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Research Symposium: Transformation of Government in the Era of Smart Technology

Smart Technology and the Emergence of Algorithmic Bureaucracy: Artificial Intelligence in UK Local Authorities

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Abstract: *In recent years, local authorities in the UK have begun to adopt a variety of "smart" technological changes to enhance service delivery. These changes are having profound impacts on the structure of public administration. Focusing on the particular case of artificial intelligence, specifically autonomous agents and predictive analytics, a combination of desk research, a survey questionnaire, and interviews were used to better understand the extent and nature of these changes in local government. Findings suggest that local authorities are beginning to adopt smart technologies and that these technologies are having an unanticipated impact on how public administrators and computational algorithms become imbricated in the delivery of public services. This imbrication is described as algorithmic bureaucracy, and it provides a framework within which to explore how these technologies transform both the socio-technical relationship between workers and their tools, as well as the ways that work is organized in the public sector.*

Evidence for Practice

- A new form of bureaucratic organization enabled by computational algorithms is beginning to emerge in local authorities.
- Autonomous agents can assist citizens with their service needs, but they can also be used to help public administrators to carry out their tasks.
- People using smart technologies in local authority service provision are attempting to deal with complexity not by simplifying problems into set procedures, but through adaptive predictive algorithmic models that can learn from new inputs and changes in conditions.
- When introducing new computational algorithms, practitioners should identify the relevant social groups that are impacted by its implementation, understand the contextual implications from their perspectives, and leverage internal capacity as much as possible in order to address local needs and challenges about which outsiders may not be aware.

In the past decades, local governments have developed digital information technology (IT) infrastructures, which create an environment that allows for the development of new applications to support efficient digital service delivery. However, these innovative possibilities create new socio-technical challenges (Rodríguez, Pedro, and López-Quiles 2018). This article focuses on the adoption of new technologies that are enabled by computational algorithms in local authorities, in particular looking at autonomous agents and decision assistance tools. It explores how computational algorithmic technologies offer an opportunity to enhance Weberian machine bureaucracy whilst preserving key public sector values of fairness, impartiality, and standardization (Cordella and Tempini 2015). In this way, these types of tools could have profound impacts on the structure of public administration in local authorities.

Whilst smart technology could easily be interpreted as a "neat and stylish term," smart technology, in this article, is understood as computational algorithmic tools that are programmed so as to be capable of some independent action, whereby they are quick at learning and are able to react or respond intelligently to their informational environment, including differing requirements, varying situations, or past events (Oxford English Dictionary 2019). Following this definition, we refer to autonomous agents and predictive analytics decision assistance tools as smart technology. Four key questions guide this research: (1) To what extent are smart technologies being adopted in UK local authorities? (2) What are the characteristics of these technologies? (3) What are the ways in which smart technology integrates into the organization of work in local authority public administration settings? (4) What are the implications of this change for how

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we conceptualize the study of public administration in the era of smart technologies?

This study suggests that smart technologies are at an early, but foundational, stage of adoption in local authorities and argues that smart technologies add a new element to the socio-technical organization of public administration in local authorities. It is not just a shift from street-level to system-level discretion (Bovens and Zouridis 2002). Instead, where there is a shift to the system level, multiple stakeholders, representing different relevant social groups with different forms of knowledge and perspectives (Vogl 2020a), are involved in design and implementation (Pinch and Bijker 1987). Where a tool in use remains at the street level, attention is needed to how smart technology mediates informational feedback loops and collective intelligence. Based on these results, this article then contributes to public administration studies by offering a socio-technical framework for the continued study of smart technologies in public administration.

Administrative systems have a long history of evolution in response to the demands of modernity. Machine bureaucracy embedded ideals of impartiality, procedural fairness, and efficiency in a hierarchy of rule-governed offices supported by files, an enhancement over previous systems, such as patrimonialism (Weber 1968). However, since the middle of the twentieth century, commentators have questioned the ability of traditional bureaucracy to deal with the increasing complexity of modernity and have worried about undesirable inertia (Elgin and Bushnell 1977). Scholars began to argue about new approaches to public administration (Pollitt and Bouckaert 2011), some of which focused on an approach that emerged in the 1980s and came to be known as New Public Management (Lynn 2001), which was characterized by managerialism and the use of market mechanisms, such as outsourcing, as a means to overcome some of the challenges associated with modern complexity and make government more efficient (Hood 1995).

In parallel with New Public Management changes, there were advancements in the development of IT that were impacting the infrastructure of public administration (Margetts 1999), in particular, the development of the internet as a means to communicate information quickly between computers (Naughton 2001). These changes had begun much earlier with the introduction of computation (Simon 1973; Wilkins 1968), and scholars realized that "[t]o design effective decision-making organizations, we must understand the structure of the decisions to be made; and we must understand the decision-making tools at our disposal, both human and mechanical - men and computers" (Simon 1973, 272). Unfortunately, whilst some had made early predictions of the valuable role that computation would play in decision support (Danziger and Kraemer 1985; Hadden 1986; Hurley and Wallace 1986), there was a period where it was seen to have been woefully neglected in the study of public administration (Dunleavy et al. 2006; Pollitt 2011), with only a select few scholars suggesting IT was changing the fundamental paradigm of public administration to one with digitalization at its core (Dunleavy et al. 2006).

More recently, there is renewed interest in the impact of new developments in IT on the very structure of public administration (Agarwal 2018; Margetts and Dorobantu 2019). Where written rules and procedures are not fast enough and there are too many for people to remember, algorithms are seen as a way to provide support. Some research has begun to look at how more sophisticated algorithms that rely on a foundation of computation, administrative data collection, and information communication create new ways to use data in public administration (Allard et al. 2018; Mergel, Rethemeyer, and Isett 2016), though not always for the better (Lavertu 2016). Other research suggests that smart technologies could displace work through automation (Bovens and Zouridis 2002). However, algorithms may do more than improve analytics and automation; they may also change the nature of public administration.

With the emergence of smart technology, this article suggests that a new model of bureaucratic administration is combining people, computational algorithms, and machine-readable electronic files and forms to deal with complexity and overcome some of the limitations of traditional bureaucracy, whilst preserving core public sector values (Vogl et al. 2019). This change necessitates a new framework within which to structure research of digital public administration. In the following section, we situate the concept of smart technology broadly within technological change and then within public administration, highlighting lacunae in the current literature on technology in local authorities. We will then set out the approach we took to explore the current state of smart technology in local authorities and its impact on the way public administration is organized, which includes a survey and two illustrative case studies. Following that, we present the results of the research, discuss their implications, and conclude.

