

# **Appendix 1: Programme for Delivery of a Data Driven Innovation Cluster in the Edinburgh City Region**

Investment in the Edinburgh Futures Institute

Project Summary

# Project Description

## Overview

The Edinburgh Futures Institute (EFI) will be a global centre for multi-disciplinary, challenge-based DDI research, teaching and impact: *“the world is experiencing major changes: climate volatility, political discontent, advances in artificial intelligence, economic upheavals. This presents big challenges. We need different ways of thinking about these issues and of devising new solutions. EFI will make that difference. It will blend theoretical and practical knowledge. It will work with organisations dealing directly with these challenges and curate meaningful interactions between seemingly disparate disciplines. We want our students to embody this approach and our partners to share the vision and help us to develop it”*<sup>1</sup>.

In fulfilling this vision EFI will provide thought-leadership in cultural, ethical, managerial, political, social and technological DDI issues by offering opportunities for a broad spectrum of academic researchers, talented students and external partners from industry and government (including regulators) to co-develop transformational improvements in the application, governance and exploitation of data.

EFI DDI activities will focus initially on three sector areas that have significant potential to deliver growth within the Edinburgh City and Region: financial services, creative industries and the public sector. In each of these sectors EFI will deliver a range of talent, research, data, adoption and entrepreneurial (TRADE) programmes that will not only address sectoral data and technology issues but also the social, political and cultural enablers and barriers that will shape the success of future DDI innovations across all the DDI hubs, WCDI and other programmes envisaged under the wider City Region Deal.

The requested contribution of £57.9 million Government funding in the EFI building refurbishment will enable the leverage of University of Edinburgh (UoE) and third party funding sources to enhance the programme of EFI activities and deliver a greater and wider range of TRADE outputs over the 15 year City Deal Programme period, including:

- **Talent:** training and in other ways engaging with around 300,000 people across a range of on and offline EFI courses, outreach programmes and events in DDI sector specific skills;
- **Research:** securing external research funding of around £108 million to address both public and private sector issues (such as helping regulators develop appropriate frameworks that facilitate innovation and protect consumers through co-design and implementation of new DDI government policies);
- **Adoption:** through interactions with an estimated level of 350 companies to address long, medium and short term DDI trends (such as disruptive innovation, automation, and disintermediation and how businesses can best adapt to these issues and generate value for

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<sup>1</sup> <https://www.ed.ac.uk/news/2017/ps10m-gift-boosts-institute-s-vision>

customers, shareholders and wider society) as well as a range of continuing professional development (CPD) and other modules to support individual employee adoption;

- **Data:** supporting initiatives, such as the Internet of Things (IoT) network and City Data Exchange, to encourage and enable the creation of new forms of data assets (conservatively estimated at a level of over 300 new EFI related data sets); and,
- **Entrepreneurship:** nurturing around 90 University DDI sponsored spinouts and around 1,700 EFI graduates in setting up or joining micro/SME businesses (through, for example, social entrepreneurship training and entrepreneurial pathway support and partnership arrangements with the Bayes and Usher Institutes).

In addition the EFI will also specifically support the Scottish Government’s inclusive growth strategy (through, for example, the City of Edinburgh Council and the Scottish Government ‘Civtech®’ initiative that aims to accelerate learning in areas such as: new models of mobility across the City Region; health and social care integration; and, the application of data science to support policy development and the delivery of major programmes).

As illustrated, in Table 1 below, the discounted EFI public sector cost of £67.6m (based on EFI and a proportion of WCDI costs) will generate an additional £827 million UK GVA and a consequent cost benefit ratio of 1 to 12.

*Table 1: EFI GVA by region*

Net DDI Programme Cost Benefit Ratio : 1:12				
	City Region	Rest of Scotland	Rest of UK	UK
<b>Net GVA</b>	£223m	£120m	£484m	£827m

Delivery will be overseen by a dedicated team and governed by an EFI Steering Group who will report to the overall DDI Programme Board. Overall the Project, its envisioned growth and associated risk profile, is affordable and capable of being self-sustaining over the longer term if the capital costs are substantively met by capital grant. Both the capital investment and Programme activities proposed can be accommodated within current University business procurement and estates management processes.

For the benefit of the reader, and to provide some background context, various points are useful to note:

- The preparation of this business case has been led by the University of Edinburgh (UoE) on behalf of City Deal consortium partners, and it has been prepared in accordance with the HM Treasury Five Cases model.
- In terms of University structure, the University of Edinburgh has three Colleges:

1. Arts, Humanities and Social Sciences;
2. Medicine and Veterinary Medicine; and,
3. Science and Engineering.

The next level down are Schools and there are twenty Schools within the three Colleges. This business case sits within both the College of Arts, Humanities and Social Sciences and the College of Science and Engineering.

- Detail has been provided in this business case where it is materially relevant and known, some of which is being worked through and consequently still to be determined.

### Aligned and material opportunity realised through UoE vision

#### Opportunity

We are on the verge of a new technological revolution that will fundamentally change the ways we live, work and interact. The speed of change has no historical precedent and creates significant challenges and opportunities for business, government and people. Comparative advantage will lie with those organisations that have invested in both their data assets - to deliver new services that engage citizens and consumers - and the associated transformational changes in individual, organisational and economy wide transactions required to ensure service benefits are fully realised.

