Socio-Technical Transitions Pathways for UK Open Government Data

Chris J. Martin
Centre for Integrated Energy Research and Socio-Technical Centre
University of Leeds
Leeds, LS2 9JT
c.a.martin@leeds.ac.uk

Tim G. Davies
Web Science Doctoral Training Centre
Electronics and Computer Science
Southampton University, SO17 1BJ
tim.davies@soton.ac.uk

Jo Bates
Information School
University of Sheffield
Sheffield, S1 4DP
jo.bates@shef.ac.uk

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Abstract
There is a growing body of research considering the opportunities and challenges associated with open government data e.g. [1-3]. To date research considering the potential medium to long-term (say 2-20 years) impact of open government data has focussed on individual potential pathways [4, 5]. The open government data agenda seeks to drive a transition in a complex socio-technical system of data providers, intermediaries and users. In this paper we outline how socio-technical systems transition theory could be applied in a UK open government data context and sketch three transition pathways that might emerge. By doing so we hope to foster a collaborative effort, across the web science research community, to explore and develop pathways for open government data.

Author Keywords
Open government data; socio-technical transitions; pathways.

ACM Classification Keywords
E.0 Data General; H.1.1 Systems and Information Theory; K.4.1 Public Policy Issues.

Background

Open Government Data

Open Government Data can be defined as data produced or commissioned by Government (and other public bodies) which is made available 'free to use, reuse, and redistribute it - subject only, at most, to the requirement to attribute and/or share-alike' [7]. The motivation for the open government data agenda is widely discussed in the academic literature [8, 9] and policy [10]. Motivating factors often include: improving transparency, democratic control, civil participation and governmental efficiency; and fostering innovation leading to new products and services and economic growth [11]. Alongside the discourse on the value of open data, there has been rapid growth in both open government data published and open data portals providing a single point of access to government data - e.g. data.gov.uk (UK).

When considering how the open data agenda might evolve, it is important to be aware of the diverse coalition of actors and interests promoting the agenda. Including actors across the private, public and third sectors, and civil society and academia [9]. Given this diversity, there is (of course) diversity in the visions of how the open data agenda might evolve. The value created in practice by open data remains difficult to identify and in some emerging case studies appears to be limited (e.g. in the health domain [12]). So a gap remains between the value currently being created from open government data and the potential value highlighted by its proponents. It is in beginning to bridge this gap that we suggest identifying possible socio-technical transition pathways is a useful activity for both practitioners and academics to engage in.

Socio-Technical Transitions Theory

Multi-level theoretical frameworks have been used to identify and develop transition pathways for a diverse range of socio-technical systems. For example, in the transport [13] and water [14] systems. In this paper we apply a simplified version of one such framework [15], previously applied to understand the transition pathways to a sustainable UK electricity system. We do not suggest that this framework is the best fit with the open data domain, but employ it for illustrative purposes seeking to demonstrate the potential value of the broader family of theoretical approaches. The objective of applying the framework is to identify plausible pathways for the UK open government data system integrating supply and demand perspectives. Seeking to address questions including: to what extent, and how, can different actors influence pathways for open data? And what might be the key technological, organisational and institutional changes involved in each pathway? The approach employed to identify the initial outline transition pathways, described below, includes three key steps (explored iteratively).

1. Mapping the current government data regime (i.e. the socio-technical system the open data agenda seeks to change) and the external landscape pressures (e.g. economic or political pressures) on the regime.
2. Identifying emerging innovative open data activity (at the niche level) seeking to transform the public data regime.
3. Exploring the interactions between 1 and 2, and employing the insight generated to sketch outline transition pathways.

In the following section we non-exhaustively sketch out some of the elements that may go into such an analysis of pathways for open data in the UK.

