Government as a Social Machine

Report 1:
The implications of government as a "social machine" for making and implementing market-based policy

Professor Michael Vitale
Monash University

Anni Rowland-Campbell
Intersticia

Valentina Cardo
University of Auckland

Peter Thompson
Centre for Leadership

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Introduction

In a recent book published on leadership in Australia, the authors state that

> "As America finished their war of independence, Australia began a long and, in many ways, fruitful dependency. Over time that dependency has shifted from the mother country to the local bureaucracy of government. Bureaucracy became the defacto imperial protector and director. It did this by creating systems and structures to provide for the colony and protect its inhabitants." (Aigner and Skelton 2013)

Government plays a vital role in Australia, not only providing the policy infrastructure and regulatory framework, but as a source of leadership and innovation. The most fundamental currency for any government is information, and, as information technologies have evolved, so necessarily have the systems and processes of government that rely on them.

When it comes to information, the World Wide Web is the largest 'information construct' ever created by humanity.[1] It has provided unprecedented access to information for anyone with an internet-connected computer and, whilst still in its infancy, the Web has already had an impact on virtually all aspects of modern life.

As a socio-technical phenomenon, the Web is dissolving the boundaries between the human as 'user' and the machine as 'tool'. This is because on the Web, the human and the machine are inextricably linked, each reliant on the activities of the other. As machines become more adept at 'learning' about the human from the data received, they become more effective at responding to queries, performing tasks and contextualising information. We are witnessing this with social media where humans can now connect on scales – and within the timeframes – only possible with the mediation of a machine, and that machine would be of little value without this human interaction.

> "Real life is and must be full of all kinds of social constraint – the very processes from which society arises. Computers can help if we use them to create abstract social machines on the Web: processes in which the people do the creative work and the machine does the administration … The stage is set for an evolutionary growth of new social engines."
> (Berners-Lee 1999)

This human-technology system is now being called a 'social machine'.

As Beth Simone Novack, United States Deputy Chief Technology Officer for Open Government, says:[2]

> "Groundbreaking technological advances, together with new social science research on collaboration, have inspired many to re-examine how we make decisions and solve problems."

This re-examination involves not only the relationship between citizens and government, but between citizens and each other, and inherent in this is the need to ensure that issues such as governance, trust, privacy, security and risk are all taken into account.

This research is a small part of that re-examination.

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[1] http://webscience.org/web-science/about-web-science/, viewed 3rd June, 2013

[2] Introduction to "Government 3.0: Solving Problems with Technology", course taught at New York University, http://mehan.github.io/gov30.html, viewed 4th September, 2013.

Project Overview

ANZSOG's purpose is

> *"to encourage improved public sector decision making, leadership and policy outcomes for the benefit of the whole society."[3]*

It seeks to do this through

- providing world-class education for public sector leaders;
- delivering programs that build new policy, research and management capability;
- conducting research that makes a significant contribution to policy knowledge; and
- encouraging public sector innovation.

This project contributes to these outcomes by explaining the current information context within which Australian 21st century governments find themselves, and articulating the major challenges and changing dynamics that confront public sector management. In addition, our goal is to translate the outcomes of this research into practical tools that can assist public sector managers in their day to day lives.

In particular the project seeks to explain how governments around the world are using the Web, and more specifically 'Web 2.0', as a market-based policy instrument. Web 2.0 technologies enable 'read/write' interactions between and among users. The belief is that by engaging with citizens via these mechanisms, government agencies can more fully understand stakeholder needs; increase productivity; and reduce waste by more effectively and efficiently delivering targeted government services.

This project explores the concept of 21st century government as a 'social machine' in its own right, with a focus on analysing the links between the rapid development of information and communications technologies and the accompanying organisational changes. There is evidence of a transition in thinking that acknowledges the disruptive and dynamic context within which government operates, whilst simultaneously recognising the challenges that governments of all kinds face as they attempt to use and exploit digital technologies.

A key objective will be to more fully understand what skills and capabilities government managers require in order to cope in this environment.

Project methodology

The project will focus on three key questions:

1. How does government acting (or viewing) itself as a 'social machine' change the way that it interacts with citizens?
2. What key challenges are revealed as a result of this perspective?
3. How are government agencies addressing these challenges?

We have taken three approaches in our analysis of key aspects of government reform: transformation, and the relationship between government and citizens; effectiveness, and the mechanisms through which government communicates; and efficiency, and the ways by which government determines its own success as a business.

Thus, the following framework has been used to address the research questions:

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[3] http://www.anzsog.edu.au/about-us/purpose-and-vision, viewed August 2013

1. **Transformation** - technology embodied by the social machine as a tool for democracy;
2. **Effectiveness** - technology embodied by the social machine as a tool for communication; and
3. **Efficiency** - technology embodied by the social machine as a tool for customer satisfaction.

In this report we focus on our initial desk-based research, which gives an overview of the development of the concept of the 'social machine', together with key insights from the emerging discipline of Web Science.[4]

Our second report will discuss a number 'government as a social machine' case studies. In addition, we are integrating the 'social machines' theory into the teaching of the 2013 *Managing Public Communication* workshop, and we will incorporate into the second paper some of the observations and insights gained from this teaching opportunity.

The key questions driving this research draw on other research currently underway, in particular SOCIAM[5], a £6m project in progress at the University of Southampton.

Links to ANZSOG Teaching

For the past three years, the *Managing Public Communication* (MPC) program has gradually been incorporating content relating to aspects of digital interaction technologies, including Web 2.0 and social media. This is a proactive recognition of the rapidly changing information and communications landscape within which public sector professionals operate, as well as a direct response to requests from the program participants themselves.

The world of digital information systems is changing rapidly, and, as we have noticed from year to year with MPC, both the awareness and the capabilities of participants are changing as well.

Numerous institutions are integrating Social Media into their courses either as part of marketing programs or as the next step in 'eGovernment'. This research links in with other international research and teaching programs in the UK and Europe in the field of 'Web Science' (www.webscience.org) as well as with other UK government initiatives (www.gov.uk), but our approach is new in that it treats government itself as a 'social machine'.

A traditional focus of ANZSOG teaching is the Harvard Case Method, and it draws on cases developed both by ANZSOG as well as partner universities.

Our approach is to observe social machines in action, and from that develop vignettes and scenarios that can link to teaching outcomes, as well as practical strategies and approaches to managing the transition to government as a social machine.

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[4] Web Science Trust, www.webscience.org.
[5] The Social Machine research project, www.sociam.org.

The changing shape of Government and Citizen Interaction

> *"Governments need information to govern; citizens need information to hold government to account."*[6]

The relationship between governments and citizens is largely based on the currency of information. As a crucial component of the 'social contract', information is something that citizens give to government; in return citizens expect that government will use it responsibly to determine needs, deliver services, and develop policy. Information is central to negotiating the relationship between government and the governed.

Whereas in previous eras governments sought to 'market' their programs to citizens through traditional communications mechanisms – marketing, advertising, lobbying and public relations – within a digitally mediated environment much of their engagement is through multi-directional interactions, often facilitated by machines. For various reasons, entrepreneurs and citizens are often taking the initiative themselves and creating new applications in response to market needs. Thus, the role of government is changing from that of being a provider, to becoming more of a facilitator.

The UK's *Power of Information* report (Allan 2009) noted that

> *"When enough people can collect, re-use and distribute public sector information, people organise around it in new ways, creating new enterprises and new communities. In each case, these are designed to offer new ways of solving old problems. In the past, only large companies, government or universities were able to re-use and recombine information. Now, the ability to mix and 'mash' data is far more widely available."*

The value of data as a currency in its own right is now gaining wide attention, not only with the recognition that some of the world's largest companies exist because of their ability to package, manage and trade it (Google and Facebook being prime examples), but with the call to 'open up' datasets, particularly those which are publicly owned, and to facilitate mechanisms by which data as a resource can be used, reused and shared.

