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Developing Data-Driven Innovation in Creative Industries

Developing Data-Driven Innovation in Creative Industries: White Paper

Caroline Parkinson, Chris Speed, Melissa Terras and Ritchie Somerville
Edinburgh, July 2020
Lead author: Caroline Parkinson (Caroline.parkinson@ed.ac.uk)

About this Document

This White Paper reports on the findings of the Data-Driven Innovation (DDI) Programme Sector Development consultation (2018-20), which investigated the data capability and further potential for innovation across the creative industries in the Edinburgh and South East City Region of Scotland. It presents an overview of the findings with early models of delivery through The University of Edinburgh to stimulate greater awareness and support for data innovation ambition, as well as key themes to focus on for future development.

Consultation was conducted with the creative industries community in the Edinburgh and South East City Region, including Scottish creative industries trade bodies and networks, leading creative companies and individual creative practitioners, and with staff in The University of Edinburgh. We are grateful to the industry for their feedback, and to colleagues within the Data-Driven Innovation Programme, Edinburgh Futures Institute, Creative Informatics Cluster and their partners Edinburgh Napier University, Codebase and Creative Edinburgh for their input, advice and support.

The consultation that informs this White Paper was initiated and supported by the Data-Driven Innovation Programme of The University of Edinburgh within the Edinburgh and South East City Region Deal.

Acknowledgements

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Foreword

In 2018 we posed the question, "How can the creative industries be best supported to make use of data-driven innovation and digital technology opportunities?" The consultation that underpins this report, and the associated Sector Plan, was undertaken prior to the coronavirus crisis.

The consequences of the preventative measures put in place to arrest the spread of the virus have been profound for the operations of many of the creative industries sub-sectors and has significantly reduced or completely erased their income streams. The survival of every creative and cultural venue is under threat, with calls for support to sustain the cultural infrastructure until operations can return to previous levels. As some parts of the creative sector have moved to online platforms to promote and sell their creative work, or to stream live music or provide online events, others have realised that their data and digital needs, in skills or innovation expertise covered in this White Paper, have become ever more pressing.

We are very aware of the suffering the current crisis has wrought on the creative sector, and we wish to do what we can as a university, with our resources and expertise, to support the journey through and out of the crisis. This may involve signposting to easily accessible learning, online sharing and 'how to' sessions. There may be potential to place internships within industry to explore new options through hands-on research support. The University of Edinburgh is able to facilitate collaborative working with industry to access research and innovation grants to fund the study, and development of new models. As well as provide expertise from our academics or to share new innovations in data-driven or creative technology to provide keys to how the sector might trade or perform through and out of this crisis.

This paper outlines the findings, plans, and activity undertaken, through late 2018 and into 2020 to which we have been working and that we consider remain relevant. Although this paper was scheduled to be published at this time, before completion we consulted with the trade bodies in the sector to provide a current perspective. As a result, we have added a note at a few points in the body of the text but have largely contained this addition within an addendum on the impact of Covid19, which, along with this foreword, bookends the original study. We hope it provides a useful roadmap for institutions, policy makers, and individuals in the creative sector, who are faced with new challenges, and a more pressing need to innovate in this rapid pivot to digital.

Caroline Parkinson
Sector Lead – Creative Industries
31 July 2020

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Executive Summary

The Edinburgh and South East Scotland City Region Deal, informed by the Science & Innovation Audit 2017[1] identified the growing strength and potential of data in the region, and proposed a Data-Driven Innovation Programme[2] (DDI) at The University of Edinburgh that would focus its energies and expertise on inclusive economic growth in ten sectors, including the Creative Industries, and the related sector, Tourism & Festivals.

To identify the needs, challenges and opportunities of the sector concerning Data-Driven Innovation, a Sector Lead for the Creative Industries was appointed in July 2018 to undertake a consultation with the sector and The University of Edinburgh stakeholders towards developing a proposal for activities to support the needs of the sector.

This White Paper outlines the findings from this consultation of the Scottish creative sector's relationship with data. It reveals variable levels of data adoption within the sector, and although data is rich with potential for innovation, for many creatives their adeptness in harnessing data for creative or business benefit requires development support, and insight. We have identified areas where The University of Edinburgh and the DDI Programme is able to provide help and have initiated co-created interventions to begin to test the effectiveness of the support designed.

The DDI Programme has consulted with Scottish creative industries trade bodies, creative networks, leading key players from a range of creative companies, and individual artists and makers across the creative industries in five data-related themes that The University of Edinburgh proposed to develop through the DDI Programme.

1. Talent – what data related knowledge or skills, or skills gaps, do you have?

2. Research – do you have ideas for innovating with your data that you would like to research further?

3. Adoption – is the company or organisation using data as a daily practice?

4. Datasets – what datasets do you hold or would find useful to combine to gain insights?

5. Entrepreneurship – what new innovations would you aspire to create in artistic work, audience experiences, or products and services that use/generate data?

The feedback presented here has informed how the DDI Programme and The University of Edinburgh could respond to the sector's data needs, and how we plan to support the desire to develop and innovate with data. Our conclusions approach the subject in terms of the value of data to creative companies, and the potential for data innovation in the creative industries to drive new products, services, artistic and creative content production, and audience experiences.

Summary of Findings

Firstly, we found that there is an uneven data capability across the 16 sub-sectors, which are defined in Scotland as; Advertising, Architecture, Visual Art, Computer Games, Craft and Antiques, Design, Fashion & Textiles, Film & Video, Heritage (Libraries & Archives), Music, Performing Arts, Photography, Radio & TV, Software/Electronic Publishing, Writing & Publishing, and includes the contribution of Cultural Education.[3]

The variety of data capability spans those excelling with data in artistic and creative content, analytics, and the innovative design of products and services; to those competently using their data for insights within their business; and to those hesitating just a few steps beyond the GDPR or information literacy starting blocks. Our interviewees emphasised a lack of comprehensive data training that is easily identified and suited to their needs. Many associated data capabilities as keys to unlock insights, with data itself as the mysterious 'black box'.

Secondly, there remained an appetite for exploring the potential of data. In general, creative practitioners recognise the power of data to provide insights, influence decision making, drive effectiveness and develop new business models. Data innovators also recognised there was more that can be achieved, and are interested in supported opportunities, and information on new developments in data and creative technology to inspire further innovation in their companies, in collaboration with The University of Edinburgh and others.

Thirdly, however, since the value of data is not fully realised by many across the sector, the impact of data has been limited and is likely to remain so until several needs are addressed:

- **Skills** – Access to training, with guidance on creative technology and selecting software and data platforms. (A barrier for certain sub-sectors of the creative and cultural industries can be affordability, and the need to justify investment in recruiting new graduates equipped with data expertise without being certain of the benefits and value of doing so.)

- **Information** – Guidance beyond GDPR, including what can be done with data, data sharing and data sharing agreements, data ethics and protocols, managing data, and data storage options.

- **Insights** – Raising awareness of the potential of data through successful examples of others' activity in the sector, demonstrations from local and national leaders in the field, as well as innovations showcased from the international creative sector, and research and innovation from within The University of Edinburgh.

- **Innovation Support** – Guidance towards innovation, workshops to facilitate ideation and to harness emerging research and new creative technology, assistance in forging collaborations, and a co-designed and financially supported process to bring innovations through to market readiness.

Proposed Action Themes

Through consultation and early activities we concluded that supporting the sector on a journey of data maturity, from wherever their particular starting point might be, is the key to developing the sector's capability and therefore confidence, leading to enhanced business and creative performance, and with further support, to realising innovation and new audience experiences.

We propose a focus on the following four themes to address the needs of the sector and develop data maturity and data-driven innovation;

1. **Data Capacity** – Upskilling and New Talent (*Talent, Adoption*), Management and Processes, Trust and Ethics (Adoption, Datasets)

2. **New Business Models** – Support to draw out value from their data, research new modes of engagement and transaction with audiences, customers and clients (*Research, Entrepreneurship*)

3. **Realising Innovative Ideas** – Collaborative partnering on new developments and invention, and providing assistance to access innovation funds and guide through design innovation processes (*Research, Entrepreneurship*)

4. **New Experiences** – Informing and inspiring on how to harness data-driven creative technology, supporting and providing space for experimentation with creative technology to develop New Experiences (*Talent, Research, Adoption, Datasets, Entrepreneurship and Public Engagement*).

This White Paper presents the background and development, and findings aligned to these four categories.

Carol Sinclair and Lorna Fraser, ceramic artists – developed innovation partnership with the University of Edinburgh exploring biodegradable materials and re-use of plastics in craft, and explored methods that could transpose to other industries.
Photo Credit: Caroline Parkinson 2017

1 https://www.ed.ac.uk/news/2016/report-points-to-digital-boost-for-economy
2 http://www.ddi.ac.uk
3 https://www.gov.scot/policies/creative-industries/

Introduction

The role of data in our society has become ubiquitous. As the digital revolution has unfolded it has been entwined with data – its use, collection, analysis, storage, and sharing. An understanding of all that this entails has evolved, and for many, their data education has lagged a few steps behind the building of the digital panoply that surrounds us.

In the creative industries the global advances in digital means of production and delivery, new technology for consumption of content, and digital communications with audiences, have transformed the sector and has required most organisations to evolve and recruit the skills to handle the digital revolution and the variety and volume of concomitant data.

The creative and cultural sector is not one thing:

• it is a collective of creative professions each with their own methods of creation, production, delivery and distribution;

• creative professions that have their own business models, history, and journey in relation to digitisation, and;

• their use, adoption and handling of data, is individual to them.