As evidenced in various Scottish and UK Government policy documents, and in publications by the OECD and global consultancies, Data Driven Innovation (DDI) has become a key pillar of 21<sup>st</sup> century growth with the potential to significantly enhance productivity, resource efficiency, economic competitiveness and social well-being. As recognised in a recent assessment it has been estimated that AI alone could add an additional £630 billion to the UK economy by 2035 increasing annual UK growth rates to 3.9%<sup>2</sup>

In harnessing such opportunities the Edinburgh and South East Scotland Science and Innovation Audit (SIA) identified that:

- The City region is already a DDI **powerhouse**;
- Growth is at a **tipping point** and requires further investment to meet demand;
- There are a number of **industry sectors** that are key to the local economy and which align to national areas of focus; and,
- Realising DDI opportunities are most likely to generate sustainable socio-economic benefits and support **inclusive growth**.

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<sup>2</sup> "GROWING THE ARTIFICIAL INTELLIGENCE INDUSTRY IN THE UK", Professor Dame Wendy Hall and Jérôme Pesenti, October 2017.

## Vision

The University of Edinburgh's **vision** is to be a world leader in Data Science. It will do this by playing to its strengths in education and research and boosting its commercial activity. Within the Edinburgh Futures Institute (EFI) it will enable these activities to maximum effect by bringing together expertise in data science and digital technologies with the arts, humanities, social and physical sciences across three key areas: public policy; creative industries and education; and finance, markets and societies. By marrying world-class expertise in the humanities, arts and social sciences with research in new data technologies in these areas EFI will produce practical solutions and new approaches for the common good.

### Current Position – good, but further investment needed

The City Region has a long history of data excellence and leadership, including the UoE School of Informatics, the UK's principal super-computing facility - the Edinburgh Parallel Computing Centre (EPCC) - and the most powerful computing science school and largest concentration of internationally significant and world-leading informatics research in the UK.

Moreover, in the last four years, local DDI capability has grown significantly as multiple new initiatives within the data science, robotics and computer systems areas have been secured. The City Region hosts Scotland-wide initiatives like the Data Lab, UK-wide research centres such as the Alan Turing Institute, Farr Institute, Centre of Excellence for Cyber Security Research and Administrative Data Research Centre, as well as securing four new doctoral training programmes in Data, Robotics, Systems and Analysis. It also hosts the UK's most successful computing start-up community around a university and has joined an elite group of five key UK universities in data science.

Underpinning UoE's success and reputation are **well established strengths** across the TRADE areas, although these require further development and focus. Additionally many of the UoE schools are geographically dispersed across Edinburgh, inhibiting the opportunity to collaborate and innovate, and potentially resulting in sub-optimal outcomes. Colocation at EFI will not only counter this but will become a catalyst for innovation.

### How UoE will achieve its vision

This business case requests an overall government contribution of **£57.9m** in EFI to fulfil the vision of drawing together world-class expertise in the humanities, arts and social sciences with sector-defining research in new data technologies to produce practical solutions and new approaches for the common good.

Achieving this vision will involve three distinct components, all of which are intrinsically linked and, importantly, interdependent:

1. **Addressing capability gaps:** to enhance and develop activities in the five key areas identified in the SIA - talent, research, adoption, data and entrepreneurship;
2. **Organise activities effectively:** to create an effective operating model to successfully organise, optimise and execute these activities underpinned by the creation of good governance with clear accountabilities and delivery plans; and,

3. **Strategic asset development:** to construct and fit-out the EFI facility, providing physical space and facilities for the relevant UoE schools and external partners to collaborate, innovate and deliver TRADE activities initially across the financial services, creative industries and the public sectors.

### Investing in and addressing core capabilities and gaps: TRADE

Figure 1 below illustrates how the investment in EFI is broken down across each TRADE element and how the activities of the key UoE constituents of EFI are focused compared to collocated external partners and EFI DDI hubs. The two red circles highlight the current relative weaknesses or capability gaps of each of the constituents and the green box highlights the enhanced capacity that EFI will create by providing the physical space, ecosystem and infrastructure to allow these constituents to come together.

Figure 1 – Who does what?

TRADE		Talent	Research	Adoption	Data	Entrepreneurship
DDI Investment Em		£7.4m	-	UoE £10.3m + Ext £17m	UoE £9.9m + Ext £15.9m	UoE £8.6m + Ext £8.6m
EFI Constituents						
Internal existing	College of Arts, Humanities and Social Sciences	✓✓	✓✓	✓		✓
	College of Science & Engineering	✓✓	✓✓	✓	✓	✓
	Public Sector partner organisations			✓	✓	
Externals (collocated)	Private Sector partner organisations			✓✓	✓	✓✓
	3rd Sector partner organisations		✓	✓	✓	
EFI (combining internal/external capabilities)	Fintech Hub	✓✓	✓✓	✓✓	✓✓	✓✓
	Creativetech	✓✓	✓✓	✓✓	✓✓	✓✓
	PublicTech	✓✓	✓✓	✓✓	✓✓	✓✓

✓✓ = Core capability or resource  
 ✓ = Some capability or resource

**Talent:** There is a need to not only enhance the supply of data technologists and data scientists who can meet the demand for more technical skillsets in organisations but also for enhanced data literacy across a range of organisational functions. In order to fully unlock the value in data, the managers, leaders and change agents of the future (across all sectors in the economy) need to understand how to interact with data in a number of ways, including:

- Setting future strategy based on data-driven insights and future technology trends;
- Enhancing the capacity for evidence-based decision-making;
- Developing new data-driven products and services;

- Creating, designing and delivering new business models in the public, private and third sectors – to maximise data-driven opportunities;
- Understanding and addressing current/future DDI talent needs;
- Working effectively with data scientists and technologists to solve problems within their organisations; and,
- Enhancing existing DDI skillsets to redeploy roles displaced by technology.

EFI's educational programmes will address these needs by:

- Bringing data literacy into the UG and PG curriculum across the arts, humanities and social sciences;
- Enhancing the delivery of arts, humanities and social science courses in the data science and data technology curricula (through collaboration with all the other DDI Hubs); and,
- Developing CPD and Executive Education programmes designed to promote data literacy across management and leadership levels within public, private and third sectors organisations in the UK and internationally.

