Using ANT to understand the Web
Part II: Open Government Data

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Web and Internet Science (WAIS)
Background

- The Web is a collection of Web Activities
  - Online Shopping, Online Banking, E-Government, Online Networking, etc.
  - These activities reflect human interaction and technological development
- Web Activities are not exclusive
  - They develop together with other activities
    - As does the development of the technologies
    - Their development are internally and externally co-constructive
- Social machines are forms of Web Activity
  - They emerge, develop, adapt and fail
The Problem Statement (1)

• Why study how the Web grows?
  – The Web is an integral part of modern society, yet methods did not describe a socio-technical understanding of how it grows through the co-construction of humans and technology
  – To be able to support or advise on the growth of the Web, first, one must be able to understand what it is, and how it operates.

• The current understanding of the Web:
  – Research was polarised between understanding the Web in regards to its technical structure, or understanding the Web at small scale social interaction
  – The Web was studied at either the micro or the macro
    • Small scale studies, or large Web Graph experiments
  – This does not help explain how the Web has grown. It is important to understand the Web beyond this disconnected perspective
The Problem Statement (2)

• We (Web Science, Researchers, Business, Society) want to understand how the Web functions
  – Often described as socio-technical – But what does that mean?

• Conceptualising the Web as a network of Social Machines
  – Examine specific activities and analyse how they operate
  – Compare the functionality of Social Machines
    • Leading to a classification of machines…

• This can be done technically! Community clustering, etc.
  – However, it does not reflect the co-constructive process of the Web

• We require a (Web Science) Theory of Web Growth
  – How they emerge, evolve and function
The Approach to the Problem

• **How to understand the growth of a socio-technical Web?**
  – Use a theory that provides an analytical window into the co-construction between humans and technologies
  – Follow human and technological actors.
  – Use quantitative and qualitative data sources, both online and offline, both individually and at scale
  – Examine the *micro* and the *macro* at the same time using a mixed methods approach

• **But, how to investigate and study the growth of the Web?**
  – The Web contains different types of Web activities (as shown in the topological Web graph analysis)
  – Take an emerging and growing area of Web activity, both active socially and technically visible
  – Examine the socio-technical processes that occur in order to enable the Web activity to grow
Introduction to the Socio-Technical Framework – Background to Theory

• **Drawing upon concepts from Actor-Network Theory (ANT)**
  – Actor-Networks are fundamental to understanding phenomena
  – Radical Symmetry of Human and Technological Actors
  – Structures emerge from the network, they are not assumed to exist
    • - The Web does not exist without the Web activities that occur
  – Exposes the interplay between humans and technologies

• **Application is beyond a descriptive framework**
  – ANT provides the underlying theoretical position
  – Mixed methods takes it from description to explanation
Introduction to the Socio-Technical Framework –
(1) Heterogeneous networks

• A social machine is a heterogeneous network of associations
  – Humans and Technologies
  – Network Artefacts
  – Agendas and Goals

• A heterogeneous network is formed around a specific agenda, i.e.
  – Open Data
  – Social Networking

• A heterogeneous network contains actors which:
  – Share a common interest or goal
  – Work towards a shared set of common outcomes
Introduction to the Socio-Technical Framework –

(1) Heterogeneous networks
Introduction to the Socio-Technical Framework – (2) Translation

- Translation describes the emergence and development of a Social Machine
  - Social Machines translate towards stability
  - Translation is a multi-staged, multi-actor process
  - From a messy, unorganized set of actors to a mobilized network of activity
- The process of translation involves
  - Focal actors setting the agenda and goals
    - problematizing actors and activity
  - The alignment of actors passing through passage points
    - Requirements for a network to succeed, i.e.
      - develop a technology, create a policy, gain more actors.
- Translation does not promise stability!
  - Network stability is only ever held in a temporary state
Introduction to the Socio-Technical Framework – (3) Phases

• Phases are the result of multiple Translations
  – The success and (temporary) stability of a network triggers changes in surrounding networks
  – Restructuring of the original agenda occurs

• Phases can be conceptualised as layers in social machine development
  – New phases build upon previous layers
    • However, previous layers must remain stable

• Transition from one phase to another
  – Contains common actants (humans or technologies)
  – Shares common goals or interests (not all)
An Empirical Study

- Examined the emergence and growth of the Open Government Data Web activity
  - How did the community emerge, both socially and technically, online and offline
    - What were the socio-technical processes that occurred
  - Used a mix of quantitative data and qualitative data sources to understand the social-technical processes at the micro and macro
    - Interviews, documents, observations, big (network) data, repository data
  - Informed by the analytical lens of Actor-Network Theory
    - At the epistemological and methodological layer
- The emergence of the Web activity exposed a number of findings with regards to human and technological interaction, and Web growth
  - Providing a new perspective on the growth of Web activity…
Exploring the Development of a Social Machine
Open Government Data

The structure of UK OGD
Exploring the Development of a Social Machine

Open Government Data
Exploring the Development of a Social Machine
Open Government Data – Phase 0

(a) Academic report on benefits of publishing UK Public Sector Information, using Semantic Web Technologies

(b) OKFN work with PSI network to examine data locked away in trading funds. OKFN working on cataloguing solutions for Linked Data

PSI and Academics – The Early Emergence of OGD
Exploring the Development of a Social Machine

Open Government Data

Expanding the Networks of Government
Exploring the Development of a Social Machine

Open Government Data
Exploring the Development of a Social Machine

Open Government Data

The ‘Obligatory Passage Point’ of data.gov.uk
Exploring the Development of a Social Machine

Open Government Data

Civic Society – Connecting Together Actor-Networks
Exploring the Development of a Social Machine
Open Government Data

The first three Phases of UK OGD

[Diagram showing the development of a social machine with phases and networks, including data.gov.uk and the London network, civic society, national media network, developer network, and London actor-network.]