The *Power of Information* report argued that government should "grasp the opportunities that are emerging in terms of the creation, consumption and re-use of information" by developing a strategy that

- welcomes and engages with users and operators of user-generated sites in pursuit of common social and economic objectives;
- supplies innovators who are re-using government-held information with the information they need, when they need it, in a way that maximises the long-term benefits for all citizens; and
- protects the public interest by preparing citizens for a world of plentiful (and sometimes unreliable) information, and helps excluded groups (Allan 2009).

As testimony to the importance of accessing government data, a recent report undertaken by The Nominet and Web Science Trusts[7], which focuses on the value of data for charities, observed that

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[6] Hon. Brendan O'Connor, Australian Attorney General, address to Office of the Australian Information Commissioner Conference, OAIC Conference, November 2011
[7] http://www.nominettrust.org.uk/knowledge-centre/articles/open-data-and-charities

> *"Existing open government data can be used by charities to add value to their work, to target services better, to improve advocacy and fundraising, and to support knowledge sharing and collaboration between different charities and agencies."*

The value of data in digital form (and as created, managed, curated and accessed in digital form) is different; data in digital form has certain characteristics that completely change the way that information and the knowledge based on that information can be created, shared and expanded.

From atoms to bits – the emergence of 'e'Government

Prior to the ubiquitous use of the internet, government information was largely captured, managed, archived and distributed via the printed medium. The 1990s saw the arrival of 'e' (or 'electronic') government, which may be defined as the process of

> *"…creating a comfortable, transparent, and cheap interaction between government and citizens (G2C – government to citizens), government and business enterprises (G2B – government to business enterprises) and relationship between governments (G2G – inter-agency relationships).*
>
> *There are four domains of e-government, namely governance, information and communication technology (ICT), business process re-engineering (BPR), and e-citizen."* (Wikipedia)

By the late 1990s, e-Government was largely undertaken by the use of the World Wide Web (Web 1.0) as both a platform where agencies could publish information and key documents online, and a mechanism to begin to gather data via online forms. This approach mirrored mechanisms adopted by many private sector organisations, particularly financial ones, and was intended to increase efficiency, reduce waste, and facilitate an easier interaction for both public servants and citizens alike. While it was essentially the migration of the physical document process to the digital world, and remained very much the 'push' model largely driven by the traditional mindset of print, it did begin the process of digitising both government and citizen information.

In the mid 2000s things changed again with the development of Web 2.0, or the 'social Web', as technologies emerged that enabled people with minimal technical skill to both consume (read) and produce (write) content. Toffler's 'prosumer' (Toffler 1980) had emerged along with the Read/Write Web.

> *"The link between communication and character is complex, but unbreakable. We cannot transform all our media of communication and expect to remain unchanged as people. A revolution in the media must mean a revolution in the psyche."*
> (Toffler 1980)

According to Wikipedia the term Web 2.0 was coined by Darcy DiNucci (1999), who writes that

> *"The Web will be understood not as screens full of text and graphics but as a transport mechanism, the ether through which interactivity happens. It will … appear on your computer screen … on your TV set … your car dashboard … your cell phone … hand-held game machines … maybe even your microwave oven."*

The term then began to enter the vernacular at the first Web 2.0 Conference,[8] where John Battelle and Tim O'Reilly outlined their definition of the 'Web as Platform', meaning that Web 2.0 software applications are built directly upon the Web as opposed to upon the desktop.

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[8] http://conferences.oreillynet.com/web2con/, http://oreilly.com/web2/archive/what-is-web-20.html

Web 2.0 involves the blending of web applications that facilitate interactive information sharing, interoperability, user-centred design, and collaboration (Wikipedia 2011). According to O'Reilly:

> *"Web 2.0 is the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an 'architecture of participation', and going beyond the page metaphor of Web 1.0 to deliver rich user experiences."* (O'Reilly 2005)

Davis (2009) and Spivack (2009) describe the internet as evolving through the following phases:

- Web 1.0 connects information and is the first phase in interacting with the internet;
- Web 2.0 connects people and begins the age of digital social participation;
- Web 3.0 represents meanings, begins to connect knowledge and brings together the connective technologies with emergent machine intelligence; and
- Web 4.0 brings together all aspects to become truly ubiquitous (Davis 2010).

This evolution is illustrated in the diagram below, and aligns with the concept that many of the original researchers, such as Mark Weiser and his colleagues at Xerox's Palo Alto Research Centre (PARC)[9], developed in the late 1990's (Weiser et al. 1999).

Figure 1: Evolution of the Internet to 2020, adapted from Davis 2009
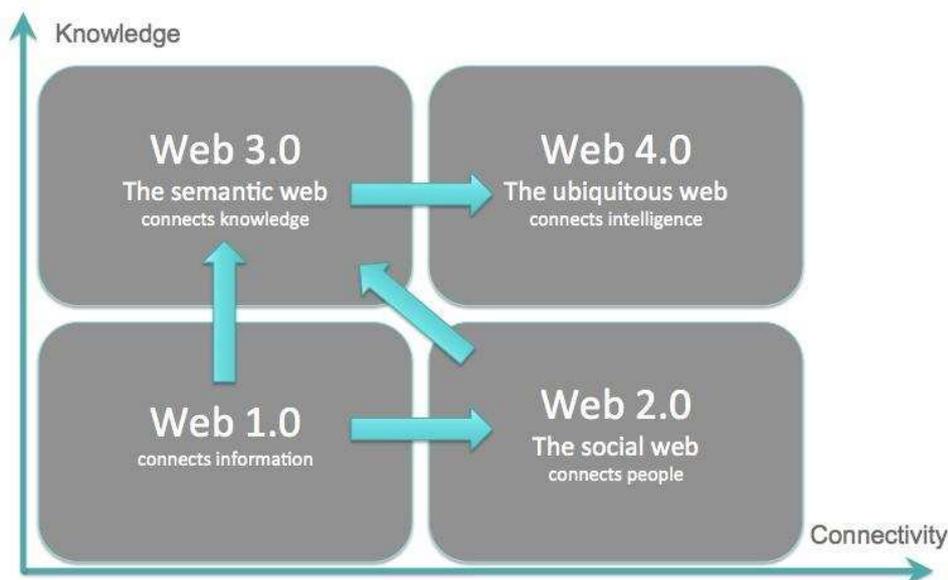
There are now number of information technologies that have matured to become commercially available products and systems (Gardner 2011), and, according to Gartner's 2013 'Hype Cycle', the movement toward Web 3.0 and Web 4.0, as manifested by the evolving relationship between humans and machines, "will improve productivity, transform citizen and customer experience, and seek competitive advantage" (Gartner 2013).

