Svenja Falk · Andrea Römmele
Michael Silverman *Editors*

Digital Government

Leveraging Innovation to Improve Public Sector Performance and Outcomes for Citizens

Springer

Digital Government

Svenja Falk • Andrea Römmele •
Michael Silverman
Editors

Digital Government

Leveraging Innovation to Improve Public Sector Performance and Outcomes for Citizens

Springer

Editors
Svenja Falk
Accenture
Berlin, Germany

Andrea Römmele
Hertie School of Governance
Berlin, Germany

Michael Silverman
School of International and Public Affairs
Columbia University
New York, NY, USA

ISBN 978-3-319-38793-2 ISBN 978-3-319-38795-6 (eBook)
DOI 10.1007/978-3-319-38795-6

Library of Congress Control Number: 2016958440

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG Switzerland

The updated original version of this book was revised. An erratum to the book can be found at DOI 10.1007/978-3-319-38795-6_10.

Foreword

Digital Government provides huge opportunities for societies and economies alike. A more citizen-centric, transparent, and efficient administration is a prerequisite for social well-being and economic growth. Many countries have embraced this opportunity, but we observe a significant gap between strategic aspiration and implementation in many countries. This book addresses these challenges by framing the context of digital Government, showcasing opportunities, and providing a set of international case studies that exemplify the case. Peter Drucker once famously states "You can only manage what you measure." This is true in Government also, and I hope that the measurement approach suggested in this book will trigger a discussion that involves Government and academia alike.

We are grateful for the opportunity to work with two leading universities, Hertie School of Governance in Europe and Columbia University in the United States, on this important topic. I am convinced that the book will contribute to important debates on digital government, its implications for operating models, and workforce development in the public sector. We strongly believe that collaboration and exchange enable us to get deeper insights and to make better decisions.

Accenture
Paris, France

Bernard Le Masson

Foreword

Digital Government: Leveraging Innovation to Improve Public Sector Performance and Outcomes for Citizens explores how advancements in digital information technology hold profound implications for governments and citizens alike, including many benefits but also heightened complexity and challenges. Why is this important? We live in an era where digital technology is profoundly reshaping our personal and public lives. Ideas and events can be communicated to and witnessed by global audiences within seconds. Data, the internet, smartphones, mobility, and the cloud are transforming the relationship between policy makers and the public. Easier access to government information and officials and the ability to access and analyze information in real time have brought many governments much closer to their citizenry. This provides positive benefits in terms of improved governance, efficiency, participation, and education that are vast and exciting. At the same time, there is a dark side. Governments and citizens face increased risks and challenges from cybersecurity and cybercrime, issues around what constitutes lawful use of data, threats to personal privacy, and the daunting task of coordinating policies and approaches across jurisdictions.

Digital Government: Leveraging Innovation to Improve Public Sector Performance and Outcomes for Citizens also reflects an important area of growing inquiry for Columbia University's School of International and Public Affairs (SIPA). In 2014, we launched a multidisciplinary effort—Tech and Policy @ SIPA—to explore the increasing impact of digital technology on public policy and its broad effects across society and the global economy. This SIPA effort brings together expertise across our campus and internationally around technology and policy issues. It includes a new technology-focused curriculum to help students build critical skills and technological awareness, funding for student projects in support of entrepreneurship that leverage data and ICT to solve global urban problems, and new interdisciplinary research around issues such as internet governance, cyber security, the digital economy and digital trade, and civic technology and innovation. By equipping the next generation of public policy practitioners and scholars with a deeper understanding of how digital technology can be utilized to support public policy, by nurturing organizations that are building novel, tech-based

solutions to pressing global public policy problems, and by supporting cutting-edge interdisciplinary research, SIPA is stimulating a host of creative endeavors at the intersection of technology and public policy.

Four of the country case studies featured in *Digital Government: Leveraging Innovation to Improve Public Sector Performance and Outcomes for Citizens* were developed by our workshop students with Michael Silverman, their faculty advisor, serving as a coeditor. These country cases illustrate the diverse opportunities that a digital government can offer, including improved access to government services in India and Mexico, increased government transparency in Brazil, and expanded broadband access in the United States. These cases were developed in SIPA's *Workshop in Development Practice*, one of our flagship capstone programs for our second-year Masters' degree students. We are grateful for the support and collaboration of Accenture Research in the workshop and the Hertie School of Governance in this publication.

Access to digital information technology offers the potential for extending opportunities for education and economic development to individuals in many poor countries. Yet the potential of digital information technology also raises a number of critical issues that affect the lives of all citizens and pose a significant challenge to public policy makers. As the book documents, digital government raises issues such as cyber security, privacy, and the emergence of big data and cloud technology that transcend national boundaries and raise new policy challenges. It also can accentuate differences and gaps within societies based on citizen access to and familiarity with the internet. These concerns are further complicated by the current multiple stakeholder approach that is the foundation of the global internet, where no single governmental or private sector entity has control over this technology and where the internet is facing fragmentation.

For scholars and students at global schools of public policy such as SIPA, the policy opportunities and challenges associated with the dispersion of digital information technology are both formidable and incredibly exciting. These issues are at the cutting edge of globalization and technological change. We welcome the insights provided in this timely volume and look forward to future scholarship in this area.

Columbia University
New York, NY
USA

Merit E. Janow

Foreword

Digitalization leads to governance challenges in many sectors of society, most strikingly in state and public administration, business, and civil society. The shape and extent of such challenges vary and depend on perspectives. In the public sector, for instance, digitalization might lead to a worrying decline in the state's capacity to analyze, regulate, coordinate, and deliver its vital services. Looking from a business perspective, digitalization will presumably change the workplace in such a profound way that it might threaten existing professions and open the way up for new ones. And for civil society digitalization will change the ways and means of social self-organization, particularly through innovations in communication technology. This volume addresses many of these issues, both highlighting dangers and potentials. It also provides practical ideas to solve arising problems and to make most use of the vast possibilities for innovation and creativity digitalization bears.

Digitalization may be a challenge, but it may just as well be a chance. Democracy, transparency, accountability, and freedom are just four fields in which digitalization may change the world for the better—and this book aims to shed light on them.

It also unites ever so many qualities and approaches the Hertie School of Governance proudly represents. Firstly, the Hertie School is convinced that cultural and academic diversity enriches any piece of work and that joint productions can produce excellent international contributions. This is why I am particularly excited to present a joint product with our long-standing partners Columbia University and Accenture Research. Columbia University is a wonderful partner we traditionally cooperate with in many ways. We provide each other's students with the opportunity to enjoy the privilege of a dual degree program, and our faculties engage in fruitful intellectual exchanges. Also, as Dean of a public policy school, I highly appreciate the growing collaboration we have with Accenture Research. One of our general aims is to get connected to other societal sectors and increase our reach, which we believe to be fundamental for policy-oriented education. Accenture as a multinational company for consulting and technology services has been a delightful partner to share practical and theoretical expertise with.

I would like to stress one other quality the Hertie School stands for: the extraordinary quality of student research, which makes this book an important contribution to the field of digital governance. The value of this book can be attributed to the hard work of students who were able to contribute and enrich this publication with their own case studies from all over the world. The Hertie School of Governance has always been striving to provide students with excellent conditions for work and research so that great results can be produced.

The book at hand is one of them.

Hertie School of Governance
Berlin, Germany

Helmut K. Anheier

Contents

Part I
Theory and Foundations of Digital Government

The Promise of Digital Government

Svenja Falk, Andrea Römmele, and Michael Silverman

"Digital" is everywhere. More than 900,000 articles including the word *digital* being published in the last 3 months[1] are testament of an impressive career. Independent of context, the term "Digital" stands for an eclectic potpourri of assumed positive and negative social and economic outcomes. Positive assumptions imply that "digital" can open up new opportunities and provide solutions to many challenges that companies and societies are facing today.[2] The pessimistic view assumes that digital technologies will destroy jobs, making human labor redundant, causing unseen disruption in social and political life.[3]

The case in business seems comparatively clear—we can already see, especially in the business to consumer space, how digital provides more tailored and cost effective services to customers based on a granular understanding of their needs, revolutionizing production and radically transforming operations and governance.

The original version of this chapter was revised. An erratum to this chapter can be found at DOI 10.1007/978-3-319-38795-6_10.

