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ECOSYSTEMS AND PARTNERSHIPS

Enabling factors for data-driven innovation in the creative industries

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Abstract

What are the ecosystems and partnerships required to enable data-driven innovation to be taken up in the creative industries? This chapter discusses how ecosystems enable different forms of innovation through partnership networks in the creative industries. Case studies from Edinburgh and the southeast Scotland region, and Wales, demonstrate how online and in-person ecosystems can be enabled and how strategic partnerships can support innovation in the creative industries. The chapter analyses what impact small industry–focused research and development grants can have on ecosystems and what barriers are observed. It reflects on the effect of strategic decision and policymaking in relation to grassroots development and conversely how emerging R&D can inform policy.

Introduction

What is the role of ecosystems and partnership networks in the development of data-driven innovation in the creative industries? We argue that the prevalence of a 'network model of governance' typifies the creative industries and is critical to support innovation in the creative industries. In this chapter, we posit that data-driven innovation in particular relies on strong ecosystems to support interdisciplinary partnerships to develop and provide case studies on a regional (southeast Scotland) and a national (Welsh) initiative to demonstrate their ecosystem's activities, reach, and impact. Furthermore, we argue that the idea of the network is critical to understanding data in the context of innovation and that it is imperative to support such networks if we wish to see growth in the use of data within the creative industries.

Creative ecosystems

The creative industries, as "those industries which have their origin in individual creativity, skill and talent and which have the potential for wealth and job creation through the generation and exploitation of intellectual property" (DCMS, 2001, p. 5; DCMS, 1998), can also be understood as *creative ecologies*. This includes the wider *creative ecosystems*, of funders, support structures, and organisations which provide the development support to creative and cultural ecosystems via a multitude of interconnections and interdependencies (Gross and Wilson, 2019; De Bernard et al., 2021; Komorowski et al., 2021b). In this chapter we argue that the creative industries, understood as a creative ecology, relies on a "network model of governance" (Jones et al., 1997, p. 911), a concept from business studies which refers to distinct forms of exchange, communication, coordination, and collaboration between businesses. The social mechanisms in network governance have been demonstrated to reduce transaction costs, which leads to comparative advantage over markets and hierarchies.

> Network governance involves a select, persistent, and structured set of autonomous firms (as well as non-profit agencies) engaged in creating products or services, based on implicit and open-ended contracts to adapt to environmental contingencies and to co-ordinate and safeguard exchanges. These contracts are socially – not legally – binding.
>
> *(Jones et al., 1997, p. 914)*

The film industry, for example, has been cited as a primary example of network governance (Jones et al., 1997, p. 916), but it typifies the creative industries at large. The network governance model has found traction in creative industries research, which in recent years has moved from an economic model to take a more ecological approach in which social network values are critical.

The creative industries sector is made up predominantly of micro businesses (less than ten staff) (94%) (Creative Industries Council, 2021; DCMS, 2018a) and has a significant proportion of sole traders (32%) (Easton and Becket, 2021), a trend which is also emergent in the wider economy. Research has demonstrated that creative industries, partially because they are dominated by sole traders and micro businesses, tend to co-locate in *creative clusters* of diverse, specialised creative businesses that rely on access to specialised labour and skills (Chapain et al., 2010; Chapain and Sagot-Duvauroux, 2020; Siepel et al., 2020). *Creative networks* are mechanisms that support the heterogeneous, largely freelance creative workforce within creative clusters. These networks are critical nodes in creative ecosystems which are as much geographically as they are socially defined and have been proven critical in supporting sustainability in the creative industries (Bakhshi et al., 2013;

Komorowski et al., 2021b). Further research (Komorowski et al., 2021b) has highlighted the *value network* which emanates from local creative networks across regional creative ecologies. The networked nature of a nimble predominantly freelance and micro business creative workforce has a responsiveness which enables it to be flexible in a volatile and uncertain marketplace. This amorphous, flexible nature of the creative industries relies on the social capital of creative ecologies as demonstrated by the model of governance. Therefore, the existence and proximity of a creative cluster, creative networks, and other creative ecosystems are critical to sustain a creative ecology.

In this chapter, we argue that a creative ecology enables access to trusted collaborators, shared risk, and common understandings that support creative and research and development (R&D) processes and underpins data-driven innovation in the creative industries. The subsectors of the creative industries share common R&D challenges, so resolving these benefits the sector more widely.

Innovation in the creative industries

The recent digital transformation of the economy (Schwab, 2015; Davis, 2016; Xu et al., 2018) has been overhauling the creative industries by enabling a vast increase in available digital content, new entrepreneurial dynamics in online markets, and new business models (Benghozi and Paris, 2016; DCMS, 2018b). During the period of global COVID-19 lockdown, five years of digital adaptation was condensed into two months (Baig et al., 2020). This significantly accelerated the shift towards digital adaptation, and the cultural and creative sector became a proving ground for data-driven innovation.

