University of BRISTOL

Bristol Digital Futures Institute

Bristol Digital Futures Institute Impact Report

Our 12 months to March 2022

Contents

Directors' Welcome

Welcome to our second Impact Report, highlighting our key developments during the twelve months to March 2022.

BDFI was founded in September 2019 thanks to £29 million of capital investment from Research England and £71 million of commitments from 27 other research partners, the University of Bristol and philanthropic sources. Since this date, we've made significant progress against our ambitions and common purpose – to change the way we do digital innovation, and develop pioneering digital technologies in concert with our academic, industry, community and government partners.

The urgency created by the pandemic, societal and government developments have continued to drive our mission against a background of rapid progress towards being the first residents in the Temple Quarter Enterprise Campus and supporting funding proposals worth £17 million.

Our most significant achievements in the last 12 months centre on places, people and projects.

Progress on our build as the first occupants of the University of Bristol's Temple Quarter Enterprise Campus have been at lightning speed – from identifying the opportunity for a new building at the end of 2022, requesting changes to funders, securing planning permission to having works nearing completion this spring. We are very excited to be able to occupy our new home and look forward to welcoming you to collaborate in our new spaces.

Our capabilities and governance have been greatly enhanced by a steady stream of new appointments. Four academic appointments are the first of many new roles that will help us work across engineering, social sciences, and the arts. Alongside this, we welcomed Jeremy Silver, CEO of Digital Catapult, as our first Steering Board Chair with a seven-strong board of community and business leaders.

To support our projects, partners and direction of travel we launched our first BDFI symposium in January, alongside smaller targeted events on digital twins and participatory digital futures. Part one of our symposium saw more than 100 people join us for discussions of the latest thinking in sociotechnical futures with a focus on the development of next-generation wireless technologies.

Our research projects are developing core capabilities for BDFI – both for the University and our city-region. These currently focus on future networks, explainable AI, smart cities, digital media and creativity, cyber security, digital manufacturing and digital health, digital technologies and healthy ageing, digital resilience in Covid, etc.

This year we also welcomed the announcement of a new £10m ESRC Centre for Sociodigital Futures to be based in Bristol. We will work with the new Centre and closely align our work together.

It's been a remarkable year and we have our sights firmly set on growing the research base and team in the next twelve months to support and develop new collaborations.

Prof. Susan Halford
Academic Co-Director

Prof. Dimitra Simeonidou
Academic Co-Director

Dr Jenny Knapp
Director of Programmes & Operations

About BDFI

Our mission

"To transform the way digital technologies are created so that they promote inclusive, prosperous and sustainable futures."

Digital technologies are woven into the fabric of society, for better or worse. To harness opportunities and address the challenges, we need to create new knowledge and understanding of sociotechnical innovation. How technologies and societies shape futures together.

This approach requires new ways of working, across disciplines with partners from all sectors, collaborating in spaces and facilities to designed to support this ecosystem.

Our year in numbers

4 new academic appointments across 2 faculties

£17m new research won by BDFI or our network of academics

7 board members and one chair recruited for external governance

2km² space being renovated

27 partners

170+ participants engaged across three events

5 seedcorn projects supported

18 thought leadership contributions

A globally-unique research facility

Creating our new home

With £29m of funding from Research England's Research Partnerships and Infrastructure Fund, we are developing world-class facilities right in the heart of Bristol – one of the most productive tech clusters in the UK.

Set in stunning 200-year-old industrial buildings (originally the Bristol Light Company's Headquarters), BDFI will become the first residents of the Temple Quarter Enterprise Campus.

With Phase 1, opening in Summer 2022, will house BDFI's offices and globally-unique research facilities including the Reality Emulator, an immersive AR/VR room, the Neutral Lab, Data Centre and training space.

When fully complete in 2023 with the adjacent building and MyWorld creative hub, up to 250 people will work in our specialist spaces, collaboration areas, training and meeting rooms.

UK RI Research England

Milestones

Planning permission
secured October 2021

200 year-old walls
exposed and repointed

Data Centre home built

Original trusses secured
and new roof revealed

World-class facilities take shape

The Reality Emulator

The world's first large-scale multi-sector digital twin.

