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A timeline analysis of Open Data development in the UK

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Conceptualizing Open Data Ecosystems: A timeline analysis of Open Data development in the UK

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Abstract: In this paper, we conceptualize Open Data ecosystems by analysing the major stakeholders in the UK. The conceptualization is based on a review of popular Open Data definitions and business ecosystem theories, which we applied to empirical data using a timeline analysis. Our work is informed by a combination of discourse analysis and in-depth interviews, undertaken during the summer of 2013. Drawing on the UK as a best practice example, we identify a set of structural business ecosystem properties: circular flow of resources, sustainability, demand that encourages supply, and dependence developing between suppliers, intermediaries, and users. However, significant gaps and shortcomings are found to remain. Most prominently, demand is not yet fully encouraging supply and actors have yet to experience fully mutual interdependence.

Keywords: Open Data Ecosystem, Open Government Data, Framework, United Kingdom

Introduction

An ecosystem does not develop solely through top down governance, but by fruitful interaction between cooperating and competing actors. To investigate the driving forces within a national Open Data ecosystem, we have utilised a business ecosystem framework to analyse developments within the United Kingdom between the late 1990s and mid-2013. The Open Data Barometer of October 2013 ranks the UK's Open Data initiative as world leading (Davies, 2013). The Open Data Index, aggregated by the Open Knowledge Foundation, also ranks the UK's Open Data ecosystem as the world's most developed, giving the country an overall score of 940 out of 1000 (Open Knowledge Foundation, 2013). Because the UK process operates as a distributed and intentional, rather than random, system, it can be regarded as a prime example of best practice. In this paper, we generalise the mechanics of Open Data ecosystems, in order to foster the development of ecosystems in other geographies. In the first two sections we review

different Open Data definitions and highlight aspects of business ecosystem theory. In the third section we assemble a narrative timeline of the Open Data ecosystems in the UK before creating a more general conceptualisation in the final section. Methodologically, our work is informed by a combination of discourse analysis and in-depth interviews, undertaken during the summer of 2013, and therefore capturing the current state of the art.

Standards for a Distributed Movement: Open Data Definitions

Open Data has emerged as a global and distributed movement involving various governmental and non-governmental actors. To enable productive communication within this system, there have to be technical and terminological standards. We therefore have reviewed, compared, and contextualised the existing body of Open Data definitions and principles, which have played a role in the development of the United Kingdom's Open Data ecosystem.

The Open Knowledge Foundation (OKF), launched in 2004, sought as one of its first projects to define digital openness by releasing the Open Knowledge Definition (Open Knowledge Foundation, 2005). By 2004, the idea of openness had already gained some ground in academia, sections of the media, and, notably, in the software community. The OKF developed its definition in an effort to prevent the concept from being diluted by a plurality of understandings (R. Pollock, personal communication, July 19, 2013; T. Steinberg, personal communication, July 17, 2013). In order to ease dissemination and understanding, the OKF outlined its criteria in a single phrase: "A work is open if it is accessible, reproducible and re-usable without legal, social or technological restriction" (Internet Archive, 2006). Over the years this summary has developed into its present wording, which was released as Version 1.1 in November 2009: "A piece of data or content is open if anyone is free to use, reuse, and redistribute it – subject only, at most, to the requirement to attribute and/or share-alike" (Open Knowledge Foundation, n.d.).

In September 2007, thirty Open Government advocates gathered in Sebastopol, California, to discuss how opening up government data could benefit democratic systems. The results of this meetup were eight principles [see Table 1], which define the structural properties government data must posses to be considered "open". The US non-profit organisation Sunlight Foundation sponsored the gathering and in 2010 released an updated version of the results containing two additional principles – permanence and usage cost – for Open Government Data [see Table 1].