[1]Factiva Search in English speaking newspapers and online journals from March 26th, 2015 to May 25th, 2015.

[2]Accenture Technology Vision 2015.

[3]Oxford professors Carl Benedikt Frey and Michael A. Osborne estimated that almost half (47 %) of total US jobs are at risk due to computerization. McKinsey's Global Institute predicts that about 140 million knowledge worker jobs are about to disappear in the digital age.

S. Falk (✉)
Accenture, Berlin, Germany
e-mail: svenja.falk@accenture.com

A. Römmele
Hertie School of Governance, Berlin, Germany

M. Silverman
School of International and Public Affairs, Columbia University, New York, NY, USA

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_1

Digital technologies have already disrupted many industries like retail, travel, media and entertainment and others. Nevertheless, companies and policy makers alike are yet to understand the underlying business models and avenues to monetize digital in many other areas like the internet of things or smart services.[4]

In government, however, the case is even less obvious. Digital seems to blend with discussions around open data, big data, broadband policy, digital inclusion or -entrepreneurship, or whole-of- government transformation, resulting in a lack of clarity. Nevertheless, enthusiasm about digital is high among politicians and policy makers alike.

1 Strategy Inflation

Many countries have launched digital strategies in the last 2 years, but definitions of digital vary from being an umbrella term for a set of technologies and their applications ("SMAC"), a new way of public service delivery up to a holistic concept of a digital society or economy.

The desired outcomes in the strategies vary, depending on policy priorities of a country or institution:

[4]Accenture worked in partnership with the National Academy of Science and Engineering and with more than 70 German companies, business associations, labor unions and the best German industrial and IT universities to develop a vision on how to compete in the digital future on a global level. The group focused on business models, the regulatory environment and the people side. On the digital enterprise side, the group predicts the emergence of a new type of Software Defined Platforms to connect intelligent products during operations and the emergence of "Everything as a Service" bundles of products and smart services.

This public private partnership supports Germany's goal to become the number one country in Europe in terms of digital growth. With its first strategic initiative "Industrie 4.0", Germany has already taken an important step towards being the first country to tap into the potential of this new form of industrialization. Now, the second strategic initiative, entitled "Smart Service Welt", is focusing on the value chains that incorporate the smart products made by Industrie 4.0 once they have left the factory. Smart products are combined with physical and digital services to create smart services that then can be marketed as a flexible, on-demand service. The disruptive impact of smart services is already visible in retail, for example in online marketplaces. However, the changes are also affecting the traditional business models of Germany's flagship industries, such as the automotive, mechanical engineering, chemicals, electrical engineering, medical technology, logistics and energy technology industries, not to mention the rest of the economy.

Digital Strategies

Country	Launch	Objective	Approach
USA	(May 2012)	Efficiency, cost reduction, citizen centricity and security	Builds on four main areas (information-centricity, customer-centricity, shared platform, security and privacy) to lay the foundation for a radically different way in which government applications and services will be developed, focusing on leveraging data through web API, on building reusable and interoperable web services, on separating a data, a platform and a presentation layer to allow services to be deployed through the most convenient channel.
UK	(November 2012)	Cost cutting and efficiency increases	Digital information at the heart of its strategy, rather than being ancillary to service provision. All new government services are required to be digital, a set of existing ones have to be transformed.
Europe	(2010; revised December 2012)	Competitiveness and growth	7 key areas for further efforts to stimulate the conditions to create growth and jobs in Europe: 1. Create a new and stable broadband regulatory environment. 2. New public digital service infrastructures through connecting Europe facility loans 3. Launch grand coalition on digital skills and jobs 4. Propose EU cyber-security strategy and directive 5. Update EU's Copyright Framework 6. Accelerate cloud computing through public sector buying power 7. Launch new electronics industrial strategy – an "Airbus of Chips"
Singapore	2011-2015	Collaborative government	• Co-creating for greater value • Connecting for active participation • Catalyzing whole-of-government transformation

Source: Country Strategies

In many cases in fact, governments have launched more than one digital strategy. Australia, for example, launched three strategies between 2011 and 2013: the "Australian Public Service Information and Communications Technology Strategy" (2013), "Advancing Australia as a Digital Economy—An updated National Digital Economy Strategy" (2012) and a "Cyber Security Strategy" (2011). Both the US and the UK formulated a total of five strategies focusing on economic development, public sector reform, cybersecurity and inclusion.

In Germany, eight ministries at the federal level have been tasked with implementing different aspects of the three strategies in place there. Economic development, for example, is being looked after by both the "Federal Ministry for Economic Affairs and Energy" as well as the "Federal Ministry for Transport and Digital Infrastructure". Security questions are on the table in five ministries. Complexity of the governance is poised to increase; Germany launched a "Digital Agenda" in August 2014, focusing on a holistic digital transformation of the country with oversight not yet being defined.

Having multiple plans owned by different departments is the rule in digital government today. When it comes to implementation, different departments are getting involved, resulting in overlap and increasing coordination efforts, often without an oversight institution being in place. As we show in this book, taking implementation down to the program and/or institution level is even more disconnected.

The "return to digital" is assessed today only in a patchy manner. The National Audit Commission in Australia or the US Office of Budget and Management, for example, are assessing how the government is doing against plan, but are not talking about social or economic outcomes. The UK looks through the lens of cost reductions and efficiency increases, assuming savings of 200 million pounds related to digital. Germany has yet to evaluate the return on digital.

2 What Is Digital: Different or More of the Same?

Some commentators proclaim a digitally enabled new age in government, whereas others feel it is nothing more than a continuation of the E-Government paradigm and therefore just old wine in new skins. The first wave of eGovernment happened in most countries of the world in the 2000s, both in mature and emerging economies.[5] Primary focus then was on the online provision of services rather than a concept of digital transformation. Digital government is a more comprehensive

[5]In 1997, for the first time ever, the United States' administration articulated the idea of online citizen service in their National Performance Review "Access America: Reengineering Through Information Technology". And indeed, the US portal, then called FirstGov went online in 2000 with the intent to provide all government information online. Governments across the globe published their eGovernment strategies in the beginning of the 2000s:

- The UK publishes their first strategy in April 2000. The document "eGovernment: a strategic framework for public services in the Information age" talks about the need for a common infrastructure, urges public sector units to modernize and innovate.
- France publishes their reform program "Governmental Action Plan for Information Society" in 1998.
- Singapore published their "eGovernment action plan" in 2000, with a strong spin on the competitiveness acceleration through focusing on the transition to the knowledge economy.
- South Africa launched their eGovernment strategy Electronic Government Framework Electronic Government—The Digital Future: A Public Service IT policy in 2001.
- India the Dept of IT and Dept of Administrative Reforms and Public Grievances (DARPG) prepared a National governance action plan which was presented to the Prime Minister in 2003.

concept and is uniquely distinct from the eGovernment across a number of dimensions. The possibilities offered by the nexus of forces from SMAC technologies could be far more powerful in enabling a whole of government transformation.

3 Opportunities

Governments see huge opportunities in digital and are making significant investments. Enablers to capitalize on the opportunities are the deployment of technologies through dedicated government organizations (US), innovation in service delivery (UK), a more transparent government (India) or more collaboration between government and citizens to enhance innovation (Singapore).