Innovation is often a poorly understood term in the creative industries (Nesta, 2008) and rarely conforms to linear models of product development but instead refers to often open, collaborative, and iterative processes (EKOS, 2017). In Scotland, an EKOS report (2017) noted that creative enterprises experience higher barriers to innovation because higher education institutions' one-size-fits-all approach is mismatched with the diversity of the creative sectors (EKOS, 2017). The EKOS report identified three areas of innovation: 1) technology innovation, 2) business model innovation, and 3) creative (aesthetic) innovation. Although successful innovation in the creative industries often includes innovation in each of these areas, it is the combination of creative, technological, and business skills, as well as data literacy (Parkinson, 2020), that is key to data-driven innovation (see also Chapter 4). Data has always informed creative product design and development: for example, development of prototypes, user testing, market research, community engagement, and so on. However, it has been argued that creatives need to understand better how to design from, with, and by data (Speed and Oberlander, 2016).

Our experience of working with creatives on data-driven innovation has demonstrated that innovation is often unrecognised by creative companies themselves as they create and solve problems 'on the go' iteratively and often do not consider, or label, this process innovation, echoing the observations made in the EKOS report (2017). This in turn often makes it invisible to researchers and policymakers. The value of networks is that recognition by others can take place. An enabling ecosystem can also appear invisible to those who may find themselves supported from within it. This suggests to us that networks and ecosystems are a critical part in the process of innovation as they support, connect, and make visible the innovation taking place in the creative industries.

Financial and knowledge support are critical to innovation in the creative industries. As noted earlier, the creative industries remain dominated by freelancers and micro businesses, with limited human and financial resources to undertake R&D. In Scotland, schemes such as Innovation Vouchers were proven to be a successful mechanism for creative businesses to provide access to academic expertise up to the value of £5000, which resulted in knowledge transfers, supporting innovation and increased networks (ibid). It is notable that there was a sizable take-up from the creative industries: (18% in 2019/20 and 21.5% 2018/19) (Interface, 2018–2019, 2019–2020), which, given the scope of industries in Scotland, is a significant proportion of innovation funding driven by the creative industries. The provision of financial incentives has been proven to support the growth of a creative innovation ecosystem, as outlined previously, but the lack of follow-up funding was identified as a key barrier for further development (ibid). However, we contend that small seed funding initiatives, such as Innovation Vouchers, are important enablers of innovation, as supported by evidence from our two case studies, but that this relies on a network of governance.

The role of organisations that provide support and resources for growth-oriented entrepreneurs in entrepreneurial ecosystems has been well documented (Bakhshi et al., 2008; Spigel, 2016) and relies on supportive policy provision, in this case the UK Industrial Strategy (2017), written in response to the UK exiting the EU. Understanding where and how creative ecosystems and clusters exist has been the subject of various mapping exercises, such as the UK map[1] created by the Policy and Evidence Centre (PEC) (Siepel et al., 2020).

In the following we discuss the importance of creative ecosystems to support data-driven innovation R&D and provide evidence of how the emergence of creative innovation ecosystems supported access to further network expansion and, critically, access to follow-up funding. We demonstrate this with illustrative examples from two cases from Scotland and Wales, two comparable small nations in the United Kingdom whose creative industries have been identified as key economic drivers (Scottish Government, 2019; Welsh Government, 2020). We present a regional approach (Case 1: Creative

Informatics in the Edinburgh and the southeast Scotland region) and a country-wide approach (Case 2: Clwstwr, Wales) and particularly look at the role of ecosystems and networks which resulted from these investments in the local innovation clusters. Creative Informatics and Clwstwr are part of the Creative Industries Clusters Programme (https://creativeindustriesclusters.com) (CICP) (UKRI, 2018) which was developed in response to the UK Industrial Strategy (2017) and funded by the Arts and Humanities Research Council's (AHRC) Research, Development and Innovation (RD&I) fund. We outline how targeted investment in creative clusters has not only resulted in the growth of regional creative businesses but, critically, has resulted in the growth of local creative ecosystems, seen in expanded networks, increased collaborations, and further investment in the region. We identify how the resulting creative ecosystem has supported innovation and data-driven innovation in particular.

Case 1: Creative Informatics, Edinburgh, Scotland – regional approach

In the Edinburgh and Southeast Scotland City Region (ESESCR) (https://esescityregiondeal.org.uk/about-us), deliberate enabling steps have been taken to create a focus on data-driven innovation for economic growth in the region. The University of Edinburgh conducted a Science & Innovation Audit (Department for Business, Energy and Industrial Strategy, 2016) which identified growth potential in data-related activity in ten sectors as well as the skills, needs, and jobs that would be required to meet that growth. This informed the ESESCR City Deal, a capital investment led by the UK government and supported by the Scottish Government (ESESCR, 2018) of £1.3bn to develop and strengthen a regional economic cluster by investing in innovation, skills, and infrastructure over 15 years in an area which comprises 26% of Scotland's population. This includes significant investment in research, development, and innovation across all industries but includes specific investment in the creative industries. The Scottish Government (2007, 2019), like its UK counterpart (UK Government, 2017), recognised the creative industries as one of seven key growth sectors for Scotland and acknowledged that the "combining of technical and creative skills, collaborative working across and beyond the sector, entrepreneurialism, social enterprise and revenue generation" (Scottish Government, 2019, p. 2) play an increasingly important role in economic, social, cultural, technological, and environmental transformations. The aforementioned map of creative clusters in the UK (PEC) (Siepel et al., 2020) offered evidence of a creative cluster in Edinburgh and highlighted a cluster in Galashiels, southeast of Edinburgh. The PEC mapping, however, did not have enough granularity to identify the rich ecosystem of creative micro business, later evidenced in the map created by the South of Scotland Enterprise development agency (SoSE) (EKOS, 2022).[2]