Theory

This study is situated in the context of evolutionary theories of digital government progress, and the associated theories around a shift from street- to system-level bureaucracy and from values of procedural equality to equality of outcomes. These three constructs are elaborated below.

Historically, changes through digitization were seen as the prerogative of central government, with smaller orders of government lacking the skills and capacity to deliver major technological change (Dunleavy et al. 2006). Some scholars suggested that as digital changes progressed, the environment would evolve to include greater digitization in, first, state, or regional, and then local government (Gil-Garcia and Martinez-Moyano 2007). Some began to test this hypothesis in the context of websites in municipalities (Moon 2002). Whilst IT may have been more centralized early on, with those closer to local matters less IT intensive, this has begun to change (Malomo and Sena 2017; Rodríguez, Pedro, and López-Quiles 2018). In the UK, with austerity and digital strategies, local authorities are looking for efficiencies using technology and there are diverse approaches across the country (Bright et al. 2019; Dencik et al. 2018; Symons 2016). Whilst some comment on the persistent challenges that local authorities face (Fischer et al. 2019; Malomo and Sena 2017), there appear to be examples where local authorities are charting a new course through the use of smart technologies. Despite this renewed

interest, some of the best publicly available data on government technological change is focused on outward-facing e-service delivery (UN 2018), rather than on how technology can transform work internally across the organization. As a result, there is a gap relative to our understanding of smart technology adoption in local government.

There has always been a balance between rules and discretion in bureaucratic organizations (Crozier 1964; Lipsky 2010; Zacka 2017). With the ability to embed rules in code (Lessig 2006), some have argued that discretion has moved from front-line workers to system designers for routine operations (Bovens and Zouridis 2002). Others suggest street-level bureaucrats may be cut out of some interactions entirely as autonomous agents over web interfaces support isocratic services for individuals (Dunleavy and Margetts 2015). However, in some cases, the reality of effective smart technology use may continue to include a role for both human and machine agents. Whilst there is a substantial literature on the imbrication of social and material agencies in organizations (Leonardi 2012, 2013; Orlikowski and Scott 2008), this understanding has not broadly translated into the public administration field.

A key characteristic of smart technologies is their ability to learn from continuous real-time data inputs and adjust their responses accordingly. Previous studies have looked at early conceptions of artificial intelligence, such as expert systems (Hadden 1986; Hurley and Wallace 1986) or the functional simplification and closure of procedures in technologies (Cordella and Tempini 2015). Some have begun to explore the potential impact of machine learning technologies on work and decision-making in public administration (Agarwal 2018). Others suggest that this shift towards learning technologies could be accompanied by a change from systems that deliver procedural equality to those that can provide equality of outcomes (Dunleavy and Margetts 2015). However, empirical study of the implications of smart technologies on the structure of public administration is more limited.

With these theoretical positions, this study aims to explore three theoretical constructs: the extent to which digital transformation has evolved towards increased smart technology use in local government, the social and material implications of smart technologies for the relationship between street-level and system-level bureaucrats, and the replacement of rule-based systems of procedural equality with outcomes-focused learning technologies. The findings have implications for the conceptualization of public administration in the era of smart technology.

Methodology

This study is based on research that took place between November 2017 and December 2018 (Bright et al. 2019). It adopts a similar methodological approach to other research in digital government change (Eynon and Dutton 2007). In particular, it included three techniques: a survey, desk research, and subsequent in-depth interviews conducted with people working in the area of local government data science in the UK. The underlying assumptions for the research are that the introduction of smart technology has socio-technical impacts on the nature of public administration in local authorities and that those impacts can be better understood by eliciting the experiences of people working with these technologies.

Desk research was used in two stages of the research. In the first stage, it was used to find organizational charts, contact lists, and other names associated with smart technology projects in local authorities to create the survey invitation list. Where specific names could not be found, invitations were sent to the generic email address of the local authority. In the second stage, it was used to find publicly reported information about smart technology projects in local authorities to enhance our understanding of the breadth of the projects, to identify people and cases of innovative practice or relevant IT change in the area of artificial intelligence and algorithms within local government in the UK, and to corroborate information from the cases discussed during interviews.

A survey instrument was developed, which included a mixture of closed and open text responses (the full survey is available in Appendix A1). The survey was originally designed to provide a broad overview of the spread of data science[1] technologies, reasons for their uptake, barriers to their implementation, and the impact of these technologies. In this paper, the focus is on a subset of questions about smart technologies. Personal email invitations to complete the survey were sent to a list of at least one person in 285 of the 408 local authorities in the UK.[2] In total, 402 invitations were sent. Individuals who were invited to participate were selected because they worked in areas related to algorithms and artificial intelligence such as IT, business intelligence, analytics, open data, and government digitization. Local authority organizational charts and contact lists were used wherever possible. The survey was at least partially completed (29% or more of the survey was completed) by 93 respondents, for a response rate of 23%. Of those respondents who provided their position (55), 32 were from intelligence, data, and research positions, 10 were from digital and IT, 7 were from policy and strategy, and 6 were from service or projects. Seventy-two different local authorities with small, medium, and large populations and geographical areas were represented. The breakdown by type of local authority is presented in table 1 below. Survey results suggested which topic areas were most common for case study follow-up, and provided an overview of trends in UK local authorities.

Thirty-four audio recorded semi-structured interviews of between 30 and 60 min in length were conducted by phone or over Skype with individuals who were selected based on their survey responses or their online profile found during the earlier desk research phase. These individuals were working in either UK local authorities, central government, or in enterprises providing algorithmic services to these authorities. Conversations were about the characteristics

Table 1 Breakdown of Number of Participants and Local Authorities by Local Authority Type

Local authority type	Number of participants	Number of local authorities of this type in the sample
County councils	30	18
District councils	17	13
Metropolitan districts	13	11
Unitary authorities	26	24
London boroughs	7	6

Notes: For more detail about the structure of local authorities in the UK, see (Law Wales 2015; Minister for Local Government, Housing and Planning 2019; Ministry of Housing, Communities, and Local Government 2019; nidirect 2015).

of projects and included details about concrete examples (semi-structured interview questions can be found in Appendix A2). Participants by position type included 20 in intelligence, data, and research, 4 in digital and IT, 6 in policy and strategy, and 4 in service or projects. Interview recordings were collectively reviewed in order to identify key themes and quotes, which were noted or transcribed. These three steps—desk research, survey results, and interview responses—were used to triangulate common themes and form more nuanced understandings of the data. Drafts of analysis were shared and discussed as a group to identify gaps, confirm relevance, and compare interpretations (Ospina, Esteve, and Lee 2018).