- **Citizen Service and Innovation**: The US Government anticipates significant service enhancements through a focus on IT tools, processes and organizations. The Digital Services Innovation Center as a branch of GSA, as well as a Digital Services Advisory Group within the White House is advising government entities to implement the strategic change.[6] There is a strong focus on a mobile digital strategy: agencies should "optimize at least two existing priority customer-facing services for mobile use and publish a plan for improving additional existing services." Many of the US agencies now have at least two mobile apps which can be found on an official website Apps.usa.gov. Agencies also find case studies and advice how to implement the mobile strategy.
- **Cost Savings**: The UK Government assumes significant savings as a result of their "digital by default" strategy. The bottom-up methodology yields an annual saving estimate from this shift to digital by default as £1.8 billion.[7] Savings result from reduced cost of service provision: For some government services, the average cost of a digital transaction is almost 20 times lower than the cost of a telephone transaction, about 30 times lower than the cost of postal transactions and about 50 times lower than a face-to-face transaction.[8]
- **Jobs and Growth**: European policy makers anticipate that the full implementation of the digital agenda would increase European GDP by 5 %, or 1500 € per person, over the next 8 years, by increasing investment in ICT, improving eSkills' levels in the labor force, enabling public sector innovation, and reforming the framework conditions for the internet economy. In terms of jobs, up to one million digital jobs risk going unfilled by 2015 without pan-European action while 1.2 million jobs could be created through infrastructure construction. This would rise to 3.8 million new jobs throughout the economy in the long term.[9]

[6] http://gsablogs.gsa.gov/dsic/strategy-milestones/

[7] http://publications.cabinetoffice.gov.uk/digital/efficiency/#fig-1

[8] http://publications.cabinetoffice.gov.uk/digital/efficiency/#fnref:1

[9] http://europa.eu/rapid/press-release_IP-12-1389_en.htm

4 Challenges

While digital objectives might differ, challenges are quite similar across countries. Governance, change management and security are on top of the list. Some well-known stumbling blocks from early eGovernment times like the lack of a whole of government approach, adoption and user take-up or vertical integration are still to be addressed.[10] An interesting finding is that nearly one third of United States' internet users are using social media to access e-services. According to a recent study, "embrace" of social media by the United States government seems to have "particular appeal" to minority groups, low-income individuals, women and other groups that have historically lagged behind in their use of eServices. These groups all use social media at a rate similar to that of other citizens, leading to a smaller gap among different socio-economic groups than through other forms of online information and service delivery. So, social media could be a way to bolster usage of government e-services.[11]

Governance Effective digital services governance structures are of key concern.[12] At the moment, we find a variety of organizational solutions, often adding new coordinating institutions. These institutions agency are mostly influencers: they help to define standards, offers technical or managerial advice.

- The US, for example, has formed two additional entities, the Digital Services Innovation Center as a branch of GSA, as well as a Digital Services Advisory Group. Another important institution is the CIO council which coordinates across states.
- The UK has ditched their cross government CIO and has built a decentralized structure under the umbrella of Government Digital Service (GDS) by appointing digital leaders in departments. Directors of Digital or CDOs are expected to work closely with departmental CIOs to deliver digital transformation (design, development and delivery of user-centric digital services) (Techmarket View 2013).
- Europe has built a cross country, cross policy agenda initiated by Neelie Kroes, former Vice-President of the European Commission.[13]

Governments are currently establishing new C level positions like Chief Digital Officer or Chief Data Officer as digital strategies are challenging the current remit of government CIOs. According to Gartner, more than 20 % of organizations will appoint a Chief Digital Officer and 10 % of organizations a Chief Data Officer by 2014 (Gartner Group 2013). At this stage, complexity of the governance structure is a key obstacle to achieving digital value; we will see further consolidation and change.

[10] http://ec.europa.eu/digital-agenda/sites/digital-agenda/files/eGov%20Benchmark%202012%20insight%20report%20published%20version%200.1%20_0.pdf

[11] http://unpan1.un.org/intradoc/groups/public/documents/un/unpan048065.pdf

[12] http://www.whitehouse.gov/blog/2012/08/23/building-blocks-21st-century-digital-government

[13] http://ec.europa.eu/digital-agenda/en/news/connected-continent-european-competitiveness

Change Management A true digital transformation requires a radically different way of doing things, including a different culture, role definition and collaboration in government. This is a journey which began in the age of eGovernment but is set to continue in a more complex and demanding environment. Funding is provided to incentivize collaboration. The European Commission, for example, has just announced a €13.7 million boost to cross-border digital public services.[14] The EURES—The **European** Job Mobility Portal would be one example. However, at the moment, there is no real incentive structure in place to motivate employees to embark on the journey. Developing approaches to build digital leadership top down and bottom up is needed to fully capitalize on the digital opportunity.

Security Currently, information security risks are making the headlines in many countries. Governments and citizens alike are concerned about the security implications of mobile technologies or open data. Security goes beyond spying: the UK Government loses over £21 billion per annum through fraud. Consequently, the Government has allocated an additional £650 million of funding at a time of extreme austerity to address these challenges.[15] The increasing dependency on data and the processes of creating, collecting and making sense of it come with a lot of risks. Even if security guidelines or policies are in place, governments find it hard to comply with them: the US Government Accountability Office (GAO) reported in February 2013 that only 8 out of 22 major federal agencies (down from 13 a year earlier) were in compliance with risk-management requirements under the Federal Information Security Management Act (FISMA).[16] "Security by default" is still a long way off.

Impact on Labor Markets The Code N competition for Start Ups at CEBIT 2015 in Hanover presented 50 "digital" entrepreneurs with innovative solutions for the digital economy and society. The Spanish company Aisoy, for example, builds a revolutionary emotional robotic mentor for kids. As per the company, the toy is friendly, helpful, intelligent and connected and enhances creativity through discovery combined with a new class of personal robotic platform for an innovative educational concept. This innovative idea exemplifies various possible perspectives on the implications of digital on life today and in the future. Many parents are keen to train their kids in human machine interaction early on to ensure their competitiveness in the labor markets, whereas others feel an era of social deterioration through lack of sufficient "natural" interaction between kids. Of course the question remains: Will we need kindergarten, school or even university professors in the future, given that machines are so much more intelligent? Are we facing an unseen disruption, with an "autonomous economy" making human

[14] http://europa.eu/rapid/press-release_IP-13-778_en.htm

[15] Digital Government Security Forum.

[16] http://www.fedtechmagazine.com/article/2013/08/state-information-security-federal-government

labor redundant or is this a temporary transformation of work, similar to the shift from artisanship to industrialized manufacturing in the nineteenth century with the number of jobs rebounding? Or are we at the beginning of a digital transformation where all jobs will be clean, healthy and enriching, leaving time for creativity, family and self-fulfillment?

If we believe leading economists, the blessing of using technology to do things faster, better and cheaper could turn into a tsunami in global labor markets, leading to economic and social repercussions unseen before. Already in 1930, John Maynard Keynes projected into the Economic Possibilities for Our Grandchildren and foresaw "technological unemployment" in the twenty-first century.

The question whether technological progress is actually creating or destroying jobs is currently on top of the agenda in many countries. While everybody is sure that technology already has an impact on the workplace and many alarmist assumptions are hitting the headlines, no one really has a clear view on the quantitative impact on the labor market and resulting implication for skilling. The main question is which (and how many) jobs will disappear, which ones will transform with human computer interactions and which new jobs will be created where. At the moment, most governments and policy makers are using academic models to come up with assumptions.

There are three main perspectives:

1. The Substitution Hypothesis: Jobs will be lost where humans compete with machines and algorithms that do the jobs faster, better and cheaper. Computerization will destroy certain jobs.
   - Oxford professors Carl Benedikt Frey and Michael A. Osborne (2013) estimated that almost half (47 %) of total US jobs are at risk due to computerization. The German Minister for Labor and Social Affairs, Andrea Nahles, has just applied this methodology to the German market, assuming a reduction of five million jobs due to computerization.
2. The Zero Sum Game Hypothesis: In contrast to earlier disruptions, which affected particular sectors of the economy, the effects of today's revolution are "general-purpose".
   - Michael Ford noted in "The Rise of the Robots" (2015) that from janitors to surgeons, virtually no jobs will be immune. Whether you are training to be an airline pilot, a retail assistant, a lawyer or a financial trader, labor-saving technology is whittling your numbers—in some cases drastically so. So, basically all jobs are affected, leading to massive unemployment and inequality. Consumption and tax revenue will collapse and redistribution policies are needed.
3. The Business as Usual Perspective (with a variation): today's displacement is similar to the shift from agriculture to industry.
   - Roughly half of Americans were employed on farms in 1900. Today they account for just 2 % of the workforce. Just as ex-farm laborers found work in the factories, so laid-off manufacturing workers were re-employed in the service industries. The IT revolution will be no different.

This deep understanding of changes to job descriptions in the digital economy is of utmost importance to inform policy in education and skilling and to help companies understand the skill requirements to remain competitive in the future. An analysis of employment trends, an understanding of changes in employment structures and organization of work should be the next step to formulate relevant labor policy strategies.

