



Department for
Business, Energy
& Industrial Strategy

South West England and South East Wales Science and Innovation Audit Summary Report

A Science and Innovation Audit Report sponsored by
the Department for Business, Energy and Industrial Strategy

Introduction

The South West England and South East Wales Science and Innovation Audit (SWW-SIA) evaluated scientific excellence and growth potential across one of the most vibrant regions of the UK, with world class universities, large-scale, high-tech industry clusters and a very high proportion of innovative SMEs.

The SIA identified areas of world-leading research and innovation in the SWW, including aerospace, microelectronics, energy generation, environmental technologies, and digital systems.

The principal conclusion of the SIA is that better integration of these scientific and industrial strengths could be driven by a series of strategic investments in **Advanced Engineering** and **Digital Innovation**. These will provide cross-cutting research expertise, skills development and create a new innovation ecosystem to stimulate long-term economic growth and job creation across the SWW.

The potential of the SWW can be realised through specific investments with immediate impact, coupled to a long term plan, embedded in the Government's Industrial Strategy. This plan will have strong industry pull and the engagement of both large industry and the SME community.

The SIA process has provided real impetus and cohesion across the SWW, which offers great benefits to be realised by systematic and sustained investment by Government in partnership with the private sector.

In the immediate-term, the SIA underlined the importance of new capabilities afforded by the *Compound Semiconductor Applications Catapult*, and recommended fully funding the proposed *Institute for Advanced Automotive Propulsion Systems (IAAPS)*, and *Composites Excellence – with National Composites Materials Centre*. These selective investments are driven by existing industrial need, in which government can play a transformative role, resulting in a highly visible return on investment.

The SWW SIA spans the South West of England (Cornwall & Isles of Scilly, Gloucestershire, Heart of the South West, Swindon & Wiltshire, and West of England LEPs) and South East Wales.

Our vision

The SWW region can lead the UK and compete with the world in advanced engineering and digital innovation, driving growth of its' large-scale aerospace, microelectronics, high tech marine engineering and energy sectors, while creating new industries across environmental technologies, digital health, and the creative sector. Strong integration of scientific excellence within its universities and institutes, with an innovative industrial sector with a thriving SME population, will lead to substantial job creation and sustained economic growth.

Advanced Engineering Key Strengths	
The largest aerospace sector in the UK – home to 14 of 15 largest aerospace companies in the world ¹ , with associated research excellence.	High tech marine and marine renewables resources, with infrastructure unique in the UK, alongside pioneering R&D capacity.
High Value Engineering Design and System Integration skills, encompassing whole structure, sub-structure and propulsion integration.	Composites and advanced manufacturing (National Composites Centre, part of the HVM Catapult).
Technical expertise, know-how and scientific excellence in Hydrogen / Fuel Cells technology.	Strong nuclear energy expertise and associated skills development capability and infrastructure.
Emerging technology cluster in distributed energy systems and smart grid technology.	Microelectronic, photonic and semiconductor expertise (Compound Semiconductor Applications Catapult).

Digital Innovation Key Strengths	
Home to the largest silicon design cluster outside of the USA ² , and a recognised powerhouse of electronics and computing in industry and in academia.	Expertise in smart cities, digital media, autonomous systems, risk, resilience and digital health in which the SWW is the national exemplar.
Pioneering technology expertise in cloud computing; communications; Internet of Things; cyber security; sensors; virtual and augmented reality; robotics / autonomous systems; microelectronics; wireless technologies; data analytics; vision; remote sensing; satellite applications; high performance computing; and quantum engineering.	Home to the most productive and second largest digital economy cluster in the UK. ³
	World leading expertise in the fields of natural hazards, climate change, marine science and broader environmental sciences; combined with the data modelling and analytics expertise, capability and assets required to translate this into profitable intelligence.

Advanced Engineering Growth Opportunities	
To grow the Aerospace and related Advanced Engineering sectors (including automotive, nuclear, space, marine and marine renewables and microelectronics) by building critical mass in the SWW to exploit synergies in skills, high-level training, research expertise and supply chains. The aerospace industry's continued success depends on investing in high value design capability in SWW and UK-wide.	To integrate the diverse SWW energy capabilities to: <ul style="list-style-type: none"> – capitalise on the SWW's unique natural environment and marine renewables assets to establish a world-leading marine renewables test-bed for commercialisation – capitalise on the economic growth potential of nuclear new-build and fleet operation in the SWW, by integration of the existing cluster of industrial and academic expertise – create a large-scale distributed energy demonstrator from cities to peripheral rural areas, incorporating nuclear, marine renewables and hydrogen fuel cells, thereby positioning the UK at the forefront of new energy technologies.
To pioneer the diversification of composite materials capabilities to secure the value chain of advanced manufacturing technology in the UK, including SWW strengths in developing technologies to deliver low-carbon technologies and the circular economy, e.g. composites waste management.	