It is important to explicitly mention at this point that Open Government Data (OGD) is not an equivalent to, but a subcategory or subset of, Open Data, which may equally originate in the commercial, academic or third sectors. As Yu and Robinson (2012) explain, the term Open Data remains neutral in regards to the content of the data sets and only describes its technical and legal shape. Kloiber (2012), however, mentions that in the majority of articles, reports and strategy papers the term is used synonymously for OGD. For the clarity and consistency on this matter we will simply use the phrase "Open Data" in this article.

Strict interpretation frameworks, such as the Open Definition and the Sunlight/Sebastopol Principles, emphasise a dichotomous classification of data: data is either open or closed. With his five star rating for Linked Open Data, Berners-Lee (2010) highlights the importance of not just legal but also technical aspects of openness, for example through the use of open standards and non-proprietary file formats for Open Data publishing. More broadly, Berners-Lee and others (Berners-Lee, 2009; Bizer et al., 2009; Heath & Bizer, 2011) promoted the concept of Linked Open Data to

transform "data on the web" into "the web of data" by encouraging the linking of one's own data with other datasets. A more recent initiative, Open Data Certificates[1], was launched in 2013 by the London-based Open Data Institute (ODI), enabling data publishers and others reliably to assess the extent to which Open Data is published according to recognised best practices. In addition to legal and technical aspects, Open Data Certificates take practical and social factors into account to provide a more holistic assessment framework. The scheme is a development of the OKF's Open Definition, the 5 star scheme, and the OPQUAST Open Data initiative checklist [see table 1] (J. Tennison, personal communication, July 11, 2013). The latter is grouped into thirteen themes (e.g. metadata, format, and license) and each principle is ranked on a scale of one to three, depending on its importance.

Table 1: Open Data Definitions and Frameworks Influencing the UK Ecosystem

#	Definition or Framework	Release Data	Summary
1	Open Definition	October 2005	Use, Reuse, and Redistribution
2	Sebastopol Principles	December 2007	8 Principles for opening up explicitly governmental data
3	Sunlight Principles	August 2010	#2 plus "Permanence" and "Marginal Usage Cost"
4	5 Star Linked Open Data	May 2010	#1, #2, and Semantic Web Technologies
5	OPQUAST Checklist	April 2011	72 Principles, 17 Themes, 3 Levels of Importance
6	Open Data White Paper	June 2012	PSI, made available as Open Data according to #1, #2, and #3
7	Open Data Certificates	June 2013	Merges #1, #4, #5 into four levels of Open Data publishing quality

So far, we have reviewed a list of definitions developed by individuals, both non-formalised and formalised civic actors. However, it is also essential to examine how the UK government itself defines Open Data (and Open Government Data). HM Government's (2012a, p. 8) *Open Data White Paper* states that Open Government Data is "Public Sector Information that has been made available to the public as Open Data". The document defines Public Sector Information (PSI) as

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[1] https://certificates.theodi.org/

"data and information produced, collected or held by public authorities, as part of their public task" (HM Government, 2012b, p. 8), and sees Open Data, in general terms, as data that is accessible (ideally via the internet) at marginal cost and without discrimination, available in digital and machine-readable format, and provided free of restrictions on use or redistribution (HM Government, 2012b).

The Ecosystem Analogy

To analyse the provision and use of Open Data by a variety of actors, a suitable framework for investigation is necessary. The biological understanding of an ecosystem has proved beneficial to various paths of investigation previously (e.g. Mars, Bronstein, & Lusch, 2012) and is applied here. Hannon (1997) explored the commonalities existent between ecology and economics, noting how both disciplines are concerned with the study of dynamic systems that incorporate methods of production, exchange, capital stocks, and storage. Lewin (1999) likewise observed how biological ecosystems and economic systems are complex adaptive systems and thus follow the same deep laws.

Use of the ecosystem analogy in relation to business practices has been notably strong. By developing a survey discussion of the *industrial ecosystem*, the *economy ecosystem*, the *social ecosystem*, and other such analogous pairings, Peltoniemi and Vuori (2004, p. 13) position a *business ecosystem* as being "a dynamic structure which consists of an interconnected population of organisations".