The Reality Emulator will harness ultra-high performance network connectivity, sensors and actuators together with reconfigurable, programmable computing and the additional capability to host new technologies emerging from research labs. It will offer multi-user, multipurpose, multisensory, interactive immersive capabilities for the development of new experience-based innovation methodologies.

The facility will work with real time and historic data, enabling the creation of 3D visualisation models, to enable collaborative experimentation, iterative design and development of new scenarios on a scale and in a way not previously possible.

Through 2021, specifications have been developed leading to a competitive tendering process to build the Reality Emulator. It is anticipated that a contract will be awarded in the early autumn 2022.

The Neutral Lab

The Neutral Lab allows project teams to co-create their own shared working environment. Diverse teams can collaboratively design and populate a bespoke space with the sensible, the surprising and the state-of-the-art. Teams will choose and use contents from the 'The Cupboard' packed with furniture options, tools, technologies and artefacts. We expect it to foster evolving communities to develop projects, work with new interdisciplinary methodologies, technologies and equipment, and discover original and provocative connections.

A pilot phase will begin this summer to test the Lab's capabilities before it is launched more widely to research communities and partners.

Keen to register your interest
in the facilities? Email:

bdfi-enquiries@bristol.ac.uk

Top: The Neutral Lab
Bottom: The Reality Emulator

"It is both a privilege and fascinating to expose and renovate such an impressive building that has, for so many years, been hidden away. Each site visit reveals interesting and often stunning new features that we hope to highlight and contrast with our ultra-modern, world-leading facilities which will sit alongside them. We will also find a new life within the building for objects that have been recovered such as cobblestones and some very large light fittings! The excitement is building as we prepare to move in and we can't wait to see the old and the new coming together in what we know will be a fantastic and inspirational new place to work and innovate with our partners."

Jenny Knapp, Director of Programmes and Operations

"The arrival of Reality Emulator in BDFI will enable me to realise the dream of Digital Twins for securing digital infrastructures that will have a direct positive impact on increasing consumers' trust in technology. The Reality Emulator will also help me to rethink the creation of digital technologies in a more efficient, secure, and sustainable manner with the users of the technology in the loop."

Rasheed Hussain, Senior Lecturer in Digital Futures

Introducing new researchers

We are proud to introduce four new BDFI appointments from across Social Sciences and Engineering – all of whom are directly engaged in driving the BDFI mission. With a total of seven research staff and 13 further appointments expected in the next two years, BDFI is growing rapidly.

Rebecca Coleman, Rasheed Hussain, Sanja Milivojevic and Jessica Ogden join us from universities around the world to spend the majority of their time engaged in BDFI projects.

Rebecca Coleman
Professor of Digital Futures, School of Sociology, Politics and International Studies (SPAIS)
Specialises in digital media with interests in the everyday life of digital media, specifically how presents and futures are made and experienced.

Rasheed Hussain
Senior Lecturer in Digital Futures, Department of Electrical and Electronic Engineering
Specialises in digital twins with interests in ad hoc networks and cybersecurity, vehicular communications security and privacy, applied cryptography, Internet of Things (IoT) security, and the role of emerging technologies (blockchain and Artificial Intelligence).

Sanja Milivojevic
Associate Professor in Digital Futures, School for Policy Studies
Specialises in criminal justice with interests in borders and mobility, security technologies and surveillance, gender and victimisation, and international criminal justice and human rights.

Jessica Ogden
Lecturer in Digital Futures, School of Sociology, Politics and International Studies
Specialises in data archives with interests in their politics, and with a focus on the ways that digital culture, media and knowledge are constructed and represented online.

Prestigious Board established

"It's a privilege to take up the role as inaugural Chair of BDFI and to work alongside a group of such talented and respected peers. What we are building in Bristol is a vital part of new global efforts to overcome the challenges created by the first generation of digital transformation and to create instead an inclusive, responsible and sustainable framework for the future, powered by digital innovation. I'm looking forward very much to working with the rest of the Steering Board to help drive the ambitious agenda of BDFI."

Jeremy Silver, CEO of Digital Catapult

Our External Steering board launched in March 2022, chaired by Jeremy Silver. It will meet twice a year and members include:

Nick Crew
COO Airbus Endeavr

Carolyn Hassan
Director, Knowle West Media Centre

Sado Jirde
Director, Black South West Network

Andrea Kells
Director, Research Ecosystem, ARM

Clare Reddington
CEO, Watershed

Tim Whitley
MD Applied Research, BT

Nik Willets
President and CEO, TM Forum

Jeremy Silver
CEO of Digital Catapult

Leads the cross-sector board to help steer BDFI's vision and strategy.

