the Australia and New Zealand
School of Government

Government as a Social Machine
The implications of government as a "social machine" for making and implementing market-based policy

Report 2:
The Machines

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Acknowledgements

This research (Reports 1 and 2) is the culmination of thoughts and ideas that Peter Thompson and I have developed over the past four years teaching ANZSOG's *Managing Public Communications* executive workshop.

What Peter and I have seen, time and again, is the need to help public sector managers understand not just what 'eGovernment' *does* (i.e. how the internet and the Web are impacting on the systems and processes of 21st century democratic societies) but what 'eGovernment' *is* and how it works. We believe that at the core is the need to develop a 'digital literacy'[1] in order to effectively and critically navigate, evaluate and create information using a range of digital technologies.

Our first major activity was a one day workshop hosted by ANZSOG in April 2012, which was attended by some of the leading Australian and New Zealand thinkers in the 'eGovernment' space. This meeting explored possible options for ANZSOG to develop and deliver educational programs in the digital space, and this research is but a first step, particularly in its attempt to connect emerging research with the necessities of practice.

Since then we have connected with the SOCIAM[2] Research project, which has both informed our thinking, but also provided us with a forum to present our ideas, and to ensure that they are contextualised within the global context.

I would like to thank the ANZSOG Research Committee for supporting this project, and Sophie Yates in particular, for her ongoing support and infectious enthusiasm. I would also like to thank Peter Thompson and Peter Debus, who have patiently and unfailingly listened to my ideas about the need to educate people about the digital economy, and helped to find ways to connect these to teaching opportunities. I would like to thank Michael Vitale and Valentina Cardo for their contributions to these reports and their stimulating questions and commentary.

There are also a number of other people who have given their time and contributed their ideas to this work:

- Leanne Fry, Chief Information Officer, Fair Work Ombudsman;
- Aron Hausler, Senior Strategist - Strategy and Innovation, Office of the Chief Information Officer, Government of South Australia;
- Tim Mares, Director, Strategic Policy & Economics, DMITRE, Government of South Australia;
- Craig Thomler, Managing Director at Delib Australia, Director at Social Media Planner, Government 2.0 Advocate at eGovAU;
- Janet Tyson, ANZSOG Case Writer/Editor; and
- Pia Waugh, Director Coordination and Gov 2.0, Working for the Australian Government Chief Technology Officer & Procurement Coordinator, Technology & Procurement Division, Department of Finance.

Much of the thinking in this research has been influenced by the emerging discipline of 'Web Science', and in particular I would like to thank:

- Dame Wendy Hall, Professor of Computer Science, Dean of the Faculty of Physical Science and Engineering, University of Southampton;

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[1] This term is explored later in the report.
[2] www.sociam.org, viewed 20 February, 2014.

- Dr Thanassis Tiropanis, Senior Lecturer at the University of Southampton (Sociam and Web Observatory); and
- Ramine Tinati, Faculty of Physical Sciences and Engineering, University of Southampton (Sociam and Web Observatory), all of whom have contributed to it.

The development of the Web is still in its infancy, as is any notion of how governments around the world are beginning to work with it as a powerful tool for democracy. Hopefully this research will add to our understanding of the possibilities and opportunities that the Web is enabling, but also create conversations amongst practitioners who are at the forefront creating the change.

Anni Rowland-Campbell
Sydney, March 2014

Introduction

> *I'll send you a presentation I did a month or so ago. It's pretty old now, but you'll get the general idea.*

So said a senior government officer when discussing the work being done in Australia on Open Data and the Digital Economy.

Life in the digital world moves very quickly, and therefore any research or report attempting to document developments in the digital information space will itself be quickly out-dated as regards any specific examples or findings.

As The Economist states in its recent article asking "What's wrong with Democracy?":

> *One reason why so many democratic experiments have failed recently is that they put too much emphasis on elections and too little on the other essential features of democracy. The power of the state needs to be checked and individual rights such as freedom of speech and freedom to organise must be guaranteed. The combination of globalisation and the digital revolution has made some of democracy's most cherished institutions look outdated. Established democracies need to update their own political systems.* [3]

This 'digital revolution' is radically changing business processes, social relationships and the dynamics of political power. The value of research is to document some of what we see around us, and to connect with others who are also adding to the knowledge base and who come from different, but complementary, perspectives. This research project attempts to do just that. Much of the thinking in this report has been influenced by the work of two key groups: the SOCIAM researchers at the University of Southampton, and some key individuals who are working within government agencies in the UK, Australia, and New Zealand, who are themselves grappling with the challenges of working with digital information platforms, systems and processes.

eGovernment and the Social Machine – works in progress

In our previous ANZSOG Research paper (Vitale et al. 2013) we gave an overview of the evolution of 'electronic', or 'digital', government over the past 30 years.

eGovernment may be defined as "digital interactions between citizens and government" and consists of "governance, information and communication technology, business process re-engineering, and e-citizen at all levels of government".[4] eGovernment itself arose largely in response to technical developments in the computing and information sciences, and these developments have now culminated in the concept of the 'social machine'. Tim Berners-Lee, inventor of the World Wide Web, originally conceived a social machine as a socio-technical system within which "*the humans do the creative work and the machines do the administration*" (Berners-Lee 1999).