The creative and cultural sector is defined in Scotland as; Advertising, Architecture, Visual Art, Computer Games, Craft and Antiques, Design, Fashion & Textiles, Film & Video, Heritage (Libraries & Archives), Music, Performing Arts, Photography, Radio & TV, Software/Electronic Publishing, Writing & Publishing, and includes the contribution of Cultural Education[4]. It includes those that create unique artistic work in art, craft, music and dance; create, present, adapt and distribute stories in literature, theatre, film, TV and radio, or information through journalism, radio and magazines in various formats for a wide range of audiences; provide creative advertising, design and marketing services to clients; design buildings, interiors, musical instruments, furniture, textiles, and fashion design, costume and clothing; develop animation, visual effects, games and interactive entertainment; and, safeguard, catalogue and exhibit the literature, culture and history of the nation. It is also the sector that provides the design and build of web platforms, and software tools to help creatives deliver to clients and audiences. All of this activity in one form or another generates or uses data. In this white paper we are differentiating between digital - digitisation of creative practice, digital systems, digital skills - and data – data gathering, manipulation, insights, data-driven technologies.

The range of forms of data is as varied as the collective itself – from artists handling data in motion graphic projection; technical directors using data in theatrical set and lighting design; librarians and archivists digitising collections; dancers and actors working with motion capture; architects and designers using data to inform design and in 3D modelling; makers using data about materials to inform production or process decisions; screen industry creating worlds with digital 'film', CGI, VFX, and animation; interactive media creators using data in games, virtual and augmented reality, photogrammetry, 3D volumetric filming; and music producers recording sound digitally, and using audio plug-ins, midi, software that manipulates the input data in recording, creating STEMs for syncing - and us, as the audience, also generate data when customising music and film streaming choices with our own preferences - and the list goes on.

Like businesses in other sectors, those working in the creative industries hold client data, financial data, sales and customer data, and have data storage and back-up systems that require high speed broadband to handle their data and conduct their business. For many creative and cultural companies data is a fundamental part of business practices, and insight from their data is essential to understanding their business, their audience, their sales and the effectiveness of their work; such as, box office statistics and audience demographics, or analysing advertising campaign success, or using analytics to inform the design of new products and services.

The legislative changes, particularly around privacy data in mid-2018 with the introduction of General Data Protection Regulation (GDPR)[5] triggered a moment to bring data front and centre, but it also created hesitation in some quarters in their further use of data. Individual practitioners and companies expressed worry about whether they were handling it correctly, which limited the adoption of new effective practices, or postponed decisions on purchasing and mastering new software and hardware.

There has been a sense that there are positive benefits and new possibilities that confident data handling could bring, but they lie just beyond reach of many individuals' current knowledge, skills, systems or budget. That is combined with a gnawing realisation for many that the move towards a data-driven digitised society is inexorable, (particularly for a post-Covid19 society) and it is now time to grasp the power of data and embed data approaches to support and deliver creative, audience, client and business benefit.

These factors drive those in the creative and cultural sector to seek out the means to inform themselves, learn more, experiment, explore solutions and funding support, research, innovate, and to develop and share data-related skills.

This presents an opportunity for The University of Edinburgh to support the sector pro-actively, in order to develop its data capability, and to promote data-driven innovation across the region.

Organisations and individuals in certain sub-sectors have mastered data-led approaches, and regularly innovate with data, and a few creative innovators have even discovered the data generated proved to be more valuable than the original business activity and have pivoted to innovate and realise the "new" value held within their data.

Yet there remain many practitioners, SMEs, and creative and cultural organisations, or layers within organisations, that have struggled to keep pace with data and related digital technology and upskilling.

4 https://www.gov.scot/policies/creative-industries/
5 https://www.legislation.gov.uk/ukpga/2018/12/
   pdfs/ukpga_20180012_en.pdf

ddi.ac.uk

Background to the Sector

The creative and cultural sector in Scotland has been growing, and the appetite for collaboration and innovation has been intensifying both within it, and also with other industries.

The latest Scottish Government Economic Growth Statistics (2018[6]) available state that the creative industries in Scotland comprised 15,505 businesses, 80,000 jobs, generating a GVA of £4.4bn, and a total turnover of £7.44bn. That being said, for many creatives and cultural organisations their businesses would still be described as fragile, with tight margins, and achieving consistent, well paid work (or secure funding) to provide core strength and reserves are the constant aims. As a result, many in the sector will be severely affected by Covid19.
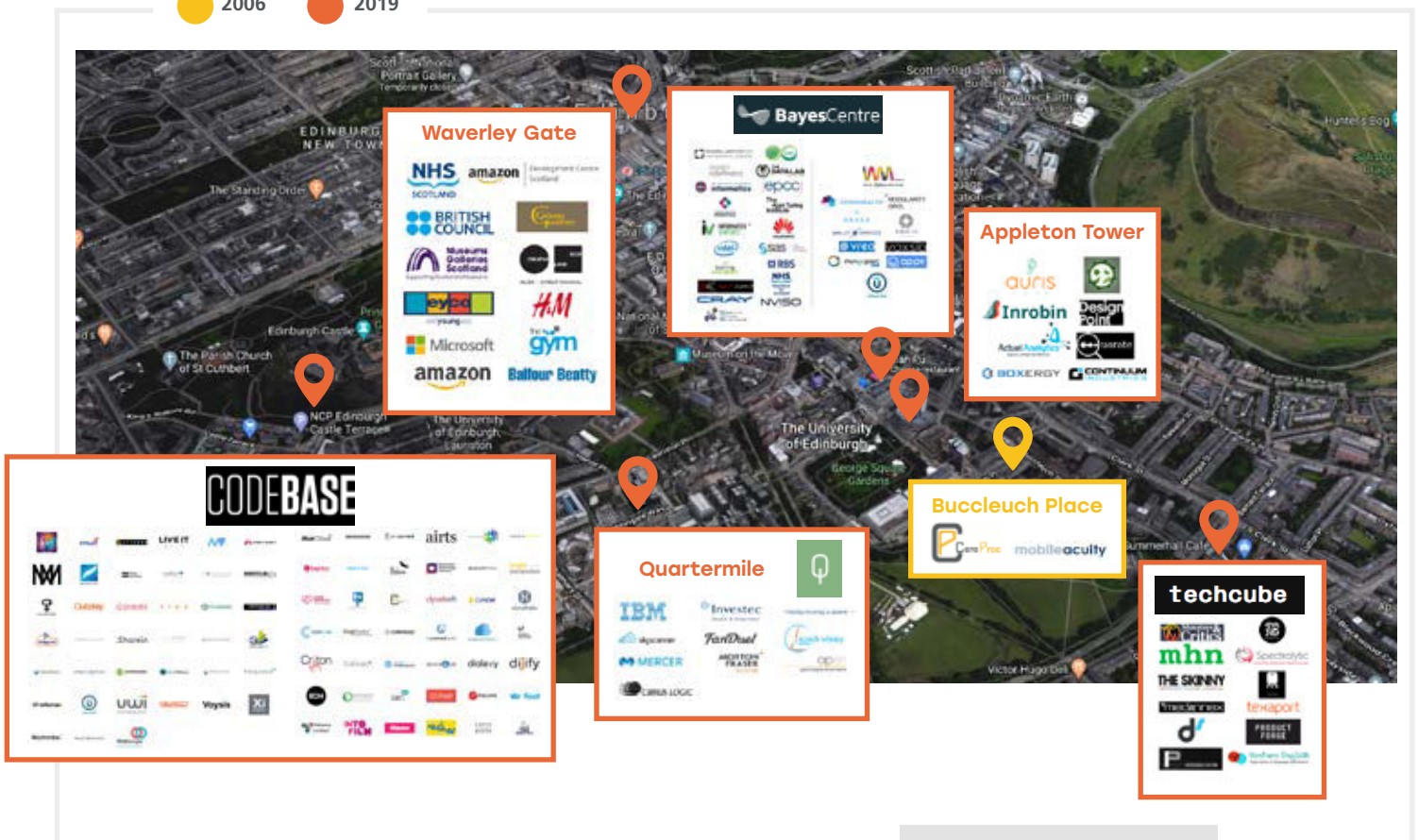
Edinburgh and South East City Region
The growth in the sector is also evidenced by the various creative hubs and co-working spaces within creative clusters around the city being at full capacity. The freelance community is a major part of the creative ecosystem, and although hard to track in official statistics, taking the membership of Creative Edinburgh as an indicator shows that Edinburgh is now burgeoning with freelance numbers, sole traders and start-ups up increasing from 3000 members in 2016 to 4700 members in 2020. Likewise, Edinburgh Innovations reports that the digital quarter around The University of Edinburgh grew from a few companies in 2006 to over a hundred in 2016.

2018

15,505
businesses

80,000
jobs

£7.44bn
total turnover

The Digital Cluster

● 2006　● 2019

5530 based in
Edinburgh & South East city region

Scottish creative companies

The total number of creative companies in Edinburgh within the Scottish Government Growth Statistics[6] was 3335 (compared with 2540 in Glasgow). When added to those within the South East City Region of Fife, 735; Midlothian, 245; West and East Lothian, 545 and 350 respectively; and the Borders, 320; the total number of 5530 reflects that just over a third of Scottish creative companies are based in Edinburgh and South East city region.

The National Endowment for Science, Technology and the Arts (NESTA) has described Edinburgh's high growth, high concentration cluster as a 'Creative Challenger', "on track to become one of the central nodes within the UK's creative geography"[7]. Awarded the British Entrepreneurial City of the year in 2016,[8] Edinburgh has the highest current activity and potential for growth across key technology sectors such as data science (artificial intelligence and machine learning) and new experience technologies (AR & VR) outside of London, and the third highest for creative tech.[9] Edinburgh hosts the European Research & Development Centre for Amazon and Microsoft, as well as home grown unicorns, Skyscanner (www.skyscanner.net) and FanDuel (www.fanduel.com), which are start-ups both incubated in Codebase (the fastest-growing creative tech accelerator in the UK) and now both located in Quartermile, near The University of Edinburgh campus.