**Research:** The collocation of arts, humanities and social sciences experts with external partners in EFI's challenge-led ecosystem provides an unparalleled opportunity to create new DDI knowledge and insight. Technological and scientific advances are rapidly extending possible applications of data technology and data science and, critical to the success of data driven innovation, will be how the EFI matches these advances to economic and inclusive growth opportunities as well as addressing related complexities (e.g. disruption and change in many aspects of society) and challenges (e.g. ethics, morality, security).

UoE has considerable strengths in conducting research in the arts, humanities and social sciences and, while there are many examples of multidisciplinary projects with external partners, the existing physical and institutional structures do not enable this at scale. EFI will provide, therefore, an important physical and virtual infrastructure both for the collaborative identification of challenge themes and for multidisciplinary researchers to collocate with external partners and stakeholders around challenge-led projects.

**Adoption:** It is critical to the success of the DDI programme that the new knowledge and insight created by EFI can be accessed, adopted and used by external stakeholders for the benefit of society. UoE will invest substantially in the business development and external engagement teams necessary to:

- Develop relationships across key EFI DDI sectors;
- Put into practice the engagement models necessary for challenge-led education and research (building on existing best-practice models such as Edinburgh Innovations' *AIMDay* and *Fast Forward* and Design Informatics' *Collider* sessions);

- Bring key partners into EFI collocation spaces;
- Identify and drive forward adoption projects with partners; and,
- Leverage funding from partners and third party funding sources.

**Data:** Gaining convenient access to “real” data is a recurring problem with the Open Research Data Task Force recognising that a number of technical, cultural and behavioural issues need attention to make data sharing more accessible. To enable greater levels of innovation in the local economy, the SIA highlighted the need for “real” data to inform talent development and research, and for access to this data to be made more straightforward.

EFI will work with partners across the DDI programme (e.g. the Bayes Centre, Usher Institute, together with the WCDI) to help increase the City Region’s ability to manage, access and utilise large pools of diverse data assets, and the associated value that it generates, by:

- Informing regulation and policy around the responsible sharing and linkage of data sets;
- Uncovering new, untapped data assets in partner organisations;
- Providing insight into the opportunities to create new value from data assets, driving higher levels of research, adoption and entrepreneurship activity; and,
- Increasing the data literacy of researchers, students and external stakeholders to support the unlocking of value from data sets.

The development of WCDI will provide EFI researchers and students with unmatched access to a range of datasets, significantly enhancing the power of EFI to deliver world class talent, research, adoption and entrepreneurship outputs.

**Entrepreneurship:** Entrepreneurship at EFI will have a particular look and feel due to the (initial) industry sectors engaged. Through challenge-led teaching and research EFI will feed the pipeline of DDI Entrepreneurship activity with ideas and opportunities through bespoke programmes for supporting the development of such ideas in collaboration with the University’s successful enterprise development teams at Edinburgh Innovations (which have supported the formation of more than 400 companies over the past decade) as well Informatics Ventures (via the Bayes Centre).

In addition, EFI will work with partner organisations such as CodeBase, the UK’s largest technology incubator, ensuring that EFI’s activities in this area add value to the City Region’s existing entrepreneurial ecosystem. Much of EFI entrepreneurship activity will be closely linked to talent development programmes as these will include entrepreneurship education.

Entrepreneurship at EFI will contribute to enhanced economic growth through innovation around the development of new products and services linked to data. The ecosystem cultivated at EFI will support a range of approaches to entrepreneurship (e.g. company formation, public sector intrapreneurship,



social enterprise). In line with EFI's sector focus activity will be organised around three interconnected hubs: PublicTech (including public services and infrastructure), FinTech (including DDI in Financial Services), and CreativeTech (including Festivals and Tourism).

EFI will foster innovation and entrepreneurship with public sector partners by bringing data driven innovation approaches to bear – including out-sourcing and intrapreneurship - to improve the efficiency of public service delivery. For example the Edinburgh Living Lab is piloting initiatives in this area already by bringing local authority partners together with data scientists and community groups to address issues in Mobility, Energy and Learning.

Social enterprise will be another key route for entrepreneurship at EFI. Already the University is supporting a growing number of students to develop social enterprises that have significant potential to create jobs and address social problems. For example, in 2018, a team of 83 Edinburgh students involved in eight social enterprises were crowned Enactus UK 2018 National Champions. EFI will provide the space, networks and support necessary to foster such activity at scale - developed through TRADE activities - to leverage the power of DDI for positive social impact.

### **Organising activities effectively**

Understanding how EFI can effectively capitalise on data opportunities is best explained by setting out who the key players are, how they will work “without falling over each other”, through a new operating model and which market opportunities they will focus on.

#### **Key Players and Collaborative Activity**

EFI will house experts from a range of disciplines within the University as well as from partner organisations with complementary capabilities. EFI is being defined with flexible collocation in mind and it is envisaged that internal and external constituents will locate in EFI across timescales ranging from the long term (e.g. via a joint Centre or Programme) to short term assignments (e.g. based on a single project).

#### **Key Internal (UoE) Players**

Figure 2 shows the range of internal academic experts involved with EFI (at the time of writing) set against a number of key thematic areas. This highlights the breadth of expertise areas covered by EFI which, when brought together in a managed way, will provide a powerful combination to addressing challenges.

