Innovation
Report 2023

VEC / UNIVERSITY OF LIVERPOOL

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Introduction

Established in 2010, the VEC bridges the gap between academic research and solving industry challenges by applying emerging and disruptive technologies with standard low-cost digital tools. Our unique expertise and knowledge enable us to offer access to digital test beds and the latest scientific infrastructure.

Access to Expertise

Our team comprises specialists in engineering, data science, computer science, advanced visualisation, software development, industrial innovation and consultancy, underpinned by the University of Liverpool and specialist centres of excellence.

The VEC works with SMEs and large enterprise businesses across all sectors. Our work ranges from digital transformation projects to fully integrated digital architecture systems that enable us to manage large scale programmes.

Our Approach

We believe that digital technologies can transform an approach to business. Therefore, we work with our clients to develop strategies, provide valuable insights, and design system architectures that deliver business growth and improve communication.

Our expert multi-disciplinary team includes technical engineers, industrialists, digital experts, technologists, research associates, marketers, and business support. We thrive on delivering creative projects, revel in the application of digital technology to solve real-life business challenges, and use our partnerships and networks to inform future government policy in the area of applied digital technology to support future research for impact.

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Foreword
Professor Andrew Levers reflects on the success of 2023

Reflecting on 2023, it's been an exceptional year for both the VEC and the Institute for Digital Engineering and Autonomous Systems (IDEAS). We're immensely proud of the substantial economic impact our projects have generated.

In less than seven years, our collaborations with Liverpool John Moores University and STFC Hartree have assisted over 650 SMEs, including 139 start-ups. Together, we've successfully developed 228 new products, with 104 already making their mark in the market, significantly bolstering the productivity and economy of our city region.

These efforts have also played a role in creating 226 new jobs across the region, increasing to 1,462 over the next nine years, underlining our steadfast commitment to supporting businesses. By 2032, we expect these initiatives to generate an impressive £121.7 million in Gross Value Added (GVA), signifying a substantial economic boost to our region's businesses and supply chains.

LCR4.0 Legacy Continues with £5.1m Award for Horizons Initiative

Expanding beyond our previous successes, the VEC has secured a notable £5.1 million grant to lead the Horizons project in collaboration with LJMU and Edge Hill University. Supported by the UK Shared Prosperity Fund (UKSPF), this new initiative exclusively aims to empower SMEs in the Liverpool City Region.

The Horizons project intends to enhance their competitiveness and productivity, offering hands-on support that promotes innovation and economic growth. SMEs will also have access to capital grant funding, further propelling innovation and fostering long-term success.

Announcing the Progress of the UK's Inaugural Centre for Digital Heritage

In another significant development, we are excited to share the progress on the UK's inaugural Centre for Digital Heritage, dedicated to digital heritage research, conservation, and enterprise.

This centre is poised to support the coun try'sheritage organisations and researchers, positioning Liverpool as a global leader in digital heritage. Scheduled to open officially in Spring 2024, we eagerly invite businesses to explore collaboration opportunities at our Sci-Tech Daresbury site.

Finally, we would like to take this opportunity to thank our partners and clients for their unwavering support, without which these achievements would not be possible. We look forward to 2024, another year of continued collaboration as we continue our work together towards a thriving and innovative future.

Campaigns

VEC Internship:
Developing skills for the future

Following a successful 2022 Internship Campaign, the VEC extended the opportunity for the University of Liverpool students to join the VEC team over several weeks to develop industry-sought-after skills to strengthen their capabilities and enhance working experiences as they kick-start their careers.

In conjunction with National Apprenticeship Week (Monday 6th - Sunday 12th February 2023), the VEC highlighted the internship for students interested in 'gaming software' to sign up and explore opportunities aligned for them.

With over 50 inspiring applications, the VEC extended the opportunity to over 4 Interns across the summer months, with the majority wanting to extend this period alongside their studies and several graduates later becoming fully-fledged members of the VEC team through applying for new roles when they became available.

Shaun's story ↗

Wiktoria's Story: Intern to Metaverse Developer ↗

Revolutionising Creativity: How Industry 4.0 Technologies Are Transforming The Creative Industry

Creative Arts Digital Sandpit

The VEC hosted an innovative event for the creative industry through the LCR4.0 Holistic project (ERDF-funded initiative) that highlighted opportunities for collaboration to develop an understanding of Industry 4.0 technologies for supporting greater connectivity, accessibility and inclusivity across the industry.