£17m new research secured

Six new externally-funded projects started this year, securing further progress against BDFI's mission. Each of these projects is led by BDFI or our affiliate academics with the supported of the Institute.

ESRC Centre for Sociodigital Futures

Led by BDFI Co-Director Susan Halford and Professor Dale Southerton (University of Bristol), this successful £10m bid will establish a new international Centre for research and collaboration.

Launched on 1st May 2022 the Centre for Sociodigital Futures brings together expertise in the Social Sciences, Engineering, Humanities and the Arts, with the Universities of Birmingham, Edinburgh, Goldsmiths (University of London), the Institute of the Arts (University of London) and Lancaster. Its' five-year programme will explore how digital technologies are shaping (and being shaped by) everyday practices of consuming, caring, learning, moving (people and goods) and organising. At the same time, the Centre will explore how cutting-edge technologies – artificial intelligence, high performance networks, robotics, and augmented/ virtual and extended reality – are imagined and innovated for a range of futures linked to these areas of practice. The Centre will work with six strategic partners - BT, Defra, Maybe*, the National Centre for Cybersecurity and UNESCO - and an international network of University partners in Australia, Italy, Norway, South Africa and the US.

Testbeds for Open Radio Access Networks

Two projects funded by the Department for Culture, Media and Sport will develop and trial new radio access systems technologies. They will help the government fulfil its ambition for 35 per cent of the UK's mobile network traffic to be carried over Open Radio Access Network (O-RAN) by 2030.

O-RANOS, which secured £1.9m with Cellnex UK, will see our engineers perform novel research on AI/ML software tools for RAN optimisation and will provide access to their testbeds, capable of hosting research for efficiently maintaining complex multi-vendor O-RAN infrastructure.

Proteus secured £3.7m with Parallel Wireless to develop a new supplier ecosystem to implement a vision of Open RAN strategic diversification.

Connecting through culture as we age: a digital innovation for healthy aging

A £1.48m project for UK Research and Innovation (UKRI) looking at a community of 60 to 75 year olds to understand their cultural and social values and experiences of digital exclusion. Partners include Knowle West Media Centre, Pervasive Media Studio, Bristol Culture and Alive, with research taking place across Bristol. The team will work alongside a group of 20 disabled, socioeconomically and racially minoritised older adults who play an active role as co-researchers. After work to understand digital experiences in 2021, the group are now collaborating to co-design and develop digital cultural products.

Exploring critical human security and public policy challenges in a post-Covid world

Looking at the UK and South Korea this £44,000 project develops a framework to understand and address policy challenges to human security in a post-Covid world. The project launched in February 2022 and includes a core strand on digitalisation. The UK team will visit Seoul in September 2022 and the joint team will coordinate a conference stream at the East Asian Social Policy Research Network Conference in June.

Remodelling SOMA

BDFI were privileged to partner on the remodelling SOMA project. Through a combination of somatic-based dance and immersive person VR, the project will help explore the ways in which we connect to our bodies, to each other and to the environment around us. The project takes place through online and in-person residencies and participatory events with highlights for the year including:

- Testing with visually impaired people, testing ideas on creative audio description and developing the sonification of the virtual environment.

- Working with Off The Record to develop and facilitate workshops with young people called 'Grow Your Own Avatar' - exploring ideas around body image, online identity and embodied practices in VR.

- Making a new VR-dance film which reveals point of view experiences and creative audio descriptions of two dancers in a duet which crosses between physical and virtual bodies and environments. Premiered at the Bloomsbury Theatre alongside performances in May 2022.

Supporting early-stage innovation

In September we released five small seed-corn grants of up to £10,000 each to help a diverse range of projects get started. We hope that the funding will help researchers take their ideas to fully worked up proposals for larger grants and exploration.

Striving for a fairer digital playing field in Brazil

Edward King

Digital inequality is a significant issue in a country as geographically, economically and socially diverse as Brazil. There's been lots of positive effort to address these issues, but the information and outputs of these efforts are rarely shared. Through recorded interviews this project documents crucial testimonies and gathers the perspectives of key leaders in the country for the first time to collate insights from the last 18 years – a period of significant political upheaval for the country.