As with all new concepts, the definition of the social machine is continuously evolving. Given that the term emanates from the new field of Web Science (which is now defining itself as

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[3] The Economist (2014) "What's gone wrong with democracy?", 1 March. http://www.economist.com/news/essays/21596796-democracy-was-most-successful-political-idea-20th-century-why-has-it-run-trouble-and-what-can-be-do.

[4] http://en.wikipedia.org/wiki/E-Government, viewed 3rd March, 2014.

"the theory and practice of social machines"),[5] the social machine brings together both computer and social science perspectives and, as such, is a hybrid concept that will be approached numerous ways, from differing perspectives and different definitions.[6]

It is important to note these changing definitions (see Appendix Three) because this research is based on models that are still very new, and even the language to describe it is evolving. Our main focus is to identify and describe a number of social machines that we see operating in, and around, the government (or governance) context, in order to explore how these socio-technical systems are impacting on, and supporting, the evolution of eGovernment itself.

The changing context of 'governance'

> *Government 2.0 is about using the new opportunities presented by Web 2.0 technical and social methodologies to achieve even more openness in government. It encapsulates next generation models for government processes including online consultation processes, realtime citizen engagement, empowerment and follow-up, a shift in government services delivery to be more citizen-centric, facilitating public and private innovation through open and permissive access to useful government data (such as maps, RSS feeds for council news, public facilities) and much more.[7]*

As we stated in our first report, 'Gov 2.0' is about much more than the utilisation of technical tools – it is really about the reinvention of government itself.[8] Prior to the age of digital information, governments used information that they collected in order to develop policy and to determine citizen needs, and the pace of change was much slower. Now, with the concept of Gov 2.0, both the pace and sources of information are changing, and this is enabling, and indeed demanding, that fundamental questions be asked about role of the state and of all other entities within the socio-political ecosystem. And it all starts with data in digital form.

Digital by default

(Zuboff and Maxmin 2002) describe nine characteristics of information in digital form that completely change the way that data is captured, curated, managed and shared, as distinct from data in analogue (or physical) form.

According to Zuboff and Maxmin (2002), 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 coordinates 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;

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[5] Notes from Web Science Trust Board meeting, 3rd February, 2014, attended by Anni Rowland-Campbell.

[6] This can be seen from work resulting from the SOCIAM project, www.sociam.org, viewed 3 February, 2014.

[7] Waugh, P. (2009) "Gov 2.0: where to begin". http://pipka.org/2009/07/08/gov-2-0-where-to-begin-part-1-of-3/, viewed 28 February, 2014

[8] Rowland-Campbell, A. (2012) "Gov 2.0 as a mindset of reinvention   and opportunity". http://intersticia.com/blog/?p=751.

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.

Each of these characteristics influences the way that data and information are created and used, and has consequences for all organisational processes and governance.

A number of governments around the world are now pushing for the creation of data in digital form as a default. This is facilitated by using the Web, and the technical systems that underpin it, and by reinventing business processes utilising digital information processes, rather than analogue (or physical) ones. This then leads to the creation of huge amounts of public data, much of which is anonymised and can be openly shared.

www.data.gov.au is just one of a number of 'open data' portals[9] that "provides an easy way to find, access and reuse public datasets from the Australian Government and state and territory governments" and aims "to encourage public access to and reuse of government data by providing it in useful formats and under open licences." www.data.gov.au represents the Australian government's response to the 2010 *Declaration of Open Government* (Tanner 16th July, 2010) and the *Government 2.0 Taskforce Report*.[10] The importance of opening up public data sets cannot be underestimated, because once data is in digital form it has many properties that change the way that it can be created, managed, used and shared. Open data combined with online citizen engagement leads to a much greater ability to develop and deliver citizen-centric services, and the more open data and online engagement there is, the better targeted those services can be. This is what is driving a fundamental reform in the ways that governments do business, because:

- governments can more easily access data and aggregate services around priorities;
- businesses can use these data to create new products and services; and
- citizens can more easily interact with government agencies and hold them to account.

The key objectives for democracies that are embracing digital information systems are very simply:

1. To promote transparency and accountability in order to facilitate democracy;
2. To ensure more efficient government systems and processes; and
3. To ensure more effective government through delivering social and economic public benefit.[11]

Those governments that are doing this most successfully are embracing new socio-technical systems that employ open and linked data, and integrate it into core business processes from the ground up. In many cases what they are doing is developing, or at least using, social machines.

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[9] See also www.data.gov.uk and www.data.gov. More information on global open data initiatives can be found at http://globalopendatainitiative.org and the Open Data Institute (http://theodi.org).
[10] This can be found at http://gov2.net.au/report/.
[11] Waugh, P. (2014) "Open – Big – Linked Data: Enabling better policy, services and cost efficiency in Government", presentation, March.

Social Machines in action

There are many examples of socio-technical systems that may initially be thought to be social machines, but, upon further analysis, are more accurately 'social media' and not necessarily 'social machines'.

