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Exploring data-in-use: the value of data for Local Government

Abstract

The power of data to support digital transformation within the context of e-Government is frequently underestimated. In this exploratory research, we develop a conceptual framework where the value of data stems from how it is used. We claim that the impact of digital transformation in the public sector presupposes an organisational culture that recognises and values *data-in-use*, by which is meant the practical application of data for a specific purpose, particularly by staff who deliver services. Through the lens of two ‘worldviews’ of data sharing, we present case studies of data use in two local authorities in Scotland. We claim that developing a culture where data is leveraged to derive insights for organisational activity requires combining working practices and technical infrastructure that centre on co-creating value with data. The presence of data intermediaries can support effective data-in-use to establish a healthy internal data ecosystem. Our research illustrates that local authorities within Scotland are still at an early stage of developing this culture.

Keywords: data ecosystem, digital transformation, local government, data use, Scotland

Zusammenfassung

Data-in-Use: Der Wert von Daten für die Kommunalverwaltung

Die Bedeutung von Daten für die digitale Transformation im Kontext von eGovernment wird häufig unterschätzt. In diesem explorativ angelegten Artikel wird ein konzeptioneller Rahmen entwickelt, bei dem der Wert von Daten für eGovernment von deren Nutzung bestimmt wird. Argumentiert wird, dass die Verwirklichung der Potenziale der digitalen Transformation im öffentlichen Sektor eine Organisationskultur voraussetzt, die *data-in-use* versteht und deren Wert erkennt. Mit „data-in-use“ ist die praktische Nutzung von Daten für einen spezifischen Zweck durch Verwaltungsmitarbeiter*innen gemeint. Empirisch basiert der Artikel auf zwei Fallstudien zur Datennutzung in schottischen Kommunalverwaltungen, die unterschiedliche Formen des Datenaustauschs repräsentieren. Die Analyse zeigt, dass ein Fokus auf Wertschöpfung (Value Co-Creation) durch Daten bei Arbeitsabläufen und technischer Infrastruktur erforderlich ist, um eine wirksame Datennutzungskultur zu entwickeln. Der Einsatz von Intermediären kann zu einer effektiven Datennutzung in einem internen Datenökosystem beitragen. Im Ergebnis wird gezeigt, dass sich Kommunalverwaltungen in Schottland noch am Anfang des Weges hin zu einer solchen Organisationskultur befinden.

Schlagwörter: Datenökosystem, digitale Transformation, Kommune, Datennutzung, Schottland

1 Introduction

The way in which public sector data is managed and valued as a resource is a crucial component in how e-Government gives rise to digital transformation. The term *data* can be interpreted in a variety of ways. We take it to mean digitally stored information which is structured (e.g., not textual data) and machine-readable (i.e., in a form that can be readily processed by a computer). In many cases this is tabular data of the kind that is familiar from spreadsheets but can also, for example, comprise spatial data of the kind that underlies digital maps.

Having data is one thing; using it is another. Emphasis on ‘data use’ leads us to ask: what data use practices best support efforts towards public sector digital transformation? We focus on addressing this question in the context of local government. This is appropriate given the vast amount of data gathered at this level of public administration, and the fact that beyond legislation on statistical reporting and data protection, there is little to guide organisations in how such data is used to create value. We introduce the term *data-in-use* to refer to the practical application of data to achieve a specific purpose. Moreover, the way that data is used is closely tied to its value and to its ‘quality’ in a normative sense (i.e., its worth), particularly in the context of local government staff delivering public services.

Within the commercial world, digital transformation has been widely promoted – and adopted – as a means of improving business outcomes (Fitzgerald, Kruschwitz, Bonnet, & Welch, 2014). While local governments work to very different objectives than the commercial sector, namely the provision of services deemed by society to be ‘public goods’, they are similarly drawn-in by the promises of digital transformation. The prospect of increasing their efficiency and effectiveness by delivering public services through digital technology is attractive, especially in an era of squeezed budgets coupled with increasing demand and rising expectations. Digital transformation sits within the broader context of the continued move towards e-Government, defined as “the use of information technology to redesign information exchanges in and surrounding public sector organizations” (Homburg, 2018, p. 350). Although much research has examined the citizen-facing aspect of e-Government (Dawes, 2009; Layne & Lee, 2001; Lindgren, Madsen, Hofmann, & Melin, 2019; OECD, 2009), our research turns attention towards practices *within* local government.

What follows is an exploration of internal e-Government themes within local government. We utilise the notion of an internal data ecosystem to present a perspective on data use that highlights the value derived from that use. A data ecosystem includes a community of actors, the data they work with, a set of operating practices and a technical infrastructure, functioning together as an interconnected whole. Through our conceptual framework and our case study examples, we discuss the factors that contribute to developing a culture which values data in a practical manner; this is an essential ingredient for a healthy data ecosystem for local government. The criterion of success is whether use of data by public sector employees generates insights and business intelligence that can underpin improved service delivery within a framework of digital transformation.

2 Data Ecosystems

Data has been widely recognised as an enabler for digital transformation within the UK, as seen for example in the strategies of government at both British and Scottish levels (Department for Digital, Culture, Media and Sport, 2017; Scottish Government, 2020). Tom Symons (2016, p. 10) points out that local authorities “sit in the middle of a web of information. Everything from social care for vulnerable children, waste collection, procurement, council tax collection to planning applications produces huge quantities of data.” He goes on to claim that better use of data and analytics is an “essential ingredient” (Symons, 2016, p. 10) in enabling local authorities to fulfil their public service goals effectively. This ‘better use’ is fundamental to local authorities becoming data-driven organisations.

The importance of data-in-use has been widely recognised in the private sector. In their discussion of how companies transition to becoming data-driven organisations, Hilary Mason and DJ Patil (2015) argue that developing an organisational data culture is crucial to success with data; and furthermore that ‘democratizing data’ is “one of the most powerful ideas to come out of data science. Everyone in an organization should have access to as much data as legally possible.” (2015, p. 6). Here, we need to understand ‘access’ as entailing subsequent use for appropriate business purposes. This in turn presupposes that the organisation has built the capacity – not just technical but also cultural (Anderson, 2015) – to understand the potential of data to create value. Unfortunately, this capacity tends to be much lower in the public sector than in commercial organisations of a comparable size.

By bringing attention to data ecosystems, we are following in the footsteps of Wanda J. Orlikowski and Suzanne C. Lacono (2001), who argue that information technology artifacts (of which data-in-use is an instance) deserve more theoretical attention in their own right, including “how their computational capabilities and cultural meanings become woven in dense and fragile ways via a variety of different and dynamic practices” (2001, p. 133).