Digital Innovation Growth Opportunities	
To integrate digital innovation investments to drive forward development of smart cities, towns and rural environments in the SWW.	To drive new industry creation through investment in a network of Digital Innovation Hubs to integrate researchers, entrepreneurs, students, industry and users to create new technologies, policies, practices, business models, and businesses for the digitalised society of tomorrow.
To work with the private sector to integrate world-leading environmental and marine science expertise and analytics capabilities to address global market failures in the provision of environmental risk management services and skills; enhancing resilience to environmental change and driving new £ multi-billion opportunities for economic growth.	

Gap analysis		
Future State We want to be...	Current State We have...	Next Actions / Proposals We need to...
<p>The global leaders in</p> <ul style="list-style-type: none"> – High Value Design – Systems Integration – Composites <p>to maintain and grow our global aerospace cluster and wider Advanced Engineering sector.</p>	<ul style="list-style-type: none"> – A world-leading aerospace cluster – An advanced engineering supply chain – An Advanced Propulsion Centre Spoke – The National Composites Centre (part of HVM Catapult). 	<p>Secure investment for:</p> <ul style="list-style-type: none"> – High Value Design – Automotive Propulsion Systems (IAAPS) – Composites Excellence – Marine / Marine Renewables prototype commercialisation.
<p>At the forefront of creating:</p> <ul style="list-style-type: none"> – the world's new industries in Digital Innovation – resilience in our smart cities, towns and rural environments. 	<ul style="list-style-type: none"> – Pioneering expertise in smart cities, digital media, autonomous systems, digital health, and environmental science – Underpinning expertise in microelectronics, wireless technologies, data analytics, vision, remote sensing, satellite applications, high performance computing, cloud computing, quantum engineering, cyber security and virtual reality. 	<p>Secure investment for Digital Innovation Hubs in:</p> <ul style="list-style-type: none"> – cloud, cyber security, communication and smart cities, digital media, autonomous systems, digital health – environmental risk and innovation <p>Investigate future Hubs such as Industry 4.0.</p>
<p>The world's first cluster dedicated to compound semiconductors.</p>	<p>UK Government commitment to siting the new Compound Semiconductor Applications Catapult in the SWW.</p>	<p>Exploit the Catapult to grow the SWW industry cluster, attracting further capital investment, jobs and growth.</p>
<p>Exemplars at meeting industry needs for graduate and PhD level workforce.</p>	<ul style="list-style-type: none"> – A strong pipeline of graduates who take up roles in these industries – Current doctoral training capacity. – Government initiatives to fund level 5-7 Degree Apprenticeships. 	<ul style="list-style-type: none"> – Secure investment in further, collaborative doctoral training with industry to address skills gaps. – Establish multi-university Degree Apprenticeships to address skills gaps.
<p>An integrated and well-networked region of academic, public sector, and industry (large and SME) partners with a shared vision for economic success.</p>	<p>A well-evidenced track record in building effective, distributed clusters.</p>	<p>Build on the momentum of the SIA by maintaining and growing productive relationships in a more sustainable framework.</p>

Key ambitions / proposals

The SWW requires sustained government support in **Advanced Engineering** and **Digital Innovation**. A series of specific investments⁴ have been identified that will increase regional GVA and drive increased productivity across a much wider geographical area of the UK.

In the immediate-term, the SIA recommends capitalising on the *Compound Semiconductor Applications Catapult*, and fully funding the proposed *Institute for Advanced Automotive Propulsion Systems (IAAPS)*, and *Composites Excellence – with National Composites Materials Centre*.

The SIA identified a very strong industry-pull to better integrate existing activities and to create new capacity in Advanced Engineering and Digital Innovation. This will drive significant added-value across the industries reviewed in the SIA. **Business Cases are available for each proposal**. Figure One shows, schematically, the Advanced Engineering and Digital Innovation inter-connected hubs and linked assets of the SWW.

Advanced Engineering

The SIA recommends investment in **High Value Engineering Design and Systems Integration Capabilities**, through establishing a design and demonstration centre of excellence focused on design integration capabilities and rapid prototyping. Although initially focused on aerospace, the related sectors of automotive, space, nuclear, marine engineering / energy and microelectronics would benefit in future phases. A Bristol-based Advanced Engineering Campus will be the catalyst. This has very strong industry support and significant commercial leadership.