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.

A social machine refers to the processes themselves, which are both social and technical, and many social media platforms, such as Twitter, Facebook, LinkedIn and others, are early social machines. The evolution will be in the increasing interoperability between these platforms to enable sharing and a much more open and dynamic system, and to bring together data gathered from multiple sources generated by people in different contexts to focus on a common problem or need.

Taking these distinctions into account, we have identified a number of social machines that have been (and some of which are still) utilised by local, state and federal governments in both Australia and New Zealand.

1. Canterbury Earthquake and Christchurch Recovery - http://eq.org.nz/
2. Country Fire Authority, Victoria - http://www.cfa.vic.gov.au/plan-prepare/fireready-app/
3. Future Melbourne - www.futuremelbourne.com.au
4. Neatstreets - http://www.neatstreets.com.au/
5. 'RealMe' Service, New Zealand - https://www.realme.govt.nz/about-realme/
6. YourSay SA - http://saplan.org.au/yoursay/sa-connected
7. Weather Observations Website - http://bom-wow.metoffice.gov.uk/

We analyse how each of these government initiatives are defined as 'social machines' in Appendix One, and we describe the context within which they were created in Appendix Two.

For the purposes of our research questions, we will use Zuboff and Maxmin's (2002) framework to match the seven social machines identified with the key characteristics of digital information.

Each of these characteristics has an impact on the relationship between government and citizen, the efficiency and effectiveness of government business processes, and the potential social benefits.

Social Machine	1	2	3	4	5	6	7
Global transparency	✔		✔	✔	✔	✔	✔
Accountability & Responsibility	✔		✔	✔	✔	✔	
Better business practices	✔	✔	✔	✔	✔	✔	
Enables dealing with complexity			✔			✔	
Comprehensive understanding through collaboration, distributed learning and customisation	✔		✔			✔	✔
Immediacy	✔	✔	✔	✔	✔		✔
Infinite plasticity			✔				✔
Kaleidoscopic supply chain relationships	✔	✔					✔
Ubiquity	✔			✔			

Table 1: Social Machines against key characteristics of digital information

In the table below we look at each of the seven social machines against the three objectives that are driving governments to embrace digital information systems: transparency, efficiency and effectiveness.

Social Machine	Transparency	Efficiency	Effectiveness
Canterbury Earthquake and Christchurch Recovery http://eq.org.nz/		Rapid communication of crucial information via website	Delivery of critical information to citizens and civil defence during earthquake crisis
Country Fire Authority http://www.cfa.vic.gov.au/plan-prepare/fireready-app/		System mediates between user input and targeted information	Most up to date fire warnings and information targeted to geolocation
Future Melbourne www.futuremelbourne.com.au	Process of government consultation regarding the development of the city is open for all to participate in and view online	Gathering of citizen input via wiki that can then easily be displayed and published	Utilisation of wiki as a platform to elicit input and facilitate forums and conversations
Neatstreets http://www.neatstreets.com.au/		Real time input of information and expectation by citizens of rapid response and solution	Utilisation of citizen data in order to inform Councils, Utilities etc. of problems on streets with infrastructure
'RealMe' https://www.realme.govt.nz/about-realme/		Should lead to major reduction in costs in terms of dealing with various government departments, and facilitation of inter-governmental business processes	Citizen interaction with key government departments facilitated by their own validation and certification. Should lead to greater utilisation of citizen data across agencies
Your Say SA http://saplan.org.au/yoursay/sa-connected	Openness of consultation processes and feedback with detailed responses to suggestions and incorporation into plan. In addition should lead to accountabilities through reporting mechanisms online	Capturing of large amounts of public data and facilitation of publication and discussion online	Utilisation of online platforms in order to elicit citizen input and feedback as to Strategic Planning process
Weather Observations Website http://bom-wow.metoffice.gov.uk/		Real time images and additional information that adds to both Met Office and BOM data both historically and real-time	Utilisation of citizen data across the world in terms of uploading images and commentary

Table 2: Social Machines and Business Processes

Each of these social machines brings together communities of people working with Web-based systems in order to facilitate processes that lead to specific outcomes, some of which might be short-term (as in consultation around a strategy or plan, or response to an emergency), and some that might become part of the fabric of citizen and government interaction.

Discussion

We gave ourselves the challenge of addressing three key questions with regard to considering Government as a 'social machine':

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

The table below gives an initial response to these questions for each of the social machines identified.

In each case the relationship between citizens and governments is mediated by the social machine, and in each case the level of trust required in relation to providing accurate information is a key characteristic – on both sides. Governments are relying on the accuracy of citizen (or business and community) information, and citizens are relying on the accuracy of government information. The system itself is mediating the relationship, and doing so in a transparent and effective way.

The challenges in each case differ, but in all cases it is the integrity of the information that ensures the continued use of the machine, and the motivation of the human participants to continue to interact with it. This is a key component of social machines. They must continually be 'fed' data by human interaction, and when the particular need no longer exists (as with the Christchurch earthquake), the machine can be mothballed until it is required at a later date. This in itself is a challenge, but also adds to efficiencies, as all that is required is a web page and some back end data storage, and the machine can be brought back online very easily when required.