The ecosystem concept has been adapted from biology to a variety of organisational domains, including economics and business (Mars, Bronstein, & Lusch, 2012; Peltoniemi & Vuori, 2008). In a systematic review of the literature on data ecosystems, Marcelo Iury S. Oliveira, Gloria de Fatima Barros Lima and Bernadette Farias Loscio (2019) discuss a variety of definitions; one example is: “a relatively self-contained, self-adjusting system of mostly loosely coupled ... actors connected by shared institutional logics and mutual value creation through service exchange.” (Lusch & Nam-bisan, 2015, p. 161).

Oliveira, Lima and Loscio (2019) also provide a useful typology of how data ecosystems are structured and organised: keystone-centric, data intermediary-based, platform-centric, marketplace-based, and business model-oriented (2019, p. 609). Although data ecosystems are usually conceived of as involving the external relationships between a variety of organisations, core aspects of data ecosystems are applicable to actors within organisations, especially when they are large and complex, such as the two local authorities discussed below. Consequently, we will focus on applying the concept of a data ecosystem to interactions and processes within a public sector body, that is, focussing on the internal data ecosystem, abstracting away from relationships with third parties.

The literature on data ecosystems commonly identifies two key ‘species’, namely data providers and data consumers. More correctly, these are roles that may or may not involve disjoint sets of actors, at both the people (i.e., staff) and organisational levels. An additional role is that of data intermediaries, for facilitating the uptake and use of data by data consumers (Oliveira, Lima & Loscio, 2019). Informed by our case studies, we will argue that data-in-use has greater potential for digital transformation when tied to local government’s service delivery functions. Moreover, we hypothesise that data intermediaries can be crucial in enabling a fruitful interaction between data providers and data consumers, in particular by supporting data-driven delivery of the organisation’s core functions.

Beyond actor roles, Maximilian Heimstädt, Fredric Saunderson and Tom Heath (2014) identify four structural properties of data ecosystems. We have slightly modified their terminology in places and the italicised text is our own.

1. A circular flow of resources – *improvements in data quality carried out by intermediaries and consumers flow back to, and are adopted by, the data providers.*
2. Sustainability – *actors within the organisation are able to make a viable business case for maintaining the flow of data.*
3. A demand-side economy – *the supply of data depends on the priorities of data consumers rather than on the agenda or preferences of data providers.*
4. Interdependence between data providers, data intermediaries and data consumers – *the actors within the ecosystem recognise that they are joint co-creators of the value of data.*

While these four structural properties are characteristic of a healthy data ecosystem, in practice local governments typically fail to recognise the importance of these socio-technical interactions – that is, of the routine practices enacted by people operating within the affordances offered by organisational structures. As already noted, these structures include both the technical infrastructure and the capacity of individual staff members to successfully play the ecosystem roles we have highlighted. Successful digital transformation requires organisations to overcome various challenges in working practices. However, without an approach that emphasises usefulness, and attention to the requirements that make data actionable in public service delivery, local government will fall short of digital transformation.

3 Framework

Our conceptual framework adds a further dimension to the data ecosystem perspective introduced above. We apply the framework to the case studies below, thus contributing novel e-Government insights at the intersection of the disciplines of Information Systems and Public Administration, whilst also guiding the lay reader – such as a local government strategist – to better understand how certain data management approaches might better support digital transformation efforts.

Mark Parsons and Peter Fox (2013) emphasise the importance of metaphorical worldviews in the way that different communities conceptualise the task of good data stewardship. They identify “five active worldviews on how to most effectively steward and share data” (Parsons & Fox, 2013, p. 34), two of which we utilise in our proposed

framework. The first is Data Publication, whose analogue is scholarly publication and which “seeks to define discrete, well-described data sets, ideally with a certain level of quality assurance” (Parsons & Fox, 2013, p. 35). The second is Science Support, “viewed as an embedded, operational support structure typically associated with a research station or lab” (Parsons & Fox, 2013, p. 35). In the context of local government, we have relabelled this worldview as Service Support, substituting “service delivery units” for “research stations”.

The Data Publication approach is easiest to describe since it has been widely disseminated across the public sector within open data initiatives. Many governmental bodies have adopted data platforms for exposing their data to the public, also referred to as ‘sharing’. As publication frameworks, these platforms should make it easy for data producers to upload datasets to a repository where they are publicly available; and make it easy for consumers to preview datasets before downloading them manually or accessing them programmatically (Hofman & Rajagopal, 2014). Therefore, data platforms also constrain and document the formats in which datasets are published.

The Service Support approach is harder than Data Publication to pin down, since it is much more dependent on the specific context in which it is adopted – Parsons and Fox (2013, p. 37) characterise it as “artisanal, task-specific production” of data. The core attribute of this approach is that data are collected and provided to meet the needs of a specific group of data consumers. The strength of the Service Support worldview is that the data producers maintain a strong relationship with the data consumers. In the best case, this close relationship will enable feedback from the consumers to flow easily back to the producers, be acted upon, and lead to better data provision in a virtuous circle.

We do not claim that the one data sharing worldview is essentially ‘better’ than the other – we see them as addressing complementary needs. Rather, we are interested in exploring which style is likely to be most effective in kick-starting a data-driven culture (Anderson, 2015; Mason & Patil, 2015), which in turn is integral to a healthy internal data ecosystem, a necessary precondition for digital transformation.

Table 1 below contrasts the two approaches and is inspired by a similar table in Parsons and Fox (2013, p. WDS39).

Table 1: Summary of strengths and weaknesses of two data sharing worldviews

	Data Publication	Service Support
Provider-Consumer Relationship	weak	strong
Feedback Incentives	weak	strong
Generality and Reusability	strong	weak
Data Quality	decoupled from use	high fitness for use
Organisational Structure	centralised	distributed
Management Style	waterfall	agile
Preservation	good	variable
Risks	poor adoption	lack of standards, data silos
Making a Business Case	hard	easy
Data Ecosystem Structure	platform-centric	intermediary-based

Source: own illustration based on Parsons & Fox, 2013, p. WDS39.

In the development of our framework, we drill down to the factors that influence the extent to which it is feasible for local government organisations to develop a data-driven culture. These factors include:

- a. What data is available and how is it accessed, processed, and analysed?
- b. What skills and changes in working practices are required for staff to establish a data-driven culture in the organisation?
- c. Is there scope to turn data-derived insights into action?

Via the examples from the case studies below, we show how working practices for data that connect to service delivery activities play a vital part in development of a data-driven culture. This corresponds to (a) and (b) above. We focus less on particular types of data, turning attention instead to the purpose for which data is applied, to explore the value of data-in-use within local government.