The University of Edinburgh proposed and partnered in the City Deal with the City of Edinburgh Council to create and deliver the Data-Driven Innovation (DDI) Programme over 15 years from 2017, building five hubs to focus on data-driven innovation research, education, entrepreneurship, and innovation with industry. The Edinburgh Futures Institute is the data-driven innovation hub for the creative industries and four other sectors. In this context the enabling ecosystem has focused its energy and resources on data-driven innovation, providing skills, education, research and innovation collaboration, and entrepreneurial support. In this setting, the Institute of Design Informatics within the University of Edinburgh proposed the Creative Informatics Cluster programme in response to the AHRC Creative Clusters Programme funding opportunity in 2018, deliberately designing their proposal to align with this wider commitment and allow for direct engagement and support with and for the creative industries to develop data-driven innovation. The DDI programme has also developed a Skills Gateway to support data skills training, as well as a Data-Driven Entrepreneurship programme and AI Accelerator to which creative innovators, including Creative Informatics participants, can apply.

Creative Informatics (CI), which emerged from these policy directions, has contributed to the emergence and growth of an innovation ecosystem and the longer-term structures and partnerships which have been put in place to sustain ecosystem support beyond the duration of the funded cluster programme. Creative Informatics received £7.7 million funding over a five-year period (2018–2023) to support R&D in the creative industries in ESECRC, mostly from the Arts and Humanities Research Council (AHRC) as part of the Creative Clusters programme. It delivered this through a multi-faceted approach to R&D that supported 1) a programme of *outreach* events (Example 1.1), 2) the investment in *physical infrastructure* (Example 1.2), 3) a *start-up programme*, and 4) a programme of strategic *investment in R&D funding* streams (Example 1.3).

Over the period of investment, Creative Informatics has supported an *outreach programme* which included over 70 networking events: 23 Labs (primarily short talks of examples of creative technologies), 22 Studios (exploratory hand-on workshops), four Partnership Forums (community feedback sessions), and four Annual Showcases (demonstrating good practice from within the CI community and external examples of creative technology innovation and several launches), including a sustained programme of networking events during the period of lockdowns (12 Friday Forum and two online Annual Showcases).[3] These events introduced creatives to existing and inspiring role models of data-driven innovation within their industry by targeting a particular creative audience (e.g., focused on music, dance, craft, performance, etc.). During the global pandemic, online digital platforms (Mighty Networks, HeySummit, and Vimeo) were used to deliver the annual Showcase, in turn innovating in how networking events could be delivered

online and advising others in this space (Chan et al., 2022). As demonstrated in our example (1.1), these networking events were crucial to introduce creative businesses and organisations to each other and often led to multiple collaborations and partnerships, with the network acting as catalyst.

Example 1.1:   Think Plastics, Applied Arts Scotland

Three craft practitioners used Interface's Innovation Voucher scheme in 2019 to access academic expertise to explore biodegradable plastics and develop sustainable plastics, working with a materials expert at Edinburgh Napier University, a chemist at the University of Edinburgh, and a biologist at Royal Botanical Gardens in Edinburgh (RBGE), resulting in the *Think Plastics* (https://www. rbge.org.uk/news/articles/artists-and-scientists-working-together-to-showcase-plastic-in-a-new-light/) exhibition at the RBGE in spring 2020. This led to a further Innovation Voucher being accessed by one of the craftspeople to develop a new compostable plastic using clay dust. Furthermore, Creative Informatics collaborated with the craft makers and the RBGE to host two networking events, which in turn led to the establishment of the Closing the Loop (https://www. appliedartsscotland.org.uk/projects/closing-the-loop/) network of craft makers in collaboration with Applied Arts Scotland to explore circular economy principles (Panneels, 2023). Applied Arts Scotland, in turn, then successfully applied for Creative Informatics funding to support the use of VR for remote collaboration (Panneels et al., 2023).

This demonstrates that Creative Informatics is operating and interacting with external network opportunities and that projects can successfully navigate this wider ecosystem and the role of the outreach programme to connect creatives to the innovation networks.

A further 80+ Creative Informatics events supported the creative community with discovery workshops, Q&A sessions, or studios to give much more tailored support for individuals. In total these events engaged with over 5,000 participants and were key for creative businesses to understand what data-driven innovation might mean for them, and more importantly to find potential partners and collaborators: the enhanced social capital on which the network of governance relies.

Creative Informatics has also seen investment in *physical infrastructure* in two key physical spaces: Inspace (University of Edinburgh) and E11 (Edinburgh Napier University). Inspace has supported a series of events such as the hosting of CI Labs, symposia, and various exhibitions, including Pip Thornton's *Newspeak* (2019) (Example 1.2) during the 2019 Edinburgh

Fringe (Thornton, 2022) and the *There Be Dragons* (https://inspace.ed.ac.uk/coming-soon-exhibition-there-be-dragons/) exhibition, which showcased work by artists exploring what data is.

