

Engineering biology call for evidence

About the Institution of Engineering and Technology (IET)

The IET is a trusted adviser of independent, impartial evidence-based engineering and technology expertise. We are a registered charity and one of the world's leading professional societies for the engineering and technology community with over 155,000 members worldwide in 148 countries. We work collaboratively with government, industry and academia to engineer solutions to society's greatest societal challenges, including tackling climate change and building a better digital world.

Summary

The UK's engineering biology sector exhibits significant strengths, such as a strong research base built around its centres of excellence. However, there are many challenges, including –

- Scaling-up production – including access to facilities and the capital required for mass production
- Access to investment for SMEs, especially in the £2m - £20m range
- Recruitment of skilled individuals, especially at the technician level – including the leakage of expertise abroad

Our recommendations to address these challenges include –

- Implement co-funded initiatives that require SMEs and larger businesses to work together, fostering mutual understanding and innovation
- Encourage government contracting with requirements for collaboration between SMEs and larger firms
- Incentivise engineering biology researchers to stay in the UK – promoting technician careers in the sector is critical

In summary, addressing these key areas will determine the UK's success in the dynamic field of engineering biology.

3. UK Value Chain for Engineering Biology

3.1. With regards to the whole sector, what do you think the UK's key strengths are in engineering biology?

The UK's strengths in engineering biology encompass several key areas:

- The country has a robust research and development ecosystem, particularly in the early-stage exploration of engineering biology.
- There is a strong interconnectedness between the healthcare sector and engineering biology, fostering innovation and application in medical fields.
- The UK boasts well-established research infrastructure within its universities and effective governance structures through bodies like the Engineering Biology Leadership Council.

However, while there are strong centres of excellence, the landscape is somewhat fragmented, with low levels of activity outside of these centres. This patchiness can limit the overall opportunity space and leave the UK vulnerable in certain areas.

3.2. With regards to the whole sector, what do you think are the UK's key challenges over the next five years?

The primary challenges facing the UK in engineering biology over the next five years include:

- The translation of ideas from the knowledge base to economic reality – turning innovative ideas into profitable ventures without businesses relocating offshore in search of capital.
- Leakage of expertise to other jurisdictions – the risk of losing talent and knowledge to other countries, particularly in the East, poses a significant challenge. Retaining and attracting top talent is essential for the sector's growth and competitiveness.

3.3. Detail your own personal experiences with the engineering biology value chain outlined below. Where do you source these inputs to your work? What difficulties have you experienced? And what do you think needs to change?

Personal experience reported by an IET member –

“My experience in the engineering biology value chain involves running a diagnostics business. However, it has faced significant challenges:

Lack of access to £3M+ finance – our business has been stuck at the proof-of-principle stage for a decade due to the difficulty in securing substantial financial resources. This highlights the need for improved access to larger capital investments.

Mass manufacturing assets – scaling up production has been a significant hurdle. Access to manufacturing facilities and the capital required for mass production are crucial areas that need improvement.”

4. Knowledge Pipeline

4.1. Within your domain, what are the key scientific and technical opportunities over the next five years for advancing the development of engineering biology, including its foundational technologies?

The key opportunities in engineering biology over the next five years include:

- **Exploiting RNA-based technologies** building on work done during the COVID-19 pandemic, offering significant potential for advancements in therapies.
- Engineering biology can play a crucial role in developing sustainable solutions for a **low-carbon economy**, including bio-based materials and energy production.
- Leveraging engineering biology for **efficient and sustainable materials production from waste and renewable sources** is a promising avenue for innovation.

5. Talent and Skills

5.1. In order for your domain or the domains of those you represent to develop, scale, and commercialize products derived from engineering biology, what are the key technical and non-technical skills?

The key skills needed in engineering biology include:

- Fundamental biology/molecular biology skills
- Bioprocessing and scale-up skills

- Data analysis and curation skills
- Biodesign skills

5.2. Please indicate what is working, not working, or not to a sufficient scale.

Support for early-career researchers: Rated 3 - Support for early-career researchers is somewhat effective but could be improved.

Support for mid-career researchers: Rated 3 - Similar to early-career support, support for mid-career researchers is somewhat effective but could be enhanced.

Support for late-career researchers: Rated 3 - Late-career researcher support is also moderately effective.

Programmes to support technicians' careers: Rated 5 - Support for technician careers is lacking and needs attention.

Programmes to support regulatory skills: Rated 1 - Support for regulatory skills is effective.

Programmes to support entrepreneurship: Rated 2 - Entrepreneurship support is good, but the issue lies in the availability of capital for entrepreneurs to realize their ideas fully.

Recruitment of skilled individuals is currently at a crisis point, and the cost of living crisis in the UK is driving talent away from the industry and abroad. This issue is critical and requires immediate attention.

6. Business Ecosystem

6.1. How do we create mechanisms which bring engineering biology SMEs together with their customers in a way that promotes a clear understanding of each other's requirements?

To promote collaboration between engineering biology SMEs and their customers:

- Co-funded schemes: Implement co-funded initiatives that require SMEs and larger businesses to work together, fostering mutual understanding and innovation.
- Government contracting: Encourage government contracting with requirements for collaboration between SMEs and larger firms, leveraging their complementary strengths.

6.3. At what stage and investment size have your company (or those you represent) found it challenging to raise finance? What were the barriers you faced at each of these stages?

Difficulty level:

< £500K: Not applicable

£500K - £1 million: Not applicable

£1 million - £2 million: Not applicable

£2 million - £20 million: Challenging (X)

£20 million +: Not applicable

Challenges have been reported about the lack of capital investment opportunities at the £2 million - £20 million range. The solution of many firms has been to seek investment or partnerships from East Asia, with the possibility of selling the business to these investors.

7. Regulatory Environment

7.1. Do you expect, or have you encountered, any specific regulatory issues when developing, scaling, and commercializing products using engineering biology?

In general, regulatory issues are not been a significant concern, except in the food and agriculture sector. Food production could benefit from relaxed regulations on genetically modified (GM) releases, which would facilitate innovation. Export controls, such as ITAR, may become potential issues, even for data and ideas.

8. Future Expectations

8.1. For your own domain or the domains you represent, please select the top three areas from the UK's Science and Technology Framework you would want the government to prioritize in any future plans for engineering biology.

The top three areas to prioritize in future plans for engineering biology are:

- Talent and skills
- Procurement
- Regulations and standards: Ensuring favorable and forward-looking regulations can support innovation, although the impact may be primarily within the domestic market due to potential divergence from EU regulations.