5 The Journey

How did it all begin? A vast body of literature published by multilateral organizations, academia, think tanks or consulting companies documents the history of priorities and activities in eGovernment quite well. The UN Public Administration Programme has published the most comprehensive set of assessments and benchmarking since 2001. They looked at online presence and maturity of 190/1 member states and assessed more than 50,000 features of eGovernment websites.[17]

We would like to introduce the main highlights of the eight reports published since then, as they reflect global discussions:

Title	Year published	Ranking: Top 3	Theme	Key Findings
E-Government for the Future We Want	2014	1. Korea 2. Australia 3. Singapore	eGovernment and innovation can provide significant opportunities to transform public administration into an instrument of sustainable development	- wide disparities among regions and countries in their state of eGovernment development - increased emphasis on eParticipation features and evidence of Open Government Data initiatives on national websites given the evolving expectations about transparency and participation in public affairs.

[17] UN.

E-Government for the People	2012	1. Korea 2. Nether-lands 3. UK	Harnessing the power of ICT for delivering much needed sustainability in social and economic services	- Whole-of-government approaches lead the way in vanguard countries - Member states are paying much closer attention to multi-channel service delivery - A good beginning but e-environment initiatives have a long way to go
Leveraging E-government at a Time of Financial and Economic Crisis	2010	1. Korea 2. USA 3. Canada	Leveraging eGovernment to mitigate the effects of the financial and economic crisis on development	- On-demand access to information, services and social networks […] is no longer considered cutting-edge but a norm - The mobile revolution and growth of high speed broadband and wireless access is beginning to have a measurable economic impact - eGovernment remains a distant hope for many of the least developed countries
From E-Government to Connected	2008	1. Sweden 2. Denmark 3. Norway	Value of eGovernment lies not in the use of	- Technology as a strategic tool and as an enabler for public
Governance			technology per se but in its application to processes of transformation	service innovation and productivity growth
From E-Government to E-Inclusion	2005	1. USA 2. Denmark 3. Sweden	Employ ICT for social empowerment and economic inclusion of citizens	- Importance of providing equal opportunity for participation in information society - Commitment and leadership for an ICT led development agenda is a prerequisite - Need for a vision to develop a socially inclusive development strategy - The market, government and citizens have a mutually beneficial role to play

Towards Access for Opportunity	2004	1. USA 2. Denmark 3. UK	Employ ICT application for creation of economic opportunities and human development	-	Widening disparities between countries in their eGovernment programs and implementations successes by income level - eParticipation as a means of user feedback
E-Government at the Crossroads	2003	1. USA 2. Sweden 3. Australia	Bridging the digital divide and providing access for all whilst enhancing eParticipation	-	There is on one model for and no distinct development stages for eGovernment development - A strong correlation between formal eGovernment policy and high rankings - ICT facilitated information and services are only reaching the privileged few in a country
Benchmarking E-government: A Global Perspective	2001	1. USA 2. Australia 3. New Zealand	Assessing the level of online presence and maturity of 190 UN member states and	-	A country's progress in eGovernment closely relates to its social, political or
			derive learnings from good practices		economic composition - Nation eGovernment development remains desultory and unsynchronized - Online service delivery should be thought of as complementary rather than accepting than […]replace many traditional channels for service delivery - National eGovernment teams are rather the exception than the rule - Considerable lack of public awareness campaigns

Governments across the globe have started to implement the online provision of services since the 2000s. According to the United Nations, 169 (88.9 %) of all UN members states used the internet to varying degrees to publish information and provide services. The main objective then was to provide current information and downloadable forms or an email address to contact a public officer. Only 17 countries (9 %) offered a set of transactional services like online payment for fees or taxes (UN 2002). Today, they are cautiously and to varying extents beginning to transform their operations, vertically crossing departmental borders and tailored to the needs of the individual citizen. In order to beat public depth, we can assume that more and more services will be provided fully online without offering access through other channels like phone or walk in offices.

Let us take a look back to the early days of taking governments online, which can be dated back to the mid 1990s. Till then corporates and governments alike, used information technology to professionalize or automate back office operations.

In 1997, for the first time ever the United States administration articulated the idea of online citizen service in their National Performance Review "Access America: Reengineering Through Information Technology".[18] And indeed, the US portal, then called FirstGov went online in 2000 with the intent to provide all government information online.

Governments across the globe published their eGovernment strategies at the beginning of the 2000s:

- The UK publishes their first strategy in April 2000. The document "eGovernment: a strategic framework for public services in the Information age" talks about the need for a common infrastructure, urges public sector units to modernize and innovate.
- France publishes their reform program "Governmental Action Plan for Information Society" in 1998.
- Singapore published their "eGovernment action plan" in 2000, with a strong spin on the competitiveness acceleration through focusing on the transition to the knowledge economy.
- South Africa launched their eGovernment strategy Electronic Government Framework Electronic Government—The Digital Future: A Public Service IT policy in 2001.
- India the Dept of IT and Dept of Administrative Reforms and Public Grievances (DARPG) prepared a National governance action plan which was presented to the Prime Minister in 2003.

The first wave of eGovernment happened in most countries of the world at the same time, regardless of whether they are considered mature or emerging economies. Primary focus was on technology and optimism that transformation of back office operations would automatically translate into better services and cost reduction.

In parallel, stakeholders from academia, business and civil society explored the potential of the internet. Think tanks built a specific policy area looking at this field,

[18] http://www.nap.edu/openbook.php?record_id=11920&page=150

universities launched institutes focusing on eGovernment as a research field, excitement was high and expectations, if you look from 10 years later, were quite low. It was simple: Governments entered the virtual world by simply putting information online, providing simple information like the opening hours of an office or papers needed to execute a certain administrative process.

Over time, more and more interactive features were added. Citizens could write emails to public officials. Connection was the mantra of that time, which started in the "Tiger States" Singapore and South Korea in Asia and the mature economies in Europe and the Americas. Governments developed eGovernment plans with the objective of making it easier and more user-friendly for citizens to connect with government. Many countries undertook detailed and time intense mappings to understand which processes would be suitable to be provided online. Germany, for example, identified 440 federal services which would be available in three different modes: publish, interact or transact. Korea identified a much larger portfolio of online services after their mapping exercise: 4400 services were meant to be published, 426 with an interactive capability and 8 services were to be fully transactional. Both countries made the commitment to have the online construction work finished by 2005. This approach was very similar in many other countries.

At this point in time, the focus was on public services rather than extending the scope of the democratic agora to the internet. By then, the web was an add-on service channel for providing selected government services. The selection of services was based on the feasibility of putting them online. The idea was to provide services multi-channel to not exclude citizens who were not online. The main objective then was to make government more efficient whilst ensuring access for everyone. Debates were mainly focusing on the need to avoid reinforcing social exclusion by not appreciating the specifics of the digital divide, which was then seen as a mirror to inequality in the physical world. Expert groups on a national and international level were looking at ways to ensure access to information and communication technologies (ICT) and knowledge.[19]

In parallel, political candidates and incumbents also started to put their personal websites online. Back then (and we are talking end 1990s, beginning of 2000s), it was seen as a way of sharing information with their internet savvy electorate, rather than connecting with them. Transparency was used by some politicians as a way to differentiate themselves from the crowd. Indeed, it was seen as a new and exciting level of transparency that one could publish a politician's income online, their appointments to advisory boards or other activities which might result in additional sources of income. The German Liberal Party (FDP) was a first mover in founding a virtual state association which helped to add freshness, youth and hype to the image of the party which used to be perceived as a bit dusty. Rather than being an enabler or tool, being online was part of one's image. At this point in time, dialogue between governments and citizens was only possible to a limited extent. The ever expanding intellectual ecosystem exploring the potential of government online

[19] http://www.un.org/documents/ecosoc/docs/2000/e2000-55.pdf

came up with a new mantra: eDemocracy. Expectations were high. Basically, in its most advanced form, eDemocracy strengthens the nexus between citizens and government to a degree to question the continuing relevance of representative institutions and organizations. Among the more radical commentators of the time there was a tendency to regard them as antiquated structures and regarded the interactive capabilities of the new ICTs as paving the way to more direct forms of mass rule. Self-governing would supersede state machinery as internet based systems of voting, referenda and discussion were set up. Details of how such systems were to work remained sketchy, however, and as the empirical evidence of a lack of interest in politics online accumulated, the dream of a return to the Athenian agora appeared to have faded.

> [. . .] e-government is about the transformation of government. Indeed, it may well be the biggest transformation since the democratic revolutions of the late 18th century.[20]

The hope was that real-time online discourse between governments and citizens would lay the ground for more inclusive, participatory and equal nations.