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[9] www.parc.com

Figure 2: Gartner 2013 Hype Cycle for emerging technologies
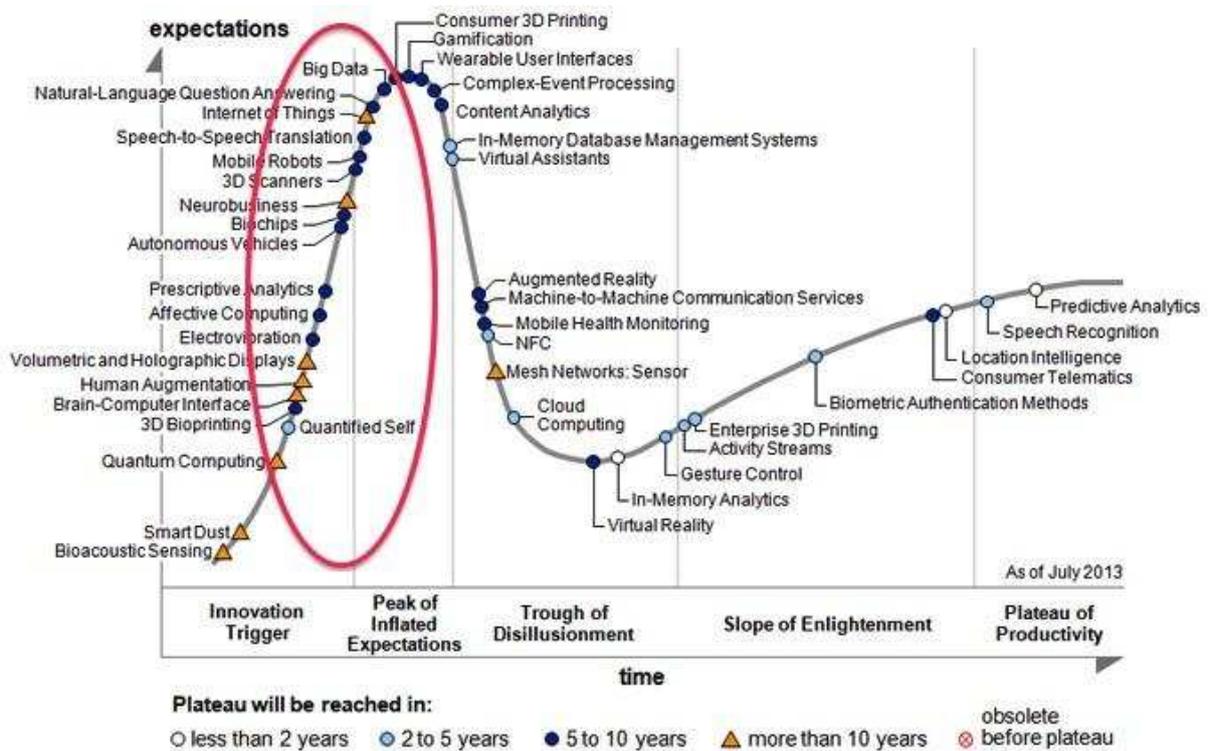
An example of the Hype Cycle, using 'Social Software:

Figure 3: Gartner 2013 Social Software Hype Cycle

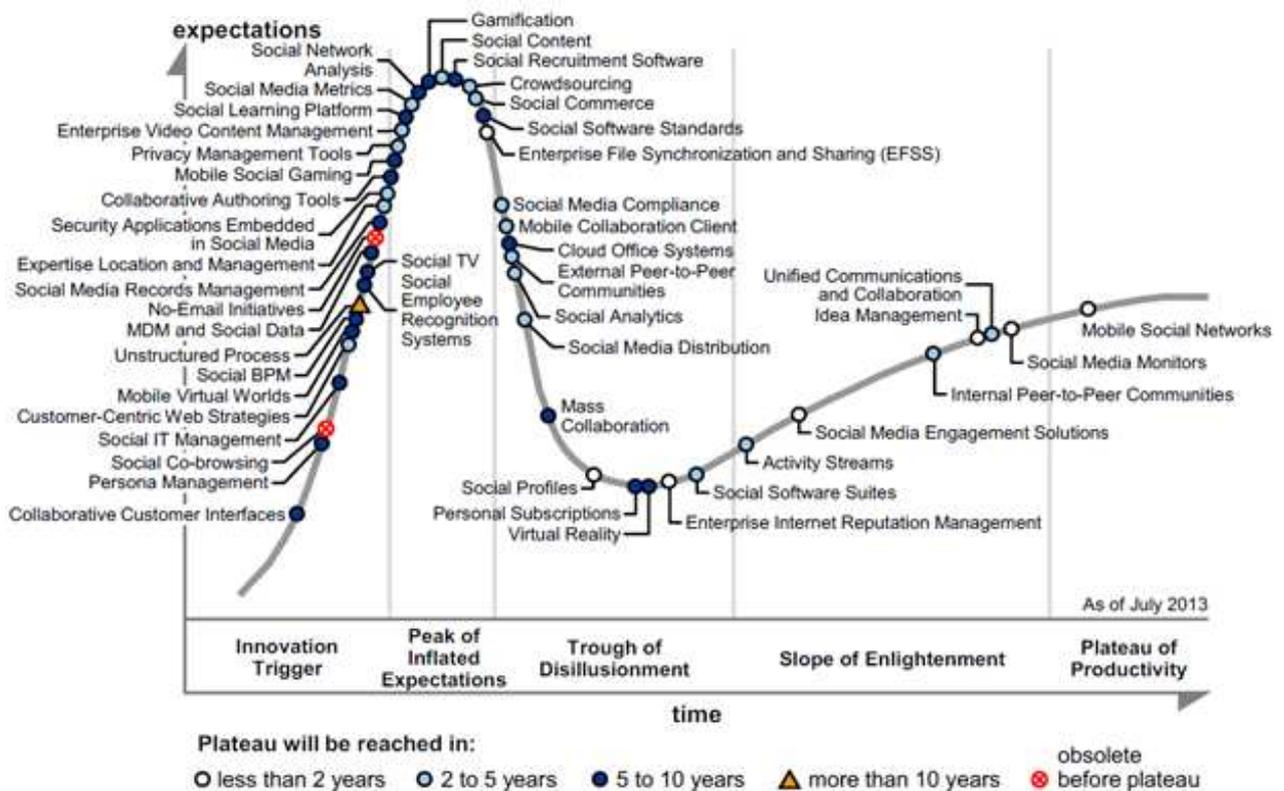McKinsey, in its recent *Disruptive Technologies* report (McKinsey 2013), notes that most of the technologies on its list are directly enabled, or enhanced, by information technology. They see three key underpinning trends:

(i) augmenting humans with technology;
(ii) machines replacing humans; and
(iii) humans and machines working alongside each other.

These trends are themselves supported by three key areas of technical change:

(i) machines are becoming better at understanding humans and the environment;
(ii) humans are becoming better at understanding machines; and
(iii) machines and humans are getting smarter by working together.

All of this is underpinned by data: data collected by machines, increasingly provided by humans (either directly or indirectly), and stored around the world but available via 'the cloud'.

Data has been with us for as long as we have had knowledge, information and stories, and physical objects. The difference in the digital world is that data has a number of characteristics that change the way that information can be created, managed, curated, stored and accessed. This difference is crucial to understanding the disruptive impact of information in digital form, and the potential when machine technologies and social interaction are combined.

Shoshana Zuboff (Zuboff and Maxmin 2002), a long standing researcher into socio-technical systems, describes nine characteristics of digital information which completely change the way that data are captured, curated, managed and shared.

Information in digital form:

1) bestows global transparency and enables the capacity to inform in a way which is visible, sharable, knowable, mobile and manageable;
2) provides both accountability and responsibility;
3) forces the need to develop better business practices;
4) maintains and co-ordinates complexity in that it enables humans to more effectively and efficiently deal with complexity;
5) provides the opportunity for comprehensive understanding through collaboration and co-ordination as a result of distributed learning and customisation;
6) provides immediacy;
7) enables infinite 'plasticity' in the manipulation and shaping of products and information;
8) changes the nature of supply chain relationships to become 'kaleidoscopes' rather than linear processes, without reference to geographical location; and
9) promotes ubiquity - information and communication can be accessed anywhere, anyhow, anytime, and on any device.

Researchers over the past few decades have recognised the potential of digital information to disrupt systems (Weiser et al. 1999; Brown and Duguid 2000; Suchman 2011) but in this current decade we are now seeing information in digital form become ubiquitous and mobile, and increasingly searchable. This results in a new socio-technical phenomenon where there is a new kind of emergent, collective problem solving:

(i) problems are beginning to be solved by very large scale human participation via the Web;

(ii)   there is access to, or the ability to generate, large amounts of relevant data using open data standards;

(iii)   there is increasing confidence in the quality of the data; and

(iv)   human-computer interfaces are becoming far more intuitive and seamless.