Figure 2 – Key Internal EFI relationships

	Themes	Economy/Finance	Democracy/Policy	Society/Education	Creativity/Design	Sustainability/Crisis	Health/Wellbeing
<b>UoE Schools</b>							
College of Arts, Humanities & Social Sciences	Politics & Social Sciences	✓	✓	✓	✓	✓	✓
	Edinburgh College of Art	✓	✓	✓	✓	✓	✓
	Education		✓	✓	✓	✓	
	Business	✓	✓	✓	✓	✓	✓
	Health in Social Science			✓		✓	✓
	History, Classics & Archeology	✓	✓	✓	✓	✓	✓
	Philosophy, Psychology & Language Sciences		✓	✓			✓
	Law	✓	✓	✓	✓		✓
	Literature, Languages & Culture	✓	✓		✓	✓	✓
	Economics	✓	✓				
Divinity	✓	✓	✓	✓	✓	✓	
College of Science & Engineering	Geosciences		✓	✓		✓	✓
	Maths	✓	✓			✓	
	Informatics	✓	✓	✓	✓	✓	✓
	Engineering		✓	✓	✓	✓	✓
Example Multi-disciplinary Centres within EFI	Centre for Future Infrastructure		✓	✓	✓	✓	✓
	Design Informatics	✓	✓	✓	✓	✓	✓
	Edinburgh Living Lab	✓	✓	✓	✓	✓	✓
	Academy of Government	✓	✓	✓			✓
	Digital Scholarship Centre	✓	✓	✓	✓	✓	✓
	Wellcome Trust Programme for Biomedicine, Self & Society		✓	✓			✓
	Programme for Rethinking Governance & the Social Contract	✓	✓	✓		✓	
	Institute for International Cultural Relations	✓	✓	✓	✓	✓	✓
	Edinburgh Centre for Data, Culture and Society	✓	✓	✓	✓	✓	✓

**The Edinburgh Centre for Data, Culture and Society (EdCDCS):** The Edinburgh Centre for Data, Culture and Society will build capacity for applied data-driven research across the College of Arts, Humanities, and Social Sciences. There are already pockets of digital innovation and research excellence across Edinburgh University in this area (the methods of which include, but are not limited to, text and data mining, data visualisation, linked open data, semantic analysis, natural language processing, and geographical information systems, applied to both historical and contemporary data sources in order to answer research questions regarding human culture and society). EdCDCS will:

- Identify and support existing data-driven research activity across the UoE’s College of Arts, Humanities and Social Sciences (CAHSS) providing a cross-college hub to promote researchers currently working in this area;
- Promote the usefulness, timeliness, and impact of data driven work across CAHSS;
- Identify and support researchers who wish to become data-fluent and to undertake applied digital research relevant to Arts, Humanities, and Social Science, in CAHSS but also across the wider University;
- Provide resources that will remove barriers to innovation for data-driven research across the Arts, Humanities and Social Sciences, including working with the wider data-science infrastructure at the UoE;
- Refocus and refine the current CAHSS Digital Scholarship activities, to provide a one-stop-shop for training and advice regarding digital research;
- Ensure that the voice and research excellence of CAHSS is promoted in data-science activities being undertaken across the University; and,

- Provide a central, easily identifiable point within the UoE for external bodies (such as libraries, museums, government, and policy makers) to engage with CAHSS' digitally enabled research and researchers.

**The Centre for Future Infrastructure (CFI):** is a world-class centre of excellence in infrastructure systems. The CFI combines knowledge and expertise within the University's expertise in engineering, informatics, architecture, social and political studies and business school. The CFI will host a city and regional infrastructure database at the WCDI that will help researchers and innovators working with city and regional administrators to inform and significantly improve decision-making. In this \$2.3 trillion annual infrastructure market worldwide the potential for spin-out companies and start-ups is significant.

**The Institute for International Cultural Relations (IICR):** was established in 2013 to explore how global cultural interactions in areas such as the arts, education, sports, and political economy can have an impact. Through programmes and research it promotes a better understanding of how to bridge the gap between diverse global cultures when engaging in political and cultural diplomacy. The IICR acts as a catalyst for interdisciplinary scholarship across the whole University and as a bridge to practice. It is committed to expand and deepen global connections to academic, decision-maker, policy and practitioner communities.

**The Wellcome Trust Programme for Biomedicine, Self and Society:** this Programme aims to understand and influence the dynamic relationship between biomedicine, individuals and society. It will deliver imaginative and innovative solutions on these issues by bringing together social science, law and bioethics to engage with biomedicine and shape new kinds of knowledge and more effective forms of action. This will allow EFI to forge novel partnerships with scientists, clinicians and policy-makers, building on unparalleled experience of collaboration between medically-related social sciences and humanities and Edinburgh's internationally leading biomedical and clinical research.

**Edinburgh Global:** leads the UoE's international strategy and global engagement. It supports and delivers collaborative, strategic projects and initiatives and provides professional services that underpin global partnership, go abroad and exchange, student recruitment, support and visa advice. As well as the Edinburgh office, Edinburgh Global has regional centres in Mumbai, Beijing, Singapore, Santiago and New York.

**Global Academies:** cross boundaries in research and teaching, adopting a multi-disciplinary, collaborative response to challenging global issues. The University has five Academies which EFI will draw upon: The Global Health Academy aims to improve global health through collaborative, interdisciplinary research, education and resource development; The Global Development Academy brings together teaching, research and partnerships, making practical and intellectual contributions to international development; The Global Justice Academy supports research, teaching and knowledge exchange on global justice issues; The Global Environment & Society Academy is a network of experts who collaborate on innovative solutions for global environmental challenges; and, The Global Academy of Agriculture and Food Security works to improve the effectiveness and sustainability of agri-food systems, which is central to many of the UN *Sustainable Development Goals*.