While these early theories envisioned a full-time erosion, a more limited usurping of government institutions was envisaged. New communication tools would provide for more direct contact between executives and citizens. Online consultation and polls by government would streamline the political process, reducing the reliance on widely intermediary bodies such as legislatures and parties. Single-issue groups and direct-action politics would increasingly dominate society as the role of aggregative structures declined (Bimber 1998: 133–160).

Modernization theorists took a more positive view of the impact of new ICTs on our representative structures, some accounts saw them as offering the possibility for reform and modernization. New ICTs could improve the image of representative institutions particularly with younger people who are the least likely to vote or see the relevance of the representative system. Finally, some commentators have adopted a more radical view of the restructuring possibilities surrounding the introduction of new media. If properly developed, the communication technologies could sit at the core of a reinvigorated representative institution that could truly listen and thus re-engage the public (Colemann 2001). Rather than just modernizing internal practices, this would provide more opportunities for the public to participate in the political system and would reconnect representative organizations with the public. New media provide institutions and organizations with opportunities for engagement through their own websites and email such as live question and answer sessions. Given these opportunities of re-connecting citizens to their representative institutions by new technologies, there is considerable hope that these developments will restore the relationship and improve people's trust and confidence in government (Norris 2001).

Parallel to this broad discussion primarily framed by scholars of democratic theory, research specifically focusing on e-government put forward different

[20] http://kta.on.ca/pdf/cg6.pdf

models (for more detail see Coursey and Norris 2008). As the authors very rightly point out: "Normatively, these models . . . tell us that more e-government is better. E-government that is interactive, transactional, and integrated is better . . . and e-government should (and will) produce e-participation or e-democracy and a fundamental transformation in the relationship between governments and citizens." (Coursey and Norris 2008: 525). In all models developed around the turn of the twenty-first century, a linear, stepwise and progressive evolution of digital government was predicted. Governments typically have a simple web presence and then in a next step move on to more interactive tools such as e-mails and social networking sites. In a following step they also offer transactional services to citizens and businesses. The final step of digital government is described variously: either as seamless delivery of government services (Ronaghan 2002), eParticipation (Hiller and Bélanger 2001), eDemocracy (Wescott 2001), or government transformation (Baum and Maio 2000) (for a good overview see Veit and Huntgeburth 2014, Chap. 1) (Fig. 1).

The models however neglect the potential that barriers to eGovernment adoption naturally exist. The models assume governments' adoption of more and better e-government. However, there are to our knowledge no theories of innovation adoption that suggest that innovations are adopted without any hurdles, problems, obstacles and draw-backs. Certain obstacles (staff, infrastructure, money, other) may be more or less important to different governments (large versus small governments, wealthy vs poor governments) at different times in the adoption process (early adopters versus laggards) and with respect to different types of applications (Coursey and Norris 2008: 532).

In many countries, a focus on digital inclusion emerged. Almost on a daily basis, statistics on online access of populations were published, benchmarking states,

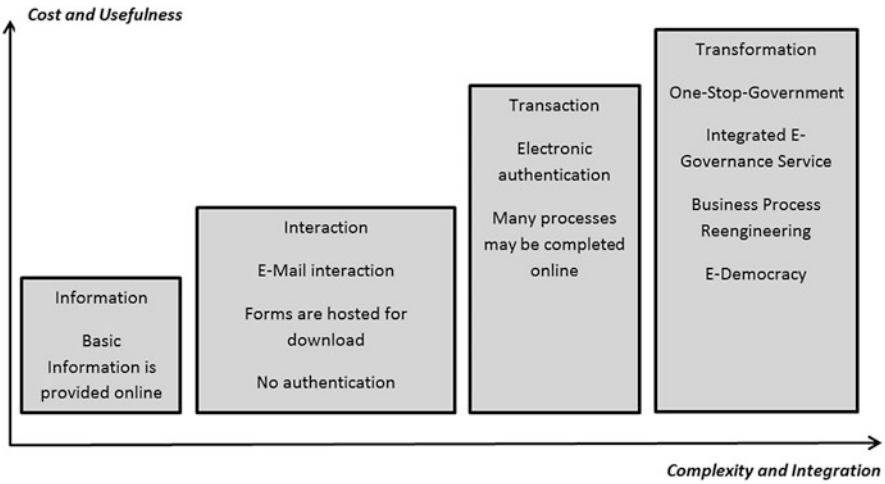


Fig. 1 Digital governance maturity model of Baum and Maio (2000)

segmented by gender, income group and educational attainment levels were published somewhere in the world. Governments were focusing on increasing online access and businesses are investing into the new goldmine of online business. Offerings for online consumers are emerging throughout the world.

Governments are beginning to realize the opportunities and challenges that digitalization brings: on the one hand it enables them to modernize, innovate, and transform the way they interact, administer and govern their countries. One the other, they see their citizens compete for jobs with people from other parts of the world. The density and speed of the online world makes globalization immediate and profound. right into their face. Globalization and the emergence of the knowledge economy have resulted in unprecedented opportunities for countries which were wholeheartedly called underdeveloped countries not long ago. Technology virtualizes services. It can import services to countries where people can do it faster, better and cheaper. India—and in particular the Indian IT industry—has spearheaded the movement to capitalize on these opportunities. The Indian IT industry barely existed in the mid 1990s and now it is generating over 146 billion dollars in 2015.[21] Indeed, India's "global sourcing" model has already altered the structure of the IT industry irrevocably and is now acting as a template for twenty-first century business models across sectors. The "Competition of Nations" (Michael Porter) is entering the debate again. Governments start to think how they can use technology as an enabler to enhance their countries' competitiveness. "Information Society" or "Knowledge Economy" is a key focus area in governments' strategic planning exercises.

Moreover, governments around the world understand that their citizens increasingly want to interact with government agencies online: in the EU 28 the number of citizen online interactions with public authorities is around 40 %.[22] However, today, people want governments to do more than put applications for drivers' licenses and birth certificates online, they want a truly connected government, which is transparent, inclusive and respectful of citizens' opinion and needs.

6 Case Studies

As an illustration of how governments are using digital technology to expand and enhance their capabilities, five digital projects from around the world were studied. The cases looked at the effectiveness of the projects in achieving their objectives as well as their relationship to their country's national digital strategy. While the projects were diverse in their scope and application, all had common elements in both their effectiveness as well as their limitations. The projects spanned both

[21] http://www.nasscom.in/indian-itbpo-industry

[22] http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/565890/EPRS_IDA(2015)565890_EN.pdf

developed and developing economies, and geographic regions of the world. The projects reflected the diverse application of the digital technology in public management.

They included:

- Mexico's single window for trade called VUCEM. Its goal was to digitize the country's international trade procedures to improve foreign trade and competitiveness.
- United States' National Broadband Plan digital strategy to improve economic growth and opportunity by increasing high-speed Internet access and adoption. The case used New York State's experience with the program.
- India's unique identity program (Aadhaar) which seeks to provide its billion plus citizens with their own identity number and card which provides linkages to other government and non-government services.
- Brazil's Transparency Portal ("Portal da Transparência") is a website that provides detailed information on the Federal government's revenues and expenditures.
- Germany: tracks and assesses how Germany implements its "National Action Plan to implement the G8 Open Data Charter".

6.1 Methodology

To provide consistency and uniformity in reviewing the projects, a common framework was created for their analyses. This included background on the country, the political and/or economic context for the project, a description of the country's national digital goals, the implementation of the project, its successes and limitations. Of particular note is a description of the internal and external drivers that both enabled the project and presented challenges to its operation.

6.2 Common Element

Despite the diversity of technologies employed and unique characteristics of the projects, all shared one common element—they are the products of government employing digital technologies to address a specific critical economic, social or political need. The United States declared that the lack of broadband accessibility in rural and economically depressed areas was a major economic and social problem that needed to be addressed. In Mexico, the need to expedite and improve trade processes was critical if the country was to remain economically competitive. The Brazilian Transparency Portal was an evolutionary step in the federal government's policy to open information to the Brazilian populace. In the Indian case, the need for information was vital to identifying its citizens and enabling their access to

government and other services, which for a large segment of its citizenry, was often not possible before the advent of the Aadhaar project.