Which forms of digital literacy are needed to effectively support social inclusion?

Caring for fragile infrastructures to enhance urban sustainability

Katharina Burger

From cancelled bus routes to overcrowded housing, we are increasingly aware of the need for innovative and participatory approaches to collectively care for our urban environments, but when people have no geographical connection to a place it's hard to create the collective response needed. ExperieNcing Infrastructures in DisrEpAiR (ENDEAR) is a new immersive virtual meeting system where multiple stakeholders in different locations, with differing perspectives can interact with 3D models of landscape.

We hope by connecting people and allowing them to explore together we can inspire collective action in complex problem situations.

How can we leverage immersive experiences in VR to instigate collective action to challenge urban poverty?

"I wanted to start a constructive conversation about digital technologies and everyday lives. Energy infrastructures do critical work but are usually hidden in the background, so we only get to see them when they break down. As we're at the cusp of digital transformation, we'll be expected to actively interact with a wide array of smart energy innovations: smart meters, flexibility markets, heat pumps. BDFI enabled us to create tangible conversation starters, which are tailored to diverse audiences and relevant to Bristol citizens"

Seedcorn recipient, Dr Ola Michalec

Helping to boost kids' confidence with maths

Alf Coles and Michael Rumblelow

Research shows that many children experience feelings of anxiety when confronted by maths, which may be contributing to a dip in numeracy among adults in the UK. Using digital technology, and children's play with arithmetic and wooden blocks, we're linking maths and play, building positive attitudes to learning maths among primary school children. This AI-driven object recognition app creates music and maths through computer-generated sounds, words and images triggered by real-world play.

Can AI play reduce maths anxiety? Could you help us test this system amongst primary age children?

Sketching new perspectives on energy systems

Ola Michalec

Digital technologies are tough to visualise. Most are represented either through highly technical diagrams or abstract futuristic images designed to inspire awe. One example of these technologies is Smart local energy systems (SLES). Combining insights from science and technology studies, computer science, and arts, and working with energy industry experts, our project aims to represent SLES more creatively. We are using illustration to provide accessible views of SLES to support public debate.

Could you draw a digital future?

Heroic verse: a poetic push for maths and tech

Rebecca Kosick

Poetry plays with the possibilities of language and breaks established conventions. It's therefore uniquely placed to help machines move beyond the standard constructions they're currently capable of and into more diverse iterations of human patterns of language use. This project aims to investigate how poetry and maths can inform one another, generating innovative insights into AI, engineering and mathematical language modelling. To do this we've created poetrishy.org, a multilingual and multidisciplinary online lab space where experimental poetry can drive new ideas in natural language processing.

How could poetry advance AI?

Growing the partnership ecosystem

We are delighted to welcome LV=General Insurance to our 27-strong partnership ecosystem of businesses, cultural, local government and community organisations working together to build better digital futures. The announcement builds on a long history of collaborative research between our organisations across multiple faculties – exploring explainable AI, to connected living or smart sensing.

"Our commitment to the Bristol Digital Futures Institute takes forward our ambition to innovate and invest in the future of digital technology and multi-disciplinary skills. Digital innovation is critical for our sector and this partnership enables us to collaborate and contribute in a sustainable, inclusive and prosperous way. This will build on the long-standing partnership we have with the University of Bristol and will be hugely beneficial for all as we share knowledge, skills and opportunities."

Keith Misson, Transformation Director at LV= General Insurance

LV=

Events

Several events have helped to catalyse connections amongst our researchers and partners

Participatory methods for digital futures, October 2021

Attended by 40 partners with contributions from LV, Knowle West Media Centre, Ashley Community Housing and University Researchers we explored the participatory approaches that have worked for a range of partners and how these approaches can be harnessed for fairer, more sustainable and prosperous digital futures.

Beyond Digital Twins, December 2021

Digital Twins are deployed around the globe – but with technological and methodological advancements on the horizon, what new frontiers are about to be pushed? Thirty industry, policy and academic attendees joined us for this business breakfast to spark new collaborations and explore what might be possible Beyond (traditional) Digital Twins. Presentations from BDFI Co-Director Professor Dimitra Simeonidou, South West Infrastructure Partnership Academic lead Professor Colin Taylor, and University of Bristol Professor Emmanouil Tranos provided provocation for discussion.