**The Academy of Government (AoG):** supports new forms of teaching and research in government, politics and public policy and aims at providing policy makers with an understanding of how

government happens, how policies are made in the everyday, whether in local, national or international contexts.

**Edinburgh Living Lab (ELL):** is a city-wide collaboration whose founding partners are the City of Edinburgh Council and the UoE. Its goal is to bring academia, the public sector, industry and the third sector together in order to work with citizens in co-designing, testing and implementing new services, processes and products that generate social, environmental and economic value. It is radically interdisciplinary and comprises a set of resources, knowledge, tools, and relationships that will develop over time.

The complex problems of modern cities require holistic approaches, and the Living Lab brings together knowledge, experience and partnerships to explore new approaches to innovation, sustainable development and informed policy-making in the City Region. ELL's approach combines data-driven analysis and participatory design techniques to support social innovation.

A key part of ELL's activities includes carrying out participatory research with 'end users' through small-scale experiments. This will contribute to ELL to develop a better understanding of the people and systems in which a proposed intervention or activity is situated and what kind of impact it may have. It is also part of an iterative process of experimenting / refining / redefining an intervention to make sure that it really works in the way that it is intended to.

**Digital Ambassador Project:** since 2016 the Digital Ambassador project has been helping to improve digital literacy amongst people in the community. The programme supports local people to gain digital skills so they can use the internet and other technologies with confidence. The Digital Ambassadors programme trains student volunteers to teach these skills through weekly classes at the Charteris Centre in the Pleasance. This helps people from all walks of life to benefit from digital literacy as an increasingly necessary life skill for everyday tasks like shopping, banking and paying bills through online platforms. Last year, the project used equipment donated through the University's WEEE recycling scheme (via WarpIT Equipment Exchange that provided iPads) and the project was run in parallel with the Scottish Council for Voluntary Organisations' Scotland-wide Digital Participation programme.

More recently, the programme has expanded with 19 volunteers and four different groups available, including an elderly persons group and one for local Muslim women hoping to return to work. The volunteers also provide Friday afternoon drop-in sessions during term-time at the city's Central Library on George IV Bridge and help at People Know How's digital outreach project in Leith, expanding their reach across the city.

The benefits to the community are clear. An evaluation of the project found that the people who attended the sessions felt their ability to use technology increased and their basic digital skills improved. Participants felt more confident using tools such as Google, email and online courses. Students also benefit from the project, gaining skills in teaching, communication and leadership. The project is also helping to fulfil one of the University's commitments to the Social Impact Pledge, a Scottish Government initiative aimed at increasing the social impact of public sector organisations across Scotland.

## **Key external players, sectoral focus and engagement activities**

EFI will provide the space, infrastructure, institutional connectivity and collaborative ecosystem necessary for the University to become a truly porous institution, with activities (e.g. teaching, research, events) driven by business and societal challenges, and shaped in collaboration with key stakeholders across public, private and third sectors, as well as civic society. To achieve this, EFI through its multidisciplinary centres, will work across three sectors. Each of these are described below, along with examples of existing and pipeline EFI activities.

**Public Services/PublicTech:** the PublicTech hub of EFI will deliver, inter alia, research, education, and engagement activities, aimed at transforming public services for inclusive societal benefit. A principal focus will be on the ways in which public policy is made and delivered, and - in particular - the role which data driven innovation can play in: supporting citizenship and participation; enabling more informed and ethical decision-making; promoting greater efficiencies in the deployment of resource and better evaluation of outcomes; and, developing effective services which have measurable and sustained benefits and enable individuals and communities to flourish including:

### ***Civic/Community Engagement***

- A major programme of public education and outreach, working with the Centre for Open Learning and the Department for Social Responsibility and Sustainability (Community Engagement team);
- A series of Utopia Labs on future-scoping, bringing together a wide spectrum of visionary thinkers, and key leaders in government, business and the community, linking to the Centre for Cultural Relations and the Institute for Academic Development;
- A series of Policy Delphi, with leaders in local/central government, linking to the Academy of Government;
- A programme of citizens' juries and experimentation with new approaches to participative and deliberative democracy, community building, place-making and identity, building on models and networks developed by Edinburgh Living Lab and the Edinburgh Partnership;
- The development of new integrative models of research and learning and teaching as being pioneered by the new Centre for Homeless and Inclusion Health and in development by the Centres for Palliative and Dementia Care (Usher Institute) and Access to Justice (School of Law);
- A programme of bold 'Whole University' place-making projects in partnership with communities, local government, third sector groups, and SMEs beginning with the 'Old Town Project', in which multi-disciplinary teams will work to devise an integrated strategy for the resolution of critical policy issues; and,

- Building capacity for public and community engagement, co-production and co-design via training and support for researchers, students and wider stakeholders, delivered under the auspices of the University's Strategy for Public Engagement with Research and in collaboration with the Institute for Academic Development and the Community of Practice for Experiential Learning.

### **Engagement with Public Service Providers**

Via EFI the University is building key partnerships across the City Region that will facilitate partnerships between the DDI programme and public service providers (*public, private and third sector*), fostering improvement in the making and delivery of public policy, both through private sector entrepreneurship and increased culture and capacity for data driven innovation within public sector organisations. Examples include:

- Early partnership and project pipeline with CivTech, the Scottish Government's challenge-led tech innovation/procurement unit;
- Development of a DDI project pipeline with stakeholders from the Edinburgh Partnership, as part of Edinburgh Living Lab; and,
- Enhancement of the teaching, research and adoption agendas between the Centre for Future Infrastructure, Costain Group and its supply chain partners, focusing on the potential for DDI to transform the management delivery of major public infrastructure projects.