The existing literature contextualises digital ecosystems as cyclical (Pollock, 2011), sustainable (Boley & Chang, 2007), demand-driven (Boley & Chang, 2007) environments oriented around the agents of various species who are mutually interdependent (Harrison, Pardo, & Cook, 2012) in the delivery of effective and efficient value. Just as methods of production, capital stocks, etc. are interrelated in a business ecosystem, within the concept of a digital ecosystem it is the sets of data, as well as the systems and actors supporting that data, which can be understood as analogous to a cyclical, biological environment. Ultimately, the difference between a digital ecosystem and, for example, a business ecosystem is one of content: digital information (e.g. government data) in the case of the former and entities of commerce (e.g. capital and means of production) in the case of the latter. In respect of principles, the various ecosystems are largely comparable, in that they are about understanding and appreciating interrelationships and interdependencies between agents and entities. Whatever the content, ecosystems do not operate in a closed, adiabatic, manner, but – in a systemic reading – constantly communicate with adjacent ecosystems. The Web, therefore, might be seen as a structure that holds several of these coevolving systems.

Development of the UK's Open Data environment over recent years is presented in the next section. In combination with this historical context, the final section removes the ecosystem analogy from abstraction and investigates its applicability to Open Data ecosystems, as well as what implications the theory can provide in practice.

Open Government Data in the UK: Assembling a Narrative Timeline

When considering how to structure a narrative describing the UK Open Government Data ecosystem, two approaches were apparent. First, the environment could be dissected thematically

(looking in turn at government reports, licensing frameworks, etc.). Second, the ecosystem could be analysed according to its temporal development. The latter approach provides greater insight into the gradual evolution of the ecosystem, and the historical context surrounding major milestones in its development, and is therefore adopted in this work.

Previous Open Data timelines, most notably Davies (2010), inform and influence our research. However, the work presented here adds a number of original contributions beyond the state of the art, through the use of expert interviews, the extension of the timeline up to 2013, and the focus on 2009 as a pivotal point in the evolution of the ecosystem.

Incubation Phase: UK Governmetn Data from 1998 to 2009

A strong community of activists and civil servants in the UK has driven initiatives to unlock the potential of Public Sector Information (PSI) since the late 1990s. The UK government's Open Data ecosystem first emerged in 1998 when the Cabinet Office published its green paper "Crown Copyright in the Information Age". This paper initiated a liberalisation process crucial to the development of open PSI. As proposed in the paper, a new "Click-Use" licensing scheme was introduced in 2000 by the Office of Public Sector Information, which allowed the commercial and non-commercial use of crown copyright material under the precondition of attribution.

In November 2003 the European Union adopted the "Directive on the Reuse of Public Sector Information" with the aim of creating a common legislative framework for public bodies across Europe to release public data. In 2005 two pillars of the developing Open Data movement were firmly established with the UK's Freedom of Information Act coming into force in January and the EU directive entering into effect in November.

In addition to these governmental efforts to reimagine the use of PSI, between 2004 and 2006 civic activism also increased. In October 2005 the OKF organised a World Summit on Free Information Infrastructure, which subsequently became the annual Open Knowledge Conference (OKCon)[2], and shortly after inaugurated its Open Knowledge Definition. In March the following year the Guardian launched its "Free Our Data" campaign, lead by the journalists Michael Cross and Charles Arthur. The newspaper argued that government trading funds, like the Ordnance Survey and the Met Office, should provide citizens with easy access to their data, on the premise that taxpayers fund data collection. In March 2008 Newbery (University of Cambridge) and Pollock (OKF) published "Models of Public Sector Information via Trading Funds", which criticised the way trading funds commoditised publicly funded data – more precisely, arguing that "the problem is not the Trading Funds themselves but the government policy" (R. Pollock, personal communication, July 19, 2013). In April 2010 these diverse external pressures finally compelled Ordnance Survey to openly release important geodata (Ordnance Survey, 2010).