Remaking Digital Futures, January 2022

More than 100 people joined us online for part one of our inaugural symposium. We were delighted to welcome a broad range of experts to our two panels on remaking digital futures and the future of wireless technology. The second part of this event took place on 4th May 2022.

Progress on launched projects

Exploring experience of digital inequalities in the context of Covid

Last year, in partnership with Knowle West Media Centre, 5,000 residents were surveyed to fully understand their experiences of digital inequality during the first Covid lockdown.

The result was a policy paper that set out how Bristol could drive initiatives to reduce the digital divide, particularly in areas of multiple deprivation. The main findings included:

- People experiencing multiple inequalities – low income, precarious employment, health conditions and food poverty – were particularly disadvantaged by digital disparities during lockdown, as information and services shifted online, and support networks were cut off.
- Only 47 per cent of those who needed a laptop/PC for homeschooling had access to one.
- Residents without internet access quoted a range of factors, including cost (50 per cent of respondents), confidence (45 per cent), skills (45 per cent), privacy and security concerns (45 per cent).

An updated survey to 6,300 residents followed-up on these results and are currently being analysed. In tandem, we are also exploring with Babbasa, Black South West Network and Ashley Community Housing if we could extend this work with their communities.

"The research highlights the need for investment in community led solutions to address the digital divide and we look forward to working local and national decision makers to make that a reality."

Carolyn Hassan, Knowle West Media Centre

Nomadic Network Community Partners

We're developing a cutting-edge Nomadic Network, or "5G in a box" that can deliver advanced functionality in a chosen location. It is designed to be moved around – hence the term 'nomadic.'

This network features ultra-low latency, high density of users, guaranteed quality of service through network slicing and software-defined management and support for edge computing.

By putting experimental technology into the hands of end users and asking, "What do you want to do?" and "What can we do together?" we can rapidly accelerate innovation and redress digital inequalities in communities or businesses who might typically be restricted by existing provision (or lack thereof). The Nomadic Network is a flexible, programmable and transportable tool that inspires end user creativity to the limits of our collective imaginations.

So far, we've launched a Community Fellowship scheme with Babbasa and Black South West Network to explore how we can accelerate community-led innovation through development and provision of the node. We've also begun exploring opportunities to deploy the Nomadic Network for everything from high-quality immersive theatre experiences, to synchronising complex data from across a smart city, or supporting connectivity in areas where access is poor.

Translating 5G into economic impact

Led by the West of England Combined Authority (WECA), this £5m project draws together 12 local partners from the worlds of academia, technology, government and logistics to develop private 5G networks for the UK market.

In the last year BDFI and Smart Internet Lab researchers collaborated with the biggest cell manager in the UK to develop a deep understanding of how private 5G infrastructure is specified, procured and managed. Considerations were made on maximizing the benefits from such deployments by integrating use cases such as goods tracking for the logistics sector, drone police surveillance and smart junctions reducing the carbon footprint of large lorries.

The project is one of 22 projects funded by the Department for Digital, Culture, Media & Sport (DCMS) under its 5G Testbeds and Trials Programme, which supports innovators exploring new uses for 5G to help improve people's lives and boost businesses.

Use cases were shared at the UK 5G showcase in March 2022.

"This Combined Authority-led project is a real vote of confidence in the West of England and further confirmation of our status as a digital powerhouse. We are testing cutting-edge technology and innovations which could well revolutionise the UK logistics industry, making it more efficient and productive, and deliver real benefits for the West of England as a whole. It will bring investment and high-skilled jobs to our region"

Dan Norris, West of England Metro Mayor

Reimagining Explainable AI

In partnership with major lines insurer LV=GI researchers are looking at how machine learning is used alongside a range of other knowledge practices in the everyday life of the business. The approach will help explain how machine learning has become part of decision-making processes and ensure that decision making within the business can be explained both internally and externally.

Researchers are working with Knowle West Media Centre and the Black South West Network to explore what machine learning means for diverse 'data publics' – particularly those not usually included in discussions about AI or explainability – and are co-designing methods for wider engagement in tracking and driving machine learning decision-making processes. The team has also built networks beyond the project, exchanging knowledge with the Cabinet Office, third sector organisations and academics from across Europe, including a collaboration with the Digital Age Research Centre at the University of Klagenfurt.

