Case Study 2:
The Digital Signal Processing Centre of Excellence

Founded in 2019, with £3.9m funding from the European Regional Development Fund through Welsh Government and an additional £3m from the North Wales Growth Deal (NWGD) through Ambition North Wales, Welsh Government and UK Government in 2022, the Digital Signal Processing (DSP) Centre develops leading-edge DSP technologies to enable advanced and intelligent systems with a focus on communication technologies such as 5G mobile networks and their associated ecosystems. Innovative DSP algorithms embedded in network devices are a cost-effective way of speeding up networks, dynamically and optimally sharing network resources and implementing power managed devices for low-carbon networks.

"The DSP Centre is a prime example of how Bangor University is collaborating with industry and other academic institutions to develop solutions to address real-world problems through world-class research and development."

Part of the School of Computer Science and Electronic Engineering in the College of Environmental Sciences and Engineering at Bangor University, the DSP Centre houses equipment and facilities worth over £3.5m (Increasing to over £5.5m by 2024), with the £3m capital funding from NWGD enabling the Centre to enhance the capability, capacity and competitiveness of its research and development activities, supporting academics and industry alike via the purchase of the latest state-of-the-art equipment

Target markets for the DSP Centre include Telecoms, Health & Social Care, Transport & Logistics, Environmental Monitoring and Remote Sensing, Internet of Things, and Digital Security. The equipment procured as a result of NWGD funding opens up collaboration opportunities with industry to develop new products and processes, allowing the DSP

Centre to drive future network innovation and accelerate economic growth through development and commercialisation of innovative products and services suitable for future networks requirements.

To date, the DSP Centre NWGD project has:

- Created four permanent, direct jobs – the aim to create 10 direct and 30 indirect gross, high-value RD&I jobs on maturity (6 to 10 years)

- Successfully captured £5m in additional funding

- Delivered a two-day training school on optical wireless communication systems

- Delivered four portable demonstrators of cutting-edge, high market value techniques

In addition, the Centre has actively contributed to the UK Government's strategy on Future Networks and built a global network of 32 partners, encompassing network/service providers, equipment vendors, software developers, device manufacturers, and universities.
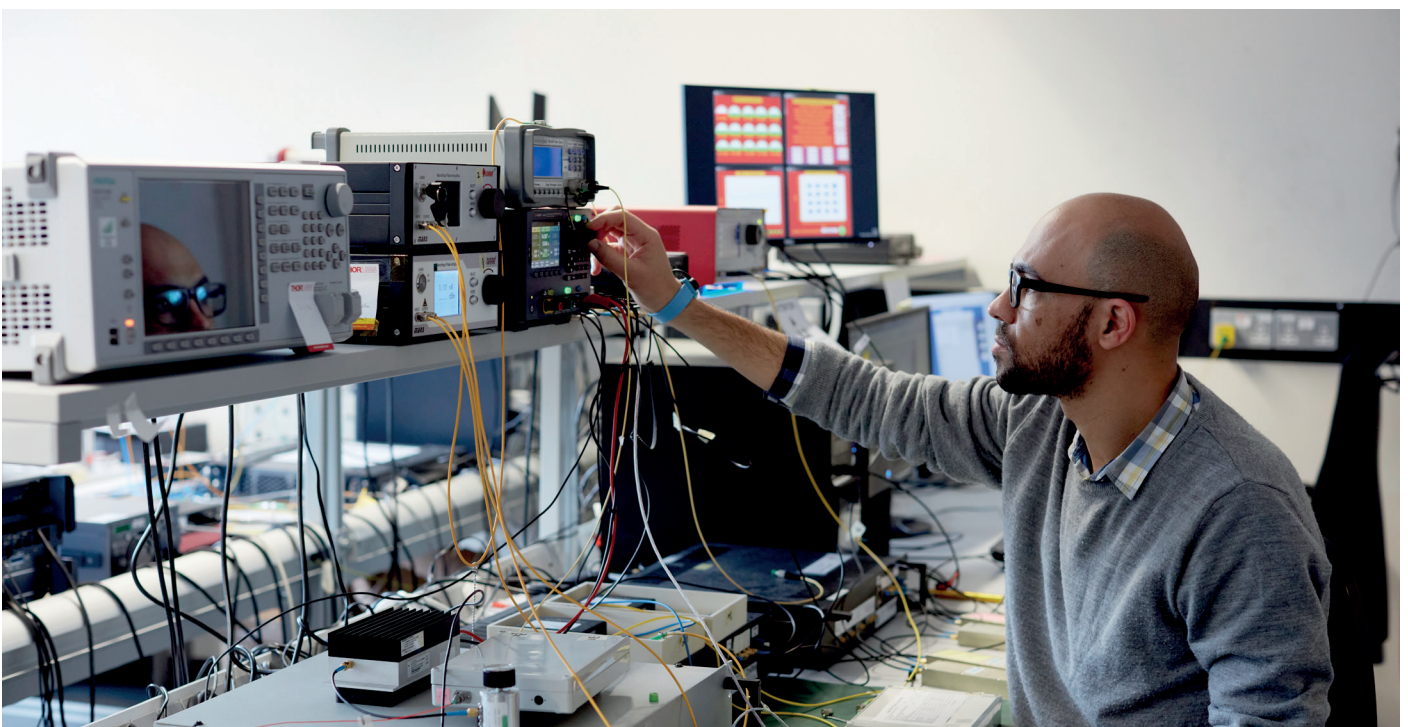
Professor Paul Spencer, Pro Vice-Chancellor for Research at Bangor University comments:

"The DSP Centre is a prime example of how Bangor University is collaborating with industry and other academic institutions to develop solutions to address real-world problems through world-class research and development.