This is in addition to exploring new methods for working that can enhance service delivery and audience participation.

The event focused on how emerging technologies can support the creation and development of a concept and how we can enrich audience experience, improving engagement and interactivity throughout a performance.

The event also talks directly to business owners to discuss how technologies can improve business processes, operational management and business opportunities such as supporting decarbonisation.

The event ran in conjunction with FACT Liverpool as numerous SMEs attended, listening to impactful stories of businesses engaged with the VEC and their projects, sharing their own experiences with emerging technologies and how these are supporting them to overcome challenges and accelerate their services and ambitions.

A unique technology demonstration then enabled curious business leaders to gain hands-on experience in working with technologies such as AI and IoT.

Creating realistic experiences through the Metaverse for improved inclusion ↗
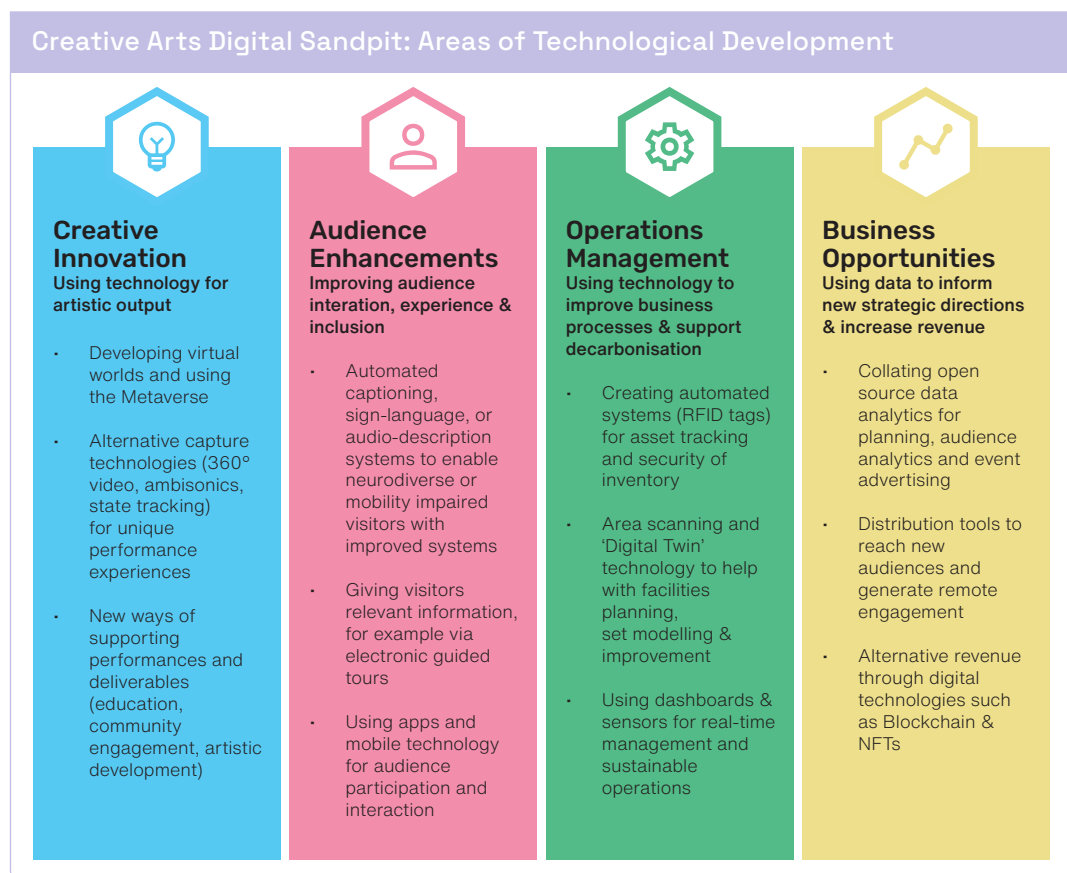
Ahead of the Sandpit event, the VEC developed a bespoke and purposely built metaverse of the event, enabling guests to remotely attend the event and virtually engage with physically attending guests. This was a key opportunity to showcase how this technology can enhance audience engagement and improve accessibility for global audiences.