4 Methods

Our approach is exploratory, investigating the extent to which analytic tools drawn from the literature on data ecosystems and data sharing increase understanding of how data can be made actionable within a public sector setting. In particular, we wish to interrogate the interplay of factors that support leveraging data within a broader digitalisation strategy for the public sector (Frach, Fehrmann, & Pfannes, 2017).

In section 5 we apply our framework to two case studies of data use in two city regions in Scotland, namely Glasgow City Council and City of Edinburgh Council. This allows us to assess a variety of approaches that have been adopted by these two organisations for exploiting data assets to directly or indirectly improve service delivery. We draw our empirical insights from several specific applications of data in the two city councils over approximately the time period between 2013–2020. These two organisations are appropriate for our analysis because in their ambitions, they are broadly representative of Scottish public sector bodies that aspire towards digital transformation.

Of course, much local government activity is determined by elected officers with their own political allegiances and agendas. Consequently, we recognise that applications of data to achieve particular policy goals and associated public service delivery outcomes could vary under differing political leadership. Despite this, the main focus of our research is working practices that were largely independent of party-political concerns during the period under consideration. Given that many local governments across Europe are pursuing digitalisation and leveraging the value of their data resources, we expect that our analysis will generalise to other municipalities seeking to use data to support digital transformation efforts.

We carried out the case studies using a combination of sources, including relevant public-facing content such as committee reports, relevant job descriptions, public presentations by representatives of the councils, press coverage, and council-based posts on blogs and social media. We also drew on our practitioner experience in various roles and interactions with the council organisations, including many informal conversations and participation in joint meetings. Our prior interaction with these municipalities, beyond a narrowly academic context, has helped us develop insights into ‘design and action’ in data use for digital transformation (Gregor, 2006).

Our choice of examples in the case studies has been driven in part by pragmatic factors, in particular the availability to us of informal but rich contextual information that goes considerably beyond existing public documentation. The Glasgow study is much broader in scope than the Edinburgh one, and many interesting and useful initiatives have been omitted from the description of data activities in City of Edinburgh Council. Despite the dissimilarities, we felt it was valid to compare them because of their shared national context, similar budgetary pressures and, ultimately, their shared aspiration to embrace digital transformation and make greater use of their data. The findings show that even with different levels of funding, the same fundamental issue arises, namely the importance of encouraging a culture of data use as a precondition for digital transformation.

We analyse the phenomenon of data culture by means of the two models of data sharing introduced in section 3, namely Data Publication and Service Support. To briefly recapitulate, in the Data Publication model, datasets are organised and presented as a published resource on a platform that anyone within the organisation can access – subject to relevant regulatory and organisational constraints. In the Service Support model, data is collected and utilised in context-specific circumstances, in direct conjunction with the aims and outcomes associated with a particular service area. The latter example includes scope for a data intermediary to broker between the needs of those tasked with public service delivery, on the one hand, and the datasets already or potentially available within the organisation, on the other hand. The case studies are also informed by the concept of a data ecosystem, illustrating the roles of data provider, data consumer, and data intermediary.

5 Case Study 1: Glasgow City Council

Our first case study is centred on Glasgow City Council (GCC), the largest council in Scotland, and one of the largest in the UK. Although the city has embarked on a series of digital transformation initiatives, we will focus on a substantial programme of activity which arguably shaped GCC's data policy for most of the decade. In January 2013, GCC was awarded £24m from the Technology Strategy Board (now Innovate UK) as winner of a UK-wide 'Future cities demonstrator competition'. The mandate of the Future City Glasgow Programme (FCGP) was to become an exemplar local authority, exploring "innovative ways to use technology and data to make life in the city safer, smarter and more sustainable" (Glasgow City Council, 2020b). The Programme ran from early 2013 until 2015, with a 'wind-down' period through 2016 during which evaluation reports were produced so that other UK cities could learn from Glasgow's experience.

5.1 Data Publication Approaches

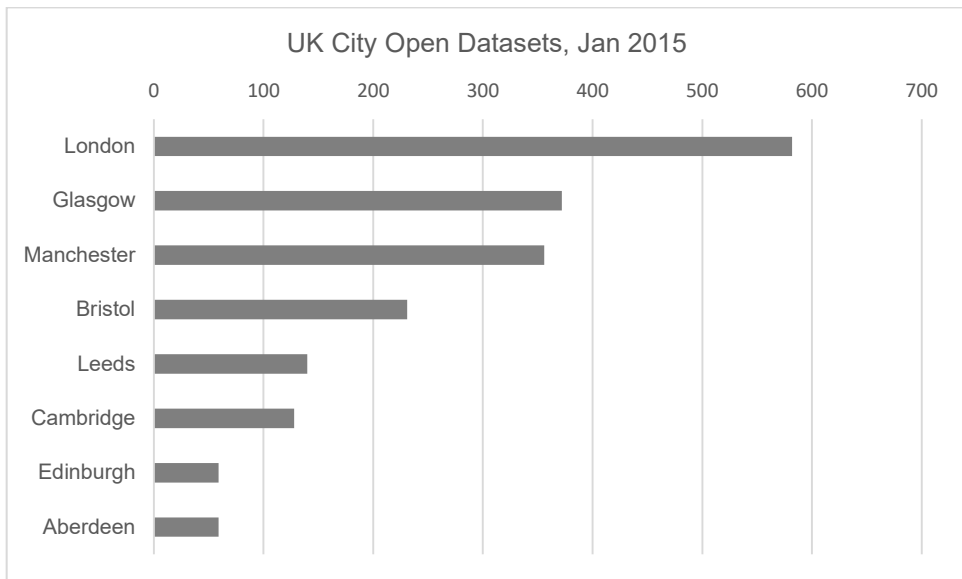
City Data Hub

Within the FCGP, it was recognised from the start that data would underpin the entirety of the Programme. Opening up data for anyone to use was central to the vision of

achieving economic, social and environmental benefits for the city. Furthermore, citizens were called upon to play a key role in shaping their city, participating in decision making via contribution of their ‘rich local knowledge’, for example in community mapping initiatives (Future City Glasgow & Pidgin Perfect, 2015; Glasgow City Council, 2020a; Leleux & Webster, 2018). The external-facing platform for publishing FCGP open data was dubbed the City Data Hub.¹ In addition to the standard reasons for publishing open data – transparency, supporting commercial and social innovation, and citizen participation and engagement (Open Knowledge Foundation, n.d.) – GCC went further, seeking to align published datasets with mission-critical goals such as improving planning and regeneration, enabling the re-design of the services provided in the city, and helping shape policy decisions (Glasgow City Council, 2020b).