Simultaneous to the Guardian's campaign, the Cabinet Office began allocating resources to the emerging idea of open PSI. As a result, the civil activists Tom Steinberg and Ed Mayo, together with the Cabinet Office, published in June 2007 the "Power of Information Review", which took a "practical look at the use and development of citizen and state-generated information in the UK" (Mayo & Steinberg, 2007, p. 3). In reaction to the report and in order to further investigate application of Steinberg and Mayo's recommendations, the UK government established the Power

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[2] The most recent OKCon took place in Geneva in September 2013 and attracted more than 900 participants from 55 countries.

of Information Task Force in March 2008. The Task Force was comprised of representatives from business, civil society and the government, and three months after establishment, together with the Cabinet Office, it announced the "Show Us A Better Way" competition (The National Archives, 2010). This competition made large and previously closed PSI data sets – for example, health care information from NHS Choices, the Official Notices from the London Gazette, and a list of all schools in England and Wales – available to developers. "Where Does My Money Go?", a service launched in December 2009 to visualise the government budget, and later folded in to the OKF-run OpenSpending, was one of the competition winners.

Rapid Growth Phase: Implementing UK Open Government Data since 2009

Impressive as initial efforts were, the year 2009 represents a major turning point, with significant developments in the United States as well as in the UK. With both countries launching data portals - the so-called and much cited "data.govs" - a notably strong environment of reciprocal enforcement (healthy competition) emerged as the two countries both witnessed rapid growth in the opening of PSI. As Pollock stated in our interview, 2009 saw significant shifts and "even the phrasing changed... [w]e started talking about Open Government Data" instead of reusable PSI as in the years before 2009. In January of that year, Barack Obama issued his memorandum on the Freedom of Information Act, committing his government to information openness. In the UK, when the Power of Information Task Force published its final report in February 2009, the Cabinet Office immediately began operationalisation. One of the recommendations in the report was creation of a single point of access for government data, and so beta work on the UK's Open Data portal - data.gov.uk - began in September. Notably, February's release by the OKF of the first version of its Open Database License (ODbL) laid important groundwork for the international application of Open Data, particularly in Europe[3] (J. Tennison, personal communication, July 11, 2013).

In May 2009 the US government launched its own data portal - data.gov - initially containing 47 data sets. The launch of this first fully operational national Open Data portal was a pivotal point for the global community of Open Data advocates – it represented tangible proof of high-level governmental support. Likewise, in June 2009 the British government appointed Berners-Lee and Nigel Shadbolt to advise government on how to open up government data in a similar manner. Shortly after his appointment, Berners-Lee officially launched data.gov.uk to the general public in January 2010.

Ahead of the 2010 general election, Conservative leader David Cameron released in March the "Conservative Technology Manifesto", which called for legislative change in favour of a "Right for Government Data" (Conservative Party, 2010, p. 3). Later that month, the incumbent Prime Minister Gordon Brown published Labour's "National Digital Strategy", which called for the creation of a Web Science Institute to be directed by Berners-Lee and Shadbolt. Upon winning the election, Cameron cancelled plans for a Web Science Institute in May 2010 and focused instead on the establishment of a new Transparency Board.

Further movement commenced when Prime Minister Cameron sent a letter to his Cabinet Ministers in June 2010 calling for practical implementation of the transparency agenda. Tennison, who worked on development of the UK's legislation.gov.uk, likened this action to a policy

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[3] Although copyright has been widely harmonised around the world, the legal situation for databases is not as clear. Databases in the US, for example, are not necessarily protectable by law, where in the EU they are. The ODbL, combined with an appropriate content license, allows the reuse of data sets under the paradigm of Open Data.

implementation wake-up call: the letter was like "being hit by a big stick", and demonstrated Cameron's personal commitment to the agenda, as well as his ministers' initial lack of enthusiasm (J. Tennison, personal communication, July 11, 2013). In September the government took a major leap towards solidifying its Open Data ecosystem by releasing specifications for a new Open Government License (OGL) to replace the Click-Use License[4]. This change is notable as a "move from the transactional Click-Use to the non-transactional Open Government License" (Employee of The National Archives, personal communication, July 7, 2013).