In all cases identified here, government agencies have embraced the potential of social machines in order not just to *communicate* with key stakeholders, but to *actively engage* with them in a dialogue and elicit their input and collaboration. As a result they have sometimes collaborated with external organisations and handed over some of the core functions to those services (Neatstreet), or they have developed in-house systems that have enabled the socio-technical processes.

Some of these social machines have arisen from within the community (Christchurch recovery), some have been the result of entrepreneurial business ideas (Neatstreet), and some sit at the core of government consultative processes.

What is fundamental is the willingness of government to embrace the opportunities afforded by partnering with other players in 'the market', and collaboratively adopt a new mechanism to approach solving some fundamental problems.

Social Machine	Citizen interaction	Key challenges	Response
Canterbury Earthquake and Christchurch Recovery http://eq.org.nz/	Citizens responding to their own needs, without waiting for Government	Government-citizen relationship disintermediated	Government needs to focus more on citizen needs than on traditional processes, particularly in emergency situations
Country Fire Authority http://www.cfa.vic.gov.au/plan-prepare/fireready-app/	Citizens relying on reliable information, and adding their own data with photos	For government agencies to ensure data and information is accurate, reliable and timely	Government agencies need to utilise latest technologies to keep up with citizen requirements
Future Melbourne www.futuremelbourne.com.au	Citizens willingly providing their feedback and ideas	For government to listen, analyse and incorporate citizen input and suggestions	Presentation of information back to citizens, and then the incorporation of it into planning and tangible benefits
Neatstreets http://www.neatstreets.com.au/	Citizens providing real-time on the street information to a variety of agencies through the application. Feedback to citizens creating expectations of agencies	To ensure that information is timely, reliable and actionable	Managing the risk of a mediated response across multiple agencies, and ensuring problems are acted on quickly, then feedback to citizens
'RealMe' https://www.realme.govt.nz/about-realme/	Citizens providing truthful and reliable information and supporting this with physical evidence	To ensure that information is properly shared across departments, is up to date and accurate, and that departments then make citizen interaction easier and more seamless	Government agencies need to ensure that their own 'back end' processes are working efficiently and that they meet citizen expectations in terms of benefits of the system
Your Say SA http://saplan.org.au/yoursay/sa-connected	Citizens willingly providing their feedback and ideas	For government to listen, analyse and incorporate citizen input and suggestions	Presentation of information back to citizens, and then the incorporation of it into state planning and tangible benefits
Weather Observations Website http://bom-wow.metoffice.gov.uk/	Citizens from across the globe providing data and input	To transform the data into meaningful information presented in a way that ensures continuing participation by citizens	Continual updating of technologies and co-operation between Met Office and BOM. Expansion into other jurisdictions and other services

Table 3: Social Machines and Government reinvention

Links to ANZSOG teaching

Initially this project sought to identify and examine a number of social machines in order to create some scenarios with which to teach students. The analysis above should be considered not with the specific social machines in mind, but rather with the scenarios that resulted in the social machines being created to serve a specific purpose and/or meet a specific need.

During our teaching of *Managing Public Communications* (MPC) in 2013 it became obvious that the concept of the 'social machine' was one that resonated with participants, who found it easy to understand. A number of examples, particularly around community consultation, were presented in class discussion, and in each case, it was useful to clarify the business need, the community response, and then the technology platform (machine or medium) that was employed. The learning came through considering resulting socio-political challenges government agencies then faced as a result.

When information was only available in analogue (or physical) form, governments used whatever systems were available to communicate, and much of this was unidirectional, stereotyped and based on generic data. What has changed in the world of digital interaction technologies is that multi-channel and multi-directional communication is at the centre of all relationships, and governments need to embrace this and become much more transparent, effective and efficient at engaging with citizens and communities in order to develop policy, and then equally transparent, effective and efficient at the resulting service delivery.

What has been clear to us over the past four years as we have delivered MPC as a program is the growing awareness of social media as a communication tool, but not necessarily an awareness of the fundamentals of the data or digital information that underpin it. This is where Zuboff's nine characteristics of digital information become important, because it is through understanding these characteristics, and being able to extrapolate the potential socio-political consequences, that the broader implications become clear. From this, better social machines can be developed and used.

Following the invention of the printing press, and the gradual expansion of the printed word, it became necessary for people to learn to read and write as a basic social skill. As information is increasingly created, shared, managed and archived in digital form, many are coming to believe that it is now necessary to bring the skills of 'literacy' (the ability to read for knowledge, write coherently and think critically about the written work) together with the ability to understand the symbolic representation of data in digital form. This is combination is known as 'digital literacy'.[12]

According to the British Computer Society:

> *Employers increasingly require validation of digital literacy skills and employability can depend on it.*[13]

It is now a fact that:

- Digital literacy is required in 77% of all employment
- Digital literacy is expected to be required in 90% of all employment by 2015
- Employability for graduates increasingly requires a broad range of digital literacy skills
- Employers expect graduates to be able to communicate using digital media.[14]

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[12] http://en.wikipedia.org/wiki/Digital_literacy, viewed 20 February, 2014.
[13] http://www.bcs.org/category/17854, viewed 20 February, 2014.