The FCGP was managed and implemented by a team of technical experts drawn from industry, working under contract for GCC. As part of the team, GCC employed a handful of ‘City Data Project Officers’ to help identify and steward datasets for publication on the City Data Hub. This constituted an entirely new role, not only within Glasgow but for local government across the UK. By early 2015 there were over 370 datasets on the City Data Hub. As shown in *Figure 1*, this placed Glasgow second only to London in the number of open datasets that were published.²

Figure 1: Number of datasets published in UK city open data portals, as of January 2015.



Note: At that point in time, Glasgow was second only to London by this metric.

Source: own illustration.

Since the completion of FCGP in 2015, the data publishing platform has been considerably overhauled and integrating openly published datasets into service support has been an ongoing endeavour. At the time of writing (December 2020), there are only 95 openly licensed datasets available on GCC’s current portal, Open Data Glasgow (see

Watt, 2018 for commentary). No explicit reason has been offered for this dramatic cull. Possible reasons include more stringent quality criteria, greater ease of maintenance, or greater potential for internal use. It is reasonable to infer that most of the datasets currently used for service support within GCC are not openly licensed, suggesting that the dual-use approach to open data has been hard to sustain.

Within the original FCGP bid, there was an explicit intention to develop a city dashboard (Kitchin & McArdle, 2017). The goal was to allow datasets hosted on the City Data Hub to be ‘used online in an accessible way which users could tailor to their needs’ (mruk, 2017, p. 42).³ The hope was that users would personalise the dashboard to show the data that they cared about. However, there was a significant challenge in encouraging citizens to engage actively with the dashboard concept, and to encourage external development of any new features (mruk, 2017, p. 43). Since the end of the FCGP, work on the city dashboard has been carried out by GCC under the auspices of *Scotland’s 8th City – the Smart City Programme* (henceforth ‘8th City’), whose goal is to help the cities become “more attractive, liveable and resilient through use of data and digital technology.” (Scottish Cities Alliance, 2018). Reorienting the dashboard to provide more service support has required extensive business process re-engineering of the data backend. One goal of GCC’s currently active ‘Advanced Data Analytics’ project in the 8th City programme is to provide elected members with an improved tool for visualising city demographic data.

5.2 Service Support Approaches

Glasgow East Alcohol Awareness Programme

Established in 1991, the Glasgow East Alcohol Awareness Project (GEAAP) has been run by a small team of staff and volunteers with the goal of supporting people recovering from drug or alcohol addictions. By sharing information about community-based activities that the clients could access, it was a prototype of the community mapping initiatives within the FCGP. However, the relevant data (for example details of times and locations of sessions available on a daily basis) was stored as a spreadsheet on the computer of an individual staff member. As a result, other members of the GEEAP team were unable to directly use the information as part of the services they were offering. Technical staff from the FCGP converted the spreadsheet into a geospatial database that was published as a searchable map on the City Data Hub. This had two clear benefits: not only was the data now shared with the rest of the GEEAP staff in their role as data consumers and service providers, but community groups could augment the resource by drawing on their own knowledge about relevant services. This was considered one of the success stories of FCGP (Future City Glasgow & Pidgin Perfect, 2015; Glasgow City Council, 2020a; Nicoll, 2015).

Integrated Social Transport

GCC operated a free social transport service that allowed children and adults with specific needs to attend residential or day care facilities across the city (Glasgow City Council, 2020b; 2020c). Under manual scheduling, vehicles would often wait idle between drop-off and pick-up times. The Integrated Social Transport initiative equipped

GCC vehicle drivers with a bespoke app on dedicated smartphones, allowing them to send and receive real-time data. By linking the app to routing software, GCC was able to respond dynamically to new transport demands, for example by redeploying vehicles already known to be in the relevant area and with a sufficient gap in their schedule. This was an example where analysis of an existing service identified the need for more accurate and timely data, which was then specifically gathered to enable what could be viewed as digital transformation of that service (although not the organisation), given the extent of changed delivery (Wessel, Baiyere, Ologeanu-Taddei, Cha, & Blegind-Jensen, 2020; West, 2004).

6 Case Study 2: City of Edinburgh Council

6.1 Overview

In this section, we draw material from a six-month project, *Data and Design for Property Planning*, that was carried out in 2019 between Edinburgh Living Lab (part of the University of Edinburgh) and the City of Edinburgh Council (CEC) (Edinburgh Living Lab, 2019). The project goal was to use data and design methods to improve decision-making about the future of council buildings in a relatively deprived neighbourhood in the south east of the city. The project explored opportunities for innovation in three thematic areas, namely, use of data in public sector decision-making; integration of insights from machine-readable data with insights from stakeholder and community engagement; and community consultation and citizen engagement.

We focus on the project's Data Workstream, primarily responsible for delivering data analysis on building usage. In particular, CEC Corporate Property wanted to judge the scope for improving alignment between local service delivery and availability of suitable buildings for hosting those services. A key consideration was ensuring that service delivery was maintained or improved in the aftermath of more efficient use of building assets, even where this involved closures.

The Data Workstream was divided into two main phases. Phase one had the broad goal of data identification and collection, in the expectation that subsequent processing of the data would support evidence-based policy. Phase two was intended to be informed by the project's Community Design Workstream, with increased emphasis on exploring data that reflected local community priorities. Key community concerns that emerged during Phase two were largely orthogonal to the CEC's main focus in property planning and covered mobility, accessibility and transport; the extent to which the leisure centre was a truly local resource, as opposed to serving relatively affluent people from outside the immediate neighbourhood; and the provision and quality of public and community spaces.

Although the project itself was a novel initiative for the CEC and therefore not a straightforward instance of 'business as usual', it revealed interesting insights into data management and data culture in the Council. One striking feature was the fact that for staff who were running the buildings and delivering services in the local area, concerns about accurate data collection barely ranked at all on their list of priorities.

6.2 Data Publication Approaches

Data Register

At the outset of the project, there was no pre-existing register of CEC datasets which would be relevant to answering questions about council building usage and it was decided that creating a Data Register was crucial to the project's success. Although the project manager within the CEC was a member of Corporate Property, the Data Register work was led by a highly experienced senior manager from Digital Services, who was also a strong evangelist for strengthening the data culture within the CEC.

As an initial step, the CEC held a series of workshops with all relevant staff based in central headquarters and also with staff and key stakeholders from the Locality in order to identify datasets or potential data sources that could inform the project. Participants were encouraged to complete a short questionnaire about their data resources, covering features such as dataset name, storage location, owner, data format, data steward/contact and current uses of the data. Information collected in this way was combined with further information from one-on-one interviews and then entered into a Data Register, implemented as a spreadsheet.

In principle, this task might have contributed to the development of a stronger data-driven culture within the CEC. However, despite the effort invested in this task, the main client for the project had little commitment to increasing data management capacity, either within their own group or within the Council as a whole. Moreover, there was no other structure or leadership within the CEC which was ready to invest in taking this work further and as far as we know, the project's Data Register has not been continued since the project terminated.

