external project dependencies are clearly identified and do not impact scope/timing</i>

Each sub-category will be given a score from 0 (lowest) to 10 (highest).

An averaged, non-weighted score will be derived for each category. We are seeking a balanced portfolio of projects, ranging from highly novel research projects to those with a very high level of capability transfer.

Projects that will position as high-ranked in both categories will be considered for the next phase.

To diversify the portfolio of projects, the assessors will also take into consideration:

- the UK engineering sector priority areas that the project is addressing and how the portfolio is balanced,
- the cost of the project to the HNCDI team and its impact to the available budget, and
- the value of the project to HNCDI team with respect to validation of its strategic and technological goals.

The proposals that make a compelling case for a substantial positive effect of productivity on the UK engineering sector from the adoption of HNCDI strategic technologies and participation in the Engineering Sector Programme carry the highest chances of being successful.

## Contracting process

For projects enabled under this call, there is a **two-stage** contracting process in place:

- i) 3 or multi-way CDA
- ii) Participation Agreement

Examples of both are available on request.

## Dates

The competition will be open for Expression of Interest forms from the 1<sup>st</sup> October 2024 to the 15<sup>th</sup> November 2024 with projects anticipated to commence at the start of April 2025.

## Contacts

For more information about the Innovation in Digital Engineering call, please use the following contact: [hartreecentre@stfc.ac.uk](mailto:hartreecentre@stfc.ac.uk)



## Appendix A | The Hartree National Centre for Digital Innovation (HNCDI)

***Enabling UK businesses and the public sector to explore and adopt innovative new digital technologies including AI and quantum computing for productivity, innovation and economic growth.***

### What is HNCDI?

The Hartree National Centre for Digital Innovation is a collaborative programme between STFC and IBM which will enable businesses to acquire the skills, knowledge and technical capability required to adopt digital technologies like supercomputing, data analytics, artificial intelligence (AI) and quantum computing.

Through HNCDI we provide a safe and supportive environment for organisations to explore the latest digital technologies and skills, develop proofs-of-concept and apply them to industry and public sector challenges. Our dynamic and collaborative approach is driven by industry requirements and will help organisations to de-risk investment in new and emerging digital technologies. Whether you're at the start of your digital journey or trying to advance to the next level, we can help you navigate the possibilities of AI and quantum computing technologies to discover the next step for your organisation.

### Who is it for?

We're here to help organisations and individuals with an appetite for change, who are ready to innovate and create useful solutions, enhance, and adapt products and processes, adopt new digital technologies and expand into new markets.

Whatever the size of your business or organisation we have an established track record working with industry, from start-ups and SMEs to large corporates, and public sector organisations such as NHS Trusts and local government.

We also offer training on an individual and group basis.

### Why work with us?

The Hartree National Centre for Digital Innovation (HNCDI) is uniquely positioned at the intersection of exciting new science and industry applications and will grow a community of discovery that combines advanced digital technologies and applies the scientific method to address key challenges across UK industry. The partnership between STFC Hartree Centre and IBM Research will bring together an established track record in applied research and innovation with a strong network of collaborators across industry and research communities built on shared interest and a goal to accelerate innovation by reducing the risk of exploring and adopting emerging technologies.

HNCDI is part of IBM's global Discovery Accelerator initiative, which seeks to accelerate discovery and innovation based on a convergence of advanced technologies by establishing research centres that foster collaborative communities and advance skills and economic growth through large-scale programmes. This programme builds on our previous Innovation Return on Research partnership



with IBM Research, which was committed to solving industrial challenges and creating societal and economic impact.

## Appendix B | NAFEMS

NAFEMS is the International Association for the Engineering Modelling, Analysis and Simulation Community.

We are a not-for-profit organisation which was established in 1983.

Our principal aims are to:

- Improve the professional status of all persons engaged in the use of engineering simulation
- Establish best practice in engineering simulation
- Provide a focal point for the dissemination and exchange of information and knowledge relating to engineering simulation
- Promote collaboration and communication
- Act as an advocate for the deployment of simulation
- Continuously improve the education and training in the use of simulation techniques
- Be recognised as a valued independent authority that operates with neutrality and integrity

We focus on the practical application of numerical engineering simulation techniques such as the Finite Element Method for Structural Analysis, Computational Fluid Dynamics, and Multibody Simulation. In addition to end users from all industry sectors, our stakeholders include technology providers, researchers and academics.