[Text: The formation of the data.gov.uk (which contains actors within the networks below) and the London actor-network, connected via the Developer Network.]

[Text: The initial activities of various networks aligning via shared interests, actors and actors. The strengthening of ties locks the different networks together.]

Exploring the Development of a Social Machine

Open Government Data

Data.gov.uk as a layer of activity
Exploring the Development of a Social Machine

Open Government Data

CKAN working as a common actant, enabling the networks which are represented by data.gov.uk to enrol actors within Local Government Network.

UK Government Actor-Network

Data.gov.uk Actor-Network

Civic Society Actor-Network

PTB Actor-Network

Network artefacts that contain the OPPs for actors to achieve

[Local Government Actor-Network represents actors such as Lichfield and Warwickshire Council]

OpenlyLocal working as an actant to gain the interests of Local Government actor, as well as inform them other networks of their activities

A Closer Look – Local Government
Exploring the Development of a Social Machine

Open Government Data

Expanding the Network - National Media
Exploring the Development of a Social Machine

Open Government Data

A network of shared Agendas

*Shared Agenda to publish Transport Data in Open formats, which include London Transport Data*

*Shared Agenda to report on the outputs of the OGD network activities*

*Shared Agenda set out by the PTB for all Councils to publish spending data over £500, also actors within Local Government are working towards Open Data portals*
Exploring the Development of a Social Machine

Open Government Data

1. Announcement of the Data Journalism Handbook, also, requests for participants for data journalism award

2. Data Journalism Handbook published

The support of ‘Data Journalism’
Exploring the Development of a Social Machine

Open Government Data

Shared Actant – Local Government Datasets published and used by actors in Citizen Network

Shared Agenda – using the data for understanding Government activity

[Data Driven Journalism]

Citizen Actor-Network

Local Government Actor-Network

National Media Actor-Network

PTB Actor Network

Shared Agenda – Local Government Datasets publishing their data in Open Formats

Shared Agenda – Provide coverage and educate a wider network of actors on how to use the data

The support of ‘Data Journalism’
Exploring the Development of a Social Machine

Open Government Data

Five Phases of OGD - a stabilised network of Activity
Exploring the Development of a Social Machine

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ODI – Representing the Stabilised Phases of UK OGD
The Findings

• The emergence and growth of the Open Government Data Web activity result of multiple networks of activity bringing:
  – Different agendas and
  – Technological and humans actors
  – Occurring both online and offline activities

• The stability of these networks worked as the building blocks or layer to enable actors to re-problematise agendas and form new Web activities
  – PSI activities → Data.gov.uk → Data Journalism and ‘Armchair accounting’ → Open Data Institute

• Structure, Agency, Competition, and Serendipity emerged as factors in success
  – These were all socio-technical processes co-constructed between humans and technology
Re-conceptualising Web Growth

- A new theoretical model to understand the development and growth of a Web activity
  - Heterogeneous networks translate, form temporarily stabilised phases and enable new forms of Web activities to emerge
  - These new phases interact and alter the previous phases, thus re-configure the ‘Web’

- This perspective re-integrates the micro and the macro (Berners-Lee’s micro and macro)
  - There is no ‘inside’ development and ‘outside’ growth, these are tightly coupled processes
Re-conceptualising Web Growth

The “Weaving of the Web” is the Web

The socio-technical processes that enable the Web activity to emerge are the same processes that lead to the growth of the Web.

The Web is not ‘out there’ – what we (humans and technologies) do is the Web.
Implications of HTP

• HTP for understanding social machines
  – Understanding a social machine is the first step to creating them
    • Their formation, development, failure?
  – Can be used to explore social machines at various scales
    • Large scale machines (Open government?)
    • Small Scale machines (reCAPTCHA?)

• Using HTP to begin predicting the behaviour of a social machine
  – Quantitative sources provide the data for network analysis/modelling
  – Mixed methods required
    • Human behaviour, motivations, incentives
Towards Theory of the Web

• **Identifying and supporting the temporarily stabilised phases that are critical to the continued growth of the Web**
  – Both a social and technical challenge, not only are technologies responsible for Web stability, but also the socio, economical, political, governance, legal factors

• **Applying a methodology developed to understand how other Web activities emerged**
  – Is it possible to use this to help predict the evolution of a “social machine”, or the Web?

• **Rethinking the way that we approach design and development of technology**
  – Not only as an engineering practice, but in terms of the wider societal factors involved in setting agendas, and forming Web activities
  – Move beyond the vision of Web activity as a development process of inside-outside the lab. Question how the fundamentals of the Web development lifecycle
Future Work

• Applying the model to other social machines
  – Can similarities be identified between their emergence, growth, structure, phases, etc.

• Developing a computational approach to tracking social machines
  – Their socio-technical development by specific metrics
    • Network structure
    • Number of users, comments, activity levels, flow of data

• Using the Web Observatory to monitor and track the Web as a social machine