Example 1.2:   Pip Thornton and Ray Interactive

Artist and academic Pip Thornton had been introduced to creative design studio Ray Interactive as the hosts of the first CI Labs in early 2019. Thornton worked with Ray Interactive on *Newspeak* (2019) (https://www.designinformatics.org/news/newspeak-2019/), which visualises the words of George Orwell's *Nineteen Eighty-Four* as if they were commodities on a stock exchange. Using live data scraped from Google Ads, the text of the book scrolls across the facade as tickertape using the projection capabilities at Inspace. The fluctuating prices of the words are determined by what they are worth to Google in the context of an advert. Thornton continues to work with Ray Interactive on various projects. In turn Ray Interactive have worked with several other CI community members: (*Tidesong* (https://victoriaevans.space/tidesong/) by Victoria Evans, and *Atmosphere* (http://www.mediascot.org/atmosphere) by New Media Scotland), delivering the tech component of creative projects.

Access to these spaces enabled experimentation and testing of new ideas by the CI community. The purpose of the E11 studio is to support the local creative industries by providing space and access to specialist equipment, including specific technologies requested by creatives to prototype and investigate new opportunities. The programme of Studios was to be delivered in these spaces but had to pivot online during the pandemic: an introductory workshop in animation, for example, was successfully delivered online using tablets or smart phones. However, online Studios were not always appropriate, as this strand relied extensively on the ability to try out new technology and equipment not normally available to creatives, such as AR or VR headsets (Panneels et al., 2023), specialist sound equipment, or 3D scanning tools.

The Creative Bridge start-up programme (https://creativeinformatics.org/creative-bridge/) was a creative industries accelerator delivered by tech ecosystem support organisation CodeBase. It supported ten cohorts, totalling 220 creative entrepreneurs, to explore data-driven innovation in their business, introducing start-up thinking playbooks and processes. The programme has supported new and emerging businesses and partnerships across the creative sectors like Boom Saloon (https://www.boomsaloon.com), a print magazine democratising print; Busking Pro CIC (https://busk.co/blog/about/), providing street buskers with digital services from online payments to selling

their music; Tinderbox Collective (https://tinderboxcollective.org), develop-ing software to enable two acoustic pianos to perform live duets remotely; or Scottie,[4] who developed a ticketing service tailored to creative producers. Key to this programme was the ability to network with others when meeting weekly in person or online during COVID-19 lockdowns.

The programme of *R&D funding schemes* supported various schemes, but three are of particular note: the Connected Innovators, Resident Entre-preneur, and Challenge projects. The Connected Innovators programme (https://creativeinformatics.org/connected-innovators/) was delivered in partnership with local network Creative Edinburgh,[5] an industry-facing net-work of over 5,000 members, which supported mentoring and funding of 27 creative practitioners. Feedback from the participants overwhelmingly noted that access to the network and the networking facilitated by Crea-tive Edinburgh was a critical part of their success. Creative Edinburgh con-tributed to knowledge building surrounding data-driven innovation in the creative industries. This was achieved through the community engagement *Talking Heads* event series showcasing data-driven projects which unpacked the potential of data in creative practices. In addition, Creative Edinburgh provided expertise and upskilling opportunities to 101 people through a mentoring programme for the development of ideas, new processes, and products, including mentoring the Resident Entrepreneur scheme[6] of 74 cre-atives. The Challenge programme[7] supported 29 Challenge Projects which actively connected cultural and creative organisations and businesses with tech specialists. These R&D funding schemes were not just important in supporting the development of new products and services but also brought to the surface existing niche networks and connected them into a wider eco-system, as outlined in Example 1.3.

Example 1.3:   Brian Baglow and the Scottish Games Network

Brian Baglow hosted an online CI Lab[8] in December 2020 to highlight the rich ecology of the Scottish indie games industry. He also received Connected Inno-vator funding, managed by Creative Edinburgh, to undertake data-led research to map the industry, which he knew well through his voluntary work running the Scottish Games Network,[9] but which was not fully understood by policy-makers and industry alike. Baglow's mapping work led him to connect to poli-cymakers with briefings to the Scottish Parliament (Scottish Parliament, 2021). He also took part in the PlayAway Games Festival in February 2021 hosted by community music collective Tinderbox,[10] who also received Creative Informat-ics funding. See also the case study accompanying this chapter on Civic Digits.

Overall, Creative Informatics funding has led to 350 awards to entrepreneurs across the Creative Informatics programme of approximately £2.8 million, which has resulted in a total of further external funding and investments to entrepreneurs of more than £7.1 million and £4.1 million of in-kind contributions towards R&D projects, resulting in 29 new start-up businesses, 143 new jobs, and 180 safeguarded jobs (and counting). Furthermore, Creative Informatics supported six collaborative projects between higher education institutions (HEIs) and creative businesses and supported 135 inward placements by creatives to HEIs. Creative Informatics had more than 5,560 engagements with local creative businesses, in addition to 787 with non-creative businesses, thus expanding the network beyond the creative industries. It must be noted that although the geographical scope of the project extended beyond the boundaries of the city of Edinburgh, the majority of funded projects and networks have been within the city postcode boundaries, despite the increased geographical reach of the Creative Informatics programme afforded by the digital pivot enforced by the global pandemic. Beyond the economic benefits, our research has shown that this investment in the creative ecosystem in the city of Edinburgh has led to its expansion and to numerous collaborations outside of the direct scope of the Creative Informatics project.[11] The importance of networks and a supportive ecosystem are critical for a thriving innovation ecology.