In addition it has recently been announced that in the UK digital literacy will be taught in schools,[15] and all organisations are beginning to compete heavily for people with digital skills, particularly in the public sector.[16]

As the push for 'digital by default' increases within government information processes around the world, the need to understand and utilise information in digital form will increase not only as a fundamental driver of current business processes, but as a source for innovation and new services (Brynjolfsson and Mcafee 2014).

Conclusion

In this report we have given an overview of the evolving concept of the 'social machine' and begun to link its use with the development of new ways that government agencies are approaching some of the fundamental problems of governance, in particular the need for transparency and accountability, more effective and efficient delivery of government services, and the creation of overall benefits to society.

In his 2011 Lecture to the British Council, internet technologist and advisor to the British government on digital information Ben Hammersley announced that

> *We are right now at this moment in the middle of something which will define humanity for the next couple of centuries.*[17]

He gave an overview of the development of government and political systems in Britain over the past century, and categorically stated that

> *What Alvin Toffler in the 70s called future shock we can now see as being the result of people having the wrong cognitive frameworks.   We are facing a generational gap where the people in charge don't even know that they don't know what is going on.   if we want to prosper in this new age   where culture can travel around the planet at the speed of the Internet   then we have to have a ruling class, and a ruling elite, who understand that.*

This notion of 'not knowing' is one that we have seen numerous times in workshops, seminars and conferences on 'social' technologies, and people looking for easy answers to the challenge of dealing with the effects and outcomes of information in digital form.

As the leading educational institution working to develop Australia's future leaders in the public sector, ANZSOG has a unique opportunity to embrace Hammersley's challenge: to assist the current generation of leaders to more fully understand the digital world and, with them, to groom the next generation who can then build these foundations to ensure that Australia is at the forefront of the digital prosperity.

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[14] Ibid

[15] http://www.bbc.co.uk/news/education-25842199, viewed 15 February, 2014

[16] http://www.theguardian.com/public-leaders-network/2014/jan/08/digital-whitehall-skills-public-sector, viewed 30 January, 2014

[17] Ben Hammersley "The Internet of People", 2011 Annual Lecture to the British Council, http://blog.britishcouncil.org/2011/03/28/annual-lecture-2011/, viewed 12 February, 2014.

Research Team

Anni Rowland-Campbell

Anni Rowland-Campbell is Director of Intersticia, a research consultancy that 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 Institute of Public Administration (IPAA), and has served on numerous State and Federal Government Boards and Committees. Anni is currently undertaking a PhD through the Deakin Graduate School of Business 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. Her 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

Michael Vitale

Professor Michael Vitale is the Director at the Monash Asia Pacific Centre for Science and Wealth Creation and focuses his teaching, research, and consulting on commercialisation of innovation. Previously Michael had a joint professorial appointment at the Melbourne Business School and ANZSOG. At MBS, he was the director of the innovation research program. Michael's expertise in the Management of Information Technologies is crucial for this research, particularly in understanding how new Web based services are being developed through innovative approaches to development and commercialisation.

http://www.monash.edu.au/research/swc/about/people.html

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 that investigates the links between women's activism and the new media. Valentina's expertise in how lobby groups utilise new media technologies has helped the team more fully understand how governments can engage these groups to both provide better services. She has also engaged directly with the New Zealand government as part of the investigation into the response to the Christchurch earthquake.

http://www.artsfaculty.auckland.ac.nz/staff/?UPI=vcar206

Peter Thompson

Peter Thompson is a Fellow of ANZSOG, 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 is to ensure that there is a direct link between the research design and findings, and application to ANZSOG's *Managing Public Communications* Executive Workshop.

http://centreforleadership.com/about/who-are-we/

Appendix One – Australian and New Zealand Social Machines

Social Machine	Description	Input	Human Computational Elements	Mediative Elements
Canterbury Earthquake http://canterburyearthquake.org.nz/ Christchurch Recovery http://eq.org.nz/	Online platform that enabled citizens to upload information relating to the location of people, accommodation, civil defence, and critical services during the New Zealand earthquakes	Citizens uploaded operational and lifeline information. Civil defence, businesses, and authorities updated information as it came to hand.	Open Data Ninjas utilised the Ushahidi platform in order to mediate real-time information during time of crisis.	Platform provided real-time information back to citizens who updated it in as near to real-time as possible.
Country Fire Authority (CFA) Fire Ready http://www.cfa.vic.gov.au/plan-prepare/fireready-app/	Official Victorian Government app for CFA, MFB and DEPI bushfire warnings and information.	Citizens utilise App with their GPS location to receive most up to date and relevant fire warnings. Can upload photos to inform State Command Centre and influence resourcing of emergency situations.	Fire Authorities receive information and system processes according to risk.	Mediation between user input and information of authorities in order to provide most up to date warnings targeted to location.
Future Melbourne www.futuremelbourne.com.au Powered by Collabforge	The first government in Australia to utilise a wiki platform for public consultation and collaboration in the development of the City of Melbourne to 2020 and beyond. "A city plan that anyone can edit."	Human input to the wiki platform so that people can directly engage and participate with the content in the plan, and to collaborate with other users and City of Melbourne staff. The wiki was used in conjunction with other consultative media such as interviews, forums, workshops,	Participants are able to directly add their own ideas to the document at the location they feel is most appropriate. A built-in history function saves and archives a new version of the document each time an edit or change is made.	Heavily influenced by the standards and procedures developed by Wikipedia leveraging the technical functions of the wiki environment and dynamic.