The following September, the American and Brazilian governments launched the Open Government Partnership (OGP), an international initiative for promoting transparency, civil participation and digital administration. As one of the eight founding members, the UK released its first OGP National Action Plan that same month. The following April, the UK assumed the co-chairmanship of the OGP and a month later the government responded to lobbying by interested parties and announced plans for an Open Data Institute to be set up in London. As with Labour's plans for a Web Science Institute, Berners-Lee and Shadbolt were appointed as president and chairman of the ODI, which officially opened in November 2012.

In May 2012 Cabinet Minister Maude appointed Heather Savory to be the first chair of the Open Data User Group, a committee established with the aim of capturing users' perspectives on the process of Open Data policymaking. In June, the government published the foundational and highly significant "Unleashing the Potential – The Open Data White Paper", as well as individual departmental Open Data strategies and an updated version of data.gov.uk. "Open Growth", a study released by the consulting firm Deloitte in December 2012, worked to quantify the economic value of Open Data for the UK economy. The report was conducted in collaboration with the ODI and formed an integral part of the widely received "Shakespeare Review of Public Sector Information" published in May 2013. This comprehensive report was accepted by the UK government as a foundation for future policy decisions, as reflected in the "Government Response to Shakespeare Review" of June 2013.

Towards a Conceptualisation of Open Data Ecosystems

We previously outlined digital ecosystems as being (1) cyclical, (2) sustainable, (3) demand-driven environments oriented around agents that are (4) mutually interdependent in the delivery of value (Boley & Chang, 2007; Harrison, Pardo, & Cook, 2012; Pollock, 2011). In this section we check these structural properties against our empirical observations in order to develop a conceptualisation of Open Government Data ecosystems.

Biological ecosystems are (1) cyclical, meaning that carbon – their central resource – is passed along the consumption chains until it loops back to its "beginning". By definition, the central resource of Open Data ecosystems is Open Data. Any data that is opened up has the potential to be processed cyclically, in that it will feed back to the system/agent it originates from. However, empirical evidence shows that this potential varies between different data categories. In June 2010

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[4] On the data.gov.uk blog, Nigel Shadbolt describes the new license: "Based on the world-leading Creative Commons family of licences, the new licence works in parallel with them and mirrors their Attribution Licence and the Open Data Commons Attribution Licence, whilst covering a broad range of information, including Crown Copyright, databases and source codes, and applying to the whole of the UK." (http://data.gov.uk/blog/new-open-government-license)

the UK government released the heavily requested COINS database as Open Data. COINS contains extensive public spending data that has enabled institutions like the OKF and The Guardian to develop in-depth spending analyses and visualisations. These have in turn been consumed by the data suppliers and have informed, or even influenced, their later decisions. Public transport data serves as an example of lower cyclical potential. Transport applications, like *Mapumental*, will likely influence users' actions (e.g. which trains they travel on), but the service appears less likely to affect the organisations that supply the data (e.g. rail operators).

In a business ecosystem (2) sustainability is understood as the ability to survive without government intervention (c.f. Peltoniemi and Vuori, 2004). However, we think it is important to differentiate. Some interventions protect ecosystems from deteriorating through external pressures (e.g. some agricultural subsidies), while others support the creation of business ecosystems with positive societal effects and high entrance barriers. Examples of the latter include subsidies for regenerative energy or a government's embracing of Open Data. In the UK the government expects positive economic and societal impacts, ergo it intervenes to nurture the ecosystem. What differentiates these interventions is the idiosyncrasy that the government itself is the bottleneck of the ecosystem, as it is the majority data holder. It therefore has to intervene *in itself* and ensure an internal sustainable data provision. However, long-term sustainability can only be achieved when the relevant data suppliers experience a tangible benefit – a task for the UK government-funded, but independently operating, ODI, which partly functions as a startup-incubator for Open Data initiatives. Therefore, government intervention not only has to tackle the supply side, but the demand side as well (S. Coleman, personal communication, July 15, 2013; G. Starks, personal communication, July 26, 2013).