**Financial Services/FinTech:** a major focus of EFI will be on the potential for DDI to transform financial markets, both disrupting and innovating in the delivery of financial services, creating both opportunities (new business models, better outcomes for customers) and challenges (workforce displacement, moral, ethical and regulatory issues). This will involve the development of an innovation ecosystem across a number of sectors and functions, including the incumbent financial services firms (banking, investment management, asset services, insurance, etc.) and FinTech SMEs. Early planned and pipeline activities include engagement with:

- **Professional bodies** (e.g. in banking, accountancy, insurance, legal services, investments) focused on re-thinking professional curricula (re-skilling of existing professionals, development of future professionals), co-creation and adoption of multi-disciplinary research;
- **Fintech Scotland and Scottish Financial Enterprise**, with a view to aligning EFI activities with national and regional objectives for talent, skills, entrepreneurship and innovation in financial services and FinTech. This includes:
  - Development of pilot executive education and CPD programmes, co-created with FS firms in a range of subsectors;
  - Challenge-led events and workshops (e.g. AIM Day) aimed at surfacing current and future-oriented challenges; and,

- Bringing the University's multi-disciplinary expertise (e.g. business, finance, maths, policy, law, data science) to help address both of the above.
- **Scottish Enterprise and SDI** to articulate the University's TRADE offer to prospective inward investors (e.g. non-UK FinTech firms).

In addition a Programme Advisory Panel will be formed in September 2019 for the MSc in Finance, Technology and Policy to co-develop the curriculum and help keep it fresh and employer oriented.

Consideration will also be given to the viability of setting up an Academy for Finance, Technology and Society aimed at engaging senior leaders in FS firms in understanding and shaping the future of Financial Services and Markets in light of disruptions caused by technology, regulation and changing societal norms.

**Creative Industries/CreativeTech, Culture and Tourism:** the CreativeTech hub will explore the potential for data-driven innovation to transform the creative industries. The current UoE EFI CreativeTech sector team have conducted extensive and intense engagement with the Creative Industries Cluster in the City Region over 2017/18 with the objective of identifying the sector's Data Driven Innovation challenges. Engagement included a mix of individual meetings, workshops attended by the Partner organisations and follow up work with individuals and smaller groups to identify potential routes for developing new products and services and ideas and approaches that will encourage entrepreneurship and the formation of new businesses. This team worked working closely with Creative Edinburgh, other trade bodies and business support organisations, to develop effective approaches for engaging with this complex sector. In particular several workshops focused on the needs of micro-businesses.

This engagement has resulted in development proposals for:

- Creative Bridge, Resident Entrepreneur and Connected Innovator programmes some of which will be led and managed by Core Partner organisations such as CodeBase and Creative Edinburgh; and,
- Creative Informatics Centre that will work with partners to grow the creative industries cluster in the City Region by meeting the need and demand for R&D and increasing data literacy to enable the sector to capitalise on new technology to develop new products and services and succeed in an increasingly competitive market.

Through EFI the University will partner with a range of organisations e.g. Edinburgh Napier University, Creative Edinburgh (with 3800+ members) and Codebase (the UK's largest and Europe's fastest growing tech incubator). It will bring together cultural partners, creative businesses and entrepreneurs, to address R&D challenges that are pertinent to the development of high quality user experiences as well as business growth.

In addition, EFI will engage extensively with cultural organisations and key players in the tourism sector to leverage the potential for DDI to both transform the way audiences interact with cultural experiences (e.g. via new audio-visual and sensory technologies) and significantly enhance the

economic potential of the tourism sector (e.g. by understanding and predicting future footfall, improving retention of visitors, increasing visitor spend and developing new products and services). Early pipeline projects include a scoping exercise with a major events listing company, data exploration with a major hotel chain and a series of workshops with Festivals Edinburgh.

Finally it is important to recognise for this (and other sectors) that EFI does not have: “a monopoly on good ideas” and that data driven innovation may not necessarily come from the places we expect. It will be a measure of success if creative businesses in the Region does develop in unexpected as well as the planned ways mapped out above. It will be important, therefore, to retain flexibility at EFI to future market needs and trends.

One specific approach will be to recruit Chancellors Fellows linked to EFI each year: for example all of the 2018 Fellows cohort are focused on data-enabled research and innovation.

### **Co-creation of UG and PG educational programmes**

In developing new, multidisciplinary educational programmes, EFI is already engaging with organisations in key sectors around the knowledge, skills and attributes required by their graduate employees in the future. For example, the curricula for the first two EFI Masters Programmes (MSc Finance, Technology & Policy and MSc Leading Major Programmes, both launching in September 2019) have all been developed in discussion with employers in the Financial Services and Infrastructure sectors respectively. Ongoing programme advisory panels will refresh and enhance programme content.

### **Challenge-based approaches**

A key role of EFI will be to bring a challenge-based approach to the way the University undertakes future education and research. The EFI will build on existing structures and models for external engagement (e.g. Edinburgh Living Lab’s approaches to citizen engagement and Edinburgh Innovation’s AIMDay model for addressing industry challenges) as well as working with partners to develop or adopt new models for challenge-based working and co-creation as exemplified by early partnerships with Nesta, CivTech and Interface.

### **Inclusive Growth Focus**

The concept (and indeed legitimacy) of data driven innovation is open to greater scrutiny than ever before (not least because of the high profile crisis linked to the activities of Cambridge Analytica/Facebook, signifying as it does the dystopic possibilities of tainted democratic processes, disempowered and manipulated citizens, and the pernicious power dynamics that can be involved in data ownership and deployment).