Case 2: Clwstwr, Wales – nationwide approach

Wales has a long history of policy support for the creative industries. For example, in 2010, the Welsh government assisted with the relocation of Wolf Studios, one of the UK's largest purpose-built studios for TV and film production (https://bad-wolf.com/wolf-studios/) to Cardiff Bay, an initiative that aimed to attract significant high-end productions to Wales (Welsh Government, 2020). Furthermore in 2016, the UK and Welsh governments, as well as the ten local authorities in southeast Wales, launched the Cardiff Capital Region (CCR) City Deal to promote considerable economic growth in the region through investment, upskilling, and enhanced physical and digital connectivity. The creative industries are one of the City Deal's six primary target sectors (Cardiff Capital Region, 2019). In the same year, there was a manifesto commitment to establish Creative Wales, an internal Welsh government agency, to support the creative industries. Creative Wales was officially launched in early 2020, with an emphasis on the film and television, music, and digital sectors (Creative Wales, 2023). Behind the Welsh government's and other regional and local authorities' strong commitment was an understanding of the need to provide a more streamlined, adaptable, and innovative service to the creative industries, which has become an important part of the nation's economy that is quickly evolving (Welsh Government, 2020).

The creative industries, particularly the audio-visual sector, have played a vital role in Wales's economic rebirth. Cardiff, according to an independent review of the creative industries commissioned by the UK government in 2017, has become one of the UK's largest media production centres outside of London, with a strong independent TV production industry (Bazalgette, 2017). In 2018, a report published by Nesta, a British foundation with the aim to support innovation, characterised Cardiff as a city undergoing rapid creative growth, fuelled by increased dynamism in digital and media technologies, and poised to become a leader in the UK's creative geography (Mateos-Garcia et al., 2018). Research from 2019 (pre-COVID-19), identified more than 8,600 active firms and 84,500 people working in Wales's creative industries (Fodor et al., 2021). The film and television cluster, in particular, has undergone a decade of robust growth, making Cardiff the third-largest film and television cluster in the UK, after London and Manchester. There are 1,318 audio-visual media enterprises in the Cardiff Capital Region, with a total annual turnover of £545 million in 2019 (Komorowski et al., 2021a).

Building on the increasing recognition of the importance of the creative industries in Wales as well as the policy support developed over time, the Clwstwr programme[12] was launched in 2018. Led by Cardiff University and in partnership with University of South Wales and Cardiff Metropolitan University, Clwstwr was a five-year programme which aimed to create sustainable growth in the creative industries in Wales (Clwstwr, 2019). The programme provided funding support, as well as training and community development, for the local creative industries, with a focus on the screen and news sectors. Clwstwr brought together all major Welsh broadcasters, including BBC Cymru Wales, S4C, and ITV Wales, as well as independent film and television production companies, national companies and creative organisations from Wales, creative coworking spaces, tech start-ups, and local governments such as Cardiff Council and the Welsh government. We outline in the following how the Clwstwr programme has contributed to the emergence and growth of an innovation ecosystem in Wales, as well as the longer-term structures and partnerships that have been put in place to sustain ecosystem support beyond the funded programme's duration.

Clwstwr's *funding calls and R&D support* have been critical for its approach to fostering an innovation ecosystem in the Welsh creative industries. Clwstwr developed and implemented nine funding rounds between 2019 and 2022, funding a total of 118 projects contributing over £3 million in direct funding to the local creative industries. These comprised co-created Seed Funding awards of up to £10K, Open Funding awards of up to £50K, and Challenge Funding awards of up to £50K. The funding rounds were created to help R&D initiatives ranging from experimental development and feasibility studies to industrial research. Through these funding calls, collaborations and valuable innovation connections have been established (see Example 2.1.)

Example 2.1:   AMPLYFI: AI In the Newsroom

AMPLYFI[13] received funding from Clwstwr in its Open Funding Round to enhance its existing AI functionality by developing deep-web capability that can provide journalists with greater clarity, deeper source information, and higher accuracy of data than traditional research methods. The project worked with journalists to deliver a fast, accurate, auditable information interface. The aim was to create a highly bespoke product designed specifically with journalists in mind, enabling them to channel their skills and time more effectively building on data available in the web. This project exemplifies the importance of integrating the end-users and professionals into the development of innovative solutions.

Within the 118 projects, more than 700 team members and freelancers were engaged with the 85 financed businesses, and more than 190 organisations were working on R&D projects (including 273 individual freelancers recruited to do R&D). Approximately two-thirds of the 118 funded projects were collaborative initiatives in which the lead firms worked with at least one additional business or freelancer. Clwstwr initiatives were often a combination of three enterprises.

Next to its funding rounds, Clwstwr launched three *Challenge Partnerships*, which were jointly funded and developed calls in conjunction with Challenge Partners, giving SMEs the possibility to collaborate on thematic R&D projects. Clwstwr prioritised socio-cultural impacts next to economic growth and collaborations through these partnership calls. The Green Cymru Challenge Fund,[14] a collaboration between Clwstwr and Ffilm Cymru,[15] made funding available for individuals, organisations, and collaborations across sectors (including media, academia, technology, transportation, energy, water, and waste management) to research and develop new, more sustainable ways of working in film and television (see Example 2.2).

