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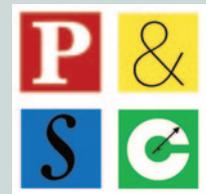
SCIENCE IN PARLIAMENT

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SUMMER 2022

INNOVATION AT THE FULCRUM OF SUSTAINABILITY & DIGITAL FUTURES

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Science in Parliament has two main objectives:

1. to inform the scientific and industrial communities of activities within Parliament of a scientific nature and of the progress of relevant legislation;
2. to keep Members of Parliament abreast of scientific affairs.



Stephen Metcalfe MP
Chairman, Parliamentary & Scientific Committee (All-Party Parliamentary Group)

A warm welcome to our Summer edition which coincides with the Parliamentary & Scientific Committee's long awaited return to the Palace of Westminster for our discussion meetings programme.

On the 4th July I chaired for the first time in over two years an excellent in-person panel discussion on the subject of Quantum Technologies in which we were partnered by Imperial College London. This was followed by the traditional reception and dinner. It was good to be back!

Our distinguished speakers have kindly agreed to contribute articles to the Autumn issue.

We plan to hold the majority of these events in Parliament and a number online. It is hoped that the day will come when the

House authorities permit a hybrid approach to our meetings.

I was delighted to welcome guests to our Annual Lunch in the Cholmondeley Room, House of Lords, on the 5th July, and thank our Vice Chair, Chi Onwurah MP, for her excellent speech.

Beyond the Summer Recess, we look forward to the Autumn and early Winter programme meetings and on the 14th December the Christmas Parliamentary Science Reception, which will be organised by P&SC, for the first time, in conjunction with the Learned Societies.

I was very pleased to sponsor the Annual Parliamentary Links Day on its return to the Palace of Westminster on the 28th June. As always a superb event, organised by the Royal Society of Biology on behalf of the STEM community.

Preparations are in place for the 26th annual STEM for BRITAIN which takes place on the 6th March. We will launch the 2023 event in Parliament on 12th September, when the application process will open to early-career researchers across the country. The closing date for submissions is Monday 28th November.

I am delighted that three of our STEM for BRITAIN 2021 Gold Medal Winners are contributing to this issue: Dr Ben Fernando (Physics and The Westminster Medal); Dr Scott Harper

(Mathematics) and Dr Nikita Mayur Patel (Biosciences and The Physiological Society Prize). My thanks to all our excellent contributors.

I am sad to report that Karen Smith, our wonderful Administrator for the past seven years, has decided to retire. Along with her husband John, who has over the past 18 months organised an excellent speaker programme, Karen has been instrumental in the success of P&SC.

My thanks to Karen and John for their tremendous hard working contribution to our Committee and for their support to me and the team led by Leigh Jeffes. We wish them well for the future.

I am delighted to welcome David Youdan as Administration and Programme Manager. David has been associated with P&SC for a number of years, including serving on the Advisory Committee of the Council.

An engineer by profession, David recently retired after 19 years as Executive Director of the Institute of Mathematics and its Applications, and therefore brings a wealth of experience to his new role.

Finally a very warm welcome to our newest member, the Isaac Newton Institute.

With best wishes for an enjoyable Summer.

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INNOVATION AT THE FULCRUM OF SUSTAINABILITY AND DIGITAL FUTURES



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Innovation continues to morph new relationships between the growing opportunities presented by the data-led digital capabilities and the desire to meet the global aspirations for a sustainable future. Managing such a balancing act requires a fresh approach to curating the way in which innovation is initiated developed, deployed and scaled, and it postulates a need for developing a better understanding of some of the common challenges that face sustainability and digital futures.

INTRODUCTION

When diagnosing their strategic directions, many organisations are now increasingly reprioritising their business goals and innovating their strategies in order to leverage both the digital capabilities and meet the sustainability imperative, in terms of its key pillars of environmental, economic and social (McKinsey, 2021). More and more organisations are using sustainability as a business driver, and exploring ways to ascertain where sustainability can make the biggest impact (IBM Institute for Business Value, 2022). In addition, organisations are also investigating how to eliminate the vast amounts of dark data (data generated but unused for any useful purpose). Furthermore, progressive organisations are also pursuing educational and awareness programmes to inform their customers and stakeholders on their plans and roadmaps to cut carbon emissions intensity and achieve net zero emissions. However, within the 'shared space' of digital and sustainability there are many challenges that go on to impede the pace of digital and sustainability transformation, and require a more of a collective approach to creating shared principles to tackle them.

