

Background. In recent years, the UK's Mathematical Sciences community has significantly expanded its focus on impact and knowledge exchange, driven by an increasing demand for mathematical modelling from industry, government, and the third sector. The growing significance and influence of data science and AI requires effective knowledge exchange between academia, government, industry and the third sector to best harness and understand their impacts on our lives. Numerous funding opportunities now support both short-term and long-term collaborations with diverse partners, posing the question: Are mathematical and computing science departments adequately equipped to integrate these activities into their portfolio?

While academic staff can allocate some time to these endeavours, they often face a difficult balance between dedicating time to impact/knowledge exchange and engaging in more fundamental research where real-world benefit takes longer to realise. Effective impact requires sustained focus and cannot be realised through sporadic efforts. Often, the involvement of postdocs or PhD students in delivery comes at the expense of their other academic responsibilities and does not necessarily support follow-through opportunities. A more systematic approach to these activities is essential to ensure both impact and academic integrity.

Innovation Research Associates (InRA). The formulation of the InRA role was introduced in 2020 by the Institute for Mathematical Innovation (IMI) at Bath and subsequently adopted by the Centre for Applications of Mathematical and Computing Sciences (CAMaCS) at Warwick. ***The InRA role addresses the challenge of academic immersion in impactful research.*** Currently, more than 10 InRAs are supported across these institutions. InRAs are postdoctoral researchers engaged in impact-focused short- and long-term research projects, working part- and full-time. They work with academics in translating research ideas into impact with external, and cross-disciplinary partners, thereby enhancing funding and impact opportunities. In the words of an existing InRA, the InRA model offers *“a platform that produces first order effects through projects as well as second order effects through building networks and providing a proof of concept for interdisciplinary/industry facing research.”* This role has parallels in engineering and medical statistics, where similar positions have long been successful.

InRA self-funding model. InRA salaries are under written by the hosting university *but are recouped by costing InRA time through impact-facing research and consultancy project funding.* This model necessitates continuous engagement with partners to secure future income for InRAs. The actual cost is therefore not the InRAs but managing the InRAs. InRA contracts can vary in duration from fixed-term to open-ended.

Funding for InRAs comes from multiple sources, the primary four are:

- *Targeted Impact Funding* including Innovate UK, NIHR, small-scale funding like the Impact Acceleration Account, A4I (Newton Gateway), and regional, industrial, NHS, and government funds.
- *Research Grants* across the UKRI spectrum (MRC, BBSRC, EPSRC, ESRC, AHRC, STFC, NERC, Research England, etc.) and learned societies, particularly for projects that emphasise impact and interdisciplinary research.
- *Existing Research Funding* for short, impact-focused work, often facilitating new cross-departmental research partnerships.
- *Consulting* where non-academic organisations pay to access university research expertise to address specific challenges.

Financial considerations. Establishing InRA posts requires up front consideration to support:

- An InRA financial recovery model, which can vary by institution in method and rate, aims to **at least** cover *their direct cost salary, pro rata*, taking account of overheads.
- An assumption that up to 20% of the InRA time is not directly costed on projects but is reserved for developing new research partnerships that lead to externally funded projects.
- A 6 month 'burn-in' period *for the very first InRA*, where salary recovery is at greater risk is typical before achieving a steady income flow, though immediate salary recovery is possible.
- Flexibility in the number of InRAs based on the workload and funding availability.

Managing InRA Positions involves not only overseeing project flows across the mathematical sciences and its diverse partners but also addressing several other operational aspects:

- **Time and Project Allocation** to ensure InRA expertise and time is appropriately and maximally covered by externally funded sources *akin to arranging pieces in a game of Tetris*. An InRA team with broad collective expertise increases its robustness, relevance, power, and visibility to potential partners.
- **Relationship management** with partners to grow and maintain research activity for the team.
- **Flexible employment** with the option to extend contracts and increase the number of posts, depending on demand, with the possibility of conversion from fixed term to permanent/open-ended, and promotion.
- **Capacity Limits** mean that each department has a natural saturation point for the number of InRAs it can support effectively, beyond which time recovery becomes impractical. It is advisable to expand InRA positions organically towards this limit.
- **Collaborative Growth** is evident as institutions like Bath and Warwick already collaborate to mutually support the careers of their InRAs. As more universities engage in this model, there is significant potential to expand this community support network.

Summary table. Below we have tabulated a summary of the InRA role and its benefits which we would encourage you to use towards making the case for these roles to your own university.

<p>Benefits to the university</p> <ul style="list-style-type: none"> ○ Research with societal impact. ○ Strategic preparation for REF assessments. ○ Networking and knowledge exchange. ○ Enhanced industry collaboration. ○ Competitive advantage in the higher education landscape. ○ Ability to respond to non-standard/short-term funding opportunities and broader access to funding. ○ Accelerated project initiation. ○ Distinctive academic leadership. ○ Development of well-rounded researchers. ○ Stronger REF (impact) environment return. ○ Alignment with national priorities. 	<p>Benefits of becoming an InRA</p> <ul style="list-style-type: none"> ○ Opportunities to build strong professional networks with leading experts in academia and industry. ○ Engagement in cross-disciplinary projects that broaden research perspectives and methodologies. ○ Benefits from mentorship by seasoned academics and industry professionals. ○ Offers a degree of independence in research direction, subject to the overarching goals of the projects. ○ Understanding the habitat that you exist in as an early career researcher. ○ Contribute to high-profile projects, enhancing personal and professional visibility in the academic and industrial communities.
<p>InRA career progression in academia</p> <ul style="list-style-type: none"> ○ Similar to pure research roles, universities provide structured promotions, allowing InRAs to advance to senior positions under permanent contracts. ○ In more advanced roles, InRAs may take on increased responsibilities such as mentoring junior InRAs, leading grant writing efforts, managing projects, and directing projects academically without faculty input while also preparing impact case studies. ○ Despite the broad scope of their work, InRAs can develop specialised expertise in specific areas of mathematics, enhancing their professional profile. ○ Bath and Warwick encourage other universities to help build a national community that supports career development for InRAs, promoting a collaborative and sustainable career pathway in academia. 	<p>The ideal InRA candidate</p> <ul style="list-style-type: none"> ○ Thrives in dynamic environments and adjusts quickly to new research directions. ○ Capable of leading projects and small teams, demonstrating leadership in research settings. ○ Strong ability to communicate complex ideas clearly to diverse audiences, including industry partners and academic peers. ○ Experienced in overseeing projects from conception to completion, ensuring efficient and timely delivery. ○ Exceptional analytical skills to dissect research questions and synthesise information. ○ Constantly seeks to expand knowledge and skills, staying abreast of the latest developments in their field. ○ Ability to foresee research trends and align projects with long-term academic and industry goals.