Spatial Data and the CEC Mapping Portal

As mentioned earlier, in Phase 2 of the project, more attention was assigned to the views expressed by local residents in a series of community engagement events and activities. This highlighted the question of what counted as a 'local area' for planning purposes. A previous initiative by the CEC had already addressed the question of vernacular geography in Edinburgh by sampling the views of residents across the city, resulting in a novel spatial area, namely 'natural neighbourhoods'. These areas still seem to align well with community perceptions of what constitutes 'local' and were therefore adopted as the relevant geography by the project.

The topic of local greenspaces cropped up a number of times in the Community Engagement workstream, summarised as "the feeling of neglect implied by poorly maintained ... outdoor spaces and public realm". Machine-readable spatial data about the city's greenspaces is published on the CEC Mapping Portal. However, metadata accompanying the audit data is sparse; it is unclear how to interpret the different assessment methods or what criteria were employed in the different assessment methods to arrive at the audit score. It is tempting to suppose that if there had been a clear use case for this data, then feedback from the data consumer about its usability and appropriateness would have led to improved metadata. As it stands, the CEC Mapping Portal⁴ is a valuable source of spatial data and allows datasets to be accessed in multiple formats, either as downloads or via an API (Application Programming Interface – see

Hofman & Rajagopal, 2014). However, it also illustrates the challenge of publishing data without any clear consideration of user needs.

6.3 Service Support Approaches

Library Borrowing Data

The library issue data collected for Edinburgh Libraries is extensive, high quality and detailed. It includes, for example, information about where and when items are borrowed and which library the borrower is registered at. The source data is managed and stored in a relational database by a third-party commercial partner. It appears that the company in question automatically generates monthly reports for the CEC by exporting the results of a database query into summary spreadsheets.

We assume that data provided to library managers is closely tuned to their requirements, and it includes some facilities for library managers to search the table. However, there are also severe limitations. There is no live access to the source data from within the spreadsheet and apparently the company does not provide Edinburgh Libraries with an API which would offer more direct access to the data. The project team found that modifying the spreadsheets to allow export to CSV format⁵ for further analysis involved time-consuming and error-prone manual steps.

In summary, by contracting a third party to provide specialised datasets for the library service, the CEC addressed the primary needs of this group of users in an effective manner. Yet this was at the expense of severely limiting opportunities for reuse of the data across the organisation, and also impeded efforts to ask novel questions of the data.

Community Centre Occupancy Data

Early in the project, the project team decided, in consultation with stakeholders, to focus attention on room usage in the local community centre. To this end, they built an initial prototype of a space occupancy visualisation tool, based on information provided by staff at the community centre about room capacity and estimates of the number of people participating in activities hosted there. However, it was not possible to progress with this task in the absence of hard figures for actual usage of the rooms. Concern about this lack of empirical data was shared by members of the project management board and it was agreed that CEC would carry out manual counts of room occupancy for five days.

CEC-run community centres appear to have little or no ability to collect systematic data about how clients use the services and facilities that they offer. The contrast between the data collection abilities of the libraries versus the community centres is stark. Of course, libraries have a long history of keeping records of both their holdings and of their borrowers, so it is not surprising to see a relatively sophisticated contemporary infrastructure for collecting and managing their data. Yet, it is notable that the leisure centre also collected extensive and detailed data about its users. One distinguishing factor is that in contrast to the community centres, access to the services of libraries and leisure centres in Edinburgh requires the user to present a membership card which enables the organisation to easily collect personal details with digital technology. Extend-

ing the same requirement to community centres, while exemplifying the trend towards ‘datafication’ castigated by José Van Dijk (2014), would offer a possible route forward for collecting more useful and accurate data.

7 Discussion

7.1 Reviewing the Two Data Sharing Worldviews

At the most basic level, an organisation needs to know what data resources it holds, since this is a fundamental precondition of developing business intelligence from data as a step towards digitalisation (Frach, Fehrmann & Pfannes, 2017). Cataloguing and providing organisation-wide access to datasets should be central to any strategy for democratising data, which is essential when an organisation aspires to manage, and leverage, data in a manner that enables digital transformation. However, it would be a mistake to regard this as a one-off task that can then be laid to rest. New datasets are continually being created while existing datasets will become obsolete or need to be updated and corrected. Moreover, an overly centralised, top-down implementation of plans for data-in-use working practices will fail to nurture the scenarios where value from data-in-use is co-created across the organisation by different teams and staff members, in particular.

The Service Support worldview is hard to pin down and is highly context dependent. Our two case studies give a better insight into the parameters of this approach. In general, we do not observe a uniform division of labour between data providers and data consumers within the organisation. In two of our examples, namely Glasgow’s Integrated Social Transport Initiative and Edinburgh’s Community Centre Occupancy, the data consumer team became aware of an absence of relevant data and put special measures into place to gather new datasets to meet the need. In the Glasgow East Alcohol Awareness Project, the data provider was a member of the group that were also the primary data consumers. Finally, in the case of Edinburgh’s Library Issue data, data provision had been outsourced to an external company which charged for the service. Clearly there is much still to be learned about different mechanisms of instigating Service Support data provision within local government.

7.2 Progress towards Digital Transformation

Although the two case studies differ considerably in scope, we note that both councils initiated open data portals in roughly the same timeframe. While we do not wish to suggest that open data publication is necessary for embarking on digital transformation, we have already noted that auditing data resources and identifying data providers is a vital precondition. In the best circumstances, the process of engaging with different teams as part of a data audit has the potential to raise awareness of data value across the organisation. According to one source within FCGP, the best approach was to ask staff members not “what data do you have?” but “what problem are you trying to solve, and what data do you need?”.

For a variety of reasons, the circumstances around establishing an open data portal had more impact for GCC than for CEC. Obviously, the injection of significant external funding for the FCGP was a major factor. It provided the impetus to establish a high-level programme coordination group that could help align disparate sections of the council towards recognising data as a cross-institutional resource. It allowed GCC to build sufficient in-house expertise to transition at least some aspects of the FCGP to a 'business as usual' basis. In part, this process was supported by developing an internal data analytics capacity that was able to demonstrate the value of data-in-use of the council's data resources. This capacity has been carried forward via a recently formed Strategic Innovation and Technology Team, which is understood to be made up of a small team of data specialists acting as data intermediaries. In this role, they work with different departments and teams in GCC to use data for improved service delivery and meeting financial savings targets.