Digital Innovation

The SIA recommends establishing an integrated network of Digital Innovation Hubs to connect academic and industry expertise. Phase one will establish a Bristol-based **Digital Innovation Hub** combining world-leading expertise in underpinning technologies (such as cloud computing, communications, and cyber security) with SWW specialisms in Smart Cities, Autonomous Systems and Digital Health. The first specialist Hub should be the **Institute for Environmental Risk and Innovation**, focused on utilizing analysis of future climate and weather risks to provide resilient infrastructure, innovation and economic gain. This should be situated on the new Global Environmental Futures Campus linked to the Met Office in Exeter. Initial investments should be followed by a series of further Hubs to co-ordinate digital innovation, enabling the SWW to be a leader in Industry 4.0.

Networking / collaboration

The SWW-SIA was led by the GW4 group of universities, along with the Universities of Plymouth and the West of England, and brought together a consortium of over 100 organisations⁵ – from across business (53%), research organisations, Local Enterprise Partnerships and local government. This truly represents a coordinated effort across the SWW region. The Steering Group, chaired by Prof. N. J. Talbot FRS, met on four occasions to provide overarching governance and ownership of the process, under the leadership of Prof. Dame Glynis Breakwell DBE DL FAcSS.

Representatives from GKN Aerospace, Compound Semiconductor Centre Ltd., Johnson Matthey, the Met Office and Oracle chaired the SWW-SIA Theme Review Panels (over 50% business membership); which provided leadership, expert guidance and advice throughout the process. 190 people registered / attended stakeholder events (37% from business, 37% universities, 11% LEPs / LAs, 8% business intermediaries, 7% catapults / other research); and further meetings and surveys engaged 100s more, particularly SMEs.⁶

This extensive engagement enabled the SWW-SIA to genuinely understand the importance of geography, synergies, structures, and opportunities in the SWW. Figure One shows a map of the SWW showing schematically the Advanced Engineering and Digital Innovation assets that span the region.

