Impact Objective

- National research centre and data service, offering expertise, training, data collections, and data tools for the benefit of cities across the UK and worldwide

Unlocking the power of big data

*Sarah Currier is the Senior Project Manager of the **Urban Big Data Centre** (UBDC) research facility. She discusses the work that takes place at the UBDC, the impact of that work, and some of the plans for the future*

Can you begin by telling us a bit about the work of the UBDC? What type of research is being completed at the Centre?

The UBDC, led by the University of Glasgow's CH2M Chair of Transport, Professor Vonu Thakuriah, is more than a research centre. While we do carry out world-leading research across a range of urban and data science disciplines, we are also a national data service, funded by the Economic and Social Research Council to support academic researchers, government policymakers, local planners, third sector organisations, businesses and ordinary citizens with data, resources, training and expert advice. We are at the cutting edge of promoting innovative research methods and the use of big data to improve social, economic and environmental wellbeing in cities. Since we began in January 2014, we have supported a wide range of users, as well as forming alliances with such bodies as the UK Office for National Statistics, AURIN in Australia, and Statistics Netherlands, and working with the Research Data Alliance and the BSI on standardisation for urban big data.

Our external data service users and partners and our internal research programme cover a vast range of areas, including transportation, education, the environment, housing, migration, social exclusion, deprivation, employment and health, as well as statistical research into using big data for understanding and visualising problems, and data science research into methods of managing and manipulating big data. Some specific impactful research we're working on includes understanding the UK's productivity shortfall, investigating the growth and implications of the private rented sector, mapping changes in the new digital and sharing economies, following educational outcomes for citizens across their entire learning journey from school to employment, and providing easily accessible insights into a range of urban factors for planners and policy makers.

What do you envisage the impact of the UBDC's work will ultimately be for society?

UBDC aspires to make positive transformations in urban life. We want our services and research to unlock the power of big data to improve social, economic and environmental wellbeing in cities. This aspiration is supported by our core values of research rigour, openness, and data quality, integrity and transparency.

How does the UBDC align its work with other related European networks or organisations involved in big data?

The UBDC's Director, Professor Vonu Thakuriah, is Co-Chair of the international Research Data Alliance's Quality of Urban Life IG, and our Senior IT and Data Services Manager, Dr Andrew McHugh, is now also representing UBDC in a range of relevant RDA work and in the development of big data standards with BSI. These links led UBDC to a close relationship with Statistics Netherlands, and, through that, discussions with Eurostat with hopes of a similar collaboration.

Other Co-Investigators within UBDC also have close links with European networks, including Professor Mike Osborne, who leads UBDC's Education research strand. He is heavily involved in a number of important international efforts, notably as Co-Director of the global Pascal International Observatory, and through his involvement in their Learning Cities Networks. He has also advised the European Commission (EC) in relation to the development of the new integrated lifelong learning programme, and the German government in the development of higher continuing education. For the EC, he has been a consultant in evaluation of the Jean Monnet Programme and development of a pan-European framework for the competences of adult educators.

What plans does the UBDC have for work in the coming year?

With the current funding for UBDC set to complete in 2019, we are working on translating our success into a sustainable business model to move forward with. As part of that we have recently released a large tranche of content demonstrating some of our impact to date, with a full pipeline which will see one new impact user story a week well into January and beyond!

Using big data to transform lives

> *The University of Glasgow's Urban Big Data Centre was established by the UK Economic and Social Research Council and addresses the social, economic and environmental challenges facing cities through a wide range of research support services*

Big data is a term that refers to the relatively recent production of massive amounts of information that cannot be analysed using traditional methods. The technological revolution that has been ushered in since the turn of the 21st century has given rise to datasets that are so complex and vast that they have real potential for transforming our lives on an unprecedented scale and in unimaginable ways.

Big data becomes urban big data when the people analysing the information find an urban use for it, where the possibility for performing quality research that makes use of the big data can improve urban living. The Urban Big Data Centre (UBDC), based at the University of Glasgow, is focused on using urban big data to address many of the social, economic and environmental challenges facing cities.

ANALYSING PREVIOUSLY INACCESSIBLE DATA

Cities in the 21st century face rapidly changing populations and all of the challenges associated with that. Improvements to the infrastructure of cities become increasingly necessary when the population of a city is burgeoning. As such, technological developments are extremely important, as they are enabling researchers to analyse big data in ways that can have a

Dr Andrew McHugh, UBDC Senior Data Services Manager, presents on data standards to an international group

direct impact on environments. Generating, facilitating, manipulating and visualising previously inaccessible data provides exciting opportunities to improve urban living.