The last characteristic is crucial to understanding the concept of the 'social machine' because the truth is that

> *"(w)e don't really want to talk with computers—we want to talk through them." (Roush 2005)*

Humans will use whatever information technologies are available in order to communicate and interact with each other. As mechanisms for generating and collecting data become more seamlessly embedded in digital interaction technologies, the amount of data generated by human activities is increasing to create what is being called a 'digital footprint'.

Studying these data is now a major research focus and Intel digital anthropologist Genevieve Bell recently asked

> *"Who is data? And if it were a person what would it be like?"*[10]

It is not only researchers who are interested in these data; this is what all marketers are interested in, and this is what is driving much of the Web 2.0 and data development in the commercial sector. The data are at the core, and the need has arisen to develop policies and systems that protect the privacy and rights of individuals, and thus their exposure to risk, while enabling access to data for use and reuse by organisations.

This is what underpins the call for 'open' data.

The push for 'open'

What has driven the unprecedented and quite extraordinary adoption and expansion of the Web has been the openness that the system affords, unfettered by gateways and obstructions that prevent people from using it. The more people use the Web, the more valuable it becomes; the more valuable it becomes, the more people use it. This is called the 'network effect'[11] and was initially recognised with the telephone and the fax machine, to now become an accepted component within economic theory.

> *"What Tim [Berners-Lee] got, which no-one else got, is that the network is everything ... the Web only works if everyone is using it ... all or nothing ... if others don't use it then it won't be complete ... and it starts to die, potentially."*
> - Professor Dame Wendy Hall on the evolution of Web Science,[1]

What undermines the value of the network effect, and therefore the Web itself, is where communications sectors become 'gated communities' and take themselves outside in order to partition and control data outside of the broader network. Some of the major commercial platforms (such as Apple, Facebook and Google) appreciate this, and have developed their business models by corralling users into a controlled environment, and then controlling the interface with the broader Web. While this does provide an increase in the security of personal data, it also fragments the information landscape and thus its networked value.

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[10] Genevieve Bell, Web 2.0 Summit, 2011, "Higher Order Bit",
   http://www.youtube.com/watch?v=Nvn_l_Vh3hw

[11] http://en.wikipedia.org/wiki/Network_effect

So, what of government? The 'open data' communities argue that the true value of government data (which is paid for by public funds) is only achieved by the opening up of government datasets, and ensuring that they remain open, integrated and available.

Essentially the promise of Web 2.0 technologies for government is that by using them to engage with citizens, and encouraging citizens to provide their data, government should be able to not only better understand their needs, but increase productivity and reduce waste by more effectively and efficiently delivering targeted Government services. The efforts of governments to embrace Web 2.0 technologies have been described as 'Gov 2.0'.

'Gov 2.0' as a technical phenomenon

According to Daniel Bevarly (2010), Gov 2.0 is broadly focused around two points: 'data' and 'dialogue'.

Much of the 'data' focus has been around making government information more 'open' in order to provide greater transparency and accountability, and through this to generate trust in order to improve governance.

Beth Novack argues that this focus on data is about two things:

> *"The secret to the success of bellwethers like Google, Amazon, eBay, Craigslist, Wikipedia, Facebook, and Twitter is that each of these sites, in its own way, has learned to harness the power of its users to add value to— no, more than that, to co-create—its offerings."*
> (O'Reilly 2010, "Government as a Platform")

1) Smarter Governance: Getting Knowledge In; and
2) Open Data Governance: Pushing Data Out.

Numerous governments have now ostensibly opened up their datasets to the world.[12] Yet while the difficulties (both technical and political) of opening up data should not be underestimated, this is the low hanging fruit in relation to the promise of Gov 2.0. The real challenge is what Novack (2013) describes as "Devolved Governance: Sharing Responsibility", and it is necessarily based on 'dialogue'.

Dialogue is much more complex; is necessarily contextual; and offers the potential to truly engage citizens as active participants in the process of governance.

A report by Digital Daya analysing the use of Twitter by political leaders found that

> *"(H)eads of state don't use Twitter to spread propaganda. In fact, just the opposite is true. Enlightened leaders in stable countries employ Twitter to engage their citizenry."* (DigitalDaya 2012)

Seeing Gov 2.0 as merely a technical development obscures some of the real reforms and challenges that are just beginning to emerge as digital information and ubiquitous computing become more pervasive within global systems.

Gov 2.0 needs to be seen as a complement and enabler to 'Open Government', and a radical shift in the relationship between governments and citizens.

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[12] http://www.opengovpartnership.org/about

The move towards 'Open' Government

The idea of 'open' government has been around for many decades, but the advent of Web 2.0, and the coming together of social and technical systems to facilitate both data and dialogue, has fundamentally changed the government information landscape.

The catalyst for change came from US President Barack Obama in his "Memorandum for the Heads of Executive Departments and Agencies", which states that

> "My Administration is committed to creating an unprecedented level of openness in Government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration. Openness will strengthen our democracy and promote efficiency and effectiveness in Government."[13]

According to the Obama administration, the concept of open government is founded on three fundamental principles:[14]

Transparency. In a well-functioning democratic society, citizens need to know what their government is doing. To do that, they must be able freely to access government data and information and to share that information with other citizens. Transparency isn't just about access, it is also about sharing and reuse – often, to understand material, it needs to be analysed and visualized and this requires that the material be open so that it can be freely used and reused.

Releasing social and commercial value. In a digital age, data are a key resource for social and commercial activities. Everything from finding your local post office to building a search engine requires access to data, much of which is created or held by government. By opening up data, government can help drive the creation of innovative business and services that deliver social and commercial value.

Participatory Governance. Much of the time citizens are only able to engage with their own governance sporadically – maybe just at an election every 4 or 5 years. By opening up data, citizens are enabled to be much more directly informed and involved in decision-making. This is more than transparency: it's about making a full 'read/write' society; not just about knowing what is happening in the governance process but being able to contribute to it.

This is based on the recognition that, in relation to information:

1) **Communities need to coordinate**. Activities like elections, emergency responses, and even community celebrations succeed only if everyone knows where to be at what time and what role to play. This requires a system of information and exchange. Information is also the central resource in enabling the creation of economic and social connections that build a community's capacity for action;

2) **Communities need to solve problems**. They have to identify goals, challenges, and options for response on everything from building the local economy, to improving the performance of community schools, to protecting health and safety and combating local hunger. They have to estimate the consequences of alternative approaches. They have to weigh those consequences in light of community values. All of this requires information, interpretation, analysis, and debate;

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[13] Obama, Barack - http://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment/.

[14] Orszag, Peter. Executive Office of the President of the United States, "Memorandum for the Heads of Executive Departments and Agencies", December 8, 2009.

3) **Communities need to establish systems of public accountability**. Public officials answer to voters for their performance in office. Voters need information and analysis to assess how officials are doing their jobs; and

4) **Communities need to develop a sense of connectedness**. They need to circulate ideas, symbols, facts, and perspectives in a way that lets people know how they fit into a shared narrative. A community's system of meaning evolves as new voices and new experiences enter the information flow. People need access to that information to avoid feeling alienated and excluded.