Example 2.2:   Severn Screen

Funded through the Clwstwr Green Cymru Challenge Fund, Severn Screen[16] developed a sustainable and collaborative infrastructure model to make film production greener. While productions generate huge amounts of data, Severn Screen aimed to use this data to better understand the carbon footprint and to make better decisions on future productions by analysing the data in a deeper

way via a data analysis platform (Power BI). The process combined carbon foot-print analysis with reporting on sustainability success stories and concept development for new apps and platforms. The project of Severn Screen highlights how data-driven innovation can break up data silos in the sector's network, providing a methodology which can be adopted to understand the emissions created by film and TV.

The National Museum Wales Challenge Fund[17] was a collaboration between Clwstwr and Amgueddfa Cymru – National Museum Wales – to investigate innovative and creative methods to rethink the museum experience and attract new audiences. The People's Newsroom Initiative Fund,[18] a Clwstwr collaboration with the Bureau of Investigative Journalism,[19] the Ethnic Minorities and Youth Support Team Wales (EYST),[20] and Lankelly Chase,[21] was designed to develop a new pipeline for media production involving hands-on business and start-up support to design innovative new journalism initiatives and invest in communities traditionally marginalised in media output. Clwstwr thus served as a catalyst for R&D.

Clwstwr served as a *networking and skills development platform for firms and freelancers* in the creative industries in Wales (and beyond), resulting in new contacts and partnerships and a new innovative ecosystem. Clwstwr participants developed a strong sense of community as a result of the programme's activities and knowledge-sharing initiatives, particularly around certain areas or topics. Clwstwr's communications initiatives boosted awareness about the importance of the creative industries in Wales. Between 2019 and 2022, Clwstwr organised 52 events focused on skill development, networking, information transfer, and the promotion of R&D projects. More than 1,300 people attended these events, which were aimed at a variety of audiences and stakeholders and included both public-facing events and cohort-only sessions. Every Clwstwr initiative that received funding was supported by a designated academic and R&D producer, resulting in academic and industrial connections (see Example 2.3).

Example 2.3:   Modular journalism

Shirish Kulkarni, journalist, researcher, and community organiser behind Monnow Media,[22] leveraged Clwstwr's assistance to create new methods of journalism storytelling, with a focus on new formats and audience involvement. He created and tested a variety of prototypes for news formats after working with storytellers from various backgrounds and consulting with university experts.

This resulted in a collaborative research study with Cardiff University, which was published in *Journalism Practice* and is already among the top ten most-viewed items on the website (see Kulkarni et al., 2022). His new types of news narrative have had a global impact in newsrooms around the world, including the *Financial Times* and the *Times of India*. This example shows the impact of academia and industry collaboration and networks.

In addition to the previous activities, there were various other areas and initiatives in which Clwstwr aimed at creating networks and collaborations through small grants and support mechanisms. One of the programme's important takeaways from creating such activities is that investment must be accompanied by an innovation ecosystem that provides support and knowledge. This can be time and resource intensive. Clwstwr's outreach consisted of 1,233 meetings with creative businesses at various stages of the process, integrating academic experts and organising 155 workshops and several Ideas Labs run by the partner PDR.[23] The majority of projects (77%) said that Clwstwr improved their perspective on R&D. This aided in the establishment of an innovation culture. As a result, between the beginning and end of Clwstwr, average annual R&D spending for Clwstwr-funded enterprises more than doubled (up 107% to £91,577). Especially targeted R&D funding encourages small companies (a significant majority of the creative industries) to contribute significant resources to R&D. Clwstwr's £3.42 million direct investment in funded projects resulted in an immediate £2.47 million company investment through match-funding, with later further investment totalling more than £5 million – a figure that will increase as more projects reach maturity. This could only be accomplished through collaboration. Overall, programs like Clwstwr can have a significant impact on economic growth, which is also driven by the ecosystems that are built. At a period when COVID-19 meant a drop in average creative company turnover (–3.2%) and employment (–11.3%) in Welsh' creative industries, Clwstwr-funded businesses increased turnover by 14.6% and employment by 21.3%. Clwstwr investment has already resulted in an increase in turnover of £20,446,443 and the creation of 446 additional jobs in the industry. Overall, every £1 of direct funding to businesses has already created £5.98 in turnover and £4.55 in GVA, with more to follow as businesses commercialise (Clwstwr Final Report: Clwstwr, 2023).

Discussion

In this section we analyse the impact small industry–focused R&D grants can have in 1) creating ecosystems of partner networks to support growth in the creative industries; 2) how data-driven innovation expands our

understanding beyond traditional measures of growth or scalability; and 3) realising a more robust notion of value, which is not only economic but also social and cultural (see also Chapter 5).

Our examples highlight that small industry–focused research and support can enable creative industries composed of micro businesses to become drivers of economic growth but that this relies on a diverse ecosystem of networks and partnerships. This chapter has demonstrated that previously independent sectors of the creative industries were funded and connected into a larger network of partnerships to explore R&D projects. We noted that the availability of funding was a critical part in the support of innovation. However, we argue that the partnership working between the educational organisations and industry partners was instrumental in supporting and enabling the ecosystem to grow. These networks were set up with the hope that they could be sustained beyond the duration of the funded projects through these existing partnerships, but future research is needed to analyse if this is the case. In addition, the network was supported by a programme of outreach events, delivered in partnerships with a myriad of hosts and sector stakeholders to expand understanding of data-driven innovation. Finally, the creative ecosystems (the universities and the industry networks) were critical in not only providing the funding and access to creative networks but also the human resources and infrastructure to manage the R&D administration, logistics, mentoring, and support for the freelancers and micro businesses and access other, larger networks for further funding and support in their innovation journey. Thus, these previously independent sectors connected to expand collaborations, improved skills, and expanded knowledge that grew the economy. This, as we noted, took significant human and financial resources.