Neatstreets http://www.neatstreets.com.au/ Powered by Pepperstack	Online public report-management system in Australia and New Zealand that has been evolving since its launch in January 2010.	Human input via App (iPhone, Windows, Android) of broken streetlights, sagging power lines, flood damage, hazards, obstructions, litter, lost trolleys. 382 Authorities participating.	Reports mediated through relationships with Local Government Authorities, State Government, Utility Providers and Supermarket Chains. Report back to human when problem is fixed.	Mediation between input of data from human participant to agency, then report back to human via websites www.neatstreets.com.au or www.neatstreets.co.nz.
'RealMe' Service, https://www.realme.govt.nz/about-realme/ http://ict.govt.nz/common-capabilities/business-processes-and-integration/the-realme-service/	Initiative of the NZ Department of Internal Affairs and NZ Post. Allows people to access a number of different participating online services with just one username and password. Also allows people who have completed a high confidence verification process to provide information about themselves online and from this the NZ Government to utilise this information across departments.	Citizens upload data from Passport combined with certified photographs (taken at Post Office). Citizens can then upload and update personal information.	System functions across a number of government departments to allow access to government services.	System analyses data from users across departments together with feedback and results.
Your Say SA http://saplan.org.au/yoursay/sa-connected	Utilisation of online platform to enable citizens to provide input and feedback about the development of South Australia's Strategic Plan.	Citizens uploaded information relating to the development of strategic plan. Reporting data published on website, and the plan is continuously updated.	Information fed back to the Offices of Premier and Relevant Departments. Targets set and then clear measurements published on website in terms of targets achieved.	Mediation between input data and publication of results against targets.
Weather Observations Website http://bom-wow.metoffice.gov.uk/	A collaboration between the UK Met Office and Australian Bureau of Meteorology to enable citizens to Australians may easily lodge and share weather observations, information and photos.	Citizens can view and contribute historic, real-time or automated weather observations, sightings and weather snaps, or simply send in a quick report via	Images and information is collated and presented via website.	Some compatible Automatic Weather Station software systems to upload files. Automatic detection of location attached to data.

Table 4: Australian and New Zealand Social Machines

Appendix Two – Social machines in context

Social Machine	Need being met	Community	Technology Platform	Risk and Sustainability
Canterbury Earthquake http://canterburyearthquake.org.nz/ Christchurch Recovery http://eq.org.nz/	Resource for both citizen and civil defence in crisis of earthquake	Citizens of Canterbury and Christchurch	Ushahidi	Open source, platform 'mothballed' but can be resurrected quickly. Relies on volunteers with some data programming skills.
Country Fire Authority (CFA) Fire Ready http://www.cfa.vic.gov.au/plan-prepare/fireready-app/	Resource for both citizens and fire authorities, police and local government in times of fire emergency	Driven by CFA but linking in with other emergency services	Development of App by CFA	Maintenance of App and ancillary web-based systems
Future Melbourne www.futuremelbourne.com.au Powered by Collabforge	Need to consult citizens on development of city plan	Citizens of Melbourne, businesses and Local Government	Collabforge utilisation of wiki	Relationship between Collabforge and Future Melbourne may be transient but this may not be important after consultation is finished
Neatstreets http://www.neatstreets.com.au/ Powered by Pepperstack	Local community desires to keep streets neat and tidy	Citizens of local communities who make reports, and Local Authorities and Utilities who respond	Pepperstack is a small open source start-up	Third party platform that collects data, and maintains platform
'RealMe' Service, https://www.realme.govt.nz/about-realme/ http://ict.govt.nz/common-capabilities/business-processes-and-integration/the-realme-service/	Need to streamline interactions between citizens and government	New Zealand citizens, and New Zealand government	ICT Government platform	Maintenance of skills within ICT NZ
Your Say SA http://saplan.org.au/yoursay/sa-connected	Need to consult citizens on development of state plan	Citizens of South Australia, businesses and State Government	SA Government platform	Maintenance of skills within SA Government
Weather Observations Website http://bom-wow.metoffice.gov.uk/	Sharing of information by those interested in meteorological science	Weather watchers and meteorologists	Developed by Met Office	Maintenance of skills within Met Office and BOM

Table 5: Social Machines in context

Appendix Three – Theoretical underpinnings

Social machines can be characterised as

> *the interaction of individual action and co-ordination, mediated and enabled by the "shared communication substrate of the Web".[18]*

According to a McKinsey report (Manyika et al. 2013), most of the current disruptive technologies are those where:

(i)   Humans are augmented with technology;
(ii)   Technology directly replaces humans; and / or
(iii)   Humans and machines work alongside each other.