Ed Haravon, Co-Founder of Get Real reflected on the VEC's Metaverse development

"We applaud the VEC for leveraging this new and innovative technology to deliver immersive and engaging content for the Creative Arts Digital Sandpit. VEC's willingness to pilot this event in the Metaverse highlights their unique position of leadership amongst their peers."

Creative Arts Digital Sandpit brochure ↗

Event video ↗

Creative Arts Digital Sandpit: Areas of Technological Development

Creative Innovation
Using technology for artistic output

- Developing virtual worlds and using the Metaverse

- Alternative capture technologies (360° video, ambisonics, state tracking) for unique performance experiences

- New ways of supporting performances and deliverables (education, community engagement, artistic development)

Audience Enhancements
Improving audience interation, experience & inclusion

- Automated captioning, sign-language, or audio-description systems to enable neurodiverse or mobility impaired visitors with improved systems

- Giving visitors relevant information, for example via electronic guided tours

- Using apps and mobile technology for audience participation and interaction

Operations Management
Using technology to improve business processes & support decarbonisation

- Creating automated systems (RFID tags) for asset tracking and security of inventory

- Area scanning and 'Digital Twin' technology to help with facilities planning, set modelling & improvement

- Using dashboards & sensors for real-time management and sustainable operations

Business Opportunities
Using data to inform new strategic directions & increase revenue

- Collating open source data analytics for planning, audience analytics and event advertising

- Distribution tools to reach new audiences and generate remote engagement

- Alternative revenue through digital technologies such as Blockchain & NFTs

University to establish £1m UK National Centre for Digital Heritage

The VEC has received £912,000 from the Arts and Humanities Research Council (AHRC) CResCa Funding to establish a National Centre for Digital Heritage Research in the VEC's Sci-Tech Daresbury base.

The Centre aims to make Liverpool a global leader in digital heritage research, conservation, and enterprise. The project is part of the UK government's World Class Laboratories Fund initiative and will bring together researchers, practitioners, and entrepreneurs from around the world to create a digital heritage ecosystem and strategy for the region.

The centre will support the digital preservation of the region's heritage assets and work collaboratively to improve the heritage economy, preservation, and engagement, as well as create impactful digital twins and immersive VR exhibitions.

Executive Chair of AHRC, Professor Christopher Smith says:

" *The Creative Research Capability Awards (CResCa) continue AHRC's commitment to supporting world-class facilities, equipment and digital research.*

University of Liverpool's VEC contributes to an ecosystem that is making the U.K. a world leader in digital heritage. It plays a key role in supporting the digital heritage locally in the Liverpool City region. AHRC is delighted to support a project that, in partnership with Liverpool City Council, will equip the VEC to deliver impactful collaborative projects and support Liverpool's heritage economy for years to come. "

VEC's Chief Technology Officer, Dr Konstantin Vikhorev explains:

" *Digital heritage is the use of digital technology to improve the understanding and preservation of cultural and natural heritage. The new centre builds on VEC's 13-year history of leading Digital Transformation across many different industries and will provide access to cutting-edge facilities that will pioneer a new approach to preserving, promoting and progressing cultural heritage through technologies such as AI, Blockchain and the Metaverse.* "

DIF Celebrates Impactful Collaborations in 1ˢᵗ Anniversary

The £12.7 million Centre of Excellence is home to emerging technologies and cutting-edge equipment within six state-of-the-art digital laboratories, covering a magnitude of capabilities and disciplines such as mixed reality, chemistry, drone technology, computer and data science, robotics, AI, machine learning, modelling and engineering.

The 1,500sq metre innovative centre drives local digital skills, generating new jobs and career opportunities whilst supporting research collaborations between academics, researchers, and industry leaders.

Since launching, the DIF Team has created over 50 new collaborations, including being heavily involved in the new research partnership with Sumy State University in Ukraine, helping to develop stronger research links and long-term partnerships focusing on digital infrastructure and digital transformation. Working closely with other departments of the University, the teams at the DIF will be supporting as key players in the University's digital theme.