> *"Government holds a wealth of information. Some of it - quite rightly - is sensitive and access should be strictly controlled - tax records for example. But in other areas, I see no reason why we can't turn government inside out, so to speak, and make the same data and information available to those outside of government. Government can tap wider resources in the community to analyse and use government data to help solve problems and produce insights."*
> - New Zealand Deputy Prime Minister Bill English on 'inside out government'.[1]

In the UK, the Knight Commission on the Information needs of Communities[15] adopted a similar mantra, and Prime Minister David Cameron pledged his government to "make things better without spending more money",[16] believing that

> *"if you give people more power and control over their lives, if you give people more choice, if you put them in the driving seat, then, actually, you can create a stronger and better society. And if you marry this fact with the incredible abundance of information that we have in our world today, I think you can completely … remake politics, remake government, remake your public services."*

Open Government in Australia

In July 2010, Australian Finance Minister Lindsay Tanner made a Declaration of Open Government,[17] stating that:

> *"The Australian Government now declares that, in order to promote greater participation in Australia's democracy, it is committed to open government based on a culture of engagement, built on better access to and use of government held information, and sustained by the innovative use of technology. …*
>
> *The Australian Government's support for openness and transparency in Government has three key principles:*
>
> *Informing: strengthening citizen's rights of access to information, establishing a pro-disclosure culture across Australian Government agencies including through online innovation, and making government information more accessible and usable;*
>
> *Engaging: collaborating with citizens on policy and service delivery to enhance the processes of government and improve the outcomes sought; and*
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> *Participating: making government more consultative and participative."*

In May 2013 Australia followed this up by joining the Open Government Partnership:[18]

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[15] http://www.knightcomm.org/category/opengovernment/

[16] Cameron, David - TED, February, 2010, http://www.ted.com/talks/david_cameron.html

[17] Tanner, Lindsay - http://agimo.govspace.gov.au/2010/07/16/declaration-of-open-government/

[18] http://www.oaic.gov.au/news-and-events/media-releases/information-policy-media-releases/australia-to-join-the-global-open-government-partnership, viewed 20th August, 2013

> *"A new multilateral initiative that aims to secure concrete commitments from governments to promote transparency, empower citizens, fight corruption, and harness new technologies to strengthen governance. In the spirit of multi-stakeholder collaboration, OGP is overseen by a steering committee of governments and civil society organizations."*[19]

Membership in the OGP requires Australia to commit to "The Open Government Partnership Declaration", a statement of commitment to improving access to information about government activities; improving civic participation; high standards of professional integrity in the public service; and increasing access to new technologies for openness and accountability. Membership also requires the development of an 'OGP Action Plan' that "outlines a vision for open government in Australia, the open government efforts to date and the roadmap for open government looking ahead, including some of the challenges and opportunities".[20]

Significantly, its proponents see the move toward open government providing

> *"an opportunity for governments to push the evolution of democracy well beyond the ballot box and into life experience through online engagement."* (Senator Kate Lundy)[21]

More recently, Queensland Premier Campbell Newman's Government[22] has embarked upon an "era of open government", with Premier Newman stating that

> *"The Liberal National Party is determined to change the culture of the Queensland Government to be more open by allowing more public access to government information collected in all regions, in all kinds of formats, for all kinds of reasons. … In the past, governments gave away land to stimulate economic development. Now information is the new currency. … Open access to information held by the State Government will help stimulate the development of new, innovative applications by all sorts of private individuals, companies and non-government organisations."*[23]

If we revisit the 'data' and 'dialogue' distinction, it is clear that governments of all persuasions are trying to use data in order to more effectively target services, stimulate innovation, and reduce waste.

In technical terms, the collection and analysis of structured and semi-structured data is well understood. What is difficult is dealing with *unstructured* data, for example that which results from conversations, and the analysis of human interaction contained in complex, contextual and often transient dialogue, much of which is now generated by the use of social media.

As the New Zealand Department of Internal Affairs has recognised:

> *"social media is different from traditional media, such as print, television, and radio because it is not a broadcast medium but a dialogue. We note that these lines are*

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[19] http://www.opengovpartnership.org/about, viewed 20th August, 2013

[20] http://www.attorneygeneral.gov.au/Mediareleases/Pages/2013/Second%20quarter/22May2013-AustraliajoinsOpenGovernmentPartnership.aspx, citing Attorney General Mark Dreyfus QC.

[21] Lundy, Kate - Gov 2.0 Expo 2010,"The Path to Open Government: The Pillars of Gov 2.0", http://blip.tv/file/3677202 and Public Sphere - http://cpd.org.au/article/case-study-public-sphere

[22] http://www.qld.gov.au/about/rights-accountability/open-transparent/review/

[23] http://statements.qld.gov.au/Statement/2012/10/9/queensland-governments-open-data-revolution-begins

increasingly blurring, as the more traditional media channels increasingly include ways and means of talking to and interacting with viewers and readers."
*(*AuditorGeneralNZ 2013)

Dialogue is what makes us human, and dialogue is essentially social.

The rise of the 'social' phenomenon

In the last decade we have heard the word 'social' bandied about a lot.

The word 'social' refers to "the interaction of organisms with other organisms and to their collective co-existence, irrespective of whether they are aware of it or not, and irrespective of whether the interaction is voluntary or involuntary".[24] It describes collections of entities which combine, and through that combination form something that is greater than the sum of the parts.

Social Media

Social media refers to the means of interaction among people in which they create, share, or exchange information and ideas with the support of technologies that enable virtual communities and networks. In essence it is the blending of technology and social interaction to enable the co-creation of value.

Social Networks

A social network is a social structure made up of a set of social actors (such as individuals or organisations) and a set of the interactive ties between these actors.

Social Business

Nobel Peace Prize laureate Professor Muhammad Yunus originally described a Social Business as a business that is created and designed to address a social problem and is a non-loss, non-dividend company. It is financially self-sustainable, and any profits realised by the business are reinvested in the business itself (or used to start other social businesses), with the aim of increasing social impact.[25] In other words, a social business applies the principles of the business world to a social purpose.[26]

As a corollary to this, with the rising interest in all things 'social', companies such as IBM define a 'social business' as "one that embraces and cultivates a spirit of collaboration and community throughout its organization—both internally and externally"[27] and has the following characteristics:

1) Engaged: deeply connecting people, including customers, employees, and partners, to be involved in productive, efficient ways.
2) Transparent: removing boundaries to information, experts and assets, helping people align every action to drive business results.
3) Nimble: speeding up business with information and insight to anticipate and address evolving opportunities.

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[24] http://en.wikipedia.org/wiki/Social, viewed September, 2013
[25] http://www.muhammadyunus.org/index.php/social-business/social-business, viewed September 2013
[26] www. socialbusinesstrust.org, viewed March 2012
[27] http://www.ibm.com/smarterplanet/us/en/socialbusiness/overview/index.html, viewed March 2012

Social Enterprise and Social Innovation

A bit more broadly, a social enterprise is an organisation that applies commercial strategies to maximise improvements in human and environmental wellbeing, rather than maximising profits for external shareholders. A social enterprise can be structured as a for-profit or a non-profit, and may take the form of a cooperative, mutual organisation, a social business, or a charitable organisation.

Social Learning and Citizen Science

In the fields of education and research there are now tools that leverage and exploit the power of group learning and facilitate both the power of the network as well as the "individual node within it" (Jarche 2001). Social learning, in itself, is having profound effects on many fields of human endeavour, in particular education. It is now being complemented by 'citizen science', in which scientific research is conducted, in whole or in part, by amateur or nonprofessional scientists, often through mechanisms of crowdsourcing and crowdfunding.

> "People are getting used to the idea that consumers have a voice, but the big change is that now people in the audience can talk directly to each other, and there is much more of that conversation than between brands and consumers."
> (Shirky 2011)

All in all, the rise of digitally enabled socio-technical systems is leading to a massive change in the dynamics of communication. We are entering the age of the 'social machine'.

The age of the 'social machine'

The recognition that technologies facilitate social movements goes back to the printing press (Eisenstein 1980), but what is happening in the digital information age is that the 'communications landscape' is becoming more complex, participatory and interconnected. This is resulting in more opportunities to engage in public speech, and an enhanced ability to organise and undertake collective action.

While the printing press enabled the transmission of ideas and opinions, which could then be echoed by friends, family and colleagues, this happened in 'physical time' – the time required to distribute the physical information and then connect via other, often one-to one means such as the telephone. What digital interaction technologies enable is not just the communication of 'one-to-many' data, but the facilitation of 'one-to-many' conversations. This is where the internet, and social media in particular, are making a difference.