We argue that the networked model of the creative industries supports different forms of growth, where growth is aligned to efficiencies in operational functionality as opposed to the linear growth model of a market driven economy, perpetuated by the start-up culture (Casnici, 2020). Scalability in the context of the creative industries relates more to efficiencies of these creative businesses by developing their existing product offer which supports the (financial) sustainability of their business proposition. With an industry dominated by micro businesses and sole traders, and with uncertain markets leading to precarity in the sector (hand to mouth), moving from bespoke services and design to scalability in terms of efficiency should thus not be confused with scaling growth as is traditionally perceived in the start-up sector.

Despite the creative industries making a significant contribution to the economy, these creative businesses consisting of 94% micro businesses, are often referred to as 'lifestyle businesses', a derogatory term (Taylor, 2011) that devalues their contribution. Recent research (Ratten, 2022) noted that societal changes in lifestyle trends affects entrepreneurship. Paying attention to cultural changes may thus signal broader changes in entrepreneurship. It is clear from Creative Informatics' research (Elsden et al., 2021) that the value

created through data-driven innovation in the creative industries was not just economic but also social and cultural. Supporting the creative ecology of partnership networks and collaborations – as outlined in our case studies – is evidence that a more flexible model of innovation that enables sustainable growth is facilitated by the network of governance that we outlined at the start of this chapter. The nature of the creative industries, with a significant percentage of SMEs and freelancers, supports a resilience at work: the loss of part of the ecosystem does not affect the overall ecosystem significantly. This would not be the case if the sector were dominated by a few large companies. Based on our collective knowledge of the creative industries, we noted that the fragmentation of the creative sector across a multitude of micro businesses is an asset with a flexibility that can respond quickly to changes in markets. However, the importance of the network is critical in sustaining and connecting those disparate parts. Further analysis of the Creative Clusters programme is expected to be published by the AHRC, but our recommendation is that funding for innovation should support not only the development of new products and services but, critically, should invest in a robust infrastructure that enables a rich ecosystem to develop by resourcing infrastructures (Examples 1 and 2) and enablers (e.g., Example 1.3). Our recommendation, following the network model of governance and the evidence of our case studies, is that investment in supporting the growth and sustenance of network is critical to a viable innovation ecosystem.

Conclusion

This chapter has demonstrated that proximity and access to creative ecologies are key to supporting innovation and growth in not only the creative industries but also to achieving the UK's goals of post-COVID recovery and the 'levelling up' agenda (UK Government, 2022) which aims to balance economic growth across regions.

This chapter shows that investment in networks is fundamental to success in innovation in the creative industries. Second, it also aligns with R&D, given that modest sums in supporting, and particularly the scaffolding infrastructure that supports R&D such as human and financial resources, can have larger effects. The networks also proved significant in attracting additional R&D funding through the networks enabled by the ecosystems. Third, we argue that the networking effect leads to the acquiring of skills through exchanges within the network and that opportunities for training arise from within these networks. (See also Chapter 4.)

However, further research is needed to ascertain how networks, established through the Creative Clusters, for example, can or will survive once the structural support has been withdrawn (funding and human resources) and the networks will rely on established connections within the ecosystem or on other partners to take over those functions.

We argue that national policy needs to support the resourcing of networks by working closely with devolved and regional partners. We argue that sustained investments in the development of networks that support cross-disciplinary creative ecologies are critical to innovation in the creative industries at large but more specifically for data-driven innovation, as it relies so fundamentally on the network governance of the creative industries.

Notes

1 The Creative Industries Policy and Evidence Centre (PEC)'s mapping of the UK's creative clusters is available at: https://www.arcgis.com/apps/View/index.html?appid=007e1de4a01a46b196ad2ccaed20eb3b&extent=-20.3307,49.5899,17.1766,59.5069
2 The South of Scotland Enterprise development agency's map of creative micro businesses in the region is available at: https://www.southofscotlandenterprise.com/media/1848/creative-industries-in-the-south-of-scotland-report.pdf
3 Recordings of the Annual Innovation Showcases can be found here: Creative Informatics Vimeo Account. https://vimeo.com/search?q=creative%20informatics%20innovation%20showcase
4 https://scottie.io/#Our-Work
5 https://creative-edinburgh.com/
6 https://creativeinformatics.org/resident-entrepreneurs/
7 https://creativeinformatics.org/challenge-projects/
8 The Lab event is available to view at https://vimeo.com/497714724
9 https://ukie.org.uk/members/scottish-games-network
10 https://tinderboxcollective.org/playaway/
11 See the Creative Informatics Annual Report, 2022, for more information about the broader networks and ecosystems supported by the project (Annual Report, 2022: https://creativeinformatics.org/wp-content/uploads/2022/06/CI-ANNUAL-REPORT-2022-FINAL-VERSION.pdf)
12 https://clwstwr.org.uk/
13 https://clwstwr.org.uk/projects/ai-newsroom
14 https://clwstwr.org.uk/clwstwr-and-ffilm-cymru-launch-new-green-cymru-challenge-fund-sustainable-screen-sector-wales
15 https://ffilmcymruwales.com
16 https://clwstwr.org.uk/severn-screen-making-film-production-greener
17 https://clwstwr.org.uk/amgueddfa-cymru-challenge
18 https://www.thebureauinvestigates.com/explainers/what-is-the-peoples-newsroom
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CASE STUDY