The city also has the largest concentration of cultural employment in the UK,[10] is among the 10 strongest clusters of Museums, Galleries and Libraries in the UK, organises and hosts the world's third largest event, the Edinburgh Festivals, and has the highest combined concentration of employment and businesses in the creative industries in Scotland.[11] The sheer intensity of arts and cultural activity, combined with proactive networks of collaborative multi-disciplinary creatives, growing design agencies, and burgeoning data/tech companies, make Edinburgh a dynamic cluster of creative industries. With nearly 30% of all creative occupations in Scotland relating to the digital sectors, the imaginative work of artists, designers, curators and programmers in Edinburgh is already creating multi-disciplinary performances, art, craft, projects and businesses.[12]

This bodes well for future creative interdisciplinarity, and NESTA identified five future career areas that will be in demand over the next 20 years, which included animation, media production and design in engineering, building and maintaining IT network systems, and research and quantitative data research. Roles that are expected to grow are those with a focus on tasks that are non-routine, problem solving, and creating digital outputs.[13] It is hard to imagine which roles will cease to be as prevalent within the sector but their study indicates that human resources management, accounting, procurement and legal advice will become more automated.

The sector is highly skilled, with over 50% having achieved a degree level of study. The two Sector Skills Councils that cover the 16 sub-sectors of the creative industries report workforce educational attainment within their footprint analyses. Screen Skills, previously Creative Skillset, reported 52% of the creative media workforce holds an ordinary degree level qualification[14], and 25% have attained a postgraduate qualification. Similarly, Creative & Cultural Skills' (CC Skills) reported that two thirds of the workforce are qualified to degree level or above.

However, education and training related to creative and artistic practice covers a wide range of professions, and data has not necessarily formed part of each strand of that provision. This was borne out in consultation with Scottish creative industries trade bodies and key creative industry players who reported that the levels of data maturity vary widely across the sector and within some sub-sectors.

This presents a complex challenge to develop data confidence and proficiency evenly across the creative and cultural industries, whilst simultaneously supporting those who are already data experts to utilise their creativity, curiosity and desire to reach out into new horizons of innovation.

The DDI Programme delivery over ten years (2018-2028) with measured impact to 2033 (15 years) provides a unique opportunity to address this set of complex needs co-creating the response in partnership with the sector.

6 https://www2.gov.scot/Topics/Statistics/Browse/Business/Publications/GrowthSectors/Database

7 https://www.nesta.org.uk/publications/creative-nation

8 https://www.greatbritishentrepreneurawards.com/previous-years/2016-winners/

9 http://odileeds.org/projects/uk-tech-innovation-index

10 https://ceprogramme.com/cicp/mapping-data

11 https://ceprogramme.com/cicp/cluster-data

12 https://www.skillsdevelopmentscotland.co.uk/media/35670/creative_sip_digital_v4.pdf

13 https://www.nesta.org.uk/report/which-digital-skills-do-you-really-need/what-we-did/

14 Creative Skillset, Creative Media Workforce Survey 2014 and Creative and Cultural Skills Sector Skills Assessment 2011. Creative Skillset's remit includes film, TV, digital media, writing and publishing and fashion and textiles; and Creative & Cultural Skills' remit is advertising, architecture, crafts, design, music, performing and visual arts.

Vision and aims

As digitisation and digital technology has revolutionised the creative and cultural industries and required the development and adaptation of individuals and organisations, so the next evolution, that of data, will also. For the city region's creative sector to continue to stay at the forefront of the market, in developing new experiences and realising new ideas using data-driven innovation, the creative industries will need resources to keep pace with change to support their data adoption and data innovation.

The Edinburgh and South East City Region Deal highlighted the potential of data-driven innovation for economic growth, and particularly specified the creative industries amongst their ten priority sectors for support. The University of Edinburgh is leading the Data-Driven Innovation Programme (DDI) on behalf of the City Region Deal and has dedicated its new Edinburgh Futures Institute (EFI) to developing the data knowledge and innovation of the creative industries, festivals and tourism, financial services, public sector and future infrastructure.

The aim of The University of Edinburgh's DDI Programme is to support the creative industries sector to become data skilled, data confident and data innovators. We seek to assist creatives to adopt data into their day to day practices, to gain insight from their data and inform decision making, to improve business effectiveness, to reach and better understand new and existing audiences, to create new exciting work that can realise what they imagine, and in turn to strengthen their audience engagement, economic resilience and growth. We will offer our expertise and draw upon the academic knowledge across The University of Edinburgh, to collaborate with creatives to allow them to innovate, to invent new experiences, and develop platforms with new business models. We will provide opportunities and space to support experimentation with data and creative technology to add to their creative practice.

The Edinburgh Futures Institute is currently developing its Under-Graduate, Post-Graduate, Continuing Professional Development and online learning programme in preparation for opening the new facility in Spring 2023. It will be a global centre for multi-disciplinary, challenge-based data-driven research and innovation, teaching and impact, and will deliver a range of talent, research, data, adoption and entrepreneurial (TRADE) and Inclusion programmes that will not only address sectoral data and technology issues but also the social, political and cultural enablers and barriers, and support other programmes under the wider City Region Deal. A particular emphasis of EFI will be on the ethical implications of big data analytics and machine learning as well as the critical infrastructure needed to drive social, economic and cultural inclusion.

EFI's focus on data ethics is essential in today's society and ethical frameworks are necessary to garner public trust in how our data is handled when recorded for medical or financial purposes, or registered for public services, including those offered by the creative and cultural sector. We aim to harness data for good and to support data citizenship so that everyone can understand, handle and protect their data. EFI will be open to the public as well as industry, and together with academia will co-create design solutions to challenges facing Edinburgh's citizens using data and develop data citizenship. EFI will provide public access to get involved in societal challenges, to test developments and see prototypes in exhibition through the Edinburgh Living Lab[15], and to participate in workshops, take classes or use online resources and attend performances in the theatre. The use of creativity and data visualisation in this context, can make the invisible visible, bringing data to life.

The city region's creative and cultural companies, freelance workers and sole traders, will all have access to the initiatives of the programme, and can engage with the programme at the level that is appropriate for them in their own data journey. Engagement will vary in intensity from e-newsletter updates, awareness raising events or seminars, to training and online learning, or demonstrations of creative technology and data-driven innovation, to opportunities for participating in innovation labs and research collaborations.

It is our aim that the activity of The University of Edinburgh will contribute to creating a culture of data awareness and ethical data practice. As the Edinburgh and South East City Region work towards the ambition of becoming regarded as the data capital of Europe, there may be scope for that to be expressed through creative and cultural means in the public space. In these ways, EFI will support the data development needs of the creative industries sector itself, and it will champion creativity, culture and design in its means of engagement with the public and other industry sectors.
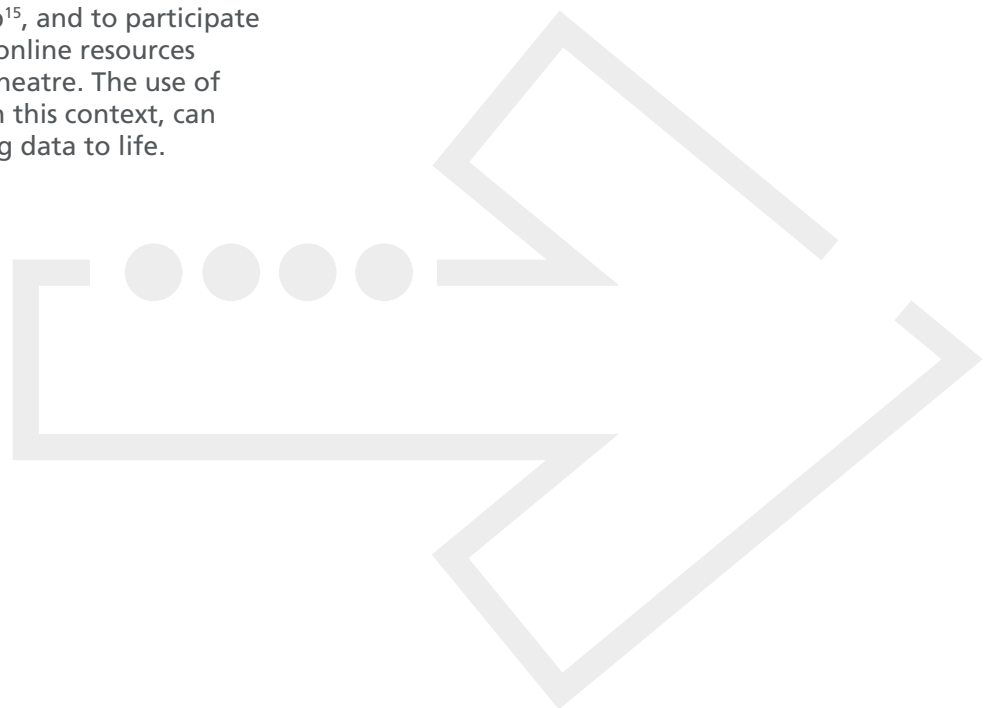
15 Edinburgh Living Lab https://www.edinburghlivinglab.org – part-funded by DDI Programme

Findings - Needs, Challenges and Opportunities

Consultation Approach

The Sector Lead for the Creative Industries was appointed in July 2018 by the DDI Programme and the Sector Consultation commenced shortly thereafter. The initial stages included stakeholder engagement across the Schools and Colleges involved in the creative industries in The University of Edinburgh, as well as business engagement managers and Edinburgh Innovations; engaging the trade bodies and networks of the creative sector to ascertain the data skills and data innovation capacity within each of the sub-sectors; discussions with a cross-section of industry players and artists using data; and national cultural bodies, City of Edinburgh Council, Creative Scotland and Screen Scotland. This led to identifying the scale of the sectoral need and demand, existing internal provision and capacity, and researching the external market in Scotland, and international best practice leading to discussions with identified organisations. A list of stakeholders we engaged with is included in the Appendix.