> "Real life is and must be full of all kinds of social constraint – the very processes from which society arises. Computers can help if we use them to create abstract social machines on the Web: processes in which the people do the creative work and the machine does the administration … The stage is set for an evolutionary growth of new social engines. The ability to create new forms of social process would be given to the world at large, and development would be rapid."
> (Berners-Lee 1999)

As Nigel Shadbolt says:

> *"Once upon a time 'machines' were programmed by programmers and used by users. The success of the Web has changed this relationship: we now see configurations of people interacting with content and with each other, typified by social websites. Rather than drawing a line through such Web-based systems to separate the human and digital parts (as computer science has traditionally done), we can now draw a line*

> *around them and treat each such compound as a 'social machine' — a machine in which the two aspects are seamlessly interwoven."* (Shadbolt et al. 2013)

In a 'social machine', "human and computational intelligence coalesce in order to achieve a given purpose" (Shadbolt et al. 2013).

Essentially, social machines can be characterised as the interaction of individual action and coordination, mediated and enabled by the "shared communication substrate of the Web".[28] They are also "collaboration platforms – for organizing work at a distance that could translate into ways to get all hands on deck to undertake action together" (Novack 2013).

As people become more comfortable and conversant with social technologies, we are seeing more and more of these socio-technical systems emerging.

Figure 4: Social Machines in Context (De Roure and Shadbolt 2013)[29]
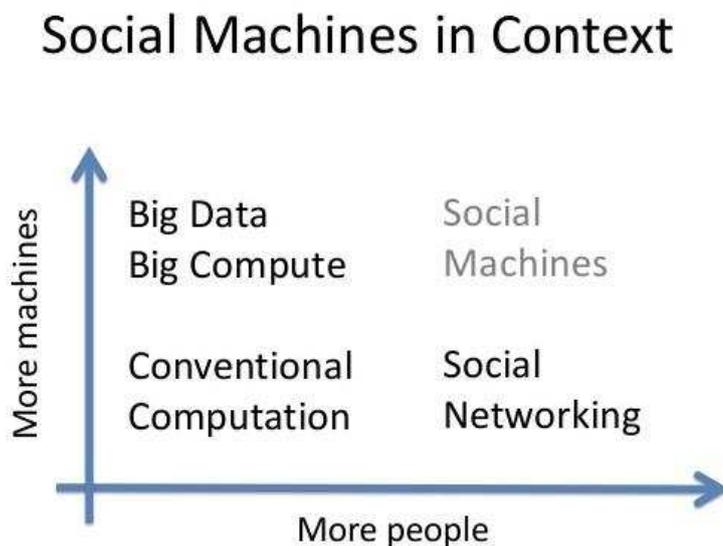
Government as a Social Machine

Governments are now increasingly employing Web 2.0 and social technologies to govern and interact with citizens,[30] and as the elements of digital information and governance become increasingly interconnected, it could be said that governments are themselves becoming 'social machines' (Berggruen and Gardels 2013).

In his Gov 2.0 article, O'Reilly argued that

> *"Government 2.0 is not a new kind of government; it is government stripped down to its core, rediscovered and reimagined as if for the first time. … (G)overnment is, at*

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[28] www.sociam.org/about, viewed 3rd May, 2013

[29] http://www.slideshare.net/sociam/sociam-the-theory-and-practice-of-social-machines, viewed May 2013

[30] The UK government is considering using social media as proof of identity, http://www.guardian.co.uk/technology/2012/oct/04/facebook-social-media-identity-proof

> *bottom, a mechanism for collective action. We band together, make laws, pay taxes, and build the institutions of government to manage problems that are too large for us individually and whose solution is in our common interest."* (O'Reilly 2010)

In other words, Gov 2.0 is about enabling citizens to use the power of information technologies to collectively solve problems. What is hoped is that instead of 'vending machine government', where we pay our taxes and expect services in return, the role of government is more like being the manager of the marketplace, or the bazaar, where the community exchanges goods and services and actively participates (Raymond 2000).

As testimony to this, governments and private enterprises are not only promoting 'open' initiatives, they are actively encouraging the participation of their citizens, customers and employees in numerous areas including product development, service offerings, and policy formulation (Shadbolt et al 2013). Once this occurs, the power dynamic between governments and citizens will change (Zuboff and Maxmin 2002; Tapscott and Williams 2006) and it could well be that

> *"(i)n the future people will not see their influence limited to elections every four to five years; rather, citizens will exercise permanent influence through constant suggestions, ideas, and contributions, all organized over the internet."* (Bohnen and Kallmorgen 2009)

Some of this change in the power dynamic comes from a growing lack of trust in public institutions around the world,[31] and particularly in Australia ,[32] resulting in moves to facilitate greater public involvement in public policy.[33] But a changing dynamic is becoming evident between governments and the governed, for which new systems of governance are required.

Jake Dunagan, Research Director for the Institute of the Future, believes that

> *Most of the failings of government can be connected to the fundamental assumption that humans are rational creatures and the inherent structural biases toward mechanical processes and short-term thinking. … We need designers, political scientists, and social activists … to take up the challenge of designing new systems of governance … that are open, accessible, and learning. They need to embody the latest thinking about how the world works, how people work, and how we can use our technologies to make life better for all.[34]*

While this is obviously not as simple or as easy as it sounds, it does begin to frame a new approach to the relationship between citizens and government, facilitated by technological systems which are increasingly becoming intuitive, intelligent and 'social'.

From conceiving government as a platform, it is but a short step to conceiving it as a social machine, once the human input is incorporated, integrated and recognised.

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[31] Edelman Trust Barometer - http://www.edelman.com/news/trust-in-government-suffers-a-severe-breakdown-across-the-globe/, viewed 3rd July, 2013

[32] http://www.edelman.com/post/a-state-of-distrust-in-australia/, viewed 3rd July, 2013

[33] http://aceproject.org/ace-en/focus/e-voting/countries, viewed 23rd July, 2013

[34] Dunagan, Jake. "The Future of Government", http://www.good.is/post/the-future-of-government/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+good%2Flbvp+%28GOOD+Main+RSS+Feed%29, 19th July, 2010

SOCIAM – www.sociam.org

A crucial part of designing and creating any new system or process is to fully understand why it is needed, and what characteristics and components it requires.

This is what is driving a £6m project entitled "SOCIAM: The Theory and Practice of Social Machines", led by Professor Nigel Shadbolt and based at the University of Southampton in the United Kingdom.

This project will investigate aspects such as human ability to represent and reason about such attributes as trustworthiness, reliability, and tacit expectations about the use of information, as well as about privacy, copyright, and other legal rules.

SOCIAM Objectives

The SOCIAM project has a number of key objectives:

Social computation - the overall objective of building the computational infrastructure to support advanced social computation, bringing together the engineering goal of generating the relevant tools and methods, and the social goal of relating human interaction to computational interaction in social architectures.

Data curation - to design the data infrastructure to support social computation, which entails the development of a computational infrastructure, and the propagation of understanding of the infrastructure through the set of potential social machine users, as well as the creation of incentives to use it.

Privacy, trust and accountability - to maximise the utility of social machines without compromising the privacy of data subjects, the intellectual property of data developers and curators, or the accountability of data users. It also has the social objective of fostering and preserving trust in social machines.

> *In looking to this future, our focus is not primarily in terms of the cyber-infrastructure of high-speed supercomputers and their networked interconnections, but the even more powerful human interactions enabled by these underlying systems. We hope we have demonstrated that exploring this new generation of social machines can take artificial intelligence researchers and others into the design of new algorithms and interfaces; into new approaches to distributed inference and query; and into developing declarative social machinery, including policy-aware systems of privacy, trust and accountability. Together, these technologies will allow us to further empower the Web of people by developing a next generation of Web technologies and to move from human in the loop to humanity in the loop.* (Hendler et al. 2008)

Interaction - to design interaction models to support users defining, requesting and coordinating computation in social machines, and where necessary innovating design and evaluation methods for social machine interaction.