The recent Growth Deal investment in the DSP Centre puts it, and North Wales, on the map in terms of its ground-breaking work in the telecoms sector."

Current and proposed projects of the DSP Centre include:

Developing a Digital Twin of the North Wales Transport Network for immersive Traffic Flow Monitoring

The DSP Centre continues the development of a digital twin of the transport network around Bangor (primarily the A55). Using the Unity game-engine, as well as basic Web Technologies and visualisation libraries, the Centre is developing two digital shadows of

the transport network, where data-driven car flows are depicted in: a) 3D and stereo (VR) environments, and b) map-based 2D visual analytics.

Two basic prototypes have been implemented and are currently being refined by the Centre to accept data from the optical sensing system currently installed across A55, working towards the implementation of a feature-rich Digital Twin of the A55 (segment around Bangor). This will enable the DSP Centre to use real data and, in turn, provide visual simulations of past events, as well as predictive analytics for short and long-term interventions (e.g., for traffic management, or urban planning respectively).

North Wales Broadband (NWBB) Project

As part of the NWBB project, a multi partner prototype will be developed which will both build a regional supply chain and also provide an integrated communication, control and remote monitoring capability. This capability could be applied in a number of potential application areas and the DSP Centre is already engaged in discussions and funding bids with National Grid, RWE, BP and the Offshore Renewables Catapult in relation to remote monitoring and preventative maintenance activities in overhead and undersea cables.

5G innovation Region Call

The NWGD has submitted an Expression of Interest to DSIT (Department for Science, Innovation & Technology) for an upcoming 5G innovation region call. This programme would involve performance of 5G test bed projects in key application areas and the DSP Centre has supplied brief details of where its technologies, and collaboration with some of its key partners, could be applied in six of these key areas.

When examining current circumstances (e.g. rurality, age profile, socio-economic profile) in North Wales, it is clear that application of a range of 5G-based digital services could have significant economic, health and well-being benefits across the Region. The research being carried out by the DSP Centre, supported, amongst other sources, by the £3m investment from the NWGD, is developing a range of capabilities in 5G network design, test beds and performance enhancement, remote diagnostics, monitoring and control which could provide a technology base for the application of 5G-based services. The Centre is working with a number of key industry partners and with the regional digital ecosystem to add value to these technologies through testing, validation and the development of regional supply chains.

Campus/Town Centre

The DSP Centre submitted a bid, in conjunction with Vodafone, for SPF funding based on establishing a 5G capability within the Bangor University/Bangor Town Centre area. This proposal had a delivery timescale comparable to the 5G Innovation region timescale. The application was not supported but this project could be mobilised relatively quickly.

Internet of Things (IOT)/Long-Range, Wide Area Network (LoRaWAN)

In collaboration with other research groups in the University, the Centre is involved in the creation of a "living lab" capability in the Adra Low-Carbon Hub in Pen-y-Groes. With the first phase of the lab forecast to be operational before the end of 2023, Adra is interested in investigating the establishment of a LoRaWAN capability to capture and communicate data from this and other data monitoring points within its housing network.

High Demand Environments, e.g., Stadiums

The DSP Centre has held preliminary discussions with Vodafone around the potential for working together on a suitable test bed project, such as a stadium. A programme of work in this area could be developed quickly and delivered in an effective, cost-efficient project.

The above projects will be delivered under the umbrella of the DSP Centre's spending objectives, namely to:

· Encourage innovation and commercialisation through knowledge transfer from the DSP Centre to the wider economy, by working on 70 collaborative projects/collaborations by 2031.

· Establish the DSP Centre as a recognised centre, by 2031, contributing to UK Government objectives for 5G roll out.

· Directly create 10 sustainable, high-value jobs in the digital sector through research excellence and indirectly support 30 jobs by 2031.

· Increase GVA by £11 million - £13 million by 2031.

· Leverage £12.5m further investment through grant capture and private sector contributions by 2031.
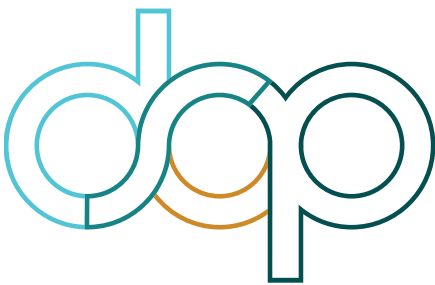
By facilitating the projects and objectives identified above, NWGD funding will allow the DSP Centre to contribute to the provision of 5G connectivity to hard-to-reach, rural areas in North Wales, facilitating accelerated innovation in local enterprises and establishing a unique "DSP Economic Zone" along the A55 corridor, not only boosting the regional economy but materially contributing to the UK's position at the forefront of 5G provision and beyond.