THE CHALLENGES

Over the past three years, the Innovation Council of the Institute of Innovation and Knowledge Exchange, which brings together over 60 c-suite executives from multinational corporations, has identified the following pertinent challenges, amongst many others:

- Agreement on the types of common knowledge, skills and competencies needed by both digital engineering and green engineering.
- Coherent standards that can demonstrate through Use Cases how sustainability and digital transformation can be interlocked and balanced effectively to yield better value, particularly, when it comes to addressing issues of accountability, transparency and responsibility together with those of ethics, safety, bias and fairness.
- Agreed practices of applying digital to an organisation's sustainability strategy to enable it to meet its Environmental, Social and Governance (ESG) goals through shared approaches for gathering and analysing ESG-related data from own operations, and across the entire value chain.
- Applying a consistent approach when managing integration complexities, particularly when it comes to data interoperating across multiple public and private infrastructure platforms (e.g. data traversing public cloud, private cloud and hybrid cloud systems in a trusted, sovereign, safe and secured manner).
- Collecting quality data to support and accelerate sustainable sourcing (e.g. wearable devices detecting health issues), reusability (e.g. materials informatics can identify ways to reduce packaging), traceability (e.g. sensors and RFID tags can trace a product's origins, while a circular economy-platform can signal when to refurbish a product), and product lifecycle management (e.g. Artificial Intelligence interacting with Internet of Things' devices can indicate the need for preventive maintenance, while ubiquitous connectivity allows remote diagnostics).

THE INNOVATION RESPONSE

Evidence demonstrates that when investing in digital and sustainability solutions, more sociotechnical innovations are required in order to mandate a more collaborative and coherent approach to greening of the industrial ecosystems, whilst ensuring consumer affordability, inclusivity and value differentiation is accomplished (EY 2021) (Nambisan et al., 2019). Sociotechnical innovations can help to assess and understand in detail the extent of what and how these innovative digital technologies are effectively contributing to the improvement of sustainability performance. For example, the role of digitally enabled services and the expansive move by many businesses towards 'Servitization' – *where customers pay for a service outcome instead of buying an equipment* – has started to offer some actionable insights into how digital can positively impact productivity, and improve transparency and standards in governance, thus future proofing sustainability integration within the organisation and across its wider ecosystem.

Undoubtedly, advancements in digital applications are transforming people's interactions and engagements (Cecchinato, 2021). Data, information, and knowledge are key factors of success that organisations must handle to open new opportunities and adopt their business and operating models. People's engagement is also becoming more amplified by the adoption of artificial intelligence and virtual reality-powered tools that combine physical and digital dimensions in a unique multi-sensorial experience (Bolton et al., 2018).

Many contemporary entrepreneurs are now embracing tightly the "Thinking Digitally" mantra to help them address some of the challenges, including those of migrating from legacy systems and infrastructures, and seize the opportunities offered by the digital technologies to secure their competitive advantage (Jacobides, 2019; Soltanifar et al., 2021; Cutolo and Kenney, 2020). These contextual sociotechnical innovative changes are increasingly attracting interests from policymakers, as well as practitioners, and academics alike to examine how these challenges could, and, should be addressed.



In addition, more disruptive innovations in the field of new climate technologies are desperately needed to generate the game changing capabilities in such fields as materials for providing higher density energy batteries; alternative materials in cement-binding (or "clinkers"); efficient, affordable and scalable green hydrogen with better membranes and catalyst electrolyzers; green ammonia production using nitrogenase to minimise the use of energy and thus cost in the bioelectrocatalysis process; metal organic frameworks (MOFs) that use adsorbents and act as a sponge to suck CO₂ from the air directly and cost effectively; and,

quantum computing and quantum-enabled technologies that allow for precise molecular-level simulation and deeper understanding of some of the challenges of how to abate or eliminate CO₂ emissions. With the estimated annual spending of \$3 to \$5 trillion in sustainability climate investment, according to McKinsey research (McKinsey, 2022), the opportunity for big companies to drive the transition net-zero is significant.

Furthermore, governments have an important role to play in incentivising and orchestrating the development of programmes and interventions that bring together business and

industry more closely with academic and educational institutions, professional bodies, research organisations, and other stakeholder networks to tap into the intellectual collective, remove roadblocks and create the much needed solutions and associated use cases that deliver on the economics of decarbonization.

THE RESEARCH STUDY

In an attempt to unearth responses to the aforementioned sustainability and digital futures challenges, my professional body, the Institution of Engineering and Technology (The IET) in partnership with my

organisation, the IKE Institute are jointly conducting a landscape research study. The primary aims of the research are to help to foster and support innovation within the drive to net zero emissions, and leverage the confluence of digitalisation to achieve the climate change targets, whilst unlocking new economic opportunities. Over 120 firms have already taken part in an extensive survey, the findings from which will be reported in a future article.

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