Two representative cases were selected based on survey results, interview responses, and publicly available documentary evidence to illustrate the breadth of phenomena that are occurring with the implementation of smart technology projects in local authorities. These two cases are autonomous agents and predictive analytics. Specifically, chatbots as autonomous agents and predictive analytics related to houses in multiple occupation (HMO) and children's social care risk. The case on predictive analytics looks at two instances of use because these use cases are the responsibility of different tiers of local authority, whilst chatbots are occurring across all types of local authority. Ten out of the 34 interview respondents from intelligence, data, and research, digital and IT, and service or projects positions were able to comment on these specific cases. Their commentary is supplemented by documentary evidence. Whilst a multi-method qualitative approach offers opportunities to corroborate information and enhance credibility (Klein and Myers 1999; Lincoln and Guba 1985; Seale 2002), the limitations are that survey respondents were self-selected and that the individuals involved responded in a personal capacity. There could be selection bias such that those who responded might be from the most innovative or the only local authorities in the UK pursuing such changes.

Results

There is evidence that local authorities are beginning to adopt smart technologies, particularly in the categories of autonomous agents and predictive analytics for decision assistance, and that these technologies are having an unanticipated impact on how public administrators and computational algorithms become imbricated in the delivery of public services. Twenty-five survey respondents (27%) mentioned that their local authority is experimenting with some kind of automatic text or content analysis. Fifteen survey respondents (17%) mentioned that their local authority is experimenting with some kind of predictive analytics. For overall data science approaches, "welfare and social care" was the biggest application domain reported in the survey (see table 2 below for a breakdown of the top application domains). Our case study examples are drawn from these service areas. The following two sub-sections look at cases of smart technology in local authorities and their impact on work and organization. The first section will specifically look at chatbots as a form of autonomous agent. The second will look at predictive analytics for HMOs and children's social care.

Table 2 Number and Percentage of Respondents Reporting on Data Science Use by Application Domain

Application domain	Number of survey respondents	Percentage of survey respondents
Welfare and social care	43	46%
Transportation	38	41%
Healthcare	38	41%
Housing and planning	33	35%

Autonomous Agents and Do-It-Yourself Service Delivery

Chatbots are autonomous agents which typically interact through a website and make use largely of text-based communication to facilitate citizen–government interactions (Androutsopoulou et al. 2018). A Chief Technology and Information Officer who has worked closely with these technologies explained that the aim of chatbots is to take pressure off of face-to-face and telephone services by allowing people to conduct transactions online, and also potentially increase engagement and accessibility to services among demographic groups that might not use other digital channels (telephone interview, third quarter, 2018). Examples of areas adopting chatbots include public transportation (Transport for London n.d.), planning permission applications for loft development (UKAuthority 2017), health diagnosis (Burnip 2017), and social housing issues reporting (Swainston 2017). But in this case, the focus is on (a) a resident-facing chatbot for planning permissions, (b) the use of virtual assistants for adult social care, and (c) the use of middleware bots to assist public administrators. Results indicate that chatbots may replace some human work, but in practice significant human work will be needed behind the scenes in order to keep the technology useful and usable. Results also indicate that there may be new dynamics between street-level workers and their clients and a refocusing of street-level work, as chatbots take over some routine tasks.

Resident-facing Chatbots for Planning Permissions. The London borough council of Enfield decided to implement IPsoft's Amelia AI assistant to deal with some planning permission applications (Everett 2017). The Assistant Director of IT at Enfield Council indicated that in the context of a growing population and continued austerity, some people still rely on in-person or phone services because they struggle with digital, but "if they could do all that by talking to a device at home, their personal assistant at home with no keyboard or screen that connects to a digital ecosystem at the back-end and handles their request, it would do so much to remove the digital divide" (Everett 2017). A user-friendly chatbot such as this could enable more isocratic service delivery, even among those who need additional assistance with digital.

The Assistant Director also indicated that rather than merely making workers redundant, "AI has the potential to take out repetitive admin processes that are too complex and nuanced for regular automation, freeing people up to do more sophisticated and gratifying work" (Everett 2017). Rather than replacing workers outright, automation with AI chatbots can deal with more complex service than procedural tools, such as web forms and expert systems, and add another tool that could be used, in conjunction with existing staff, to provide more efficient responses to public service queries of a range of different levels of complexity. This suggests that work may not shift entirely to the system level, but that responses will be made up of an imbrication of material and human agents.

The Assistant Director also explained how the process of development and implementation required the involvement of

more than just technical staff: "You need three things, so people who understand the system, that is IPSoft and us in terms of the dictionary of terms. You need the business planning team, who map out processes, work out the kinds of questions people will ask in what order and what kind of words they use. And then you have to work with residents and people doing the testing to feed back into the project" (Everett 2017). Even a system-level bureaucracy requires input from multiple parties, suggesting that a front-end that may look like an isocratic tool may in fact require a significant socio-technical administrative infrastructure in order to function. The Assistant Director explained: "When you have more than 600 processes touching on multiple applications, it's easy to underestimate the time it will take to get it right. But to get it to work, you have to be able to plug everything into the system and build on that. So AI may become the face of the Council, but behind the scenes is a whole body of things that have to work together" (Everett 2017). Work at the system level is complex in local authorities because of the diverse range of processes that smart technologies need to address and the stakeholder groups that need to be involved.

Whilst the council did experience challenges with Amelia, it was able to find a solution (UKAuthority 2017). An individual working on the project explained that there was "very much a significant divide between what was perceived as being this avatar that could speak to anybody and the reality of a system that required expert coding at the back end to actually deliver it" (telephone interview, third quarter, 2018). In the end, the natural-language processing only applied to the structure of the question, whilst behind the scenes the chatbot "was fed by a logical workflow hand-coded into the system" (telephone interview, third quarter, 2018). Even at the system level, there is a need for continuous human supervision and input into a smart tool. This may demonstrate that the current status of chatbots does not meet the threshold for pure learning technologies that can deliver equality of outcomes through appropriate responses to citizen requests. In this example, there is a blending of the ability to learn from natural language with a reliance on procedures embedded in code.

The Use of Virtual Assistants for Adult Social Care. In adult social care, whilst chatbots and automated assistants, such as Amazon's Alexa, can provide some support and allow for some isocratic service delivery in clients' homes (Taylor 2018), there are still many instances where a human needs to be involved, for example, where a chatbot cannot answer a question, where an automated assistant cannot carry out a physical or social task, or where the workers who fulfill these tasks may generate valuable data in their documentation. An IT consultant highlighted that "many may still need hands-on support from human carers; these consumer devices clearly cannot replace that" (telephone interview, third quarter, 2018). In these cases, a chatbot can supplement a service by enabling communication with caregivers and family, as well as providing control over connected smart home technologies, but it cannot replace the components of that service that require human presence. In addition to giving clients more independence, these technologies can free caregivers from routine tasks, allowing them to instead "do more of the human touch" (Taylor 2018).