**Collaborative R&D into new modalities of experience:
Civic Digits Theatre Company and *The Big Data Show***

Civic Digits Theatre Company[1] was formed in 2017 by artistic director Clare Duffy, a playwright and director who wanted to create a space to figure out what it means to be human in our digital futures. *The Big Data Show* (https:// civicdigits.com/project/the-big-data-show), Civic Digits' first major production, emerged from a chance meeting between Clare and Rupert Goodwins,[2] a technology writer and journalist and chief technology officer for Civic Digits. In 1984 Rupert was one of a group of young hackers involved in gaining access to Prince Philip's BT email, which became the subject of a landmark legal case – an experience which became the inspiration for the show, co-authored by Clare and Rupert.

Following several years of development, *The Big Data Show* has emerged as an immersive hybrid performance exploring cyber resilience and digital citizenship and designed for audiences around 11–13 years old. It takes place simultaneously on mobile phones and either online (delivery via a website) or (as originally envisioned pre-COVID-19) in a theatre/school environment. The show and accompanying workshops are recognised as an SQA-accredited course (Civic Digits, 2021). It has been funded by Creative Scotland, the Scottish government (Cyber Resilience unit), Garfield Weston, and Digital Xtra and co-produced with Perth Theatre and Unlimited Theatre.

Civic Digits first approached CI/Design Informatics in late 2019 to explore potential collaboration for a series of workshops to accompany a planned tour of *The Big Data Show*, which would take the production to schools across Scotland and public performances at the Lyceum Theatre, Edinburgh. Civic Digits worked with Creative Informatics PDRAs Pip Thornton and Susan Lechelt as well as CI/Design Informatics research software engineer Evan Morgan to develop the workshop concept as well as providing some support for evaluation approaches. The workshops were trialled in late 2019 using a 'Build your own motorised emoji' idea that takes facial recognition data and open source data sets and translates it to 'data physicalisation' – a series of motorised blocks/ modules that express data in playful and engaging ways (e.g., representing data as the wiggle of a very tangible furry eyebrow). This work builds upon recent Design Informatics research and the emergent 'VizBlocks' software approach, which is a tangible, modular, and hackable toolkit to support physical data visualisation (Visblocks, n.d.).[3] The development of the workshops was mutually beneficial for both Civic Digits and Creative Informatics, as it allowed the existing research approaches to be applied and tested by a highly engaged

and critical young audience. This led to development of the workshop formats themselves, as well as furthering development of the VizBlocks system with benefits for other projects using it. In addition to researcher contributions, Creative Informatics supported the costs of expanding the physical hardware so that sufficient kits could be created for touring.

Civic Digits were able to pivot *The Big Data Show* to a new digital version (*Cy and Bug's Big Data Show*) with performances running from September 2020, developing substantial new expertise to deliver compelling online experiences. An online handbook[4] helped teachers, educators, or guardians to tell the story of the first public hack and how this impacts us today. CI is currently collaborating on potential approaches to package (e.g., as shippable kits) the VizBlocks workshop to schools engaging in a re-imagined workshop format to accompany the online show. This work was dependent on anticipated returns to physical schooling following the easing of lockdowns.

In December 2020 Civic Digits was also successful in securing funding of £50k from Creative Scotland, supported by a further commitment of £9,500 cash and in-kind support from Creative Informatics for 'Digitally Extended and Expanded Performance' workshops build on concepts and literacies introduced in *The Big Data Show*, which encourage children to play, explore, and understand how they can take control and reflect upon their relationship with data. An extensive schedule of workshops and performances had been planned for spring/summer 2020 when the COVID-19 lockdown began. This new R&D project allowed Civic Digits to build on strategic and operational work initiated during development, production, and digital pivot (due to COVID-19) of *The Big Data Show*.

In addition to this new project, Clare Duffy was also successful in an application to become a Creative Informatics Connected Innovator, supporting skills development and explorations of new data-driven and technical approaches that should further enhance Clare and Civic Digits' capability to deliver exceptional and highly innovative new theatrical experiences.

Civic Digits' work also featured at the PlayAway Games Festival organised by Tinderbox Collective and hosted by another CI recipient and Connected Innovator, Brian Baglow (Tinderbox, 2023), and CI Lab #15: *Just the Ticket – Performance, Payment and Data*. Two free performances of *The Big Data Show* took place during Cyber Security Week Scotland in 2021.

As outlined, through the Creative Informatics network, Civic Digits gained access to collaborators, funders, and partners that helped them develop their work and amplify it through the various networks that Creative Informatics connected them to. Thus, the network governance was enabled by the Creative Informatics network to connect to a wide ecosystem of partners.

Inge Panneels

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Case study notes

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