Consultation Questions

Approximately 60 Creative industries consultees were asked a set of semi-structured interview questions around their data needs, which framed discussion;

1. **Talent – what data related knowledge or skills, or skills gaps, do you have?**

2. **Research – do you have ideas for innovating with your data that you would like to research further?**

3. **Adoption – is the company or organisation using data as a daily practice?**

4. **Datasets – what datasets do you hold or would find useful to combine to gain insights?**

5. **Entrepreneurship – what new innovations would you aspire to create in artistic work, audience experiences, or products and services that use/generate data?**

Findings

Creative trade bodies reported regular requests from members for information to stay up to date with data and digital developments including data regarding the sector, audience and business data systems, online retail platforms and data analytics, and training seminars and conference workshops on these subjects. We observed hesitancy in implementation within members' companies for a range of reasons including: being confident in making decisions armed with the latest up to date information; reluctance to invest in a system they fear may be outpaced shortly after with a new and better solution; weighing up business benefit versus commitment of budget to invest in new systems, upskilling, consultancy advice, storage and cloud services, or caution in the resources needed to create a new post with data expertise to develop their data capability.

Sole traders, individual artists and makers expressed hesitancy and feeling under-equipped to make decisions relating to data management. They could assess digital developments more easily and calculate a direct correlation to positive impact on their creativity or business, which led to quicker decisions to commit budget to purchase and time to learn and implement new digital creative practices or online marketing and sales platforms. Their awareness of the need to familiarise themselves more with the potential of data remains, and with positive curiosity in how they could harness it to enhance their creative practice. Yet some still expressed fear in handling data correctly with compliance and ethics in mind, and a concern that data was shrouded in mystery and handling data was a 'dark art' mastered by others, and not by them. Artists working with digital technology and data sought to know more to fuel their imagination and take their creativity further. However, to develop innovation and experiment with new audience experiences requires financial resource.

Creative and cultural companies were largely very conversant with their own data and some were reviewing their processes, cleaning their databases, drawing insights from their client, audience and customer data, and enhancing their service to their audiences as a result. Some were also considering how to share data with others in the same field for greater insights and examining trends in audiences and the market. Their main aim was to improve their data and looking to develop enhanced services and better decision making from their data. The potential to access external data sources for greater insight and exploring what was possible in innovation were of interest. Those creating audience experiences were using digital technology and data to enhance creative output e.g. technical theatre were interested in new developments to bring to productions for audience enjoyment, such as motion capture and holographic projection.

Leading industry players demonstrated adeptness with their use of data for themselves and their clients, proficiency in setting up analytics to draw out the performance and monitoring reports they require, layering data from various systems to gain insights, and external data analysis to identify trends, market gaps or sales potential. Companies generating data from the use of creative technology in creating content were looking for new innovations to quicken the process across the chain; in workload management, spotting errors in creative work through artificial intelligence (AI) or machine learning (ML), exploring high volume data storage, speed of handling, and secure affordable back-up systems. Some had paid to install their own broadband fibre in their street to increase their connectivity volume and speed, developed their server capacity, purchased cloud back-up storage and developed their own render farms. They were eager to keep abreast of international markets through data on their industries, and emerging new creative technology, and compete at a national and international level. Their investment in time and funds into innovation was mentioned but they would seek collaborative support and investment to develop and realise innovative ideas.

The consultation findings from the above groups can be collated under the following categories, in all points trust and ethics were raised as a concern;

1. **Data Capacity – People and Systems** – The need for better data skills (upskilling and new talent); how to identify the right software platforms for data processing; securing fast broadband connectivity for processing, handling and transferring high volumes of data at speed; data security and selecting the best data storage systems for the longer term.

2. **New Business Models** – Understanding the value of data to their business; how their data can be harnessed in new ways that can create added value; how they can work with client data to design enhanced or new products, services; if they have digital assets - archived creative content or digitised artefacts - can ideation and research support help drive value from these assets?

3. **Realising innovative ideas** – Creative practitioners, cultural organisations and creative companies require support to innovate, in guidance, research for specific knowledge gaps and early stage funding support. Realising an idea quickly for market advantage is a challenge requiring a timeous process of advice, development and investment. Although proficient in ideation and co-creation design with clients and prototyping, much of the creative sector is not as confident with commercial investment and innovation processes, and only recently become aware of the potential of R&D tax credits.

4. **New Experiences** – The strength of the sector lies in the imaginative power of creatives and artists to bring to the public new experiences, using all sorts of media. To imagine what is possible with data-driven creative technology requires awareness of new developments, demonstrations of their capabilities, and access to experiment with these tools in a test space before installed in situ.
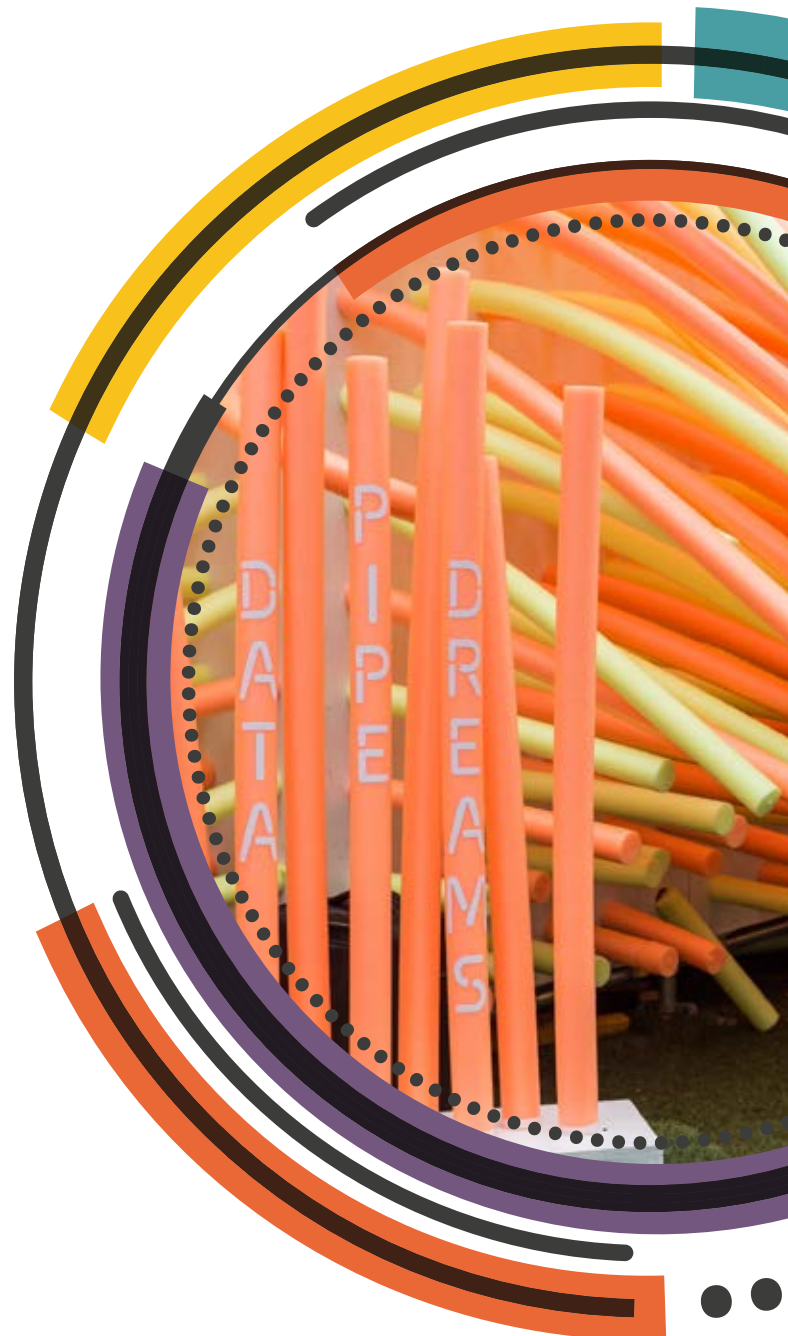
Data Pipe Dreams Pavilion by Design Informatics at the Edinburgh Festival Fringe, 2018. Credit: Design Informatics

Engagement Activities

The consultation was augmented by the Sector Lead for the Creative Industries delivering a range of engagement activities throughout 2019. Informed by the consultation findings, the approach taken was to deliver awareness raising events, trade body specific development seminars, and innovation workshops and demonstrations.

Awareness-raising

- Attended creative industry events to speak on data-driven innovation.

- Conducted consultative workshops on data as part of creative industry conferences.

- Wrote articles and blogs to raise the profile of data-driven innovation in creative industries.

- Enhanced Student awareness of data opportunities in creative sector through Careers Fairs and supporting Data Marketing Association's three-day Creative Data Academy at Inspace.

- Showcased creative data-driven innovation in the DDI annual conference.

Development

- Business engagement to identify potential skills, research or innovation collaborations.

- DDI sponsorship of Scotland IS Skills Survey including questions on data[16].

- Co-created seminar and case studies for the Publishing, Literature and Theatre sectors.

Innovation

- 'Collider' Innovation Workshop for Articulate Trust (www.articulatehub.com), which provides art and making experiences for cared-for young people. Workshop leading to academic collaboration on research and designed tool for cared-for young people and social workers.

- 'Collider' Innovation Workshop with Design Informatics for the Institute for Practitioners in Advertising and Data Marketing Association showcasing a range of new data-driven technologies from the Design Informatics department and facilitating ideation to place these into practical customer facing services.

- Creative 'mash-ups' - collaboration with space and satellite academics at the Bayes Centre and industry representatives with the creatives from data visualisation, games and animation sector leading to new project ideas.