Whilst virtual assistants support some simple coordination tasks, for example, by helping caregivers to leave messages for one another, there are also certain limitations. The smart home ecosystem is immature, the devices have difficulty understanding social care terminology and requests, and proprietary technologies do not allow councils to push messages out to their clients (telephone interview, third quarter, 2018). The aspiration is that as these smart technologies develop, intelligence could be shared more effectively between caregivers, Internet of Things data could provide early warning signs that enable improved preventative services, and this human and material data could potentially enable a shift to equality of outcomes, but this is not currently the reality. An IT consultant predicted that "inside that data, that technology will give us the capability to say, 'I am going to vary this depending on need, I am going to intervene earlier on, before a crisis, and I am going to make this personalized rather than standardized'" (telephone interview, third quarter, 2018). The interesting point it that in both the current and the aspirational settings, the integration of workers and smart technology is key.

The Use of Middleware Bots to Assist Public Administrators. Some automated services are not directed towards citizens, but instead support public servants or professionals. A local government official highlighted how this type of chatbot could potentially be used to simplify and automate "extract, transform, and load" tasks in a variety of local government application areas, such as statutory reporting, acting as a kind of automated assistant for public servants, so that they could focus on more complex analytical tasks rather than more mundane routine administrative ones (telephone interview, third quarter, 2018). An innovation team lead explained, "I've started to see the use of software bots, effectively one bit of software driving another, to try and optimize certain processes where, to be honest, human activity isn't, perhaps, the best use of resources" (telephone interview, second quarter, 2018). Statutory returns create a significant draw on analyst time. If the processing of these returns could be automated, workers could have more time to work on more complex, innovative, and meaningful data analysis projects (telephone interview, third quarter, 2018).

Such automated tools can also help to highlight where practices differ across teams, such as where a workaround may have been adopted in day-to-day work to deal with a problem. The innovation team lead explained that "a bigger opportunity or bigger challenge, certainly in the use of AI or robotics, is that the initial implementation will expose that there have not been standard practices at play" (telephone interview, second quarter, 2018). The interaction between the technology and the people working with it can lead to greater efficiency, not only by automating routine tasks, but by highlighting biases and inefficiencies in human information practices that could be improved upon (Mittelstadt et al. 2016). By revealing instances where workarounds were developed to deal with various data deficiencies, local governments can begin to tackle the root causes.

Autonomous agents represent an ongoing evolution in the adoption of technologies within local governments; however, the aspirations for these technologies are not being met as expected. Whilst there is some transition from street-level to system-level administration, the transformation is actually much more complex. The involvement of multiple stakeholders is needed for chatbots to work, virtual assistants complement street-level work, and middleware bots can also provide support to public servants

and other professionals. Further, current autonomous agents combine new learning techniques that focus on outcomes atop a foundation of procedural equality. Emergent findings suggest that autonomous agents can free workers from routine tasks, provide feedback on the consistency of human practice, such as when things are not being done as expected, and reveal that whilst vendors may over-promise and under-deliver, local authorities may have internal capacity that can develop smart technologies that are sensitive to local context. In the next section, we will look at tools that are specifically designed to support workers by enhancing their decision-making.

Predictive Analytics and Learning in Complex Systems

In addition to providing professionals with assistance when carrying out routine tasks, smart technologies are also helping with decision-making. A considerable proportion of local government work involves making complex decisions about when, where, and to whom to deliver services and interventions. These decisions are complex because they involve a wide variety of contexts and situations. A combination of rich data, large caseloads, and significant consequences taxes the information-processing capacity of professional staff, which could lead them to make decisions based on heuristics or the limited information that they have been able to retrieve and analyze within the available timeframes (Cuccaro-Alamin et al. 2017; Sanders et al. 2017). A Senior Intelligence Lead explained, "front-line staff are having to make decisions about individuals, often in the backdrop of huge time pressures and system pressures" (telephone interview, second quarter, 2018).

Smart technologies are beginning to help in the context of complexity and time pressure by means of predictive decision assistance (Rogge, Agasisti, and De Witte 2017). These technologies are computerized systems which seek to guide people making service intervention decisions. Often, they rely on machine learning techniques that make use of algorithms and past data to make predictions about future outcomes. Crucially, rather than being explicitly programmed, the algorithm learns from training data and responds to new data inputs. Whilst these systems can take many forms, currently there is growth in the use of machine learning techniques to produce predictions or risk scores. Two examples of service areas where local authorities are applying predictive models are HMOs and decisions in children's social care. In these cases, the focus is on (d) worker feedback to designers, (e) collective knowledge, and (f) worker–smart technology feedback loops. Results indicate that predictive analytics depends on the contextual knowledge of street-level workers during design. Results also indicate that predictive analytics enables collective intelligence and generates positive feedback loops around data collection, processing, and presentation for use.

Targeted inspections of HMOs are one area of predictive analytics adoption. A variety of different branches of local government need to enforce local rules. Inspections are one potential way of enforcing these rules, and one potential use of predictive analytics is to improve the efficiency of these inspection operations. In the case of HMOs, there were examples showing how a reliance on data and smart technologies alone was not sufficient to deliver the results that local authorities were looking for. Software was developed in conjunction with Nesta which aimed to help find hidden HMOs, which are a major source of both unclaimed rates and potential health and safety risks (Copeland 2017; Dragicevic et al. 2018). The software provided a probability for each property and allowed inspectors to potentially guide decisions with respect to which properties to inspect. Nesta had hired a company that the local authorities would work with on a predictive model.

Worker Feedback to Designers. A data scientist in a local authority explained their experience of the HMO inspection project saying that "we provided the data that the company requested but the model that was produced didn't do what we hoped" (telephone interview, third quarter, 2018). The data scientist went on to explain that "there are a couple of big authorities that had a similar experience, they were not impressed with the results, and others had problems providing the data in the first place" (telephone interview, third quarter, 2018). Furthermore, even in cases where the results are generally acceptable, the data scientist explained that if the system makes predictions that are clearly absurd to seasoned workers, trust in the system as a whole could be undermined (telephone interview, third quarter, 2018). The data scientist gave an example of how, in one of the pilots, inspection officers were unimpressed because the system was recommending things which were (to the officers) obviously not HMOs: "Through no fault of their own, the company who developed this particular model simply didn't have the detailed knowledge of the borough … But this knowledge is crucial" (telephone interview, third quarter, 2018). Vendors lacked the relevant contextual knowledge to design predictive tools in which workers had confidence.