By contrast, in 2013 CEC had a single member of staff with technical data expertise who was able to support the data backend for the CEC Open Data Portal; moreover, this individual left the council in early 2015 and was not replaced. Arguably the lack of in-house data expertise in CEC illustrates some of the negative consequences of outsourcing IT functions to the private sector, which was part and parcel of the New Public Management reforms across the UK (Dunleavy, Margetts, Bastow, & Tinkler, 2006). Although CEC has a Strategy and Insight team with some responsibility for data management, it is unclear what their mission is and to what extent they utilise data analytics skills.

7.3 Towards an Intermediary-Based Data Ecosystem

Anne Fleur Van Veenstra, Bram Klievink and Marijn Janssen (2011) identify lack of IT skills and personnel as a frequent barrier to achieving transformational government. We could extend this to include a lack of understanding amongst staff of the value of data-in-use. In an organisation that seeks to extract value from data-in-use, all staff that interface with digital data (a rapidly increasing amount) must have adequate ability and inclination to co-create value with data in order to drive transformation within the organisation. Necessary components of this are informing policy development with the business intelligence derived from data and formulating persuasive business cases for sustaining a flow of data across the organisation.

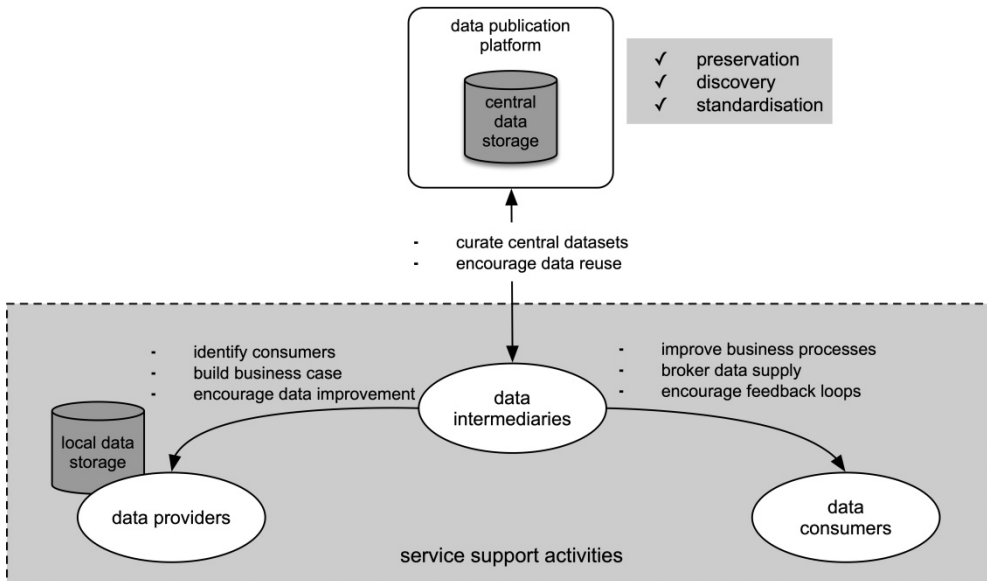
Considerable effort is required for establishing and maintaining a robust data platform. How can this significant investment be justified? To make a convincing case that there will be a good return on investment, evangelists for an organisation-internal Data Publication approach need to demonstrate that it will contribute to value creation. Making this business case depends on demonstrating the 'value-in-use' (Lusch & Nambrisan, 2015, p. 159) of the data for improving service delivery and meeting savings targets. But the Data Publication approach offers no guarantees that the datasets are relevant to the needs of potential data consumers. In fact, by focussing on data products, the model implicitly decouples data producers from consumers. And as a model of value creation, this worldview focusses on supply-side economics with minimal regard for the demand-side (Lee & Estefan, 2013).

Although an institutional data publication platform will serve a useful function, our exploratory research indicates that a platform-centric approach is an ineffective method for seeding and growing a strong internal data ecosystem. When starting from a low baseline of data understanding, staff will often not know what data they want to look for on a data platform. A similar objection could be made against the Service Support model: how feasible is it for staff to articulate what their data requirements are? In particular, staff may be unable to conceptualise how data can be relevant to their needs. This is in effect a problem of ‘unknown unknowns’: they do not know what they do not know. There is a hierarchy of knowledge underpinning the extent to which staff can view themselves as potential data consumers:

1. Awareness that a service delivery process *could* be informed by data.
2. Awareness of *what* data would be relevant to a given task.
3. Awareness of *how* to apply data analysis to the data and what data features are important.

Level (3) presupposes (2), which in turn presupposes (1). However, if (1) is largely absent across the organisation, then extra measures are required to address the lack. We believe that the introduction of data intermediaries is a plausible solution. *Figure 2* illustrates how data intermediaries could act as a kind of ‘pioneer species’ in converting a data-barren landscape into one with a thriving data ecosystem.

Figure 2: Data intermediaries play a central, enabling role in a data ecosystem and help connect data providers with data consumers in a mutually beneficial relationship that underpins service support data use



Source: own illustration.

Developing a structure such as this would require a combination of top-down and bottom-up interventions: a clearly defined strategy for centrally supporting a team of data

intermediaries, driven by a senior manager, combined with ‘grassroots’ initiatives to build problem-oriented data supply relationships informed by knowledge of the public service processes and data management across the organisation. Within GCC, the establishment of the Strategic Innovation and Technology Team appears to be filling this niche. We should emphasise that *Figure 2* describes roles rather than actors. For example, in the case of GEAAP in section 5.2, the data provider was also a member of the group of data consumers, and the FCGP project team acted as data intermediary to increase the usability and extensibility of the data.

8 Conclusion

Our starting point for the research was that digital transformation in local government depends on an appropriate understanding of the value of data as a resource for the organisation. We set out to explore what data use practices best support efforts towards public sector digital transformation by analysing instances of data-in-use. While data ecosystems have typically been invoked as a means of understanding interactions *between* organisations, these can equally well be used to analyse data management processes *within* complex organisations. This is demonstrated in our two case studies, describing various instances of data value and use within two Scottish local government organisations.

Becoming an organisation that values data as a resource is a socio-technical challenge. In the context of data-in-use, our research illustrates how a significant challenge lies in the ‘socio’ component, namely the central role of people. Value, through the digitalisation process of an organisation seeking to leverage its data resources, is co-created by data providers and data consumers. The framework of a data ecosystem, highlighting the cyclic interaction between different actors, offers us a more realistic perspective on data value creation than linear value chains (Normann & Ramírez, 1993). Furthermore, we draw on work that postulates different metaphors for understanding how data can be utilised (Parsons & Fox, 2013), to contrast two worldviews relevant to local government: Data Publication versus Service Support. These provided a lens for examining two very different data initiatives in two city-region local authorities in Scotland, namely the *Future City Glasgow Programme* and a vastly smaller project in Edinburgh, *Data and Design for Property Planning*. In both cases, there was a commitment to a Data Publication approach to data sharing and, in both cases, the approach seemed insufficient on its own to significantly launch a viable internal data ecosystem. We also observed that while the Service Support metaphor is useful, within our small sample of case studies there seemed to be significant variation. The case studies also reinforced the importance of recognising that data provider and data consumer are just roles, and that the same group of actors can play both roles.