6.3 Project Outcomes

The projects demonstrated that digital government initiatives entail a number of important features to be effective. These ranged from understanding technology's strengths and limitations, garnering political support, managing stakeholder requirements, having adequate financial resources, and even the ability to address legal challenges (in the case of India). They also require considerable coordination between government agencies and the need to review administrative requirements to avoid, as was stated in the VUCEM case study, merely "digitizing bureaucracy". A number of important points are derived from the case studies:

- None of the projects were started de novo but were evolutionary in their history. All the projects had their origins in earlier government policies, programs and initiatives often arising from efforts in eGovernment.
- Effectiveness of a project cannot be assured without the support of senior government officials who are willing to provide the power and prestige of their office to achieving the goals of the project. For example, the United States' case had both President Obama and the Governor of New York State championing the need to expand broadband access to its citizens, in Mexico the president was a supporter of the VUCEM project.
- Equally important, there was a legal framework that created the need for the project and eased its implementation. For example, in the Brazilian project, the legal framework gave "support" to the Portal and the mandate that government agencies cooperate in the project. Similarly, in Mexico, the government through a series of legislative reforms and mandates, e.g. digital signature law (FIEL) enabled the VUCEM to succeed.
- No project can succeed without the necessary resources (time, money, personnel) to fulfill its objectives. Governments in these cases were willing to commit the necessary funds to enable the projects. Equally important, to avoid squabbling between agencies and delays in implementing the project, funding for the projects were directed and provided by one agency.
- Given the complexity of their operations, the projects required considerable coordination between government agencies and non-government stakeholders. In the Indian project, a combination of government agencies (e.g. the department of posts) and private contractors were needed to effectively gather information for the Aadhaar project. The VUCEM project in Mexico required the cooperation of 12 different ministries, and the Brazilian Transparency Portal needed input from multiple ministries to supply the needed data. The US Broadband project required coordination between federal, state and local officials, private contractors, community representatives, and telecommunications companies.

- Management of the projects required one agency or unit to be specifically given the authority and responsibility to coordinate the project. Without assigning this authority, the government's ability to manage a complex project would be extremely, if not almost completely, difficult to implement.
- Beyond the primary objectives of the projects, there were a number of important ancillary benefits cited. For example, Brazil, Mexico and India each mentioned that implementation of their projects would have a positive impact on minimizing corruption in their countries.

6.4 Challenges

While the cases presented many positive attributes of the projects, the projects were not without a number of issues and challenges:

- Technology can be complex, ever changing, and often daunting to use. For example, in the Unites States' case, the very nature of broadband is changing rapidly with the expansion of wireless technology. But equally challenging is citizen usage of broadband technology. Without promoting adoption of broadband usage, expansion of access has little value. In the Mexico project, the training of both government officials and business trade officials was critical to effective utilization of the new VUCEM system, and as stated in the case, many government officials were fearful of the new technology. In the Brazil case, it was recommended that the presentation of the data be reformatted to make it more "user-friendly" for citizens who do not have an understanding of budgetary information. In India, the use of biometric data and creation of an enormous database of personal information caused considerable concern regarding individual privacy.
    - The projects' relationship to national digital strategy was often marginal, more inferential rather than explicit. While the projects came within the general scope and intent of the country's national digital strategy (where it existed), they, except for one case, were neither a direct result of country's digital strategy, not cited as a major priority, nor linked to other projects in the national strategy. For example, under the Indian national strategy "Digital India", the massive UIDAI program received a single reference under Digital India's "e-Governance" pillar. In Mexico, VUCEM was started before the current national data strategy was formulated, and in Brazil, there is no overarching national data strategy but a set of digital initiatives formulated by the federal government (of which the Portal is one). Only in the U.S. case was the New York State broadband project a result of the national strategy to expand broadband access.
    - Given the complexity of the projects, timetables and internal deadlines often met with delays. The projects needed additional time to be implemented. Reasons for delays were varied and ranged from technology implementation

(Mexico), legal challenges (India), to the complexities of government contracting for services (US).

- None of the projects were subject to any comprehensive evaluation or analysis as to their effectiveness or impact in reaching their ultimate goals. Each case cited limitations on project assessment. For instance, the Brazilian government had not examined the impact of the Portal. While it may track visits to the database, it had not evaluated the relationship between the Portal and its impact on Brazilian society. Similarly, the U.S. broadband, Indian Aadhaar, and Mexican VUCEM cases all cited the lack of assessment of their projects' ultimate goals, their involvement in other projects under the government's digital strategy program. The Mexican case, for example, specifically asks the question as to how the government will achieve synergies between its various eGovernment projects and initiatives.

7 Summary and Outlook

Governments across the globe began to embark on the digital government journey about 25 years ago. Much has been achieved since then, with most countries having a sophisticated online presence, channels to interact with their citizenry, more access and transparency as well as process optimization in some cases. However, the promise of digital government is still to be fulfilled—the aspirations of measurable citizen outcomes, transformative service delivery and public governance are not yet met. Our case studies show a disconnect between strategy formulation and implementation.

Our argument is that we can, in this regard, be optimistic. Economic and political flux brings the potential of convergence around shared goals and new ways of delivering public service value. Social pressure opens up the possibility of citizen-driven digital services that tap into the energy of citizens, entrepreneurs and communities. New technologies offer the potential of substantial change to the delivery of public services across the operations and management of government. Where to begin? Core to achieving these benefits is connecting strategy with implementation as well as effective measurement of outcomes—of a government's performance, its effectiveness and the productivity of the public services it funds and provides. Sustainable future public services will be about aligning incentives, performance and productivity across the spectrum of government. It is about the transformation of public services to deliver more personalized digital services. Also, it is about the transformation of government's role to be an enabler for growth and innovation.

Bibliography

Baum, C. H., & Di Maio, A. (2000). Gartner's four phases of e-government model. Accessed July 10, 2015, from https://www.gartner.com/doc/317292

Bellamy, C., & Taylor, J. (1998). *Governing in the information age*. Buckingham: Open University Press.

Bimber, B. (1998). The internet and political transformation: Populism, community, and accelerated pluralism. *Polity, 31*, 133–160.

Colemann, S. (2001). *Democracy online: What do we want from MPs' web sites?* London: Hansard Society.

Coursey, D., & Norris, D. F. (2008). Models of E-government: Are they correct? An empirical assessment. *Public Administration Review, 68*, 523–536.

Gartner Group. (2013, October 7). Beyond the Government CIO: Chief Data or Digital Officers?.

Hiller, J. S., & Bélanger, F. (2001). Privacy strategies for electronic government. In M. A. Abramson & G. Means (Eds.), *E-government 2001* (pp. 162–198). Lanham: Rowman and Littlefield.

Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the internet worldwide*. Cambridge: Cambridge University Press.

Techmarket View. (2013, April 23). UK central government: The rise of 'digital'.

United Nations. (2002). *Benchmarking E-government: A global perspective. Assessing the Progress of the UN Member States*. New York: United Nations.

Veit, D., & Huntgeburth, J. (2014). *Foundations of digital government: Leading and managing in the digital era*. Heidelberg: Springer.

Wescott, C. (2001). E-government in the Asia-Pacific region. *Asian Journal of Political Science, 9*, 1–24.

Measuring Digital Government: How to Assess and Compare Digitalisation in Public Sector Organisations

Lotte Frach, Thomas Fehrmann, and Peter Pfannes

1 Digitalisation and Government: Beyond the Buzz

Digitalisation is currently among the contenders for the top spot on any list of key drivers of societal, economic, and political change. In many ways, the world has changed dramatically due to the digital revolution: traditional business models are questioned, consumer behaviours change dramatically, and societies find themselves in need of new rules to govern the digital age. Due to ever-expanding digital infrastructures, increasingly affordable means of access and rapidly improving digital literacy, this applies to countries at all levels of development and to nearly every economic sector.

The term 'digitalisation', however, as shown by a Google Ngram search, is not new. It had its first heyday in the 1960s and 1970s, when the silicon microchip triggered the computer revolution. Back then, digitalisation referred to the transition from analogue methods of recording and processing information to the digital standard of the computer age. In this regard, claiming to 'be digital' is easy. Businesses and governments alike tend to fall prey to the basic misunderstanding that the use of digital technologies and the digitalisation of previously analogue data make them 'digital'.