- Space & Satellite Data Artists Residencies with a showcase within Inspace (postponed due to Covid19) announced 4.3.20 and launched online on 16.7.20 (www.inspace.ed.ac.uk).

16 Scotland IS Skills Survey (additional data questions supported by DDI Programme) https://www.scotlandis.com/scottishtechsurvey/

Reflections on Consultation and Engagement Activities

As the sector is a collective of 16 different professions, the potential for data-driven innovation in creative terms lies in exploration within each discipline; – exploring what could be done in animation and VFX, advertising, digital design, fashion wearables, and fashion retail, games, immersive experiences, film & TV, music, visual art, craft, dance, theatre, writing and publishing, and photography. There is a myriad of opportunity in supporting the sector's creativity and imagination to develop new audience experiences through exploration of data-driven creative technology.

Fast adoption of national and international industry developments in creative technology was noted as a motivating driver for Scottish companies, as this enables them to keep pace, perform, and compete on an international stage. Equally, the opportunity to innovate from Scotland to lead in their industry or their creative discipline is a keen ambition.

Supporting the data capacity and data innovation of the creative sector is an opportunity for The University of Edinburgh to assist the sector in achieving these ambitions.

Rather than in the commonality of business data development needs, **the innovation within creativity is where the greatest prize lies**, and where excitement and curiosity has been observed in the creative practitioners and company leaders that have attended our events. They were very interested to learn about the new data-driven innovation and creative technology emanating from The University of Edinburgh or from industry colleagues. Repeat event attendance and follow up enquiries suggest readiness to grasp the opportunity to work with The University of Edinburgh researchers and industry colleagues to collaborate in innovation and partner to identify funds to facilitate development.

For some creatives, attending our demonstrations and workshops, this creative data innovation is 'where they live'. For others it is definitely 'what's next', and for many it is 'a huge leap' from where they are. For example, from implementing data privacy compliance for marketing, to understanding artificial intelligence, machine learning, algorithms creating digital visual art, motion graphic projections, geolocation data, blockchain smart contracts, and crypto currencies represents a significant knowledge chasm.

It is difficult to be wholly accurate regarding data capacity without sector-specific surveys, but through the consultation and engagement events it would appear that in general terms, as there are exceptions, there are three tiers of data capability in the sector;

(1) Data unaware, or aware but hesitant to develop further,
(2) Data users of organisational information for business insights, and technical creativity
(3) Data experts fluent with data systems, devising and interrogating analytics, layering datasets for deeper insights; and artists, creators and innovators with data.

Models portraying the stages of data capacity or data maturity vary in how they are expressed, but essentially it is a stepped journey from initial data awareness, to becoming highly capable with data and embedding data into day to day business practices.
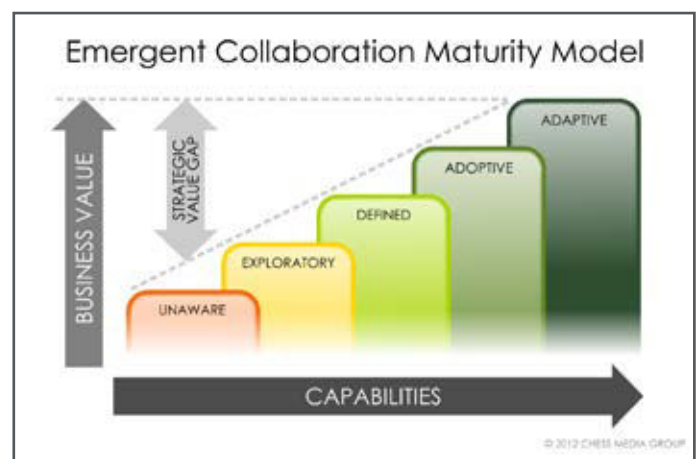

Fig 1 Emergent Collaboration Maturity Model, by Jacob Morgan, "The Collaborative Organisation", TheFutureOrganization.com © [17]

Our aim is to support development from wherever the starting point lies, in order to bring the whole sector if at all possible, to a shared understanding and high level of competence that will allow them to explore their creative potential with data confidently, and become data mature data innovators.

17 Jacob Morgan, 'The Collaborative Organisation', https://thefutureorganization.com/books/

Pathways to Becoming a Data-Centric Sector

Exploring Pathways to Developing Data Capacity and Data Innovation Potential

In October 2018 The University of Edinburgh's engagement and support to the creative sector was significantly enhanced through a successful application by the Centre for Design Informatics with Edinburgh Napier University to the Arts & Humanities Research Council (AHRC) Creative Clusters programme. Edinburgh became one of nine awarded in the UK. The Creative Informatics Cluster (CIC) is led by Professor Chris Speed, Chair of Design Informatics, and involves industry partners Creative Edinburgh and Codebase. This five-year project attracted £5.5m funding from AHRC, £1.6m from DDI Programme, £500k from Scottish Funding Council (SFC) and £2.3m in-kind from creative and cultural partners.

Due to the applied research focus on creative data innovation support with and for the creative industries, the project contributes to the Research theme.

The Creative Informatics Cluster will research the following;

• Developing access to and engagement with new audiences and markets

• Developing new modalities of experience

• Unlocking value in datasets and archives

• Revealing new business models for the creative and cultural industries.

The programme includes three strands to develop the skills, knowledge and ideas of creative innovators and entrepreneurs in data and bring them to the point of realisation, two large research strands to tackle industry challenges and develop new emerging technologies, and a strand of industry awareness raising events to share new technology and creative ideas.

1. Creative Informatics Labs and Studios – raise awareness and share skills and knowledge

2. Creative Bridge – develop initial ideas into viable business propositions (£5k voucher delivered by Codebase)

3. Resident Entrepreneurs – stipends to support entrepreneurs to dedicate time to developing their business ideas and bring them into reality. (Funded by DDI Programme £1.6m for 72 entrepreneurs supported with a £12k max. stipend over 3-9 months with an industry mentor.)

4. Connected Innovators – research and development time for individual creative practitioners granted awards of £10k for approximately six months.

5. Horizon Projects – cutting edge research in creative informatics led by the Post-Doctoral Research Associates of the programme.

6. Challenge Projects - challenges presented by sector organisations for SMEs to respond to with creative solutions, awarded £20k to develop the proposed solution, licensed to the challenge holder, with SME retaining IP upon which to build a business.

In tandem with the consultation, the activities of the Creative Informatics Cluster, as well as the DDI and EFI arranged events, provided direct engagement with creative practitioners, artists, creative technologists and creative and cultural companies which enriched our knowledge and allowed The University of Edinburgh to test approaches and gain deeper insights from the sector to inform our overall response.

Response

The Edinburgh and South East Scotland City Region Deal's DDI Programme, delivered by The University of Edinburgh and Heriot Watt University, is in the process of setting out a three-year plan to tackle the issues raised within the DDI creative sector consultation. The findings regarding Data Capacity, New Business Models, Realising Innovative Ideas and New Experiences are correlated to the five TRADE (Talent-Research-Adoption-Datasets-Entrepreneurship) themes of the DDI Programme. Although the DDI Programme and The University of Edinburgh support being developed in response is in the context of Edinburgh and South East City Region, these resources can be pulled on by the entire sector across Scotland.

To engage the sector widely with The University of Edinburgh's planned support, to assist their data capacity and innovation journey, will require significant outreach and industry engagement. Therefore, The University of Edinburgh has invested in the capacity to engage in this activity as well as in the development of the support itself, outlined below.

1. (a) Data Capacity – Talent

Providing highly skilled data graduates to the Edinburgh and South East City Region, and beyond, will require the development of new Under-Graduate and Post Graduate programmes with data at their core. The post graduate programmes also provide upskilling opportunities for the current creative and cultural workforce. (See Appendix for list of courses available.)

(i) The Edinburgh Futures Institute (EFI) is developing four new programmes for the creative industries in consultation with creative practitioners.
MSc Future Storytelling (hybrid format 2022-23)
MSc Creative Industries
MSc Design Futures (proposed 2022-23)
MSc Service Management and Design

Students studying towards all pathway programmes will complete common core courses undertaken within multidisciplinary teams. This will enable them to collect, manage and analyse computational datasets, but also how to interrogate data for bias and to present and creatively visualise data. It will support them to apply creative, critical and data-informed thinking, integrating computational data with other forms of data and evidence, to complex social challenges.

(ii) The Bayes Centre has developed the Data Science Education Centre of Excellence (ed.ac.uk/bayes/about-us/our-work/education), which currently hosts a flexible online postgraduate programme in Data Science, Technology and Innovation (DSTI) aimed at working professionals studying either single courses, or up to Postgraduate Certificate, Postgraduate Diploma or MSc level. Courses cross a range of subject areas related to data science including the social sciences. The Bayes Centre has ambitions to grow the portfolio of courses and programmes including new postgraduate programmes in Data Entrepreneurship.

The Bayes Centre also hosts the Workforce Development Portfolio of courses offering short Continuing Professional Development (CPD) courses for working professionals looking to upskill, currently with funded places for those eligible through Scottish Funding Council funding. Massive Open Online Courses (MOOCs) are also available across a range of data science areas (ed.ac.uk/bayes/about-us/our-work/education/data-science-programmes-courses/online-learning-moocs).

(iii) The Edinburgh Centre for Data, Culture & Society has developed training in data for academic researchers. (cdcs.ed.ac.uk/training#paragraph-id--147)

(iv) The Business School has developed MSc in Business Analytics (business-school.ed.ac.uk/msc/business-analytics), and, Online Micromasters in Predictive Analytics (business-school.ed.ac.uk/online/predictive-analytics-business-applications).