For the final 18 months of the project, activity includes creative activities by the community groups to reach into their local areas and enable new forms of engagement with machine learning and automated decision making; analysis and collation of findings; creating spaces for dialogue between organisations using machine learning for automated decision making, and those whose lives these decisions affect. The team will also continue to disseminate the project findings at a range of conferences in the UK and internationally.

"The Black South West Network research partnership with BDFI provides an opening to centre equitable approaches and include community-led methodology into leading research around the socio-economic declinations of explainability approaches. This is an opportunity to gain an in-depth understanding of the barriers to inclusion when it comes to the AI and machine learning research fields, which would then allow us to take an informed approach when responding to systemic exclusion-related challenges."

Chiara Lodi, Senior Research Officer at BSWN

MyWorld

MyWorld's vision is for the West of England to fulfil its potential as a world player in creative media production and technology

Launched in April 2021, and now in the delivery phase, MyWorld is a unique five-year programme operating alongside BDFI at 65 Avon Street, looking to embed a culture of research and development (R&D) at scale, across the creative technology sector in the West of England region.

Part of the MyWorld offer includes extraordinary new facilities for experimental and commercial production as well as research and teaching. They will also deliver funding opportunities, mentoring and training to facilitate the creation of new products and processes ahead of emerging markets, uncovering and solving engineering challenges, to build the platforms on which future media experiences will be based.

The impact of MyWorld funding and the inward investment it attracts is estimated to be £223 million in economic activity, 21 new businesses and the creation of more than 700 jobs in the region. Visit MyWorld to get involved.

Shaping Debate

Alongside leadership roles in Government taskforces and UKRI, our Directors continued to shape debate around digital futures.

BDFI Co-Director Professor Dimitra Simeonidou contributed to:

- Keynote speech for Westminster eForum policy conference: Next Steps for UK mobile
- Panellist at 5G Development Pathways
- Panellist at 5G Realised conference
- OFC Symposium: On the Edge
- Chair of QT EPSRC Fellowship panel
- Programme Chair of OFC 2022, San Diego
- Plenary talks for UK 5G Showcase
- Talk for the government of Luxembourgh on 5G ecosystems
- Talk at Jesus College, University of Cambridge on Virtual Dialogue on the Digital Economy
- Talk and organiser at Royal Academy of Engineering,: Future Wireless systems workshop
- Talk at ECO6G European Ecosystem Event on 6G

BDFI Co-Director Professor Susan Halford contributed to:

- Keynote speaker, BT Tommy Flowers conference
- Chair, British Sociological Association (BSA) Gary Younge Public Lecture
- Convenor and Chair, BSA President's Panel: Re-Making Futures, BSA Annual Conference
- Speaker, GW4 Social Justice and AI Workshop
- Chair, ESRC Digital Footprints Academic Leadership Group
- Keynote speaker, Response-ability conference
- Invited speaker, Brigstow Institute online event, 'What is Robotics made of?'

Our ambitions for 2022-23

Our focus will continue to build our place, people and projects. By this time next year we will have:

- Moved into our new premises as the first residents in the University's Temple Quarter Campus.
- Held an opening event for all our partners and collaborators.
- Published a 'History of The Sheds' and commenced a community engagement project to gather more local social history.
- Started pilot work for the Neutral Lab and launched the Lab for researcher and partner collaborations.
- Awarded the contract to build the Reality Emulator.
- Appointed five academic posts with the Faculty of Social Science and Law and three academic posts in the Faculty of Engineering. A further five academic appointments are planned with Engineering during the next two years.
- Worked with Temple Quarter Campus and MyWorld on the completion of their building and the Instrumented Auditorium.
- Recruited Business Development Manager and Facilities and Services Manager.
- Hosted two external steering board meetings.
- Seen the launch of the new ESRC Centre for Sociodigital Futures.

Work with us

We are open to new collaborations and ideas to use our facilities.

Get in touch:

- Get in touch: BDFI-equiries@bristol.ac.uk
- Sign up to our newsletter
- Follow our activities on Twitter and LinkedIn
- Read about our ideas and projects on our blogspot