Other collaborations have included aerospace giant Airbus, St George's Hall Trust, School of Health Sciences (Department for Orthoptics), Civic Data Cooperative, Unilever, University of Exeter, Dogs Trust, and many more, crossing over multiple sectors and industries for broader learning, cooperative working and effective economic delivery.

DIF residents include the Materials Innovation Facility ('MIF') and the Institute of Digital Engineering and Autonomous Systems (IDEAS), comprising the Digital Innovation Facility and Virtual Engineering Centre, are working together to co-develop the technical foundation and key technologies to demonstrate the value and efficacy of Laboratories of the Future.

The DIF has also generated over 70 new jobs as it nurtures skills advancements within the Liverpool City Region. The newly created jobs have been placed within areas including digital engineering, Virtual Reality specialists, translational research, lecturers, data science and software engineering, to name but a few.

LCR4.0 generates over £121m in GVA as it drives innovation and economic growth for SMEs in the LCR and beyond

The LCR4.0 initiative was an ERDF-funded project that aimed to promote the growth of the manufacturing industry across the Liverpool City Region through the adoption of Industry 4.0 technologies. LCR4.0 was led by VEC and the University of Liverpool, with other partners including Liverpool John Moores University, and the Science and Technology Facilities Council and supported by the Growth Platform, Liverpool City Region Growth Company.

The initiative provided tailor-made recommendations, hosted local knowledge exchange workshops, and developed emerging and state-of-the-art technologies to increase efficiencies and productivity from across the region.

LCR4.0 helped over 650 SMEs including 139 start-ups, and helped to develop 228 new products, 104 of which were launched as new products to market, in addition to supporting the creation of 226 new jobs, with a further 1,462 predicted in the next nine years.

The success of the LCR4.0 programmes has proven the potential for HEIs to deliver economic value and support to the local supply chain, boosting competitiveness for their local communities on a national level.

This has enabled businesses to scale up and confidently take advantage of Industry 4.0 technologies, creating new jobs and driving innovation throughout the region, learning from the challenges of both Brexit and COVID-19 to realise new potential for our UK industry.

Prof. Andrew Levers, Executive Director for the Institution for Digital Engineering and Autonomous Systems (IDEAS), University of Liverpool and Principal Investigator LCR4.0, LCR4 START and LCR4.0 Holistic.

By 2032 it is anticipated that LCR4.0 will have generated £121.7m in GVA, demonstrating a significant economic impact on the region, its businesses, and supply chains for the future.

LCR4.0's success led to the launch of additional programs such as Made Smarter and the expansion into new regions such as Cheshire and Warrington.

LCR 4.0 Brochure ↗

LCR4 START Brochure ↗

LCR 4.0 Holistic Brochure ↗

C&W 4.0 Brochure ↗

LCR4 Final Data Report

A lasting legacy for Liverpool City Region SME's

650 businesses supported

139 were new start-ups

1,462 new jobs by 2028

581 R&D collaborations between Universities and SME's

£121.7m in net GVA by 2032

104 new products to market

WE ARE LCR4.0

European Union European Regional Development Fund

NORTHERN POWERHOUSE HM Government

*Data taken from a Summative Assessment Report undertaken by a third-party company.

Liverpool's VEC to lead on £5.1m innovation support programme for City Region's SMEs

A new partnership between the University of Liverpool's VEC, Liverpool John Moores University (LJMU) and Edge Hill University has launched to support business innovation across the Liverpool City Region (LCR).

The new £5.1m Horizons programme, funded by the Liverpool City Region's £44m UK Shared Prosperity Fund (UKSPF) allocation, will support more than 100 SMEs in its pilot phase. The partnership aims to deliver industry-leading innovations across six boroughs, providing the expertise, facilities, and funding businesses need to drive innovation.

Launched by Liverpool City Region Mayor Steve Rotherham, Horizons is the first innovation support programme in the city region funded by the UKSPF and will prioritise supporting businesses providing sustainable practices and technologies.

SMEs accessing the support via a streamlined paperless process can also apply for capital grant funding to further accelerate innovation, drive long-term success across communities and businesses, and support the upskilling of their people.

Since 2016, the VEC has led projects that have helped organisations across the Liverpool City Region contribute more than £121 million GVA to the local economy, creating more than 1,400 jobs across multiple businesses.