Potential displacement of key segments of the City and Region’s workforce is also a challenge to growth via data-driven innovation. The role of EFI is thus crucial in providing, not only the knowledge-base, critical thinking, and multi-disciplinary outlook that are all needed to engage with the transformative possibilities of data driven innovation, but also the philosophical, regulatory and legal expertise and inspiration needed to develop models for good governance, ethical practice and public education which are core to delivering inclusive benefit. An early example of a pipeline

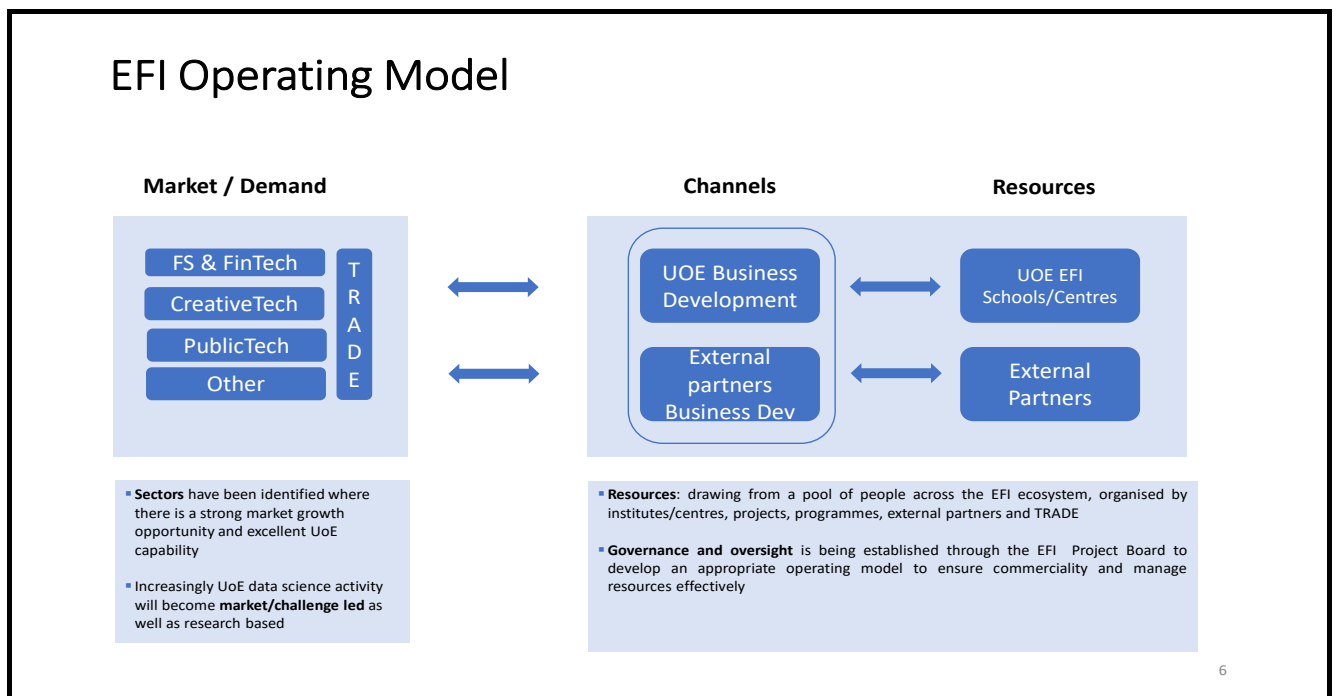


project/partnership with an inclusive growth focus is the Open Jobs proposition with Nesta aimed at improving social mobility through creation of a more efficient, data-driven labour market.

## Operating Model

The above list of capabilities and resources is broad and of high quality with many recognised for excellence nationally and internationally. The challenge is being able to further leverage these assets to drive innovation so that the collective is significantly greater than the individual parts. The objective is to collocate these high quality initiatives, programmes and projects. Given the nature of EFI's cross matrix organisational structure and its data driven innovation remit, Figure 3 depicts a high level view of the operating model (which will be designed to align and intersect with existing UoE operating models as well as those of the other DDI hubs (e.g. Bayes, Usher)).

Figure 3 – Draft EFI Operating Model



The above (operating) model will be overseen by a robust governance structure as set out in the Management Case section.

## Challenges & Business Needs

In its current form (i.e. in the absence of dedicated physical premises) EFI faces various challenges:

- It is virtual, with disparate groups of researchers, students and industry partners scattered across a variety of UoE campus locations;
- Across the various locations there is minimal space for interaction and co-location with external partners (corporates, SMEs, third sector organisations) few collaborative zones and little room to accommodate spin out companies;

- There is, therefore, no ability to establish critical mass, host regular as well as serendipitous opportunities for exchange or establish physical centres of excellence around well-understood EFI DDI opportunities;
- Existing space is consequently not fit for purpose and lacks the infrastructure to take full advantage of the improvements in the data access and handling capabilities that will be enabled via WCDI;
- Lack of shared infrastructure also prevents certain critical interdisciplinary research, entrepreneurship and adoption activities from taking place (particularly in relation to working collaboratively with external partners); and,
- The ability to attract large scale industry investment is constrained given the lack of suitable conditions for joint working (e.g. premises and access to researchers).

In short, the lack of high-quality, flexible teaching and learning spaces (suitable for executive education, blended learning and digital skills courses) currently limits the ability to maximise EFIs potential contribution to the DDI skills and talent pipeline and wider co-design and co-delivery relationships with external partners.

The activities through which these objectives will be achieved are summarised in Table 3 below. Government investment will allow EFI to build upon this demand and to take forward future opportunities that -in the absence of increased TRADE capacity - are unlikely to be realised.