Socio-Technical Transitions and Sketching Pathways for UK Open Government Data

The UK Government Data Regime

The production, storage and open provision of, government data takes place within the wider context of public sector strategies, and enabling ICT services and infrastructures. Over recent decades we can observe significant trends including:

- Increased use of central government targets to manage the performance of public service providers, leading to an increase in the volume of data generated as a management tool in the course of public service provision - e.g. within the education sector [16];
- Increased use of ICT outsourcing, and large scale ICT systems in government [17];
- Increased use of the web as a primary delivery channel for public services. With an initial proliferation of public body websites and subsequent consolidation and centralisation - e.g. development of individual websites for central government departments followed by the migration to the GOV.UK platform (Government Digital Strategy [18]). Government has also articulated the ambition to move to a model of public service provision where services are both digital by default and inclusive to those without access to the web [18].
- The evolving PSI (public sector information) agenda, initially focused government attention on developing revenue streams from the sale of valuable state data and information products. Since the middle of the last decade, there has been a rapid rise to prominence of open government data concepts, leading to a cross departmental Open Data White Paper [10] and individual departmental open data strategies - e.g. [19].

Wider political and exogenous factors beyond core government ICT and information strategy also influence and shape efforts to create a more open government data regime. These include:

- The portfolio of UK and EC legislation and policy related to data and information including the: Data Protection Act 2008; Freedom of Information act 2000; the Directive on the Re-use of Public Sector Information (2003/98/EC); and the INSPIRE Directive for geospatial data (2007/2/EC). These restrict and mandate certain forms of data sharing respectively. Policy tensions between data protection and open data remain unresolved.
- The broader government transparency agenda, that encompasses open data, and the connections of this agenda with efforts to rebuild public trust in government following the parliamentary expenses 'scandal' of 2009.
- The 2008 financial crisis and subsequent austerity policies of the UK Government that placed issues of reducing public spending and stimulating economic growth at the centre of political discourse. With the change of government in 2010 a shift in emphasis to focus on economic impacts of open data was evident. This has resulted in investment in the Open Data Institute (£10 million public funds over five years) to stimulate open data driven economic activity.
- The open public services agenda [20] seeking to increase the opportunities for private and third sector

Technological Innovations that may Influence the Pathways

Standardisation

Data standards make combining datasets easier. There are many layers of standardization, from file-format, to field names and shared code lists. When local authorities were mandated to publish spending data, a process of agreeing a spend data standard was undertaken with wide consultation. The International Aid Transparency Initiative XML open data standard has also seen widespread global adoption allowing integration of related datasets. However, in other domains limited standardization is taking place.

Data catalogues, meta-data management and federation

Public sector data is spread across a number of different repositories. To meet the needs of the INSPIRE directive data.gov.uk has incorporated geodata features and features for data

organisations to deliver public services. Where open data potentially plays an enabling role in these new models of public service delivery.

- Ideological commitments to the liberal market economy. In this framework, government data is considered to be a resource that public sector is not capable of exploiting maximum value from.

Emerging Niche Innovation

Central government policy and practice is relatively easy to 'read', yet future trajectories of open data are also likely to be affected by emerging innovation and new forms of practice. Various actors are driving technological, social and institutional innovations seeking to realise the value of open government data. Below we provide some indicative examples of such innovations, identified through previous research and personal contacts.

- **Public sector data providers** are strategically opening up data and developing services that make open data easier to use. For example: data on the quality of coastal and inland bathing waters has been made available using linked data technologies [21], and Police.uk [22] provides open data and a GIS tool for exploring instances of crime and anti-social behaviour.
- **Large-scale corporate data users** have gained access to previously unavailable data creating new commercial opportunities. For example, pharmaceutical companies have gained access to detailed GP (General Practitioner) prescription data [23], creating the potential for greater insight into customer markets.
- **Small-scale data users** across the private and third sectors and civil society have developed innovative applications underpinned by open data. For example, City Farmers (a Community Interest Company) [24] are fostering social growth by enabling individuals and groups to identify urban spaces for growing food.

Potential Transition Pathways

We have identified three illustrative pathways for open data below, drawing on our open data related research experience, the outlines of the public data regime and niche innovations above. Demonstrating the diversity of potential pathways for open government data each presenting different potential risks and issues. The future technological innovations that may influence each of the pathways are discussed in the sidebars to the left and below.