These technologies are maturing rapidly, enabled by the fact that:

(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.

The 'social machine' is just such a disruptive technology, and the research literature is slowly growing thanks to the work being done by the SOCIAM Project[19] and the Web Science Observatory.[20] As more and more work is being done, researchers are beginning to categorise, and more fully understand, the nature of the social machine and how it actually operates.

SOCIAM defines the social machine as a "socio-technical phenomenon where there is a new kind of emergent, collective problem solving" in which:

(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.

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

Social machines are not social media or social networks, they are much more than either of these, because of the very nature of the interdependence between the human participants and the underlying technological processes.

SOCIAM researchers have begun to grapple with this question themselves and have adopted the following definition:

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[18] www.sociam.org/about, viewed 3 May, 2013
[19] www.sociam.org, specifically http://www.sociam.org/publications, viewed 20 February, 2014
[20] http://www.sociam.org/content/updates-sociam-web-observatory and http://webscience.org/web-observatory/, viewed 20 February, 2014

> *Social machines are Web-based socio-technical systems in which the human and technological elements play the role of participant machinery with respect to the mechanistic realization of system-level processes (Smart et al. 2014).*

From a public policy point of view this definition sounds quite technologically deterministic, and from the socio-political perspective it could be useful to more fully understand the relationship between these systems and the socio-political context within which they exist. This will be influenced, but not determined, by the machines. The machines are catalysts for human action and platforms for human communication (as was seen with the use of Twitter during the Arab Spring, or Ushahidi during the Kenyan Revolution), but are not the action itself.

From this we therefore need to recognise that all 'machines',[21] be they social or otherwise, exist within ecosystems of people and environments that are emergent, dynamic and constantly changing.

> *One of the fascinating aspects of a Social Machine as an (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 (De Roure and Hooper 2013).*

If we revisit the Zuboff characteristics, we can begin to link the concept of social machines with the socio-political consequences of their use, and create a framework within which to analyse how they are impacting on government processes, both internally and within the broader community.

Each of these characteristics impacts on the relationship between the creators of information and the consumers, and thus influences the social aspects of the information exchange.

Characteristic	Transparency	Effectiveness/ Efficiency	Social Benefit
Global transparency	✔		✔
Accountability & Responsibility	✔		✔
Better business practices		✔	✔
Enables dealing with complexity		✔	✔
Comprehensive understanding through collaboration, distributed learning and customisation	✔	✔	✔
Immediacy		✔	
Infinite plasticity	✔	✔	
Kaleidoscopic supply chain relationships		✔	
Ubiquity			✔

Table 6: Characteristics of Digital Information aligned with Open Government Goals

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[21] A "machine" is a tool containing one or more parts that uses energy to perform an intended action, http://en.wikipedia.org/wiki/Machine, viewed 3 March, 2014

Drawing from this, and the SOCIAM work, we propose five characteristics of social machines:

1. **social machines are "bio-technologically hybrid systems",** and by virtue of this they are often able to extend the reach of both human and machine intelligence, supporting capabilities that less integrated systems might find difficult to accomplish. They do this by drawing on the distinctive capabilities of both humans and machines, and complement these with respect to the processes that are being realised;

2. **social machines are Web-based systems** leveraging the unique interface that the Web has as an embedded medium with the human social environment;

3. **social machines are systems that draw on the actions of multiple (human) individuals** that can facilitate decentralised analysis, draw in a broad range of abilities, skills, insights, perspectives, knowledge, geographical location, experiences, group membership, social position, and diversity, and exploit the so called 'wisdom of crowds' phenomenon;

4. **processes are central to any understanding of social machines** because they are the physical systems that perform, implement or realise such processes. These processes may be long or short-lived in duration, depending on the types of contributions made by the human participants, which may change over time;

5. **social machines are often concerned with processes that are relevant to the social interactions and relationships between individuals and the structure and dynamics of a group** of people.
   As such they may include: the coordination of collective action (e.g., implementations based on the Ushahidi platform); the pooling and distribution of resources (e.g., YouTube); the influencing of individual thoughts and actions (e.g., Twitter); the formation, maintenance, and dissolution of social relationships (e.g., Facebook); the collaborative creation of socially-shared assets (e.g., Wikipedia); and the social distribution of problem-solving processes (e.g., Galaxy Zoo). In general, the role of the machine or technological elements with respect to these processes is to constrain, control, coordinate or otherwise influence the social interactions between people (e.g., LinkedIn) or, alternatively, to govern the way in which individual human contributions are collectively factored into some other process (e.g., reCAPTCHA14) (Smart et al. 2014).

The fundamental aspect is that

> *we tend to discern a social machine when we can identify a Web-based socio-technical system that is involved in the realisation of processes associated with the performance of a particular task (Smart et al. 2014).*

This 'particular task' is often the catalyst that brings together a community with a need, and the systems that enable particular processes to solve that need. Whilst communities have always come together to solve needs, what is different with the social machine is

      (a) the speed with which the collective can form;
      (b) the global reach of that collective;
      (c) the ability to connect 'the crowd'.