Social machine implementation - to use the insights from implementations and observation to enrich the theoretical understanding of social machines.

Social machine observatory - to classify and model existing social machines in order to support the design of new social machines and the prediction of behaviour, especially for data-intensive problems.

From a research point of view, a number of key questions arise:

- What are the fundamental theoretical properties of social machines, and what kinds of algorithms are needed to create them?
- What underlying architectural principles are needed to guide the design and efficient engineering of new Web infrastructure components for this social software?
- How can we extend the current Web infrastructure to provide mechanisms that make the social properties of information-sharing explicit and guarantee that the use of this information conforms to relevant social policy expectations?
- How do cultural differences affect the development and use of social mechanisms on the Web? As the Web is indeed worldwide, the properties desired by one culture may be seen as counterproductive by others. Can Web infrastructure help bridge cultural divides and/or increase cross-cultural understanding?

SOCIAM aims to use the Web as both an 'observatory' of human behaviour as facilitated and mediated by digital interaction technologies, and a 'laboratory' to design new systems and experiment with their potential to facilitate change.

Social Machines in action

The SOCIAM project is focusing on three key areas within which social machines are being utilised: health, citizen policing, and citizen science.

Some initial results have been published on the SOCIAM website[35], and much of their initial work has been to more fully articulate exactly what a social machine is and how to define it (Shadbolt, Smith et al. 2013).

There are now many social machines operating throughout the world, and a brief list, based on the work of the SOCIAM project, is given in Appendix One.

Research into practice

The growing awareness of the impact of digital interaction technologies on society is driving all sorts of new research across many domains, as evidenced by the development of Web Science. A corollary to this is the paramount need to create and deliver educational resources to help people develop digital literacy, and to navigate and make sense of the modern information environment. For those who work in and with the public sector, this education is crucial, but it needs to be founded on the fundamentals of the social sciences

Nigel Shadbolt lucidly explains this in a presentation to the Royal Society (Shadbolt 2010), in which he articulates the components of Web Science and stresses the need to take a dynamic and holistic approach to any study of it.

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[35] http://www.sociam.org/publications, viewed 3rd September, 2013

Figure 5: The Components of Web Science (Shadbolt 2010)
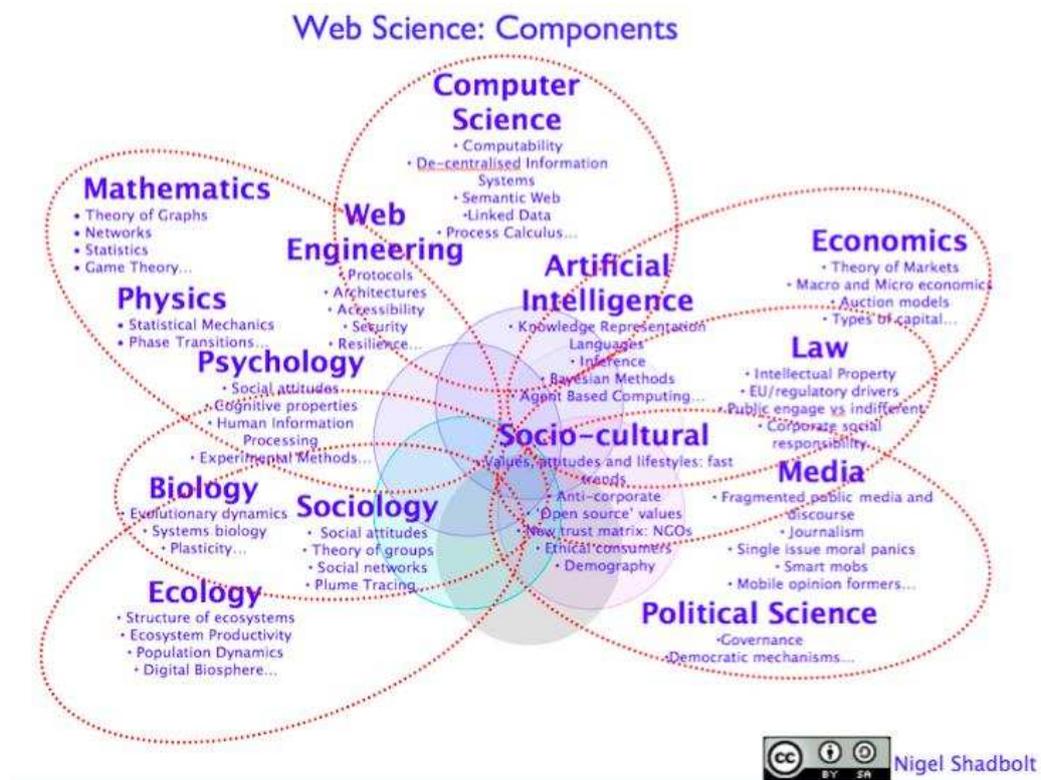
In an early paper produced by the SOCIAM group, the authors state that

> *One of the fascinating aspects of a Social Machine as a (eco-)system is its ability to resist attempts at defining it. Inspect it too closely and you'll end-up studying its constituting parts in great detail (humans, machines, bots); step away too much and you lose sight of what the constituting parts are doing.*

> *One of the main reasons why this is happening is that a successful Social Machine, whether intentionally designed or serendipitously emerging, has all the properties of an emergent system; the fabric itself of its constituting parts mutates under their mutual influence, as do the interactions between them. The result is that the constituting parts cannot be classified into straightforward layers anymore but actually span various layers.* (De Roure et al. 2013)

For the concept of 'government as a social machine' this advice is crucial, and our approach is necessarily ecological and contextual in the case of each example.

In our second research report we will identify and describe a number of social machines that operate within a government, or governance, context, in order to explore how these socio-technical systems are impacting on government reform; in particular:

- transformation, and the relationship between government and citizens;
- effectiveness, and the mechanisms through which government communicates; and
- efficiency, and the ways by which government determines its own success as a business.

Guided by the SOCIAM processes (De Roure et al. 2013), which are themselves evolving, we will specifically examine:

1) The intent and evolving purpose for which the machine has been created;
2) The human and technology interface, and in particular the digital – physical interaction;
3) The drivers for emergent and ongoing behaviour; and
4) The degree to which the human needs have been (or are being) met.

We will then analyse our findings in relation to our three key research questions:

1) How does Government as a 'social machine' change the way that it interacts with citizens?
2) What key challenges are emerging as a result of this perspective?
3) How are Government agencies addressing these challenges?

Research Team

Michael Vitale

Professor Michael Vitale is a professor at Monash University and focuses his teaching, research, and consulting on entrepreneurship and the commercialisation of innovation. Previously Michael had a joint professorial appointment at the Melbourne Business School and the Australia New Zealand School of Government (ANZSOG). At MBS, he was the director of the innovation research program. Michael's expertise in the Management of Information Technologies is crucial in terms of this research particularly in understanding how new Web based services are being developed through innovative approaches to development and commercialisation.