In order to resolve this issue, the data scientist explained how they developed their own solution, and that "the key thing was that we were very careful to work with service about what variables to include, which properties to include in the test and the training set, and so on and so forth and we actually came up with much better results" (telephone interview, third quarter, 2018). Making a useful predictive model involves not only the data and smart technology, but an understanding of the context and what street-level factors should be included in the model, which only front-line staff possess. Ultimately, "this was seen as an aid, as a tool, rather than the answer. So, together with that and the local knowledge of the officers and phone calls from members of the public or councillors, the staff have a much better idea of which properties are worth inspecting" (telephone interview, third quarter, 2018).

Predictions can also be made at the individual level, and these results can be used for operational purposes, providing a tool which frontline managers and workers alike can use to aid decisions, either by helping to retrieve, analyze, and present more context and background information, or by generating an assessment to supplement existing judgment (Pratchett 1999). A specific example in children's social care is related to decision support technologies that could provide a useful supplement to workers who screen cases to identify if further action is needed, potentially enabling social workers to concentrate their effort on higher risk cases whilst sparing low-risk families the intrusion of being screened. One example of such a trial is provided by the Behavioral Insights Team, which has developed a structural topic model that is applied to the case notes of social workers (Sanders et al. 2017). Similar to the HMO example, the Behavioral Insights

Team sought feedback from social workers and team managers during the development of the tool to determine if the topics identified by the natural-language processing algorithm made sense to the workers (Sanders et al. 2017). They are currently developing the model into a risk assessment tool that can inform decision-making in the area. Beyond the feedback from front-line workers, a data scientist cautioned that the algorithms do also need to be retrained from time to time, highlighting the continued role of people in the supervision of smart technology (telephone interview, third quarter, 2018). People continue to play an important role in the development and supervision of machine learning models.

Collective Knowledge. An advantage of smart technologies is that they can learn and adapt, improving pattern identification and prediction, in response to inputs documented by different workers. For example, in the case of social work in children's social care, a Head of Knowledge and Intelligence said that: "as an individual social worker … you work with individual children and families and you document the work you have done … but there might be something else, a more strategic view that the data can offer, which would support your decision-making" (telephone interview, third quarter, 2018). A consultant working with a local authority shared this sentiment, saying that:

> it's not just about the service user, it's about their circle of support and it's about sharing intelligence. It's exactly the kind of thing that has caused the disasters in public services where the police knew something was wrong, the school knew something was wrong, the social worker knew something was wrong, and actually if they had all spoken to each other they would all know that something was catastrophically wrong, but they did not effectively share what they each knew. So, you end up with a crisis situation. Those little snippets of intelligence and those little insights from other people that mean you can make a more complete judgement about what somebody's needs are and how they need to be supported are really important (telephone interview, 3rd quarter, 2018).

Decision support is required where the need to parse the vast quantities of data is beyond the ability of a human or overwhelms their ability to make a decision on that basis.

All interviewees who addressed the subject of predictive analytics were careful to highlight that these tools should supplement rather than replace existing skilled insight, and hence act as a kind of secondary check on decisions already made. A Head of Quantitative Research said "a machine alone cannot make a decision that has legal consequence for an individual … even the legalities of it aside, I think it's absolutely correct that the human makes the final decision because … there may be some pieces of a particular case that are very unique to that case which are not reflected by the model … so we very much view this as a decision aid" (telephone interview, third quarter, 2018). Other interviewees also supported the idea that predictive analytics should act only as a decision-support tool. A Head of Knowledge and Intelligence emphasized that predictive tools are "just trying to give practitioners another piece of information to help them make better decisions" (telephone interview, third quarter, 2018). However, the practitioners' judgment should always overrule a computational decision. A scholar noted that in practice this seems to be how the technology is used: "the most common response about the impact of the decision support tool is that it made case workers stop and think in certain cases where previously they might have gone faster, rather than replacing their judgment" (Skype interview, third quarter, 2018). This highlights the continued importance of front-line workers and their lived experience as a critical factor in service-level decision-making, and how this can be supported by decision assistance based on the collective intelligence of all workers recording data.

Worker–Smart Technology Feedback Loops. The socio-technical relationship between those who collect the data, the machines that store and process it, the information system designers, and the people who retrieve and use the relevant information is critical to its functioning. The model is only as good as the input data that is collected and its ability to describe the context of the case. Feedback loops can help support data collection. An Intelligence Lead explained that "[t]he minute that our social workers and our occupational therapists saw the information displayed, it suddenly had a different purpose to it, and not just a purpose in terms of the use of data, but actually a purpose in their own head around why they write something or how they write something." (telephone interview, second quarter, 2018). The interaction between technology and staff helps to support learning. The technology learns from the data and produces useful analysis, and workers learn how to collect data to enable the technology. This creates a positive symbiotic relationship between the workers collecting data and the smart technologies that process it. Getting data collection right is important. As one Head of Knowledge and Intelligence worried, "predictive analytics might just be a little blip, if we can't sort out all the data underneath it" (telephone interview, third quarter, 2018). Predictive analytics depends on an accurate and reliable foundation of integrated data that is accurately collected (Vogl 2020b).

Making predictive decision assistance technologies work involves technology and working with staff to identify which data sources need to be brought together. An innovation team lead explained, "it is now entirely technically possible for me to look at natural language processing, so free text, across a social care record, a health record, a police record, DWP [UK Department for Work and Pensions], so from all those different data sources, effectively create a data universe around a particular individual" (telephone interview, second quarter, 2018). The innovation team lead went on to say, "I think there's a really interesting piece of research yet to be fully undertaken with practitioners about how you create that risk universe and what are all the data points you would need and what would it actually do? Would it instruct an intervention, or would it just flag up the possibility of something, or the probability of something being an issue?" (telephone interview, second quarter, 2018). Making smart predictive tools work involves not just the technology, but the interaction between the technology, those who feed the information into the technology, and those who use the outputs of that technology to help inform their work. The innovation team lead concluded that "I think the human side of this is going to be more critical than the technology side" (telephone interview, second quarter, 2018). A research agenda for smart technologies needs to look at the technological and the human aspects of the information infrastructure that supports smart technology in local authorities.

Predictive analytics also represents an ongoing evolution in the adoption of technologies within local governments, but, again, the aspirations for these technologies are not being met as expected. Whilst there is some transition from street-level to system-level administration, the transformation is actually much more complex. The contextual knowledge of street-level workers is invaluable in system design, predictive analytics complement street-level work by bringing to bear the collective intelligence of all workers, and positive feedback loops can be developed where public servants and other professionals are shown the value of quality data collection and data integration. More than in the case of autonomous agents, predictive analytics promises greater equality of outcomes by learning from data and offering guidance specific to those inputs, rather than focusing on a procedural logic. Emergent findings suggest that predictive analytics reveals how smart technology depends on more than the simple dichotomy between street- and system-level administrators, and, again, that local authorities may need to take over from vendors in order to develop smart technologies that are sensitive to local context.