As a matter of fact, nearly every government claims to be a digital government nowadays. Due to the successes of E-Government programmes, much has been achieved and the public sector is even ahead of a number of private industries in electronic service provision. But when we compare our citizen experience in

L. Frach (✉)
Health and Public Service Research, Accenture, Berlin, Germany
e-mail: lotte.frach@accenture.com

T. Fehrmann • P. Pfannes
Health and Public Service Strategy, Accenture, Berlin, Germany
e-mail: thomas.fehrmann@accenture.com; peter.pfannes@accenture.com

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_2

dealing with government agencies with our customer experience with truly digital companies, we realise that there is still much to be achieved. This is particularly true when we compare the states of internal, enterprise-level digitalisation—relating to workflow and production processes, data analysis, and resource management—between the leading digital companies and government agencies.

Nevertheless, we also (and with increasing frequency) learn of shining examples of public sector digitalisation that we believe to be worthy of emulation, such as in Norway or Singapore. In fact, many governments recognise that they drive, regulate and are affected by the digital revolution we are currently witnessing. They work on digital strategies and roadmaps, establish the roles of government CIOs, CDOs or equivalent and look for the best ways to support their economy to prevail and thrive in the digital age. Digital maturity has evolved into an important indicator of competitiveness among countries, measured, for example, in various global benchmarks and indices such as the WEF ICT Readiness Index or the Accenture Digital Density Index.

Considering the high levels of attention on 'digital' among governments today, it is all the more surprising that still only 40 % of citizens in key developed countries state that they are satisfied with the current level of digitalisation of public services.[1] This shows that governments are not only facilitators and regulators of private-sector digitalisation, but also active players on the digital field: they need to transform themselves and the public services they offers to citizens who experience and are growing to expect a high degree of digitalisation in their every-day life. For public services, the potential of digital is particularly promising: instant interaction with citizens is facilitated, new ways of inclusion and accountability can increase citizens' trust and new technologies enable a transition from government-centric to citizen-centric services. This means a democratisation of knowledge and a new way of ensuring transparency, since digital data can be measured, published and read by anyone at any time.

However, the task of releasing this positive potential can only be accomplished when two key requirements are met: governments (a) need to develop an understanding of what 'digital' means in a public sector context—to define their strategic direction—and (b) require comparable information on their current states of digitalisation—to be able to learn from each other and share good practice. This contribution seeks to focus on these two aspects by outlining a new and innovative approach to assess and compare public sector digitalisation. Firstly, we explain the importance of narrowing the focus to look at individual agencies in addition to existing whole-of-government perspectives (2). The following chapter (3) focuses on the development of the **Public Services Digitalisation Index**, designed by a team at Accenture, a leading global management consulting, technology, and outsourcing services firm. Thereafter, we present and discuss key findings from its application to public pensions and employment agencies across 11 countries (4).

[1]Average of citizens saying they are satisfied with public services of government in seven surveyed countries, Accenture Citizen Survey 2015.

In a short conclusion (5), we explain how our approach to measuring digital government and its outcomes can help public sector decision-makers in charting the course for their organisations to become truly digital.

2 Focusing on Where Digitalisation Is Implemented: Individual Agencies

In order to understand how well governments are actually performing in transforming public services and delivering on those new digital pledges, we need to go beyond the whole-of-government view (at national/federal and state-levels alike) and look at individual public agencies. Until now, research has tended to avoid this granular look on the digitalisation of public services at the agency-level and rather benchmarked on the whole-of-government level. These whole-of-government analyses and benchmarks certainly create valuable insights on how countries perform overall, have evolved and ensure their competitiveness, leading to highly relevant policy-recommendations for governments.

Nevertheless, individual agencies are the key to successful public service digitalisation, for three reasons:

- While digitalisation requires strong overall strategic guidance and corresponding investment of political, administrative, social, and financial capital, these factors need to be translated into agency-specific strategies, initiatives and plans to gain real traction. Even under optimal conditions—such as in unitary, centralised states—governments cannot simply command digitalisation. This becomes even more evident if we look at decentralised, federal states or countries with strong local governments. The only common denominator across all cases are individual public agencies with their distinct levels of digitalisation at the organisational level.
- Digitalisation has an external dimension, in the provision of digitally enabled and enhanced services to citizens and businesses. This service dimension can, of course, be studied at an aggregate, whole-of-government level. However, it is very difficult to translate such aggregated data into concrete policy measures that address the specific challenges faced by an agency in a specific policy field (and perhaps even in a specific region). Thus, it is necessary to see how individual agencies are performing in order to gain a detailed view of public sector digital service provision.
- Most important, however, is the fact that digitalisation is at least as much a question of internal reform than of pure service transformation. New and innovative services need to be based on enterprise-level digital infrastructures and platforms, need to be integrated into the internal workings and processes of an agency, and need to be designed to inform management and policy decisions through data-driven analytic insights. In view of the fragmented organisational,

technological, and procedural landscape in the public sector, this can only be done in a meaningful way at the individual agency level.

Given that individual agencies are responsible for taking care of most citizen interactions and are looking for ways to digitally transform to keep up with citizens' expectations and budget limitations, they need to be focal points of any digitalisation measurement. In the reality of those public agencies, digitalisation of their service delivery model is not a distinct task—it is closely connected with their efforts to digitalize internally. And in order to achieve this complex holistic transformation, more and more agencies realize they need to improve their strategic planning.

For the individual public agency however, it would be of great additional value to have an analytical tool to define what digital actually means for them, what their current status of digitalisation is and how it can improve. Finding a way to measure digitalisation on the agency-level across countries, different government models and the various policy fields, would provide further insights on what drives successful digitalisation of public services.

3 The Accenture Public Services Digitalisation Index

In summer 2014, a team at Accenture started to investigate what such an evaluation of digital maturity could look like for public agencies. We evaluated the analytical tool Accenture had successfully developed for and applied to the private sector: The Digitalisation Index, assessing the progress companies have made in implementing digital technologies. Subsequently, we fine-tuned and adapted this methodology to the public sector and proposed a study in key policy areas in several key countries. The following sections outline the methodology and its development.

3.1 Starting Point: The Accenture Digitalisation Index Framework

The Accenture Digitalisation Index Framework was first designed and implemented in 2013 to measure the digitalisation levels of private sector companies in Germany (as part of Accenture's annual Top 500 study). It was created for three main reasons: (1) to define "digitalisation" in a complete yet sufficiently simple way that enables meaningful conversations about the necessary next steps; (2) to design a tool that can be applied to a broad range of contexts to measure and compare levels of digitalisation; and (3) to understand how digitalisation corresponds to other indicators, such as business performance. The index methodology has since been applied by Accenture across the globe and in a broad range of industries.

The Index framework assesses a company's digital maturity against three indicators: (1) Digital strategy—referring not only to the extent to which a company's strategy acknowledges digitalisation as a decisive trend within their industry, but also the extent to which strategic objectives are based on digitalisation; (2) Digital services—assessing the company's products, solutions and services as well as the function companies use to interact with their customers; and (3) Digital enablement—considering the use of digital technologies and applications to support internal processes.

Accenture's framework divides these three indicators into sub-categories and assigns a grade for each sub-category. The grade of the indicator is the average value of its sub-category grades. Finally, the average of these three indicator grades forms the Digitalisation Index value.

The Digitalisation Index provides an indication of which companies could become Growth Champions in the coming years—and which ones could lose their position. Accenture correlated the value of the Digitalisation Index to three key indicators of business success: return on equity; return on sales; and revenue growth. This enables us to predict which of today's Growth Champions have the best prospects of continuing their above-average performance in the future.

Overall, the Top500 companies in Germany increased their index value by 9.8 % in 2014 compared to the previous year. The most considerable progress was made in the field of digital enablement; the value in this dimension increased by 14.3 %. For the digital strategy and digital services indicators, the improvements were 6.5 % and 9.7 %, respectively (Fig. 1).[2]

Interestingly, an industry comparison revealed significant differences. Companies in the IT, media/entertainment and telecommunications industries had a higher Digitalisation Index value. They were more likely to have digital business models and were among the first to react to the disruptive potential of the Internet. Energy, resources and construction companies were much less mature when it came to digitalisation.

3.2 Development of the Accenture Public Service Digitalisation Index

Thinking about how to adapt the framework for public agencies, we realized that the overall three indicators of Digital Strategy, Digital Services and Digital Enablement also apply to the holistic understanding needed for digital in government.