Anni Rowland-Campbell

Anni Rowland-Campbell is Director of Intersticia, a research consultancy which provides strategic advice to organisations as they learn to actively engage with 'new media'. Anni is a former NSW State Ministerial Advisor, was formerly Executive Director of the NSW Division of the Institute of Public Administration (IPAA), and has served on numerous State and Federal Government Boards and Committees. Anni is currently undertaking research focusing on the emerging Web and systems of governance. From 2006 – 2012 Anni led two ARC funded research projects into the impact of emerging Web technologies on information and communication (www.circlesofsustainability.org). Anni is a Member of the Board of Web Science Australia. Anni's expertise is crucial in understanding how individuals and organisations are using the Web to engage with stakeholders, together with framing this into a research context. In addition her network of contacts within government is vital in garnering public sector support.
(www.intersticia.com)

Valentina Cardo

Dr Valentina Cardo is a Lecturer in the Department of Film, Television and Media Studies, University of Auckland. Her particular focus is on how politics (political ideas, values, ideologies, policy) is communicated through popular channels and the democratic consequences of such communication. She is currently working on a project which investigates the links between women's activism and the new media. Valentina's expertise in how lobby groups utilise new media technologies will be leveraged in order to more fully understand how governments can engage these groups to both provide better services. She will also engage directly with the New Zealand government as part of the investigations into the response to the Christchurch earthquake.
(http://www.artsfaculty.auckland.ac.nz/staff/?UPI=vcar206)

Peter Thompson

Peter Thompson is a Fellow of the Australia and New Zealand School of Government where he teaches executive programs in communication strategy and adaptive change, risk and crisis communication and behavioural change. Peter is also is an Adjunct Professor at Macquarie University's Department of International Communication, and directs the Centre for Leadership which works with the public, private and not-for-profit sectors on communication strategy and practice. Peter's role in the research will be to ensure that there is a direct link between the research design and findings, and application into ANZSOG Managing Public Communications Executive Workshop.
(http://centreforleadership.com/about/who-are-we/)

Appendix One – An overview of some Social Machines (from www.sociam.org/social-machines)

Social Machine	Description	Input	Human Computational Elements	Mediative Elements
Collabmap www.collabmap.org	The platform crowdsources the task of identifying building evacuation routes to a large number of users, by offering them freely available data, such as satellite imagery (e.g. Google Maps), panoramic views (e.g. Google Streetview) and building shapes to carry out this task.	• Satellite imagery, panoramic views, building shapes	Users infer evacuation routes based upon visible features and draw them on the map	Provides mechanism of specifying how users correct each other? Are there elements of reward?
Crime Reports www.crimereports.com	Crimereports.com is commercial service providing a visualisation / mapping platform established to both allow police authorities to make crime data about neighbourhoods accessible to the public, and to allow members of the public to submit tips about crimes in their area	• Police authorities: crime incidents, (fire, police) traffic, quality of life metrics (deprivation indices), other emergencies • Users: 'tips' about crimes Outputs/benefits: • direct: Tips about crimes solicited from citizens • indirect : greater awareness of crimes going on, greater public safety	Users provide tips/insight about crimes, which are fed back to the authorities	Visualisation facilities and organizes crimes geographically and by type/severity Perceived problems : In order to protect the privacy of members of the public and accused offenders prior to conviction, crime information goes through a dramatic redaction / anonymisation process which has been perceived by some to reduce the usefulness of this data
delicious www.delicious.com	A social bookmarking web service for storing, sharing, and discovering web bookmarks	• Primary - 1. Web site links, submitted either directly via the web site or through browser Bookmarklets. • Secondary - Each link submitted can be annotated with a textual description and a set of tags. Delicious pioneered work with folksonomies with their interface that suggested tags based on heuristics similarity to others' bookmarks	Humans bookmark, categorize and comment	Easy bookmarking (through bookmarklets) Tag suggestion (via tag prediction algorithm)

eBay www.ebay.com	Provides an online auction model, with internet users as buyers and sellers and eBay acting as the auction house	• Seller promises in the form of listings; • Buyer/Seller communications, both before and after commitment to buy. • Sellers' fulfilment of those promises, as perceived by the buyers, in the form of feedback	Anything requiring judgement. eBay from time to time adjusts the feedback mechanism to draw particular attention to certain elements of a seller's performance, in order to further improve the customer experience.	In addition to raw feedback, the system also provides aggregated feedback in the form of simple numeric scores and even coloured logos. Can automatically remove sellers with consistently poor feedback
Fix My Street www.fixmystreet.org	A website through which users can report potholes, broken street lights and similar problems with streets and roads to their local council or related organisation, and see what reports have already been made	Notification of "things requiring attention"	Data relating to problem	Provides geo-contextualised and temporally filtered list of reported incidents and things, visualised on a map for easy consumption
Foursquare https://foursquare.com	A location-based social networking website for mobile devices, such as smartphones	Users 'check in' at venues using a mobile website, text messaging or a device-specific application by selecting from a list of venues the application locates nearby.	Location is based on GPS hardware in the mobile device or network location provided by the application, and the map is based on data from the OpenStreetMap project.	Each check-in awards the user points and sometimes 'badges', impetus to continue 'playing'
Flickr www.flickr.com	An image hosting and video hosting website, web services suite, and online community that was created by Ludicorp in 2004 and acquired by Yahoo! in 2005. In addition to being a popular website for users to share and embed personal photographs, the service is widely used by bloggers to host images that they embed in blogs and social media.	• Photos (some of which are geo-tagged with EXIF data) • Tags for photos	Users tag the photos they upload	Users are encouraged to tag and license their photos, and a variety of beautiful presentation schemes are provided. Flickr was one of the first sites to integrate Creative Commons licensing into their site, allowing people to license their photos (if they wanted) for use under a variety of different CC-based schemes.
LinkedIn www.linkedin.com	A social networking website for people in professional occupations. Founded in December 2002 and launched on May 5, 2003, it is mainly used for professional networking. As of September 2013, LinkedIn reported more than 225 million registered users in more	• Users: Social network profiles, personal information, contribution of information to user-formed interest groups • Employers: Descriptions and lists of jobs • Hiring Managers: Profile for allowing users to identify hiring	Recommendation systems for endorsements and gathering additional input.	Matching technologies which suggest relationships and 'degrees of separation'. Viewing information in paid versions.

	than 200 countries and territories.	tracks • Companies: Profiles		
Mechanical Turk www.mturk.com	Amazon's 'crowdsourcing' internet marketplace that enables individuals or businesses (known as Requesters) to co-ordinate the use of human intelligence to perform tasks that computers are currently unable to do.	• The Requesters are able to post tasks known as HITs (Human Intelligence Tasks), such as choosing the best among several photographs of a store-front, writing product descriptions, or identifying performers on music CDs. • Workers (called Providers in Mechanical Turk's Terms of Service, or, more colloquially, Turkers) can then browse among existing tasks and complete them for a monetary payment set by the Requester. • To place HITs, the requesting programs use an open Application Programming Interface, or the more limited MTurk Requester site. • Requesters are restricted to US-based entities	Human input into tasks with expertise, creativity and knowledge	Matching of Workers to Tasks, collation of solutions, facilitation of rewards
ReCAPTCHA www.recaptcha.com	Asks users to enter words seen in distorted text images onscreen. By presenting two words it both protects websites from bots attempting to access restricted areas and helps digitise the text of books.	• Pieces of text from printed books which are undecipherable	Humans perceive letters and numbers on pages and input solutions via typed units	Human input verifies the words, which are confirmed in the system. Links to determining whether user is a human or a computer program.
Ushahidi www.ushahidi.com	A non-profit tech company that specializes in developing free and open source software for information collection, visualization and interactive mapping. Originally an online system for the collaboration of Kenyan citizen journalists during a time of crisis, the original website was used to map incidents of violence and	• Humans upload data such as GPS locations, photos, videos, other information via mobile devices	Data is collated and presented back to users who then correct, amend and amplify	Humans utilise data to deliver physical resources as required, and link to logistics and emergency services

	peace efforts throughout the country based on reports submitted via the web and mobile phones. Is now used in crisis situations such as Haiti earthquake, Christchurch earthquake.			
Zooniverse www.zooniverse.com	Galaxy Zoo is an online astronomy project which invites people to assist in the morphological classification of large numbers of galaxies . It is an example of citizen science as it enlists the help of members of the public to help in scientific research. An improved version— Galaxy Zoo 2 —went live on 17 February 2009.	• By researchers: data from Hubble Space Telescope, Sloan Digital Sky Survey and the Apache Point Observatory	By players: 'Rounds' corresponding to solutions to the feature identification problem	Input from players is ranked according to player performance and consistency with other players; highest scoring and novel solutions are verified by scientists Accomplishments: More than 20 papers have resulted from GalaxyZoo/Zooniverse player participation.

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