### Priority Goals for the Development of the Organisation

NAFEMS strives to continually evolve the ways in which it operates and to constantly improve the extent to which it fulfils the primary aims that are listed above. The Council of Management has established the following priority goals for the development of the organisation:

- Increase our global reach
- Enlarge our technological breadth
- Strengthen our involvement in the provision of simulation training and extend the training material that is available
- Publish up to date practical simulation cases of value and substance to simulation engineers
- Expand the information that is available on different simulation techniques and the various simulation tools that are provided
- Further develop services for the exchange of simulation information between specialists worldwide on topics of particular interest
- Improve our interaction with existing member companies and communicate with an increased number of individuals within those companies.

## Appendix C | Frequently Asked Questions

### **How are projects being funded?**

Projects will be directly funded through the HNCDI Programme through government investment into the STFC Hartree Centre.

### **How and when will I be notified if my EOI or full proposal is successful?**

The HNCDI team will continue to engage with all parties who have submitted an EOI proposal to understand the best route to bring the EOI to the Full Project Proposal stage, guiding the Full Project Proposal phase. As soon as the HNCDI management board believes that the Full Project Proposal contains all the convincing arguments to start the project, the organisation will be notified. The latest date for approval is 31st March, 2025.

### **Do EOI submissions have to come from within the engineering sector?**

The Engineering Sector Call team will accept proposals from organisations outside of the engineering sector. However, the overall scope, objectives and activity carried out within a project should be demonstrated through a primary use case in engineering.

### **Do I need to establish a consortium to submit an EOI?**

No, the Engineering Sector Call Programme is specifically designed to accommodate a single organisation that would work with the STFC and IBM teams. However, consortia can apply where appropriate.

### **Can non-UK companies submit an EOI proposal and access the Engineering Sector Call services?**

Overseas companies can only submit an EOI proposal if they have UK registered subsidiary and can guarantee that the R&D in a resulting funded project will be carried out in the UK and the results of the projects will be exploited from or in the UK.

### **How will EOI and Full Proposal submissions be assessed?**

The HNCDI management board will apply a simple grading structure to assess proposals in line with the section "Selection Criteria" for both the EOI and the Full Project Proposal. The HNCDI team will provide feedback on how the proposal can be developed and improved on a regular basis.

### **What is the difference between HNCDI and Engineering Sector Call?**

The HNCDI is the wide initiative under which the Engineering Sector Call Programme is running. Whilst the HNCDI covers a broader scope, the Engineering Sector Call will be targeting the engineering sector only.

## Appendix D | Expression of Interest form

### **Introduction & Background**

*Brief introduction that provides background and context for the reader (approx. maximum 500 words);*

**Customer Response:**

### **Problem Statement**

*Describe the problem you are encountering in sufficient detail that allows the reader an understanding of the challenges you face. This should include:*

- *Clear description the problem challenge or business need*
- *Describe the current situation and how we expect this project to change it*
- *The expected technical outcomes of overcoming the problem.*

*(approx. maximum 500 words)*

**Customer Response:**

**Previous Attempts to Solve the Problem**

*Describe what previous attempts have been made to solve the problem.*

- *Approaches taken, including analytical methods used;*
- *Barriers identified*
- *Conclusion of these efforts.*
- *Have you seen a solution to a similar problem in another application / field?*

*(approx. maximum 500 words)*

**Customer Response:**

**Solution Specification**

*If defined, what are the key criteria the solution must fulfil? What criteria are desirable but not essential?*

- *Things to consider: functionality, customisability, adaptability, accessibility, availability, compatibility, interoperability, scalability, accuracy, precision, security, privacy, ethical, licensing/IP.*

*(approx. maximum 500 words);*

**Customer Response:**

**Expected or Estimated Impact/Value of the Project to your Business and/or Potential Impact to Wider Industry, Society, etc.**

Please complete the boxes below (approx. maximum 100 words) each:

<p>Will there be an increase in revenue from sales? (Include estimated value in £).</p>	
<p>Will there be an increase in revenue from licensing? (Include estimated value in £).</p>	

Will there be an increase in revenue from exports? (Include estimated value in £).	
Will the quality of products or services improve?	
Will there be an increase in staff employment?	
What impact on productivity could be achieved? (Include efficiencies in processes, cost reductions in products or skilled services)	
Will the successful completion of the project provide a technological advancement to gain competitive advantage?	
What timescale would you expect to realise the benefits described above?	
Will the successful completion of the project accelerate the route to market for your product or service, and if so how?	
What benefits could the project have more widely to your industry?	
What benefits could the project have more widely to your geographical region?	
What other impacts could be expected from this work?	

**Company Details**

Please complete the boxes below:

Company name	
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Companies House registration number	
Company's registered address (head office)	
Company's trading address (if different)	
Postcode where majority of work will be carried out	
Lead contact at company and contact details	
Total number of staff and size of organisation	
Where did you hear about the Engineering Sector Call programme	
Suggested technologies or equipment to be used (if known)	