

## Written evidence from Cystel Limited (SFF0001)

Question: What kinds of skills do you think will be needed for the future of the UK economy? Is the UK's skills and training system capable of equipping increasing numbers of people with these skills?

### Introduction

Cystel Limited is a research driven cybersecurity, quantum computing company that specialises in cybersecurity solutions and services. Incorporated in 2018 and based in Newcastle Upon Tyne, England, Cystel offers a range of services designed to enhance the security posture of organisations, including vulnerability assessments, penetration testing, and cybersecurity risk assessments as well as Quantum Transformation Services.

The company is submitting the evidence above to showcase its expertise and commitment to advancing cybersecurity and quantum computing by creating new roles and furthering training in this field.

The company recently created the first two roles in UK, in the field of quantum cybersecurity '**Cyber Quantum GRC Specialists' (to the best of our knowledge these roles have not existed before )**, for a UKRI project. By highlighting the intersection of cybersecurity, AI, and Quantum Computing, Cystel aims to demonstrate the importance of these fields in the future of technology and the UK economy. This submission emphasises the need for a skilled workforce capable of developing secure, AI-driven, quantum-resistant technologies, which is essential for protecting against the sophisticated cyber threats of the digital age.

Cystel Limited's contribution to this discussion underlines our role as an educational leader in cybersecurity, preparing individuals and organisations to meet the challenges of tomorrow's technological landscape. We are dedicated to fostering a deep understanding of cybersecurity, AI, and Quantum Computing among students and professionals.

### UK Skills and Training

The UK economy's future will be shaped by a diverse range of skills, especially in rapidly advancing fields like Artificial Intelligence (AI) and Quantum Computing. These technologies are poised to drive significant innovation and economic growth.

### Skills for the Future

In AI, expertise in **data science, machine learning, neural networks,** and **natural language processing** will be vital. Professionals must excel in creating algorithms that can analyse extensive datasets for predictions or task automation. The business aspect of AI demands skills in identifying strategies to leverage AI effectively. Additionally, the convergence of AI with legal and cybersecurity domains necessitates skills in regulatory assessment and the protection of AI systems.

Quantum Computing requires a profound understanding of **quantum mechanics, quantum algorithms,** and **quantum error correction.** This interdisciplinary field could lead to breakthroughs in various sectors, including drug discovery and secure communications. Skills to defend against quantum-based attacks will be crucial due to the intersection of Quantum Computing and Cybersecurity.

The intersection of cybersecurity, AI, and Quantum Computing is a complex and rapidly evolving domain that is critical for the future of technology and the UK economy.

**Cybersecurity:** Cybersecurity is the practice of protecting systems, networks, and programs from digital attacks. As cyber threats become more sophisticated, the skills required to counter them evolve. AI plays a significant role in enhancing cybersecurity measures by automating threat detection and response.

**AI in Cybersecurity:** AI's ability to learn and adapt makes it invaluable for cybersecurity. Machine learning algorithms can predict and identify cyber threats faster than traditional methods. Skills in developing and managing AI-driven security systems will be essential.

**Quantum Computing in Cybersecurity:** Quantum Computing has the potential to disrupt current cybersecurity protocols. Quantum computers can process information at unprecedented speeds, which could enable them to break encryption that is currently considered secure. This threat necessitates the development of quantum-resistant encryption methods, known as post-quantum cryptography (PQC).

**The Convergence of AI and Quantum Computing:** The fusion of AI and Quantum Computing can lead to more robust cybersecurity solutions. Quantum decision-making can enhance AI's capabilities by allowing it to process information and identify threats at quantum speeds.

**Skills Required at the Intersection:** Professionals working at the intersection of these fields will need a blend of skills:

- **Quantum Mechanics:** Understanding the principles of quantum behaviour is fundamental.

- **Machine Learning:** Expertise in AI and machine learning for threat detection and response.
- **Cryptography:** Knowledge of current and future encryption methods, including PQC.
- **Data Analysis:** Ability to process and analyse large datasets quickly and accurately.
- **Ethical Hacking:** Skills in penetration testing and vulnerability assessment to improve system security.
- **Regulatory Knowledge:** Awareness of legal and ethical considerations in AI and cybersecurity.

In summary, the intersection of cybersecurity, AI, and Quantum Computing represents a frontier of technological advancement. The UK economy will benefit from a workforce skilled in these areas, capable of developing secure, AI-driven, quantum-resistant technologies for a safer digital future.

## UK's Skills and Training System

The UK's system is evolving to meet the modern economy's needs. The **Skills for Jobs White Paper** envisions a post-16 education system that equips individuals with necessary skills, supported by initiatives like the **Lifetime Skills Guarantee** and **Skills Bootcamps** for adult retraining in high-demand areas.

### Key Areas for Development:

- **Rapid Upskilling in Adult Education:** Universities and educational institutions should offer specialised programs in AI and Quantum Computing, blending theoretical knowledge with practical applications, specifically for adult learners.
- **Research Opportunities:** Access to advanced labs and research projects is essential for fostering innovation and hands-on experience.
- **Industry Partnerships:** Collaboration with tech companies can provide practical insights and opportunities for internships and job placements.
- **Educator Training:** Continuous professional development for educators is crucial to stay abreast of technological advancements.
- **Deep Tech Start-up Ecosystem Incubation:** Supporting emerging start-ups in AI and Quantum Computing through a network of resources can drive R&D and innovation.

In summary, while the UK is progressing towards a skilled workforce, ongoing investment in education and training, particularly in AI and Quantum Computing, is imperative to meet the UK economy's future demands. The current system is promising but must remain flexible and responsive to the fast-paced technological evolution.

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