The first pathway **Central Government Data Push** envisions public sector actors seeking to rapidly make large quantities open government data available, postponing considerations of whether the data is likely to be of use. Efforts to engage with the users of open data will be either relatively high-level (e.g. via the Open Data User Group) or ad hoc (e.g. requests via data portals or via personal contacts with shared interests in a given dataset). Initial efforts to catalyse demand for open data and support the growth of open data markets will be unsuccessful. Subsequently public bodies will withdraw from such activities. On this pathway risks and issues may emerge including: selective release of data by public bodies based on convenience or organisational interests; and investment of effort in making large quantities of data open that is unlikely to be used.

The second pathway **Corporate Led and Market Rules** envisions increasing influence of private sector

federation. However, few domestic portals federate data, leaving re-users having to search across a number of portals to find the data.

Linked Data
Data.gov.uk assesses datasets against the '5 stars of linked data' [6] which gives highest marks to datasets published in RDF format and linked to common identifiers. Efforts to establish common URI sets, vocabularies and linked data publication practices across the public sector are ongoing. Considerable EU investment is going into building tools, platforms and services for working with linked data.

Emerging Future Technologies
The pathways may also be strongly influenced by emerging technological paradigms and radical innovations such as: the internet of things; big data analytics; cloud computing; crowdsourcing; and natural language question answering.

actors on the open government data agenda. Combined with a focus on exploiting open data to generate economic value at the expense of fostering social and environmental value. Efforts of open government data providers to engage with open data users will become dominated by the interests of a small group of private sector actors. Such actors will exploit economies of scale to: develop the organisational capabilities needed to extract value from open data; and forge the long-term relationships with open data providers gaining privileged access to the knowledge and skills needed to make profitable use of open data. On this pathway issues and risk may emerge including: creation of barriers to SMEs entering open data markets; 'cosy' relationships forming between open data suppliers and users reducing opportunities for greater transparency; and, disengagement across the broader coalition of actors currently engaged with the open data agenda.

The third pathway **Decentralised Demand Pull** envisions rapid growth of markets for and uses of open government data catalysed by a portfolio of interventions by the Government. This portfolio could include: establishing effective mechanisms for engaging with a diverse community of open data users; developing new institutions and/or adapting existing institutions to embed open data and transparency within public service delivery and democratic processes; financial incentives for start-up companies to build applications and services underpinned by open government data. Once established these markets for open government data create a decentralised 'pull' for open government data from actors across the public, private and third sectors and civil society. In turn this 'pull' will shape a user-orientated open data agenda within government. On this pathway risks and issues may emerge including: demand for open data collapsing as initial support for open data re-use is phased out; challenges obtaining government funds for interventions to develop markets; and demand for open data not being met due to limited government resources resulting in disengagement of members of the open data user community.

Conclusion and Future Work

In this paper we have identified a need to consider how open data may evolve. We have sketched three socio-technical pathways demonstrating a range of possibilities for how the open government data agenda may evolve in the UK. Progress in realising the value of open data may follow approximately one of the pathways presented, or a pathway that combines elements of the illustrative pathways and/or other elements not considered. Interesting questions have emerged to be pursued in future work including: which pathway is the UK on? What might a fourth pathway of radical social change look like? What other factors beyond technological, organisational and institutional changes might impact on the shaping of pathways?

The pathways sketched are intended as a starting point for discussion amongst the community of academics and practitioners with interests in open government data. To develop a credible set of transition pathways for open government data we suggest an approach including: further exploration of socio-technical systems transitions theory to identify the best fit with the open government data domain; refinement of the definition of the boundaries of the socio-technical system of interest; analysis of historical transitions in the public data system to develop insight on how future transitions might unfold and be shaped; identification of

diverse perspectives and visions for open government data; and analysis and integration of these perspectives to form a credible set of pathways.

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