Rather than replacing human intervention outright, for example, with the introduction of autonomous agents, smart technologies could be used to enhance the decision-making capabilities of professional service providers by bringing together the knowledge of multiple professionals, lightening the burden of some information retrieval and analysis tasks, and freeing up attention needed for direct service. Smart technologies also crucially depend on the situated knowledge, data collection, and interpretations of front-line workers to be most effective. In the next section, we will look at what these findings mean for current theory and propose a new conception of public administration in the era of smart technology that can act as a framework for future research.

Discussion

Findings suggest that, whilst at a nascent stage, local authorities are beginning to adopt smart technologies, though not necessarily in the ways that were envisioned. The findings also suggest that whilst smart technologies may automate certain types of local government work, there are numerous cases where a new relationship is being created between public administrators and artificial intelligence technologies. This relationship is described here as algorithmic bureaucracy, recognizing the interaction between offices held by public administrators, both street level and system level, and computational algorithms that are increasingly becoming an everyday part of the working environment. This paper establishes a framework setting out six of the principal ways in which these technologies are not simply replacing people but are transforming the socio-technical relationship between workers and their tools, as well as the way that work is organized in the public sector.

In the context of this research, it is important to consider two key insights, "that bureaucracies are sociotechnical systems; and that the organization of information-processing is key to bureaucratization pushing ahead (for better or worse) the modernization and rationalization of human conduct." (Dunleavy et al. 2006, 40). Public administration in local authorities is experiencing automation and the adoption of predictive tools. Automation is not just about isocratic service delivery (Dunleavy and Margetts 2015) but requires the involvement of multiple stakeholders and supports the work of public servants, both street and system level. Predictive tools depend on the contextual knowledge of street-level workers, support decision-making by processing and bringing to bear more information than any individual could have, and enable positive feedback loops related to information collection, processing, and presentation, which allows the public sector to handle greater complexity, including in the decision space of front-line workers. Automation and predictive analytics was also found to free workers from routine tasks, provide feedback on the consistency of human practice, demonstrate the need for the involvement of multiple stakeholders, and reveal the latent capacity to deliver smart technologies that exists within local authorities. If algorithms represent a computational procedure or set of rules used in problem-solving, then we may expect them to automate many public service functions. Whilst this may be the case for chatbots that interact with residents, we have also seen from chatbots for public administrators and predictive tools for decision assistance that there is still an important role for people and organization. These phenomena suggest a shift from traditional bureaucracy to algorithmic bureaucracy in local authorities. Table 3 below shows the similarities and differences between traditional bureaucracy and algorithmic bureaucracy along a number of key dimensions identified in the theory and results:

The new features highlighted in table 3 suggest both a set of propositions setting out a research agenda to further establish the theory of algorithmic bureaucracy and the need for a new framework to capture the types of socio-technical relationships that manifest under this form of public administration. There are five key propositions suggested by the results. Research will need to explore: (1) how different groups are (or are not) engaged in the design, development, and application of smart technologies, and how the type of collaboration influences their adoption and use; (2) how smart technologies support positive feedback loops that link together the collection, storage, retrieval, processing, and presentation of information; (3) how smart technologies can support greater responsiveness and adaptation to different contexts than procedural rules; (4) how smart technologies can enable collective intelligence, where all information collected across a service sector can be processed and analyzed to provide useful insights to individual workers who need to make decisions; and (5)

Table 3 Similarities and Differences between Traditional Bureaucracy and Algorithmic Bureaucracy

Dimension	Traditional bureaucracy	Algorithmic bureaucracy
Organization	Hierarchy: top-down, siloed structure	Collaboration: melding vertical and horizontal with top-down and bottom-up
Service output	Procedures: services follow a system of eligibility and rules	Context: services respond to the unique needs of clients
Knowledge	Specialization: individual bureaucrats are experts in their particular function	Collective intelligence: making the knowledge of many available to all
Tools	Storage: paper records stored in filing cabinets or their electronic equivalents	Feedback: retrievable and usable records that can inform decisions in real time
Values	Procedural equality: rules that treat everyone equally, regardless of their context	Equality of outcomes: unique approaches that get everyone to the same destination

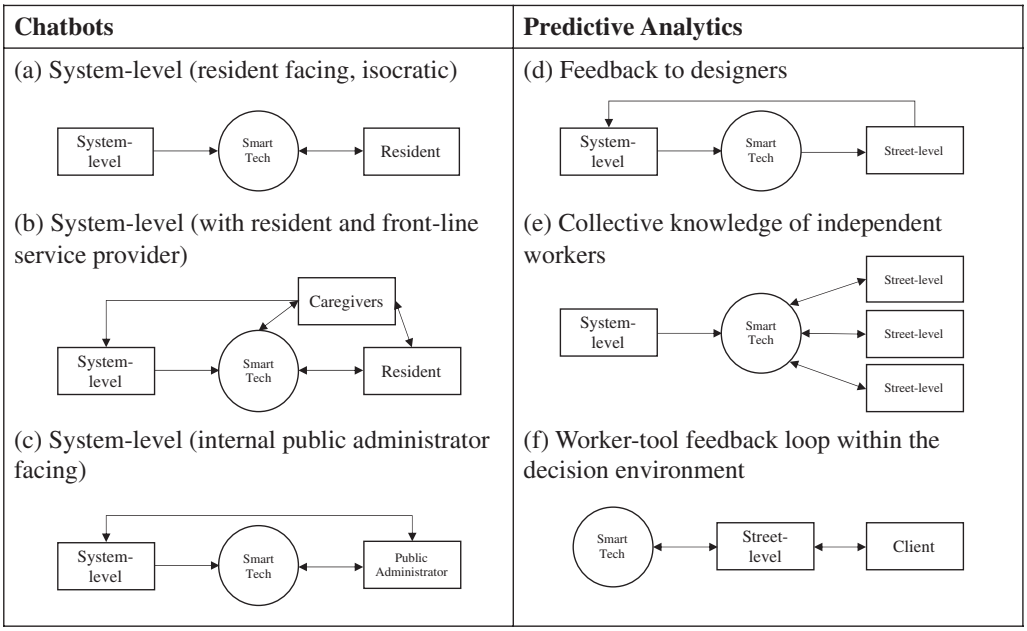


Figure 1 Socio-technical Relationships Involving Smart Technologies

how smart technologies are changing the focus from procedural equality to equality of outcomes.