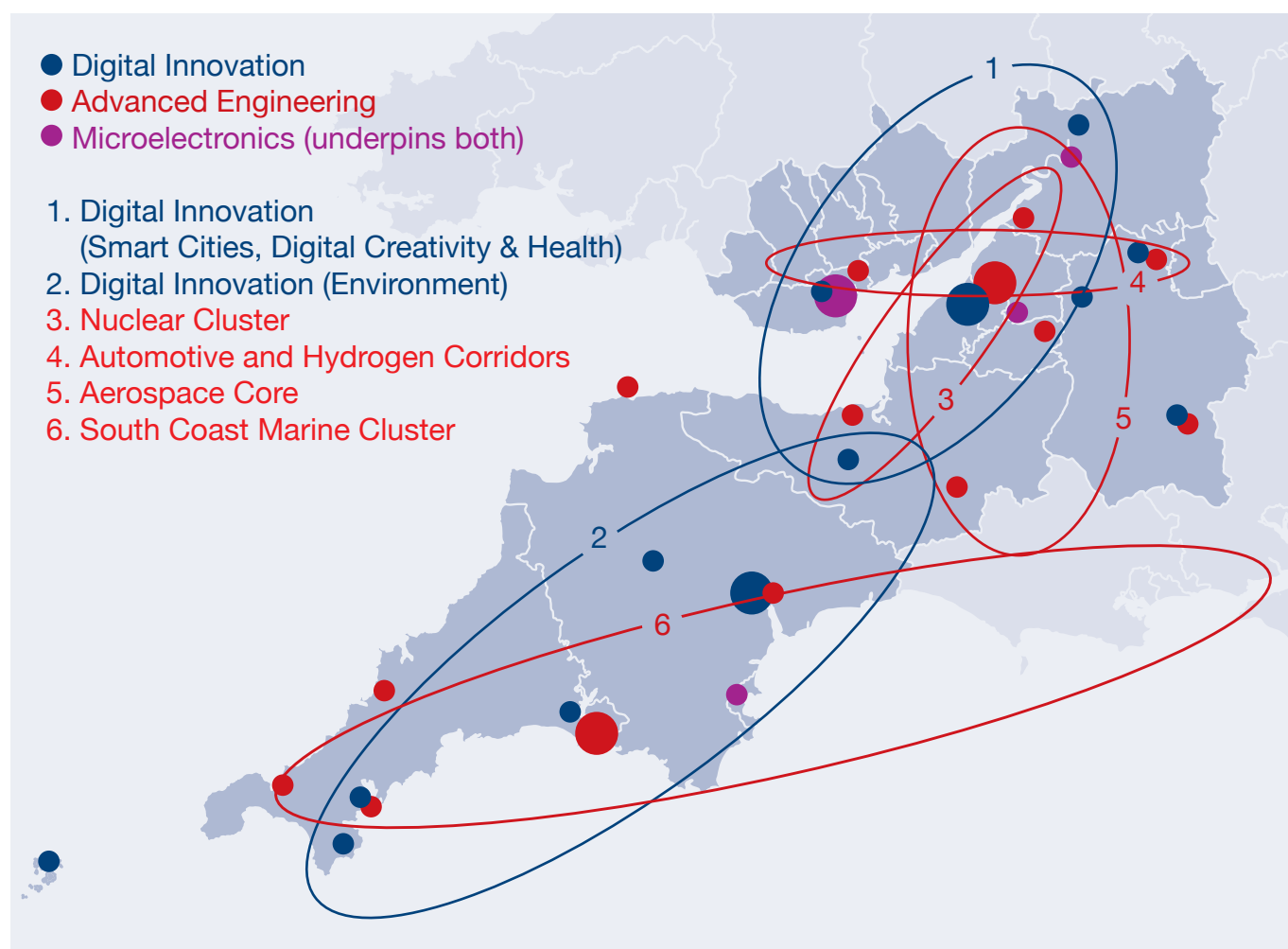


Figure 1. Map of the South West England and South East Wales Science and Innovation Audit region – showing Advanced Engineering and Digital Innovation inter-connected hubs ○ and linked assets ● (Note: schematic – size does not reflect scale.)

The SWW-SIA has been a catalyst for regional collaboration and innovation. Figure Two shows the impact and added value of undertaking the SWW-SIA, and as a result we will:

- achieve a step change in collaboration, with a newly articulated focus around Advanced Engineering and Digital Innovation
- build on synergies identified to develop a cohesive plan for the future of the SWW
- undertake a coordinated initiative to bring together innovators in academia and industry – driven by industry pull
- fully engage with and contribute to the Government’s Industrial Strategy
- accelerate innovation through scientific excellence across SWW for the benefit of the region and the UK
- Empower the region’s LEPs to take on a leadership role to implement the SIA.

The SIA Steering Group will meet in December 2016 to ensure momentum in implementation of the SWW-SIA.

Figure 2. Quotes showing the impact and added value of undertaking the SWW–SIA.

“The workshops and networking developed during the SIA have led to a new understanding of the opportunity to work together at a regional level to deliver a global scale solution to global scale problems.”

Sandra Rothwell, Cornwall and Isles of Scilly LEP

“A joint industry – NCC workshop during the SWW–SIA led to confirming the concept of a Composites Excellence focus in the SWW, delivering for the UK and with a vision to be the Global place to come to for Composites.”

Alison Starr, NCC

“The attention to extracting focus and priority on the wide range of competing technology areas has delivered a clear rationale for the conclusions in the headline report.”

Wyn Meredith, Compound Semiconductor Centre Ltd.

“The workshops enabled the Torbay photonics cluster to engage with the Compound Semiconductor Applications Catapult & academic photonics research for the first time – a link that is now developing and a number of follow-on meetings have taken place.”

Daniel Newman, TDA

“During the SWW–SIA the Advanced Engineering Theme received responses from 100+ SMEs. As a result, a SME engagement event in October 2016 will explore forming a supply chain cluster around advanced automotive propulsion.”

Mike Adams, HiETA Technologies Ltd.

“The SIA has produced a rich knowledge of the capabilities and opportunities in the region, and established good working relationships that can be built on in the future.”

Vicky Pope, Met Office

“Core to this [SWW–SIA] outcome is the support that these developments will bring to deliver the national agenda for aerospace design and industrial development.”

Mark Howard, Airbus

“The concept of an Energy Demonstrator came directly from industry at the New Energy Systems stakeholder event. The SIA process was the catalyst that brought together experts from across marine renewables, nuclear and fuel cells, and we are now actively pursuing the opportunity.”

Jonathan Frost, Johnson Matthey

“The SWW–SIA process has enabled accelerating industry and academic collaboration in cloud computing, next generation communications and creative digital media (e.g. VR / AR)”

Phil Bates Oracle

“It is clear that there is extraordinary potential to better integrate these sectors and to provide greater innovative potential by focused investment.”

Dame Glynis Breakwell, on behalf of the SWW–SIA and GW4 Council

“Individually, Leonardo, Airbus, and Rolls-Royce were looking at retaining high value design skills, and were speaking to the ATI separately. The SWW–SIA pulled the strands together and it now forms part of a UK-wide discussion”

Dean Jones, Rolls Royce

References

- ¹ www.pwc.co.uk/industries/aerospace-defence/top-100-aerospace-companies-2014.html
- ² Silicon Southwest <http://ubic.org.uk/siliconsouthwest>
- ³ Various, including:
www.techcityuk.com/wp-content/uploads/2016/02/Tech-Nation-2016_FINAL-ONLINE-1.pdf
- ⁴ SWW–SIA Annex N – provides outlines of planned investments
- ⁵ SWW–SIA Annex A – Membership of Steering Group
- ⁶ SWW–SIA Annex A – Theme Panel membership and stakeholder event attendees