The Horizons programme, which was developed following consultation with SMEs and in partnership with the Combined Authority and the city's Universities, will deliver on Mayor Rotheram's ambitions to turn the Liverpool City Region into the UK's next science and innovation superpower.

Steve Rotheram, Mayor of the Liverpool City Region, said: *"Horizon is the first innovation support programme of its kind that directly connects our region's SMEs to our world leading institutions. It's my hope that this partnership will help more entrepreneurs and innovators to achieve their ambitions and, more crucially, help us to catapult our area to the forefront of UK science and innovation."*

Full Press Release ↗

Case Studies

Local Museum explores digital technologies for the preservation of Egyptian Artefacts

The Garstang Museum in Liverpool partnered with the VEC to digitally preserve and promote their historical Egyptian assets and artefacts using emerging technologies like hand-held scanning devices and photogrammetry technology.

This project supports improved preservation, accessibility, and inclusivity of heritage assets while encouraging and increasing remote visitors.

The benefits include detailed and accurate records of artefacts, non-intrusive scanning practices for preservation, virtual tours of the museum and exhibitions for increased inclusivity, and greater community engagement. Garstang Museum plans to invest in similar scanning equipment for future exhibitions and artefacts previously archived through limited floor space, enabling and encouraging wider learning and exposure whilst preserving these.

"Digital engagement with our collections is an increasing focus, but creating 3D representations of our artefacts doesn't end there – it's very useful for documentation, research, & conservation purposes.

With our collections comprising tens of thousands of artefacts, what this technology and the VEC team have done is allow for us to create accurate 3D records of ancient artefacts in a fraction of the time it has taken us using other methods in the past."

**Dr Gina Criscenzo-Laycock,
Curator of the Garstang Museum**

Full Case study ↗

GARSTANG MUSEUM

Distributed Simulation for simultaneous and remote testing using multiple robotics on a virtual planet

VEC created a high-fidelity virtual Mars environment to model robotic orbiters and landers, plan future missions, and provide virtual interplanetary trips through virtual reality technologies.

The environment simulates the Martian environment with gravity, atmosphere, and weather conditions like dust storms and includes sounds captured on Mars.

The simulation helps to de-risk complex missions, reduce resources, support better-informed decisions, and enable collaborative testing and sample collections.

Using High-level Architecture standard for distributed simulation empowers a 'digital backbone' and provides standardised services through different programming languages.

The project also enhances research for remote environments within space, combining physical and virtual environments and assets through distributed simulations, greater access for students, researchers, and engineers, and creating a realistic environment including physical variables such as weather conditions.

Full Case study ↗

Case study video ↗

Innovative Solutions for Net Zero Targets: Harnessing the Power of Machine Learning and IoT

AllGreen Energy aims to reduce energy costs for SMEs and businesses through green energy solutions, using renewable energy, battery storage, IoT, big data, machine learning, and cloud computing.

They collaborated with the VEC to explore additional Industry 4.0 technologies to enhance solar panel services, collating efficient data sets from remote and hard-to-reach devices.

The VEC suggested using machine learning to evaluate historical and ongoing data, offering a more holistic view and to support the prediction of future energy consumption and cost.

This would lead to informed decision-making, reducing the need for human interference and uncovering opportunities for energy-saving in areas that may not have been initially considered.

"VEC's study demonstrated the potential of AI for enhancing energy efficiency, reducing carbon emissions and lowering energy costs. This boosts our confidence in developing AI-based energy management systems. We highly appreciate the VEC's excellent support."

George Huang, Managing Director for AllGreen Energy

Full Case study ↗

Video Case Study Playlist

C&W Case Study: Autac Products Ltd ↗

C&W Case Study: Aquacut ↗

C&W Case Study: Flint Percussion ↗

LCR Holisitc Study: CNC Robotics ↗

In the News

Insider: Liverpool's VEC to deliver £5.1m innovation support programme for city region's SMEs ↗

The Manufacturer: Digital support for North West manufacturers set to deliver £100m GVA boost benefit for region ↗

Insider Magazine feature: Birth of the Digital Twin ↗

ITV Tonight: Dangerous Dogs - What's the Truth? ↗

VEC