The concept of algorithmic bureaucracy provides a framework to understand how computational algorithms are affecting all offices in the public sector, from the street to the system level. This framework accounts for: automated processes made possible by algorithms; the system of roles, hierarchy, and files that constitute traditional bureaucracy; and how these two things interact. As Simon stressed decades ago, "we must understand the decision-making tools at our disposal, both human and mechanical - men and computers" (1973, 272). Figure 1 illustrates the six socio-technical interactions that are suggested by the findings (from (a) to (f)) and the manifold ways in which smart technologies and public administrators are imbricated in an algorithmic bureaucracy. Under chatbots, there is (a) isocratic system-level relationships, which represents the standard perspective on the adoption of smart technologies in public administration, though even in this case, the picture was more complex, given the number of stakeholder groups involved in design. There are also (b) relationships between front-line caregivers and smart technology that frees those individuals from routine tasks and allows them to communicate more effectively, so that they can focus on the human elements of care work, and (c) internal relationships between system-level designers, middleware bots, and administrators to realign tasks and uncover unproductive practices. Under predictive analytics, there is (d) the critical role of feedback from workers to designers when evaluating the utility of such tools. There are also (e) feedback from many individual workers to the tool, creating collective knowledge for all workers, and (f) feedback loops between workers who collect and use information, and the smart technologies that process and present the client-related data for use within the decision environment.

The theoretical implications of these findings are mixed. They suggest an ongoing evolution in the extent to which digital transformation is occurring in local government. Whilst in some cases they do support the idea that there is a transition from street- to system-level administration, there are many other cases where this picture is not as clear, as multiple stakeholders continue to have some involvement in the design, implementation, and application of smart technologies. Finally, they also show that some applications of smart technologies are made with the intent to focus on equality of outcomes using adaptive learning technologies; however, there are other cases in which smart technologies are built on a foundation of procedural equality. Emergent findings suggest that the introduction of autonomous agents and predictive analytics will free workers from routine tasks, provide feedback on the consistency of human practice, demonstrate the need for the involvement of multiple stakeholders, and reveal the latent internal capacity that exists within local authorities to deliver contextually sound smart technology. Algorithmic bureaucracy suggests that there are multiple ways in which smart technologies and public administrators become imbricated in the delivery of services. This conceptual framework illustrates some of these interactions and provides an example of how to clarify and study the many and diverse implications of smart technologies in public administration settings.

Conclusion

This study, which included three techniques: a survey, desk research, and subsequent in-depth interviews, indicates that smart technologies are increasingly being adopted and used to automate certain tasks and enhance human work practices and decision-making in local authorities in the UK. Smart technologies appear to involve more stakeholders than initially expected, mediate work relationships between professionals and their clients, offer public-administrator-facing in addition to client-facing support, necessitate feedback between street-level and system-level public administrators, enable collective intelligence, and create positive feedback loops with street-level workers. Overall, the more widespread introduction of computational and algorithmic tools across service areas in local authorities is evidence for a change in the nature of public administration towards a form of algorithmic

bureaucracy. However, this change is not a wholesale replacement of public administrators and traditional mechanisms of organization in public administration, but a transformation of the socio-technical relationship between workers and their tools, as well as the way that work is organized in the public sector. Thus, an algorithmic bureaucracy is able to handle greater complexity in the decision environment whilst also enhancing individual and administrator competence when trying to solve problems.

The findings suggest a new way of conceptualizing public administration in the context of smart technologies. The concept of algorithmic bureaucracy calls attention to the need to study the imbrication of computational algorithms with traditional public sector organizing. This paper has presented five propositions for developing the theory of algorithmic bureaucracy (related to collaboration, context, collective intelligence, feedback, and equality of outcomes), as well as six different forms of interaction across the two cases of autonomous agents and predictive analytics. These forms of interaction set out the constructs that need to be studied when trying to understand the implications of the introduction of smart technologies in public sector settings. Future research could use these constructs to study similar phenomena in different jurisdictions or service sectors or could expand on these six constructs to further elaborate the concept of algorithmic bureaucracy. Hopefully, this paper provides a robust framework for the continued study of smart technology in socio-technical systems.

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Notes

1 Data science is defined as bringing in new decision-making and analytical techniques to local government work (e.g., machine learning and predictive analytics) and also expanding the types of data local government makes use of.

2 343 local authorities in England (36 metropolitan districts, 32 London boroughs plus the City of London, 55 unitary authorities plus the Isles of Scilly, 26 county councils, and 192 district councils), 32 unitary authorities in Scotland, 22 unitary authorities in Wales, and 11 unitary authorities in Northern Ireland.

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Appendix A1: Survey

The aim of this short survey is to understand more about both the data sources and the analytical techniques that local governments use to inform policy and deliver services. We are particularly interested in the growing use of new data sources (such as open data, internet of things data and social media) and novel approaches to policy implementation and analysis (such as the use of experiments and machine learning), a joint change which some are labelling the emergence of "data science". We are interested in measuring the spread of this type of data science within local governments in Europe.

You have been invited to participate because you work in local government and we would welcome your views on how data science is used in your organization.

The survey consists of nine questions that we ask you to answer to the best of your knowledge. It should take less than 10 minutes to complete.

Please note that your participation is voluntary. You may withdraw at any point during the survey for any reason simply by closing the browser. You do not have to answer all questions to complete the survey: you can ignore any questions which you would prefer not to answer.

There are no direct benefits to taking part, but we will of course send you a copy of the results when we have collected them! Many thanks indeed for considering taking part.

If you agree to proceed, please indicate your consent to participate in the survey by clicking on the two statements below.

Please note that you may only participate in this survey if you are 18 years of age or over.

- ☐ I certify that I am 18 years of age or older (1)
- ☐ I have read the information above and agree to participate in this survey with the understanding that the data (including any personal data) will be processed according to the details above. (3)

Question 1 of 9

To the best of your knowledge, which of the following types of data are actively used in your organization to inform service delivery and/or policy making?

NB If you see the error "You have entered a response for an unselected answer. Please select it or remove the response" after trying to submit your answers: Please click on the option "Other (click here then please specify below)" and then try again. Typing in the text box without clicking on this option causes the error.

- ☐ Official central government statistics or EU statistics (e.g. Eurostat) (12)
- ☐ Open data from other organizations, including government or private sector (1)
- ☐ Social media data (e.g. from Twitter or Facebook) (2)
- ☐ Third party business data (e.g. mobile phone data) (3)
- ☐ Survey data (5)
- ☐ Data from sensors or Internet of Things devices (6)
- ☐ Re-purposed administrative data (9)
- ☐ None of the above (8)
- ☐ Other (click here then please specify below) (7) _____

If you selected any types of data above, could you give one or two brief examples of how they are used?