(v) The DDI Skills Gateway is developing programmes to support data literacy competencies spanning activities in schools, colleges, universities and in the workplace, including;
• Creative lesson plans for schools (including data within the Daydream Believers series);
• National Progression Award (NPA) Data Science (SCQF 4-6) in Secondary Schools
• Professional Development Award (PDA) Data Science (SCQF 7-9) in workplace, developed by SQA in partnership with DDI Skills Gateway Team;
• BSc in Data Science at Edinburgh Napier University;
• Data additions to a range of HN and degree courses, and,
• Data skills embedded in core competencies across the region's Colleges (at both FE and HE levels).

Work has begun on retraining opportunities for the unemployed and reaching out to women returners, and learners with disabilities who have much to offer in tech-related roles.

Nationally, a new HND Data Science (SCQF Level 8) will be developed during 2020-21. It is likely that it will be included in appropriate Modern Apprenticeships, and qualifications will be developed for a Graduate Apprenticeship also.

(b) Data Capacity – Adoption
Support to help embed data in the day-to-day activities of creative companies can be drawn upon in different forms such as workplace training, specific project support through an internship, academic expertise and consultancy, or research and development collaboration.

The Sector Lead for the Creative Industries will continue to partner with trade bodies, creative networks, Creative Scotland and Screen Scotland to support outreach and inform the sector on data-driven innovation seminars, training and workshops; to co-design and deliver bespoke events; and to identify other funding routes to support skills development.

The Edinburgh Futures Institute and Creative Informatics Cluster will continue to develop initiatives, programmes, events and workshops to raise awareness and promote and support understanding of data-driven innovation, and is currently developing bespoke learning resources such as;

- 'Developing a Data-Driven Creative Company' – a new Executive Education programme from EFI and the Business School has been created in response to the DDI Creative Industries Consultation. It is a bespoke programme for creative leaders, to provide learning across a range of data subjects with creative industry case studies and guidance towards forming a self-directed action plan to improve their company's data use and insights. (business-school.ed.ac.uk/event/developing-a-data-driven-creative-company)

- 'Raise Your Game' – a new Digital Skills Programme has been developed by Creative Edinburgh, partners in the Creative Informatics Cluster, in response to the observed sectoral need. This is currently being finalised for delivery in Autumn 2020. (creative-edinburgh.com).

- 'Training the Data Trainer' – the Creative Informatics Cluster will develop the capacity of the post-doctoral research associates within the Cluster to support data training for the creative community.

- Students as Change Agents – the DDI programme has supported this initiative to place multidisciplinary small groups of students as a resource to tackle real-world challenges linked to the UN SDGs set by sector experts. This could support tackling data related projects within creative businesses.

This will provide a range of entry points to support the creative industries' identified needs through information, knowledge sharing, upskilling, and resources to develop data capacity towards innovation.

This Adoption activity, along with outreach and business engagement activity will lead to stimulating new ideas for collaboration, research and entrepreneurial ventures.

Creative Edinburgh, Credit: Eilidh Haig

2. New Business Models (Research, Entrepreneurship)

Provision of academic expertise to support creatives to develop new business models by assisting their development of new creative business ideas. This will be complemented by sharing learning from academic studies of new business models being employed in the national or international context and understanding how to adopt data-driven technologies within their business to deliver more effectively, or create new products, services and experiences and/or pivot their current business.

This will involve design support as an essential component in the process to develop a value proposition attractive to their audiences and clients, e.g. how might one productise an existing digital archive?

Academic expertise may also be drawn upon at an earlier stage to inform decision making, for example, to better understand the scope of new data-driven technologies for creative purposes and business exploitation. This may include seminars or workshops on machine learning, algorithms, artificial intelligence, cyber security, crypto currencies, geolocation data, internet of things, blockchain, and the developments in sensors, data visualisation, virtual and augmented reality, 3D, holographic projection, motion capture and motion graphic projection.

3. Realising Innovative New Ideas (Research, Entrepreneurship)

Provision of innovation support including collaboration workshops to support ideation and development; research assistance to support new ideas to come to fruition; and a safe haven to test and experiment with new platforms and functions. (This support can dovetail with the activities within the previous section.)

However, consultation feedback suggested that for this support to maximise its potential for creative entrepreneurs, and to address the ambition and concern regarding bringing entrepreneurs' data-driven innovations to market to realise an advantageous market position, will require relevant and timeous financial support as well as raising the level of business awareness and acuity for early stage entrepreneurs. Partners in the Creative Informatics Cluster (CIC) have observed through the process of awarding grants over the past year of £12,000-£20,000 from the CIC programme to Resident Entrepreneurs and Challenge responders, and feedback from Codebase regarding the Creative Bridge participants, that they need business start-up guidance, and see the CIC programme, rightly or wrongly, as the only suitable source of early innovation funding in the city

region at present. Given this is an Arts & Humanities Research Council award through the UK Government Industrial Strategy funds, and is a five-year temporary initiative to 2023, this is concerning feedback for the future of creative data-driven innovation in the city region after the Cluster initiative ends, and for achieving the ambitions of EFI and the 15-year DDI Programme within the City Region Deal. Therefore an essential consideration within The University of Edinburgh's support would be the embedding in another form, or continuation, of the Creative Informatics Cluster strands for years 5-15 of the DDI Programme, to continue to support innovation and work closely with the creative community, and with Edinburgh Innovations Ltd (EI), the entrepreneurship arm of The University of Edinburgh, as well as the other partners in the innovation development 'chain'. To do this will require another source of funding for The University of Edinburgh for a further 10 years, or indeed partnership or signposting to an external source of funding, or investment for creative data innovators. However, this proposed consideration comes at a time of great economic uncertainty, with challenges facing both the university sector and creative and cultural industries.

The intensity of creative community engagement through the combined efforts of the DDI consultation and the CIC programme has brought to light that new entrants to the creative community and early stage creative entrepreneurs require business knowledge, digital and data training, as well as research and innovation support for the development of their creative data-driven product, service or audience experience. As innovative ideas are developed through a process of research – design – prototype – test - and iterate, into a minimum viable product upon which to build a business, this process will require, as previously mentioned, to be underpinned with the right type of finance at the right moment, and finance that is relatively quick to access. Although the financial support for innovation has improved over recent years in Scotland, the feedback may suggest the provision is not always suitable for the activity, or accessible for creative industries companies, and they perceive there is a gap that - for now - CIC is filling. Certainly, the high application levels would seem to support that view.

Supporting bodies have also mentioned that creative start-up companies require development to demonstrate commercial investment readiness. This is not a criticism, rather an observation. In response, we must ask ourselves how can we help prepare creative companies for commercial investment? In general, creative businesses or their proposed ideas have oft been regarded as a risk by financial investors and this has eroded creative entrepreneurs' continuation of effort to seek to attain this, undermining their confidence. This in turn intensifies their search for, or reliance on, public innovation funding rather than commercial investment. This will need a puncture point in this vicious circle.

As the Creative Informatics Cluster noted in its proposal for AHRC support, the Edinburgh 'hackers and hustlers' are adept at building business models toward new products and services that are built upon software, but the regional 'hipsters' require support and confidence to make the innovation triad successful[18].

Therefore, The University of Edinburgh, through the Creative Informatics Cluster and Edinburgh Innovations Ltd, as partners in the innovation landscape, will begin dialogue on this point with the creative and economic support agencies in the city region, and representatives of the investment community. This collaborative approach would aim to finesse the city region's innovation support in order to guide, equip and accelerate the development specifically of creatives' innovative ideas. This dialogue should also establish if indeed there are any gaps in the financial support available in the city region towards realising innovative ideas.

During this consultation period a few investors expressed their strong interest in creative companies and would be keen to participate in an innovation process at an early stage, to inform and develop a close relationship with entrepreneurs before investing.

A key part of that process that we considered to be missing is a Creative Informatics Accelerator that could provide intensive support to the emerging creative entrepreneurs and their data-driven innovation ideas and develop them to the point of market launch. This may be the mechanism that can best facilitate the forging of creative:investor partnerships. This co-designed process, in whatever form it emerges, must strive to be seamlessness in its design and most importantly in its delivery; coupled with a supportive, open and encouraging attitude to the creative sector.

4. New Experiences (Talent, Research, Adoption, Datasets, Entrepreneurship)

Providing a place for imagination and creativity, to test and experiment with digital technology and equipment, and to give creative partners the opportunity to learn and explore in practice with demonstrations of creative technologies to understand their potential to create new experiences and to test them on and with potential audiences. The University of Edinburgh has the power to convene and the expertise to facilitate and encourage learning and sharing. The Inspace Gallery within the Design Informatics Department provides a space for experimentation and to host design workshops, and the team have become expert at delivering ideation workshops entitled 'Colliders' (process developed by Prof Chris Speed, Chair of Design Informatics) and hosting a range of creative activities.

It is worth noting here, that design is the connector in interdisciplinary working, and the team also provide Colliders for other industries, bringing design and creativity to the challenges affecting their sectors. The DDI Programme is supporting a series of cross-sectoral working through a creative lens at Inspace, commencing with the Space & Satellite Artists Residencies with EFI (inspace.ed.ac.uk).

18 The Dream Team: Hipster, Hacker, and Hustler, Forbes 2012. https://www.forbes.com/sites/andyellwood/2012/08/22/the-dream-team-hipster-hacker-and-hustler/#5bec2bb2c85e

Chris Scott, Maxime Ragni
(KISS Photography and Design).