Understanding the extent to which staff are aware of data as a resource and how it can be applied to support their day-to-day job represents a key component for achieving digital transformation. Within local government, data publication (via open data or otherwise) is an important endeavour, but without connecting directly to public service delivery activities, our exploration shows that this threatens attainment of digital transformation. Paradoxically, prioritising a mode of data sharing that makes it available for ‘anyone to use’ may sometimes mean that the data is useful for no-one, or at least not directly usable by any specific team in a particular public service delivery context.

We demonstrate that in order to develop a strong data ecosystem within public sector, there is benefit from having appropriately skilled data intermediaries, who can facilitate the flow of data in a manner that directly supports the organisation's public service delivery. This is crucial for building business cases that justify the costs of maintaining data flow and ensuring a constant attention to data quality, relating to scope for use and value as a resource. Our research indicates that achieving digital transformation involves developing a data-driven culture, combining working practices and technical infrastructure centred on creating value with data. In our estimation, most local authorities within Scotland are at an early stage of developing this culture.

We recognise the limitations of the findings presented here. For reasons of space, we did not delve into the important theme of data quality (Otto, 2015; Redman, 2013; Wang & Strong, 1996). Furthermore, we note the limited scope of the cases selected and the range of empirical data sources. For future research, we recommend more extensive analysis into how the mechanisms and cultural norms within local government determine the extent to which data intermediaries can successfully instigate or consolidate Service Support data access and, ultimately, use. While we have argued that the Data Publication and Service Support approaches are complementary, more investigation is required to tease out this relationship in practice. We consider Participatory Action Research (Chevalier & Buckles, 2019) to be an appropriate method to further explore the components of a culture that values data in a practical manner. Given the particularities and heavily context-dependent realities of each instance of real-life local government data-in-use, this could be an impactful and insightful approach for exploring the extent of a pro-active internal organisational culture of data.

Notes

- 1 Now rebranded as Open Data Glasgow: <http://data.glasgow.gov.uk/>
- 2 There was a wave of UK public sector bodies establishing open data portals around this time – related to national policy and funding incentives in this regard e.g., the UK Government signed up to the G8 Open Data Charter in 2013 (<https://www.gov.uk/government/publications/open-data-charter>) and in the absence of better metrics, the main criterion of success was often taken to be the number of datasets, regardless of quality or relevance.
- 3 At the time of writing, the FCGP dashboard is no longer available online.
- 4 <http://data.edinburghcouncilmaps.info>
- 5 The Comma Separated Values (CSV) format is a non-proprietary standard for representing tabular data.

References

- Anderson, Carl. (2015). *Creating a Data-Driven Organization: Practical Advice from the Trenches*. Sebastopol, CA: O'Reilly Media, Inc.
- Chevalier, Jacques, & Buckles, Daniel. (2019). *Participatory Action Research: Theory and Methods for Engaged Inquiry* (2nd ed.). London: Routledge.
- Dawes, Sharon S. (2009). Governance in the digital age: A research and action framework for an uncertain future. *Government Information Quarterly*, 26 (2), 257-264. <https://doi.org/10.1016/j.giq.2008.12.003>.
- Department for Digital, Culture, Media and Sport (DCMS). (2017). *United Kingdom Digital Strategy*. Retrieved from: <https://www.gov.uk/government/publications/uk-digital-strategy/uk-digital-strategy>.

- Dunleavy, Patrick, Margetts, Helen, Bastow, Simon, & Tinkler, Jane. (2006). New Public Management Is Dead – Long Live Digital-Era Governance. *Journal of Public Administration Research and Theory*, 16. <https://doi.org/10.1093/jopart/mui057>.
- Edinburgh Living Lab. (2019). Projects: Data and Design for Property Planning. Retrieved from <https://www.edinburghlivinglab.org/projects/data-and-design-for-property-planning> [3 July 2020].
- Fitzgerald, Michael, Kruschwitz, Nina, Bonnet, Didier, & Welch, Michael. (2014). Embracing Digital Technology: A New Strategic Imperative. *MIT Sloan Management Review*, 55 (2), 1-12.
- Frach, Lotte, Fehrmann, Thomas, & Pfannes, Peter. (2017). Measuring Digital Government: How to Assess and Compare Digitalisation in Public Sector Organisations. In Svenja Falk, Andrea Römmele, & Michael Silverman (Eds.), *Digital Government: Leveraging Innovation to Improve Public Sector Performance and Outcomes for Citizens* (pp. 25-38). https://doi.org/10.1007/978-3-319-38795-6_2.
- Future City Glasgow & Pidgin Perfect. (2015). *Future Maps: Sourcing City Data from Citizens*. Retrieved from: <https://futurecity.glasgow.gov.uk/pdfs/FUTURE%20MAPS%20FINAL%20REPORT.pdf>.
- Glasgow City Council. (2020a). Community Mapping | Future City Glasgow. Retrieved from <https://futurecity.glasgow.gov.uk/community-mapping/> [24 June 2020].
- Glasgow City Council. (2020b). Future City Glasgow. Retrieved from <https://futurecity.glasgow.gov.uk/> [28 June 2020].
- Glasgow City Council. (2020c). Social Transport Demonstrator | Future City Glasgow. Retrieved from: <https://futurecity.glasgow.gov.uk/social-transport/> [28 June 2020].
- Gregor, Shirley. (2006). The Nature of Theory in Information Systems. *MIS Quarterly*, 30 (3), 611-642. <https://doi.org/10.2307/25148742>.
- Heimstädt, Maximilian, Saunderson, Frederick, & Heath, Tom. (2014). Conceptualizing open data ecosystems: A timeline analysis of open data development in the UK. *Proceedings of the International Conference for E-Democracy and Open Government 2014*, 245-255.
- Hofman, Wout, & Rajagopal, Madan. (2014). A Technical Framework for Data Sharing. *Journal of Theoretical and Applied Electronic Commerce Research*, 9 (3), 45-58. <https://doi.org/10.4067/S0718-18762014000300005>.
- Homburg, Vincent. (2018). ICT, e-Government and e-Governance: Bits & bytes for public administration. In Edoardo Ongaro & Sandra V. Thiel (Eds.), *The Palgrave Handbook of Public Administration and Management in Europe* (pp. 347-361). Springer.
- Kitchin, Rob, & McArdle, Gavin. (2017). Urban data and city dashboards: Six key issues. In Rob Kitchin, Tracey P. Lauriault, & Gavin McArdle (Eds.), *Data and the City* (pp. 111-126). <https://doi.org/10.4324/9781315407388>.
- Layne, Karen, & Lee, Jungwoo. (2001). Developing fully functional E-government: A four stage model. *Government Information Quarterly*, 18 (2), 122-136. [https://doi.org/10.1016/S0740-624X\(01\)00066-1](https://doi.org/10.1016/S0740-624X(01)00066-1).
- Lee, Samuel, & Estefan, Felipe. (2013, April 4). Understanding the Demand for Open Financial Data. Retrieved from World Bank Blogs website: <https://blogs.worldbank.org/opendata/understanding-the-demand-for-open-financial-data> [26 February 2020].
- Leleux, Charles, & Webster, C. William R. (2018). Delivering Smart Governance in a Future City: The Case of Glasgow. *Media and Communication*, 6 (4), 163-174. <https://doi.org/10.17645/mac.v6i4.1639>.
- Lindgren, Ida, Madsen, Christian Østergaard, Hofmann, Sara, & Melin, Ulf. (2019). Close encounters of the digital kind: A research agenda for the digitalization of public services. *Government Information Quarterly*, 36 (3), 427-436. <https://doi.org/10.1016/j.giq.2019.03.002>.
- Lusch, Robert F., & Nambisan, Satish. (2015). Service Innovation: A Service-Dominant Logic Perspective. *MIS Quarterly*, 39 (1), 155-175. <https://doi.org/10.25300/MISQ/2015/39.1.07>.
- Mars, Matthew M., Bronstein, Judith L., & Lusch, Robert F. (2012). The value of a metaphor. *Organizational Dynamics*, 41 (4), 271-280. <https://doi.org/10.1016/j.orgdyn.2012.08.002>.