_____
_____
_____
_____
_____

Question 2 of 9

To the best of your knowledge, which of the following data processing and analysis techniques are used in your organization?

NB If you see the error "You have entered a response for an unselected answer. Please select it or remove the response" after trying to submit your answers: Please click on the option "Other (click here then please specify below)" and then try again. Typing in the text box without clicking on this option causes the error.

- ▫ Inferential statistical analysis (e.g. linear regression) (1)
- ▫ Experiments (e.g. A/B testing) (2)
- ▫ Machine learning or other types of predictive analytics (3)
- ▫ Data mining (4)
- ▫ Network analysis (5)
- ▫ Automatic text or content analysis (6)
- ▫ Spatial analysis and GIS (geographic information systems) (10)
- ▫ Modeling (e.g. agent based modeling) (13)
- ▫ None of the above (8)
- ▫ Other (click here then please specify below) (7) _____

If you selected any techniques above, could you give one or two brief examples of how they are used?

_____
_____
_____
_____
_____

Question 3 of 9

To the best of your knowledge, which sectors or divisions in your local government are using data science techniques as described in Question 2?

	Using data science (1)	Not using data science (2)	Our organization is not responsible for this sector (3)	Unknown (5)
Policing and public safety (1)	○	○	○	○
Welfare and social care (2)	○	○	○	○
Healthcare (3)	○	○	○	○
Education (4)	○	○	○	○
Culture and tourism (5)	○	○	○	○
Housing and planning (6)	○	○	○	○
Transportation (roads, highways and public transportation) (7)	○	○	○	○
Emergency planning and preparedness (8)	○	○	○	○
Finances (including pensions, salaries, and benefits) (9)	○	○	○	○
Environment and sustainability (10)	○	○	○	○
Licensing and regulation (11)	○	○	○	○
Waste management (12)	○	○	○	○

Are any sectors or divisions sharing data or collaborating on this type of data analysis? If so, could you provide a brief example of this type of collaboration?

_____
_____
_____
_____
_____

Question 4 of 9

To the best of your knowledge, which of the following data management, processing, and analysis tools are used in your organization?

NB If you see the error "You have entered a response for an unselected answer. Please select it or remove the response" after trying to submit your answers: Please click on the option "Other (click here then please specify below)" and then try again. Typing in the text box without clicking on this option causes the error.

- ▫ Microsoft Excel (1)
- ▫ SQL databases (including Microsoft Access) (12)
- ▫ Tableau (2)
- ▫ R (3)
- ▫ Python (4)
- ▫ SPSS, Stata, SAS or other proprietary statistics package (5)
- ▫ Hadoop/Spark (6)
- ▫ Google Apps for Business (7)
- ▫ Amazon Web Services (8)
- ▫ IBM solutions (including IBM Analytics, Watson, and other services) (9)
- ▫ Geographic Information Systems (including ArcGIS, QGIS, or other package) (10)
- ▫ Dashboards (23)
- ▫ Other (click here then please specify below) (11) _____

Question 5 of 9.

What kind of practices are used to support data science in your local government?

NB If you see the error "You have entered a response for an unselected answer. Please select it or remove the response" after trying to submit your answers: Please click on the option "Other (click here then please specify below)" and then try again. Typing in the text box without clicking on this option causes the error.

- ▫ Public participation in open data platforms (1)
- ▫ Organizing hackathons (2)
- ▫ Data sharing agreements with other local governments (10)
- ▫ Working with the private sector (3)
- ▫ Procurement and open calls for solutions (4)
- ▫ Crowdsourcing solutions (5)
- ▫ Working with the university and think tank sector (6)
- ▫ Maintaining digital innovation hubs (7)
- ▫ Training programmes for staff (11)
- ▫ Other (click here then please specify below) (9) _____

Question 6 of 9

Where does your organization look for new ideas regarding data science for local government?

NB If you see the error "You have entered a response for an unselected answer. Please select it or remove the response" after trying to submit your answers: Please click on the option "Other (click here then please specify below)" and then try again. Typing in the text box without clicking on this option causes the error.

- ▫ Other towns, cities, and regions (1)
- ▫ Professional conferences (2)
- ▫ Private sector (3)
- ▫ Central government (4)
- ▫ Publications (books, magazines, journals) (5)
- ▫ Other (click here then please specify below) (6) _____

Question 7 of 9

In your opinion, what are the main barriers to using data science in the local government context?

NB If you see the error "You have entered a response for an unselected answer. Please select it or remove the response" after trying to submit your answers: Please click on the option "Other (click here then please specify below)" and then try again. Typing in the text box without clicking on this option causes the error.

- ▫ Difficulty of accessing relevant data sources (1)
- ▫ Difficulty of hiring and training staff with data science capacity (2)
- ▫ Difficulty due to lack of available equipment (3)
- ▫ Difficulty of contracting out and working with the private sector (4)
- ▫ Difficulty of creating a culture of innovation and experimentation within local government (10)
- ▫ Difficulty due to data silos and lack of interoperable databases (5)
- ▫ Difficulty in coordinating between local government and other stakeholders (9)
- ▫ Difficulty due to lack of funding for data science projects (6)
- ▫ Difficulty due to legislation, privacy concerns or information security (8)
- ▫ Other (click here then please specify below) (7) _____

If you wish to provide any more comments on the barriers to using data science in the local government context, please use this text space:
_____
_____
_____
_____
_____

Question 8 of 9

If you have any further comments you would like to add regarding the use of data science in local government, please use this text space below:
_____
_____
_____
_____
_____

Question 9 of 9

Thank you very much for responding to our survey. Before you finish, we ask that you provide your contact details below. These details will allow us to categorize your responses correctly (so we know which country you are from and what type of municipality you represent). We ask for your email address because we might contact you to ask for permission to directly quote some of your responses in the report, and perhaps to ask for permission to conduct a follow up interview. We will also use it to keep you informed of the results of the survey.

We will not publish any of your personal information in the report.

Q1 What is your name?
_____

Q3 What is your position or title?
_____

Q4 Which city, municipality, or region do you work in?

_____

Q2 Which branch of local government do you work in?

_____

Q6 In which country are you based?

_____

Q7 What is your email address?

_____

Appendix A2: Semi-structured interview questions

- How do you get a 'data science' project off the ground?
  - How do you identify need/skills
  - What's the baseline?
  - How do you organize data sharing?

- How are these implemented?
  - What skills?
  - What data?
  - What approach?

- What are the results?
  - Money/time saved?
  - Staff/policymaker adoption?

- Key insights for others?
- What things would you like to do but aren't doing?
- What are the barriers / what would enable them?