Sarah Currier, Senior Project Manager at UBDC, understands why urban big data is so important to enable researchers, policy makers, businesses, third sector organisations and everyday citizens to harness the potential of this type of data. 'Urban big data encompasses a wide range of data types that fall outside the usual information sources used in policymaking, planning and business intelligence,' she explains. 'Whereas organisations and academic researchers have previously relied on census outputs and formal surveys, with all their built-in design and checks-and-balances, we are investigating the use of "naturally occurring" data that has not been formally gathered for research purposes.'

That this data has been largely inaccessible for reliable use in the past demonstrates the exciting potential effectively analysing it enables. For instance, administrative data that was not initially gathered for research purposes, or the social media and app data that has been collected over the years, can now be analysed to form new modes of understanding. Take the data that transport authorities collect for example, by recording the number of cars going through an intersection, or the ambient temperature at different road locations. By analysing such massive datasets, refinements can be made that improve the lives of citizens in subtle ways.

THE IMPORTANCE OF COLLABORATIONS

Given the complexity of the challenges that UBDC is seeking to address, forming partnerships and collaborating is an essential undertaking. Although it is based at the

University of Glasgow, UBDC is composed of a consortium of seven universities, including the University of Illinois at Chicago, University of Bristol, University of Edinburgh, University of Reading, University of Sheffield and University of Cambridge. This imbues its projects with a broad range of expertise and disciplinary coverage, as well as enabling the Centre to reach beyond Scotland and stretch across the whole of the UK.

Without these partnerships and collaborations, it would be impossible to effectively manage the tasks at hand, so support from data owners such as Glasgow City Council, Transport Scotland and the British Geological Survey has also been important. 'The relationships we have built have enabled us to make data collected by others more readily available for research use, to provide much-needed capacity building, and to influence the development of government data policy,' observes Currier. 'During the span of UBDC we have also developed a range of other collaborations, such as with the UK Office for National Statistics, Statistics Netherlands, standards bodies the RDA and BSI; third sector organisations such as SUSTRANS, Changeworks and Cycling Scotland; and businesses such as CH2M and TravelAi.'

URBAN BIG DATA

UBDC gives researchers access to urban big data so they can improve urban living. Alongside this, they provide support, tools and infrastructure so that a wealth of stakeholders can use big data as a lens to understand their cities and enhance the urban environment. The Centre has been running for three and a half years now, and during that time they have formed a range of partnerships, projects and training programmes that show some early results and their impact — both scientific and for
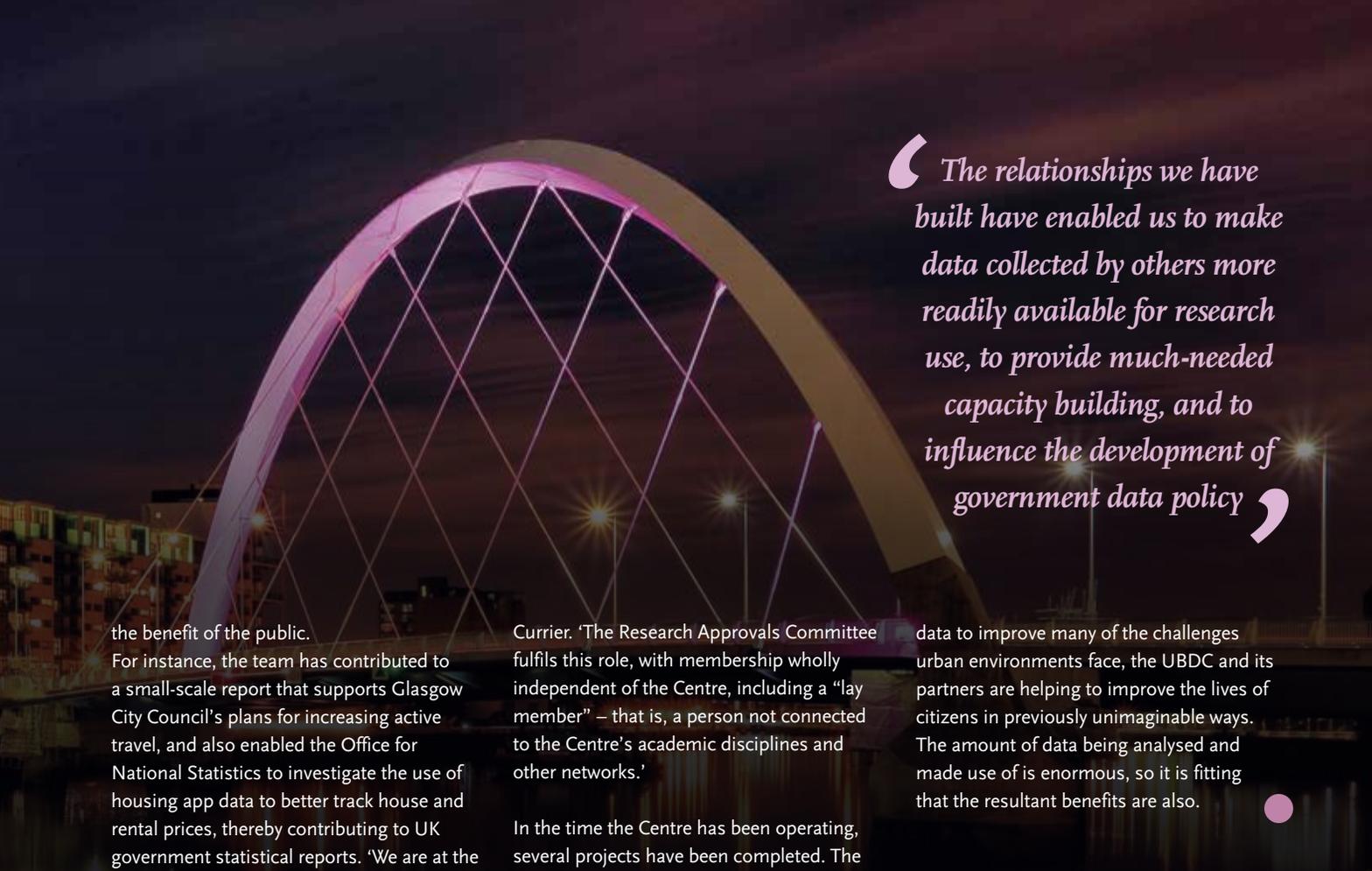
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the benefit of the public.
For instance, the team has contributed to a small-scale report that supports Glasgow City Council's plans for increasing active travel, and also enabled the Office for National Statistics to investigate the use of housing app data to better track house and rental prices, thereby contributing to UK government statistical reports. 'We are at the forefront of scientific impact, as is seen in our work on our own data collection project, the integrated Multimedia City Data (iMCD) project,' outlines Currier. 'This includes a strand where we gathered lifelogging photographic and GPS data from survey participants.' The data has shown numerous challenges that cross over between ethics and technology, such as image anonymisation in a huge dataset including photographs.