In healthy, non-monopolistic business ecosystems (3) demand regulates supply. However, Open Data ecosystems operate slightly differently. The main resource – Open Data – is often produced within natural monopolies, due to high fixed costs, low variable costs and a rather small number of potential customers for the data (think, for example, of one national statistics agency). These natural monopolies within public services likely have certain economic benefits, but they also prevent the competitive environment that is so often the cornerstone of innovation. As we have shown above, data holding bodies only publish their data sustainably if they experience demand, which in turn will result in benefits for the agency (think of a useful analysis or an app). In the UK we observed that in some data areas – such as transport, financial, and health data – an initial release triggered significant demand, noticeable through early use cases such as *Prescribing Analytics*, *Where Does My Money Go?*, and *CityMapper*. However, other key datasets, such as the Postcode Address File (PAF), which are in high public and academic demand,[5] have not been opened[6] (demand has not generated supply).

Lastly, we investigated whether agents in Open Data ecosystems are (4) mutually interdependent in their delivery of value. The minimal value chain within Open Data ecosystems consists of three elements: data suppliers, data intermediaries, and data consumers. Whilst intermediaries and consumers usually conduct a traditional exchange of goods, suppliers (embodied largely by public agencies) are required to provide Open Data to the public as part of their operational mandate. If, for whatever reason, a data collecting agency stops providing data, it would not experience negative effects to its core business. However, private developers, who build

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[5] e.g. Shadbolt (2013)

[6] c.f. Savory (2013)

businesses based on that data, would be unable to continue. In this manner, Open Data ecosystems do not always show robust mutual interdependence, but rather they often demonstrate more of a one-sided dependency. This is likely to have adverse effects on the ecosystem when not regulated by the government.

Conclusion

The United Kingdom has incubated and advanced a robust and world leading Open Government Data ecosystem over the past 15 years. In that time there have been two primary trajectories: the push of activists and the initiative of government itself. With a greatly accelerated pace since 2009, the UK has seen the latter of these two seize the agenda ever more and establish meaningful Open Data policies as part of a determined agenda for growth.

This paper examined the UK's experience of establishing a functioning Open Data environment and focused its analysis on the applicable notion of an analogous ecosystem: a system which is cyclical, sustainable, and demand driven around mutually dependent actors. The work found that in many respects, the last 15 years have shaped the UK's Open Data environment into an Open Data ecosystem. There are clear signs of a cycle, of sustainability, of demand encouraging supply, and of dependence developing between suppliers, intermediaries, and users. However, it was also found that significant gaps and shortcomings remain. Most prominently, demand is not yet fully encouraging supply and actors have yet to experience entirely mutual interdependence.

Our research indicates where future Open Data research, integrated with the ecosystem perspective, may develop. The Open Data Institute, for example, is relatively new to the UK ecosystem, but in time the institution's role as a Public Open Innovation intermediary (Bakici et al., 2013) could be examined. Furthermore, greater emphasis should be placed on meet-ups and hack-days as loci of inter-stakeholder dialogue, with these occasions arguably being conceptualized as field configuring events (Lampel & Meyer, 2008).

On the basis of our findings we propose that Open Data initiatives be assessed by ecosystem criteria to generate interoperable data allowing for extensive cross-case analysis It is well established that the tenants of an ecosystem generate strong, sustainable, and meaningful survival. The UK, a leader already by many Open Data assessments, is well on its way to establishing a fully functioning ecosystem. But there is, as outlined, more to be done. It is the view here that once the four ecosystem criteria are fully and comprehensively met, the environment can be considered developed and sustainable. The UK is not yet at the end of the road, nor are other governments' Open Data endeavours. However, understanding the significance of an operational ecosystem (as outlined here) and what this entails in the Open Data context can clearly be of benefit to the initiative.

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