- Mason, Hilary, & Patil, D. J. (2015). *Data Driven: Creating a Data Culture*. Sebastopol, CA: O'Reilly Media, Inc.
- mruk. (2017). *Building a Future City – Future City Glasgow evaluation*. Retrieved from Glasgow City Council website:
https://futurecity.glasgow.gov.uk/reports/12826M_FutureCityGlasgow_Evaluation_Final_v10.0.pdf.
- Nicoll, Vivienne. (2015, March 31). Website to help alcohol abuse sufferers. *Glasgow Times*. Retrieved from:
<https://www.glasgowtimes.co.uk/news/13305138.website-to-help-alcohol-abuse-sufferers/>.
- Normann, Richard, & Ramirez, Rafael. (1993). From value chain to value constellation: designing interactive strategy. *Harvard Business Review*, 71 (4), 65-77.
- Organisation for Economic Co-Operation and Development (OECD). (2009). *Rethinking e-Government Services: User-centred Approaches*. Retrieved from:
<https://dx.doi.org/10.1787/9789264059412-en>.
- Open Knowledge Foundation (OKFN). (n.d.). Why open data? Retrieved from: Open Knowledge Foundation website: <https://okfn.org/opendata/why-open-data/> [19 June 2020].
- Oliveira, Marcelo Iury S., Lima, Glória de Fátima Barros, & Lóscio, Bernadette Farias. (2019). Investigations into Data Ecosystems: a systematic mapping study. *Knowledge and Information Systems*, 61 (2), 589-630. <https://doi.org/10.1007/s10115-018-1323-6>.
- Orlikowski, Wanda J., & Lacono, C. Suzanne. (2001). Research Commentary: Desperately Seeking the “IT” in IT Research – A Call to Theorizing the IT Artifact. *Information Systems Research*, 12 (2), 121-134. <https://doi.org/10.1287/isre.12.2.121.9700>.
- Otto, Boris. (2015). Quality and Value of the Data Resource in Large Enterprises. *Information Systems Management*, 32 (3), 234-251. <https://doi.org/10.1080/10580530.2015.1044344>.
- Parsons, Mark, & Fox, Peter. (2013). Is Data Publication the Right Metaphor? *Data Science Journal*, 12 (0), WDS32-WDS46. <https://doi.org/10.2481/dsj.WDS-042>.
- Peltoniemi, Mirva, & Vuori, Elisa. (2008). Business Ecosystem as the New Approach to Complex Adaptive Business Environments. Retrieved from:
- Redman, Thomas C. (2013). Data Quality Management Past, Present, and Future: Towards a Management System for Data. In Shazia Sadiq (Ed.), *Handbook of Data Quality: Research and Practice* (pp. 15-40). https://doi.org/10.1007/978-3-642-36257-6_2.
- Scottish Cities Alliance. (2018, March 13). Scotland's 8th City – the Smart City. Retrieved 2 March 2020, from <https://www.scottishcities.org.uk/media/blog/scotlands-8th-city-the-smart-city>
- Scottish Government. (2020, 01). Digital: Using data effectively. Retrieved from:
<https://www.gov.scot/policies/digital/data/> [1 June 2020].
- Symons, Tom. (2016). *Wise Council: Insights from the cutting edge of data-driven local government*. Retrieved from Nesta website: <https://www.nesta.org.uk/report/wise-council-insights-from-the-cutting-edge-of-data-driven-local-government/>.
- Van Dijck, José. (2014). Datafication, dataism and dataveillance: Big Data between scientific paradigm and ideology. *Surveillance & Society*, 12 (2), 197-208.
<https://doi.org/10.24908/ss.v12i2.4776>.
- Van Veenstra, Anne Fleur, Klievink, Bram, & Janssen, Marijn. (2011). Barriers and impediments to transformational government: Insights from literature and practice. *EG*, 8 (2/3), 226–241.
- Wang, Richard Y., & Strong, Diane M. (1996). Beyond Accuracy: What Data Quality Means to Data Consumers. *Journal of Management Information Systems*, 12 (4), 5-33.
- Watt, Ian. (2018, June 19). Scottish Open Data – how do we get there? Retrieved from: CodeTheCity Studio website:
<https://codethecity.co.uk/2018/06/19/scottish-open-data-how-do-we-get-there/> [21 June 2020].
- Wessel, Laurie, Baiyere, Abayomi, Ologeanu-Taddei, Roxana, Cha, Jonghyuk, & Blegind-Jensen, Tina (2020). Unpacking the difference between digital transformation and IT-enabled organizational transformation. *Journal of the Association for Information Systems*. Retrieved from:

<https://westminsterresearch.westminster.ac.uk/item/qyv8v/unpacking-the-difference-between-digital-transformation-and-it-enabled-organizational-transformation>.

West, Darrell M. (2004). E-Government and the Transformation of Service Delivery and Citizen Attitudes. *Public Administration Review*, 64 (1), 15-27.
<https://doi.org/10.1111/j.1540-6210.2004.00343.x>.

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