SUCCESSFUL OUTCOMES
Given that UBDC is a publicly funded centre, it is essential that there is appropriate scrutiny and support for its activities. As such, the Centre's governance structure has been set up in a way that supports the work of the Director and staff in developing and managing the Centre. In so doing, long-term success and sustainability is ensured. The central role is played by the UBDC Advisory Group, which is primarily made up of members that come from outside of the Centre. This naturally lends an impartial quality to the group, which includes very senior and notable academics, such as its Chair, Professor David Banister of Oxford University's Transport Studies Unit, as well as representatives of other user communities, such as businesses interested in data and third sector organisations. 'Our funders, the UK Economic and Social Research Council, require that decisions about the use of Centre infrastructure and resources are taken independently of the Centre,' explains

Currier. 'The Research Approvals Committee fulfils this role, with membership wholly independent of the Centre, including a "lay member" – that is, a person not connected to the Centre's academic disciplines and other networks.'

In the time the Centre has been operating, several projects have been completed. The Social Analytics Strategic Network (SASNet) was a joint proposal by UBDC and BLG DRC (another data investment in the Big Data Network (BDN)) that proved to be a huge success. The aim of it was to extend the BDN's capacity-building activities around social analytics by providing training and fellowships in cutting-edge work. SASNet enabled UBDC and BLG DRC to present a number of fascinating seminars, webinars, lectures and masterclasses, presented by world leading experts, along with lab-based training sessions.

Another UBDC activity that has been garnering worldwide interest from a range of cities is a geographic database called the Spatial Urban Data System (SUDS), which uses various data to visually tell complex, multi-dimensional stories of how cities work through scalable, intuitive and interactive interfaces. In the first prototype release, SUDS presents a simple spatial interface that enables users to query public transportation data, enabling transport availability analytics across the UK. The platform provides intuitive means for users to spatially query transport indicators that will enable greater understanding of transport availability dynamics at varying spatial scales. The UBDC's geospatial data team will be building on this with indicators across a range of additional areas in the next year.

Ultimately, by promoting innovative research methods that make use of big

data to improve many of the challenges urban environments face, the UBDC and its partners are helping to improve the lives of citizens in previously unimaginable ways. The amount of data being analysed and made use of is enormous, so it is fitting that the resultant benefits are also.

Project Insights

UBDC OBJECTIVES
UBDC's vision is Innovations for Smart, Sustainable and Socially Just Cities.
We provide:
• Access to a wide spectrum of big and complex data on urban areas
• Training and events, including technical, methodological and policy-focused sessions
• High quality research demonstrating urban and methodological impact

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• University of Edinburgh
• University of Glasgow
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