There are differing layers that constitute the social machine ecosystem where there are human causes or groups (participants) who interact with specific services supported by

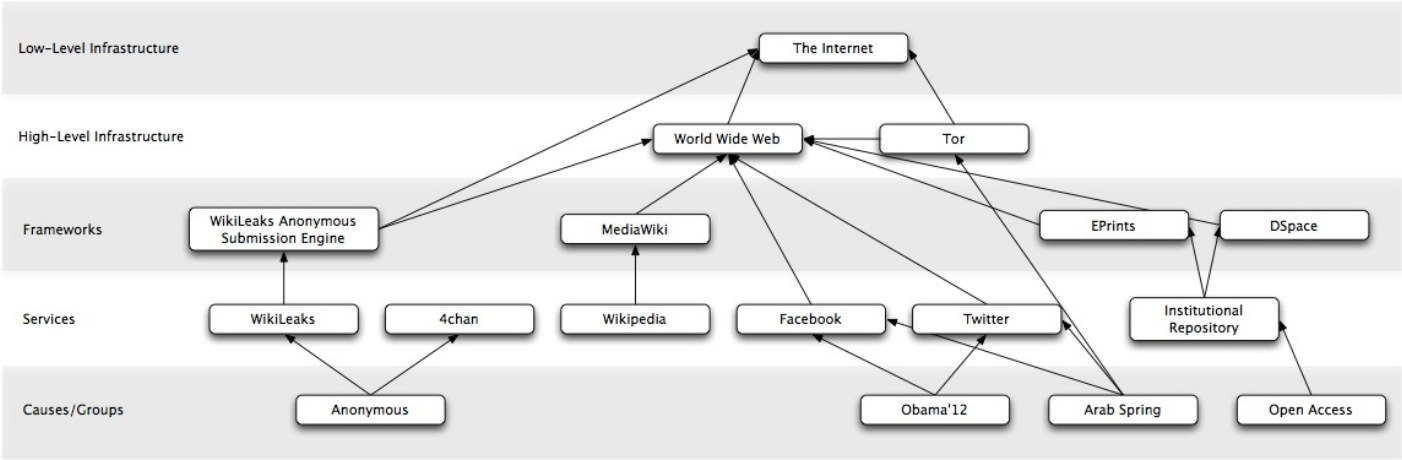technology frameworks and infrastructure in order to achieve certain outcomes (Shadbolt et al. 2013).

Figure 1: Overview of the technology and social ecosystems for a 'social machine'

Figure 1 identifies a number of social groups and causes (Anonymous, the Obama 2012 Campaign, the Arab Spring and the Open Access movement), and articulates the Web 2.0 services that they used to facilitate their campaigns. It is the Web based systems, in particular those with 'Web 2.0' or 'read/write' characteristics, that provide the core processes to facilitate the outcomes required, and this is as important for government as it is for social groups. It also highlights a crucial aspect of social machines – that they exist within, and are supported by, ecosystems.

In our first paper we suggested the idea that government itself could be considered as a social machine. However, taking all of the above into consideration, and bringing together the socio-political, as well as the socio-technical aspects, we see that a far better framework is that of government within a social machine ecosystem.

> *An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment. (D)efined by the network of interactions among organisms, and between organisms and their environment.*[22]

Government exists as a mechanism for collective action in order to fulfil citizen and community needs, and it does this by articulating societal values through policies and programs that rely on the currency of information. As such it is essentially a 'system' within an 'ecosystem', which operates through the interaction of citizen behaviours and administrative processes driven by the collection, curation and management of information.

In past eras the so called 'machinery of government' (Mills 1861) had characteristics that were determined by the properties of information in the physical world. As information becomes digital in format, government processes are slowly changing and adapting to the affordances of digital systems, but this is resulting in some fundamental changes in the relationships that exist, and an opportunity to challenge some of the established thinking around the role of 'The State'. The UK's *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"*; in essence, government in the digital age can, and should, be "reinvented" (Allan 2009).

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[22] Wikipedia, http://en.wikipedia.org/wiki/Ecosystem, viewed 12 February, 2014.

This is precisely what The Economist is calling for in relation to democracy within the digital age,[23] and because governments exist within ecosystems of people and organisations – who are themselves connected via digital interaction technologies[24] – governments can become *"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). In Australia this is translating into the notion of 'Government as an API'[25] where there is collaboration between systems, data and people in order to achieve outcomes.

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[23] The Economist (2014) "What's gone wrong with democracy?", 1 March. http://www.economist.com/news/essays/21596796-democracy-was-most-successful-political-idea-20th-century-why-has-it-run-trouble-and-what-can-be-do.

[24] These specifically refer to digital technologies that are "interactive", and therefore have a social component, between people and systems, and between the systems themselves.

[25] API – application programming interface - http://en.wikipedia.org/wiki/Api. Tim O'Reilly (2010) talked about "Government as a Platform". O'Reilly, T. (2010) "Government as a Platform." innovations **6**.It should be noted that an API is not a social machine, it is merely a constituent part.

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