Summary of Response Activity and Support

Community Engagement	Skills Development	Entrepreneurship	Industrial Innovation
Creative Community – Speaking at Events	EFI Masters Programmes	*Hatchery*	Responding jointly to innovation challenges
Entry level hands-on Workshops	Executive Education Courses	Colliders – Innovation workshops	Students responding to creative company challenges
121 Business Engagement	MOOCs	Mashups – design as facilitation	Academic expertise for specific creative company developments
Trade Body comms – skills surveys	Skills Seminars	Studentships & Internships	Collaborative design innovation workshops and partnerships
CPD & bespoke events	EFI Masters Units offered as CPD	*Start-up*	Joint partnership projects with research funding
Communications partnerships with national cultural agencies and creative trade bodies	Studentships & Internships	CI Creative Bridge	
CI Labs & Studios	Creative Edinburgh new digital & data skills programmes	DDI Resident Entrepreneurs	
		Scaleup	
		Proposed – EI Creative Accelerator – entry for creative data innovators & entrepreneurs	
		Investment Programme with EI and other partners	

TRADE Cycle

The desire of creative companies and practitioners to innovate, provide new audience or client experiences, and develop new opportunities for creativity and income streams will drive demand for skilled data conversant creatives, coders and software developers, for insight and advice on new business models, and assembling skilled teams of data scientists, data analysts, and mathematicians for research collaborations with creatives.

We anticipate that creative practitioners and company leaders will therefore access a range of The University of Edinburgh's support right across the TRADE themes.

Conclusion

Creating a Data Culture

The Data-Driven Innovation (DDI) programme can provide a bridge for the creative and cultural sector at whatever point on the data maturity journey they consider themselves to be. We can support the development of their data skills and capacity and inspire those who are data confident into developing further and exploring new advancements in data-driven creative technology to innovate.

Our aim is to support the creative sector in Edinburgh and the South East City Region to become confident data-driven innovators and contribute to inclusive economic growth across the region, and Scotland. Our aim is that over the course of the 15-year DDI Programme the creative sector becomes as conversant with data as they have done with digital, thereby embedding a data culture into the day-to-day practice of creative and cultural companies across the city region.

However, we also wish to support creative data-driven innovations for the city region's citizens and visitors - be that in creative and cultural services and products or audience experiences. It behoves the creative industries Data-Driven Innovation plan to support culture in its widest sense, and as the Edinburgh and South East City Region works towards the ambition of becoming regarded as the data capital of Europe, that The University of Edinburgh, in collaboration with the sector, should express that ambition visibly through creative and cultural means in the public space. Examples of such activity include the Space & Satellite Artists Residencies exhibition (inspace.ed.ac.uk); the Design Informatics department's Data Pavilion in George Street in the 2018 Edinburgh Fringe Festival and the Data Play installation during the Fringe Festival of 2019 within the Bayes Centre courtyard, and exhibitions of academics and artists' work with AI presented by motion graphic projections through the Inspace street-facing window screens. An inspiring project of note in this context was the 'Message from the Skies' project during Hogmanay 2018, presented by the Edinburgh International Book Festival and Edinburgh UNESCO City of Literature, that graphically projected onto six buildings in Edinburgh quotes from six Scottish writers: this was funded by Creative Scotland through the Scottish Government's Festivals EXPO Fund.

Data Play Launch, August 2019 at Inspace – Image featuring Dave Shaw, Head of Digital, Tesco Bank announcing the Mercury Project within Data Play, with Prof Chris Speed, Chair, Design Informatics. Credit: Design Informatics

To create a data culture requires both work and play. There is work to be done, but also creativity and inspiration to be encouraged, supported, expressed and celebrated. The city region has a very talented, motivated, and supportive creative community, that sits in close proximity with other sectors and their skillsets, generating an intense collaborative richness of innovation and ingenuity. With support, what more can they create and achieve, and bring to the city region's audiences, industry and citizens?

In this paper we have outlined what The University of Edinburgh aims to do in education, training, research and innovation collaboration to support creatives on their data maturity journey to becoming confident data innovators. With the addition of bespoke and intensified innovation support and financial investment, the resultant shift as a whole will take the sector through designing **from** data, to designing **with** data, and into the future of innovating through design **by** data, taking their place on the national and international stage.

The aforementioned would have been our concluding point, however, with the advent of Covid19 the creative and cultural sector is severely affected by the crisis, and the extent to which this will impact their dynamic culture is as yet unclear. The funding requirements we have sketched out to support innovation may now also be a stretch for public funding sources and investors, although it is support that we believe comes at a time where the creative and cultural sector requires it most.

Data Play 2019,
Credit: Design Informatics

Addendum

Responding to the Covid19 Impact on the Creative Sector

The DDI Programme Consultation with the creative sector, which began in late 2018, identified their data-driven innovation development needs and ambitions as creative innovators. During 2019 the Sector Lead for the Creative Industries had been developing and delivering early interventions in response, alongside the multiple activities of the Creative Informatics Cluster. The measures to contain coronavirus in mid-March 2020 led to the cessation of in-person support to and events with the sector, and we pivoted activities to online delivery such as the Space & Satellite Artists Residencies (inspace.ed.ac.uk).

The University of Edinburgh moved quickly to deliver online student teaching and learning, and the Data-Driven Innovation Programme and Creative Informatics Cluster team, also quickly organised mechanisms to facilitate effective remote working from home.

The DDI Programme Sector Lead for the Creative Industries and the Creative Informatics Cluster team's main concern was to continue to support the sector where possible in their digital pivot or data innovation ambitions amplified by Covid19: in the short term, this was through online seminars, online training resources, and in quickly identifying and applying for collaborative research funding that could support industry partners.

The Creative Informatics Cluster ensured a fast process for awarding the third round of Resident Entrepreneurships to release funds as quickly as possible and provided additional online contact to prevent isolation through the establishment of the Friday Forums with Visual Arts Scotland (creativeinformatics.org/event/friday-forum-11/).

The DDI Programme created a specific data-driven innovation fund for ideas to respond to Covid19 crisis. The Sector Lead for the Creative Industries contacted the sectoral trade bodies that were consulted in the original consultation to understand the intricacies of the impact of the coronavirus crisis on each sub-sector and through dialogue identified support that The University of Edinburgh could provide.

The sectoral trade bodies reported varying degrees of impact through loss of income, some by a third, some by half, or in music in most cases an entire drop off of income. Even with galleries, music venues, theatres, cinemas, and film and TV sets considering modelling to adjust to social distancing measures, they calculated this would not mitigate financial losses: rather, opening and operating with reduced audiences could worsen their position. A few sectors fared better as they could deliver digital creative content in a socially distanced manner such as animation, VFX, CGI, computer games development, software or digital design and advertising.

Many of the Scottish creative sector trade bodies conducted surveys of their memberships and with Culture Counts, Scottish Music Industry Association (SMIA), Scottish Contemporary Arts Network (SCAN), Federation of Scottish Theatre (FST) and Publishing Scotland presented these to the Cabinet Secretary for Economy, Fair Work and Culture. This combined advocacy with direct impact information provided by the sector, and the contribution of individual creative practitioners, and the advocacy of Creative and Screen Scotland, Cross Party Group (CPG) on Music, and feedback from industry through Scottish Enterprise has led to various support schemes and funds being made available to the sector through these agencies or industry representative bodies.

The focus is on survival: on financial cashflow and protecting staff, and retention of talent within the sector and capital infrastructure. Culture Counts has suggested redeployment of freelance creative talent leading to the National Arts Force, composed of freelance and gig economy workers across the sector, to work in schools, care homes and communities.

The need to pivot to online remote working, digital trading, and delivery of services brought with it an intensification of the data, digital and business skills needs mentioned in the original DDI Creative Industries consultation. Signposting to resources such as online training, opportunities for research collaboration, or innovation funds were the main requests.

However, discussions beyond immediate financial and talent retention concerns turned towards the future, and the potential for innovating through and out of Covid19. What will be the 'new normal'? For example in music, dance, theatre and comedy, what is the likelihood of a hybrid two strand approach for the foreseeable duration e.g. live events with socially distanced audiences and potential secondary income from ticketed live streaming online, potentially retaining the online streaming after the introduction of a vaccine to provide access for all, to broaden international reach, and to support a reduction in travelling.

Observations of the positive effects the cessation of travel and commuting had on the environment also enlivened discussions on 'building back better' and greener. Working from home was reported in press coverage as not having the expected degree of negative impact on productivity levels, and in some cases had increased productivity as home workers were not able to easily demarcate the end of the working day, or to creatively or mentally switch off from the work tasks at hand. Employers could trust their staff to deliver and also to contribute to reimagining the future of their company. This has started to shape the dialogue in creative companies around digital and data innovation, digital remote working with rotational office presence, or using a smaller office for (socially distanced) meetings, and processes for remote digital engagement and delivery of creative work for clients, alongside building in a better work life balance for employees for the longer term.

The outcome of these various responses and requirements could include mothballed or permanently lost cultural venues, offices that are no longer necessary, some companies and cultural organisations unable to survive the long tail of financial ramifications of lockdown, the loss of talent to other industries, and the potential of not being able to return to capacity gatherings for orchestral concerts, music gigs, festivals, film screenings, circus, comedy, dance and theatre performances, or participating in or seeing choirs. But the flipside to this is: can companies and creative individuals pivot their practice or business? Can there be new opportunities, new greener methods, new ways of doing things, new inclusive ways of doing things, or indeed - new things?

Beyond financial survival, the sector is turning its thoughts to innovation, and this will need support in order to focus on a drive towards innovation, whilst also working to remain afloat.

In this paper's recommendations there is a proposal for The University of Edinburgh to work with partners to discuss and finesse the innovation support for creative entrepreneurs within the context of data-driven innovation in the Edinburgh and South East city region. It strikes us from the recent dialogue with sectoral trade bodies that due to the impact of Covid19 this proposal should be considered for the wider creative sector across Scotland to support their innovation through and out of Covid19. That is of course, beyond the remit of this consultation context and paper. However, given innovation is of significant import to Scotland's Economic Strategy, and referred to in the Culture Strategy for Scotland[19], it may be that in response to the coronavirus crisis innovation support should be specifically considered at this time as another substantive measure to assist the creative sector's recovery.