Table 2: EFI proposed activities

SIA Theme	Activity Proposed
<b>Talent</b>	<p>Work has already begun on the design and delivery of suites of new Postgraduate, Undergraduate, Executive Education and CPD courses. These will be:</p> <ul style="list-style-type: none"> <li>• Co-designed and co-delivered with partners, ensuring that knowledge, skills and capabilities are aligned with the needs of employers;</li> <li>• Research-led, so that the curriculum is informed by cutting edge ideas and innovations;</li> <li>• Multidisciplinary, blending data science with arts, humanities and social sciences to foster talent that can not only handle data but also use this data to generate insight, create value and solve problems;</li> <li>• Challenge-based, encouraging students to apply their learning to apply to real world opportunities; and,</li> <li>• Scalable by making use of online distance learning wherever possible.</li> </ul> <p>In addition EFI will work with inclusive growth partners, across the City Region and Scotland, to extend the reach of relevant elements of this curriculum (e.g. via primary and secondary schools, skills academies and the Further Education sector).</p>
<b>Research</b>	<p>EFI will develop a multi-disciplinary programme of research, building on existing best-practice examples and custom-designed new spaces to hold a range of innovative meeting and event formats (e.g. AimDays®, Colliders and Sandpits) and leveraging sector-specific research funding from:</p> <ul style="list-style-type: none"> <li>• UK Research Councils;</li> <li>• The Scottish Funding Council;</li> <li>• UK Government (e.g. Innovate UK);</li> <li>• Industrial Partners; and,</li> </ul>

SIA Theme	Activity Proposed
	<ul style="list-style-type: none"> <li>Charities and foundations.</li> </ul> <p>EFI will also create new DDI researchers through:</p> <ul style="list-style-type: none"> <li>Industrial PhDs (students working on research in collaboration with partners);</li> <li>Professional doctorates (managers and leaders in private, public and third sector organisations conducting research to enhance their DDI knowledge and skills, and innovate in their organisation, sector or ecosystem); and,</li> <li>Visiting fellowships and secondments (similar to professional doctorates but on shorter term projects and initiatives).</li> </ul> <p>Finally, the UoE is exploring the possibility of housing EFI research journals aimed at publishing high-quality collaborative and interdisciplinary DDI research.</p>
<b>Adoption</b>	<p>All EFI teaching and research activities will be carried out in collaboration with partners by co-creating DDI knowledge, insight and solutions primed for adoption by partners and their networks, professions and supply chains. For example the Creative Industries and Tourism sectors are particularly characterised by microbusinesses. To develop activities in CreativeTech EFI will (therefore) work with membership organisations such as Creative Edinburgh and trade bodies such as IPA (Institute of Practitioners in Advertising) to build communities of micro-businesses and help them to engage with the potential of data driven innovation.</p> <p>This adoption will be enhanced by the increased space for short-term and long-term co-location with organisations (corporates, SMEs, public sector departments and R&amp;D teams).</p> <p>Multi-stakeholder networks, events and projects will bring service providers, end users and technology firms together with academic experts to identify challenges and co-design pathways to solutions (generating a pipeline of entrepreneurial ideas for the DDI Programme and fostering adoption across sectors, supply chains and communities).</p>
<b>Data</b>	<p>EFI will unlock value from datasets by working with partners - and leveraging WCDI and the regional IoT network - to:</p> <ul style="list-style-type: none"> <li>Generate new datasets (e.g. through sensors or digitisation of offline information);</li> <li>Gather and integrate existing datasets;</li> <li>Promote the sharing of data between partners to create new value;</li> <li>Form new novel approaches to creating value by interrogating or visualising data; and,</li> <li>Use a challenge-based approach to solving problems and identifying new data-driven business and service models.</li> </ul>
<b>Entrepreneurship</b>	<p>EFI's collaborative challenge based approach will generate a pipeline of data-driven ideas for solving problems and exploiting new market opportunities.</p> <p>New collaboration spaces will allow EFI to incubate and nurture start-up companies with data-driven business models (leveraging entrepreneurial support from the wider DDI Programme).</p> <p>In particular EFI and Edinburgh Innovations will support entrepreneurs with:</p> <ul style="list-style-type: none"> <li>Ideas development;</li> <li>Mentoring and networking;</li> <li>Professional services support; and,</li> <li>Scaling up and linking with potential private sector investors.</li> </ul>

## Scope of Investment Requirements



The investment required to undertake the activities above is £131.3 million with £57.9 million drawn from City Deal funding and up to the remaining £73.4 million underwritten by the UoE. As detailed in the commercial case re-imagining the iconic, centrally-located Old Royal Infirmary building

at Quartermile (22,000 sq.m.) will comprise specially designed spaces for collaborative innovation, novel modes of learning, professional networking, public engagement events and entrepreneurship and commercialisation.

## Overall Affordability

The EFI financial case is based upon the assumptions that:

1. The EFI total capital requirement is £131.3 million;
2. UoE underwrites up to £73.4 million of the total capital requirement;
3. £57.9 million of the total capital requirement is funded by City Deal;
4. UoE funds the ongoing operating costs; and,
5. UoE will fully fund the continued operation of the EFI facility beyond year 15.

Overall the initial due diligence undertaken by the University indicates that the preferred option and associated risk profile is affordable and capable of being self-sustaining over the longer term if the capital grant is approved at the currently requested level and phasing.

The profile of forecast capital expenditure over 15 years is shown below.

Emillions	To 2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
<b>Spend p.a.</b>	29	32	41	26	3	-	-	-	-	-	-	-	-	-	-
<b>Cumulative spend</b>	29	61	102	128	131	131	131	131	131	131	131	131	131	131	131
<b>Expected grant profile</b>	-	-	18	4	13	3	20	-	-	-	-	-	-	-	-
<b>Cumulative grant profile</b>	-	-	18	22	35	38	58	58	58	58	58	58	58	58	58