For our part, the DDI Programme and Creative Informatics Cluster would consider it an essential contribution in support of the sector to participate in any agency or government-led dialogue on this subject, as we continue to support the creative and cultural sector, as best we can, through this societal and economic crisis.

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19 Culture Strategy for Scotland, https://www.gov.scot/publications/culture-strategy-scotland/

Page 20 'Policy Statement for the Creative Industries17. This statement sets out our vision and priorities for the sector. It highlights that creative businesses and skills are those of the future – they are less likely to be replaced by automation and artificial intelligence and the creative sector is leading the way in innovation of new business models. It is adapting more quickly than other sectors to the transformation through the fourth industrial revolution. Combining technical and creative skills, the sector plays a significant role in unlocking innovation and growth in other sectors.'

Acknowledgements

Appendix

1. Courses and Programmes (2020)
List of University of Edinburgh Creative Industries Programmes involving Data-driven Innovation

School of Informatics - Design Informatics	CAHSS/ECA	Science and Engineering	
Advanced Design Informatics MSc (2 years)	Acoustics and Music Technology BSc	Mathematics and Music BA	
Design Informatics Masters (MFA/MA)	Animation BA/MFA	**School of Philosophy, Politics and Language Sciences (PPLS) -** Speech and Language Programming MSc	
Design for Change (MA)	Architecture BA/MA		
	Business with Marketing MA		
	Design and Digital Media MSc		
	Product Design BA		

Courses in Programmes

	CAHSS/ECA Courses in PG Programmes	CAHSS Courses in PG Programmes	
	3D & Animated Design (20 credits) Also Online.		
	Interactive Visual Design (20 credits) Also Online.	**School of Social and Political Science**	
	Design with Data (20 credits)	Controversies in Data Society (20 credits)	
	Data Science for Design (20 credits)	Understanding Data Visualisation (20 credits)	
	Dynamic Web Design (20 credits) Also Online.		

College of Science and Engineering Programmes in Data-Driven Innovation

School of Informatics	School of Mathematics, School of Geosciences and School of Engineering	Edinburgh Parallel Computing Centre (EPCC)	Online Learning
Artificial Intelligence BSc/Msc	MSc In Leading Major Programmes (professional development to support career progression)	High Performance Computing MSc	Data Science, Technology and Innovation
Artificial Intelligence & Computer Science BSc	MSc in Geographical Information Systems	High Performance Computing with Data Science MSc	Digital Media Design MSc
Computer Science BEng/BSc/MSc	MSc in Earth Observation & Geoinformation Management		Game Design Studio (20 credits)
Cognitive Science MSc	MSc Statistics with Data Science		**Business School** - Business Analytics MSc https://www.business-school.ed.ac.uk/msc/business-analytics
Cyber Security, Privacy and Trust MSc	MSc in Operational Research with Data Science		Online Micromasters in Predictive Analytics https://www.business-school.ed.ac.uk/online/predictive-analytics-business-applications
Data Science MSc	MSc in Statistics and Operational Research		**Bayes Education:** https://www.ed.ac.uk/bayes/about-us/our-work/education https://www.ed.ac.uk/bayes/about-us/our-work/education/data-science-programmes/on-campus
Data Science BSc (Graduate Apprenticeship)	MSc In Leading Major Programmes (professional development to support career progression)		**DSTI:** https://www.ed.ac.uk/bayes/about-us/our-work/education/data-science-technology-and-innovation **Workforce Development:** https://www.ed.ac.uk/bayes/about-us/our-work/education/workforce-development

School of Informatics	School of Mathematics, School of Geosciences and School of Engineering	Edinburgh Parallel Computing Centre (EPCC)	Online Learning
Informatics MSc, MInf			MOOCs https://www.ed.ac.uk/ bayes/about-us/our-work/ education/data-science-programmes-courses/ online-learning-moocs
Software Engineering BEng			*MOOC - Data-driven decision-making in the arts and creative industries';* *MOOC - DataLab online learning courses; Driving Value from Data, Data Science in the Games Industry (https://www. thedatalab.com/skills-talent/online-learning/)*

List of Consultees

National Creative Sector Funding Bodies

Creative Scotland

Screen Scotland

Trade Associations/Networks

Architecture & Design Scotland (A&DS)

Scottish Contemporary Arts Network (SCAN)

Institute for Practitioners in Advertising (IPA)

British Interactive Media Association (BIMA)

Data Marketing Association (DMA)

Applied Arts Scotland (AAS)

Craft Scotland

Design Exhibition Scotland (DES)

Long Lunch (Design network)

Textiles Scotland

Scottish Games Development Association (SGDA)

TV Working Group

Scottish Music Industry Association (SMIA)

Federation of Scottish Theatre (FST)

Edinburgh Performing Arts Development (EPAD)

Publishing Scotland

Periodical Publishing Association

Literature Alliance Scotland

City of Literature

Scotland IS

Creative Edinburgh

Codebase, Edinburgh

Companies

DigitasLbi

Frame

i-Prospect

MediaCom

Austin Lord Architects

Brightside

Ray Interactive

Carol Sinclair Ceramics Ltd

Whitespace

ISO Design

Soluis

Graphical House

Equator

D8

Kestin (Kestin Hare, Fashion Designer)

Axis Animation

Synchronicity

Tag

Biome Collective

Delic.Network by Superational Ltd

Chris Close Photography

Amazon R&D

Wallet.Services

Traverse Theatre

The List

Festivals Edinburgh

Matchlight TV

Caledonia TV

Plum Films

Radio Magnetic

Scotsman

BBC

STV

TRC Media

National Library of Scotland (NLS)
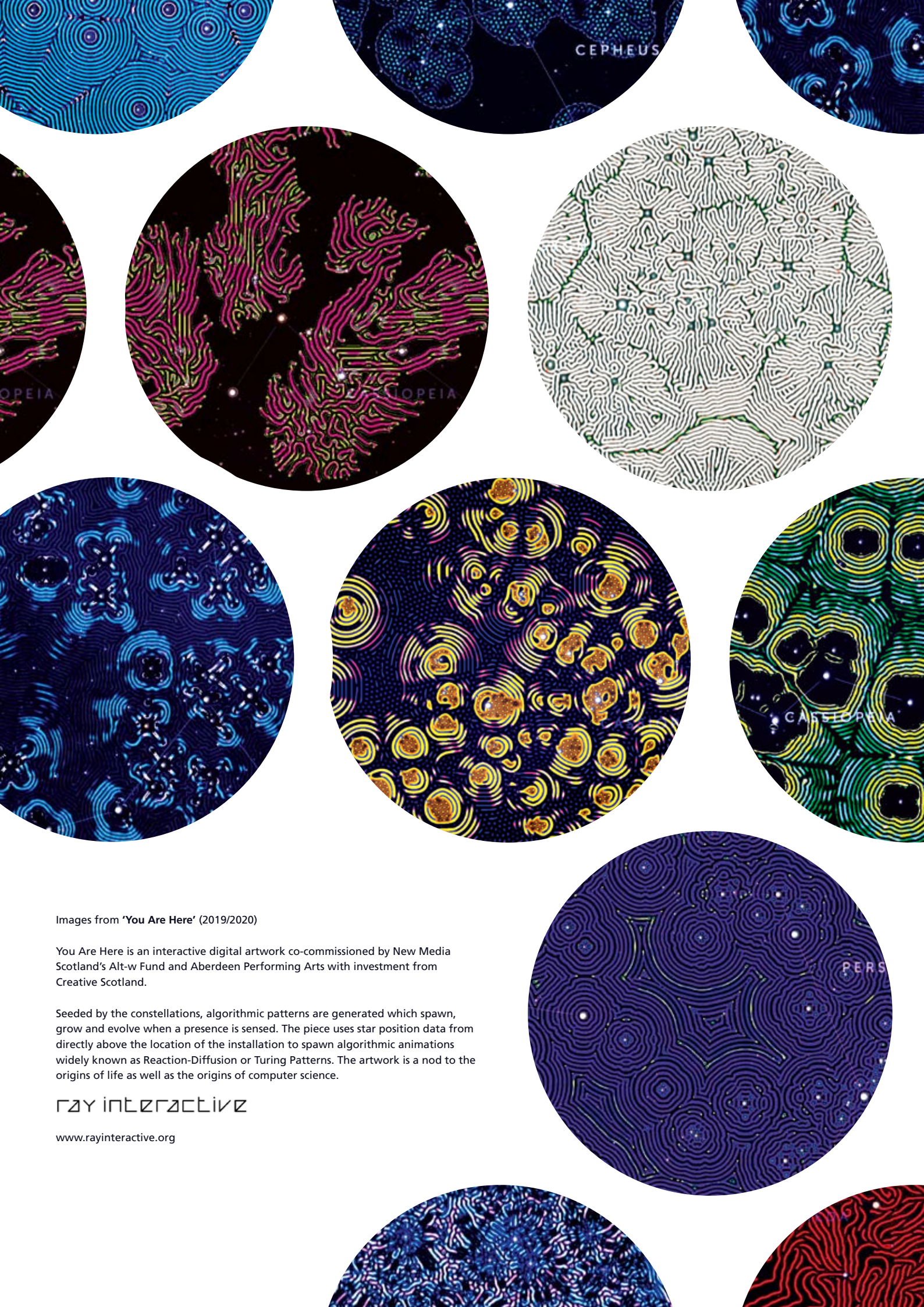
Images from **'You Are Here'** (2019/2020)

You Are Here is an interactive digital artwork co-commissioned by New Media Scotland's Alt-w Fund and Aberdeen Performing Arts with investment from Creative Scotland.

Seeded by the constellations, algorithmic patterns are generated which spawn, grow and evolve when a presence is sensed. The piece uses star position data from directly above the location of the installation to spawn algorithmic animations widely known as Reaction-Diffusion or Turing Patterns. The artwork is a nod to the origins of life as well as the origins of computer science.

ray interactive