In the early stages of E-Government, public agencies concentrated a lot on moving their high-volume services to the online channel, looking for cost-savings

[2]Accenture/Die Welt, Courage to think differently. Digitization strategies of Germany's TOP 500, 2015.

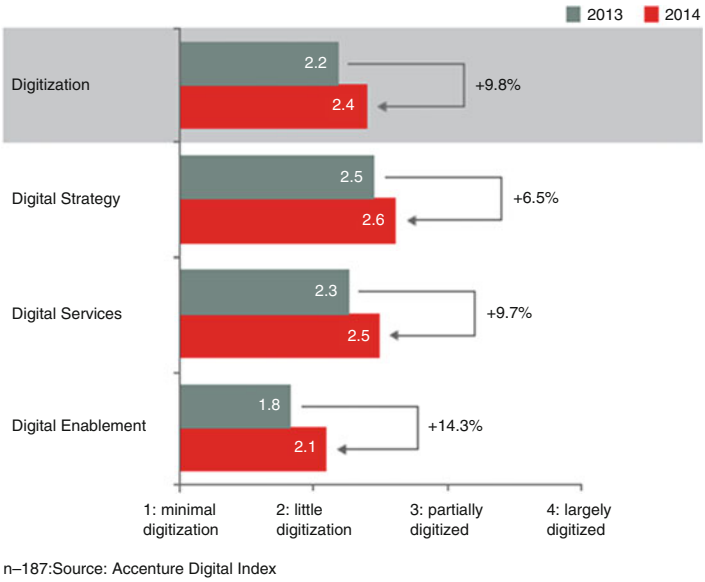


Fig. 1 Digitization of Top500 companies in Germany in 2013 and 2014. *Source*: Accenture/Die Welt, Courage to think differently. Digitization strategies of Germany's TOP 500, 2015

and increase of efficiency. In contrast, leading public agencies nowadays are working on capturing the benefits of being digital "in-depth": Digital is now seen as an amazing opportunity to use new technology to not only increase efficiency but also be seamlessly connected with citizens, companies, other public agencies and non-governmental organizations. Those public agencies consider themselves part of an eco-system and open up for collaboration with private and public partners in order to achieve more. Innovative services for and developed with citizens and other stakeholders actually move beyond the original service portfolio of the public agency, supporting it to achieve mission-critical outcomes. Furthermore, digitalisation extends deeply into the organisation itself, where entire process landscapes need to be redesigned in order to make an organisation digital.

To give an example of transformational digital change, a young family with a newborn child might in the near future be offered a broad range of digital services, similar to the way Amazon.com offers additional products that often go hand-in-hand with a current purchase. After registering the birth and the name of the child online, for example, the parents could agree to a one-time transfer of the relevant data to a broad range of other (digital) services, such as waiting lists for day-care, tax return forms, or passport applications. In each case, the information about the newborn would automatically alter the outcome of all these other processes, while parents could remain in control of permission to conduct one-time data transfers. To achieve this goal, however, it is not sufficient to simply design individual services. It also requires a broad digital strategy and implementation of truly digital enterprise-level processes that allow for a seamless integration of the external dimension into the internal workings of an agency.

Index Dimension	Rationale for Public Service Digitalisation
Digital Strategy	The organization's strategy needs to reflect digitalization as a transformative trend and set ambitious strategic objectives for how to reform. In order to achieve measurable outcomes, the agency needs to establish and follow a digital roadmap for transformation that has a clear governance structure, detailed implementation plans and key performance indicators (KPIs) measuring progress and success.
Digital Services	Public agencies should use digital as a means to transform and innovate their service delivery model, making it smarter and outcome-driven instead of process-focused. The user's needs should be at the centre of this new service model, allowing disruptive effects to unfold in public services as seen elsewhere in the private sector.
Digital Enterprise	In the digital age, public agencies have to become digital in themselves – a digital enterprise. This means transforming the workforce and organization, establishing end-to-end digital internal processes in a highly secure IT architecture and employing analytics to revolutionize operations through a new thinking based on data.

Fig. 2 Three dimensions of the Accenture Public Service Digitalisation Index. *Source*: Author's own illustration

Taking such a holistic transformation of the public service delivery model seriously requires public agencies to apply strategic planning instead of ad-hoc projects. It also requires changes in the internal processes of the agency, which needs to adopt a citizen-centric mindset, increase the digital skills of the workforce and build capabilities and infrastructures for seamless and automated processing of the new service delivery model.

Public agencies share the challenge of companies to transform their strategic planning, their services and their internal processes. We therefore kept those three dimensions of the Digitalisation Index for our adaptation applied to public services. A number of own characteristics were however needed to evaluate the public agencies' performance for each of the three indicators and to better reflect their differences to companies; for example, their focus on public goods and services instead of selling of products and their aim to achieve public goals instead of increasing revenue.

We have applied this reasoning to the three Index dimensions, leading to the following overall structure (Fig. 2).

The Public Sector Digitalisation Index thus encompasses three dimensions (Strategy, Services and Enterprise), further defined by four sub-dimensions each, leading to an overall structure of twelve sub-dimensions. Each of these is clearly defined, as shown in Fig. 3.

In order to be able to define how far a public agency has progressed in its digitalisation journey, we further needed to have criteria allowing us to grade each of the sub-categories using publicly available information. Whilst we experienced that the 12 sub-categories remained valid across policy-fields, the criteria on how to assess them needed to be adapted to pay credit to the different challenges and tasks across the policy-fields.

As a result, the assessments of the public agencies were built on a wide-range of 80–90 criteria that our researchers evaluated—an average of seven criteria per sub-category. Grades were given for each sub-category ranging from 1 (not

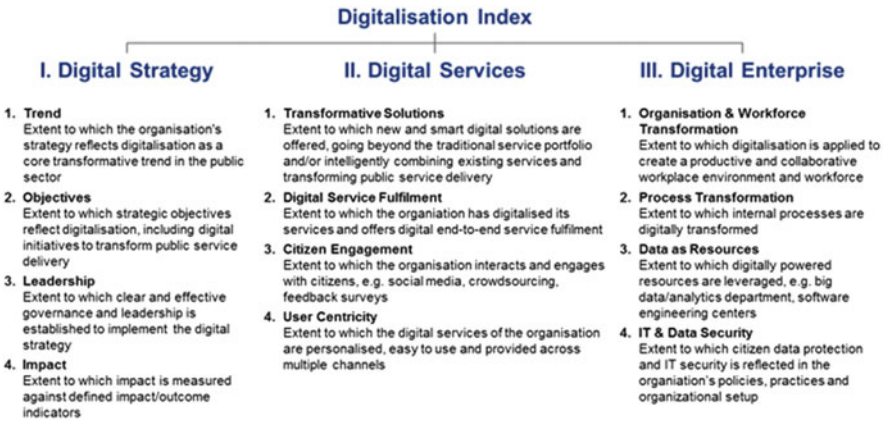


Fig. 3 Digitalisation index—structure for public sector organisations. *Source*: Author's own illustration

Assessment Criteria for *Organization & Workforce Transformation*

- Digital department/ Digital expert groups/innovation taskforce
- Internal Social Media (e.g. yammer, intranet)
- Internal Collaboration Tools (e.g. Lync, video conferencing)
- Digital knowledge management
- Self-service administrative tasks for employees
- Telework capabilities
- Shared Services
- Smart devices for field teams
- Bring your own devices offerings
- State of the art software/hardware
- Training for use of software/hardware

Fig. 4 Example for assessment criteria. *Source*: Author's own illustration

digitized) to 5 (digitally transformed). As with the Digitalisation Index for companies, the grade for each of the three indicators is the average value of its sub-category grades. Finally, the average of these three indicator grades forms the PS Digitalisation Index value (Fig. 4).

4 Exemplary Findings for Pensions Administration and Public Employment Services

The framework has so far been applied to public agencies in three policy fields: Pensions administrations, Public Employment Services and Policing (in progress). For each policy-field we looked at the relevant public agency in 11 countries, defining how far the public agency has progressed in its digitalisation journey and comparing it to international peers.

Our assessments delivered the following key findings across the two policy fields of pensions and public employment services.

4.1 Overall Findings

The results show varying degrees of maturity across the 3 Index indicators—Strategy, Services and Enterprise.

In both Pensions and Public Employment Services, public agencies perform significantly better in Digital Services than in Strategy and Enterprise. This validates the hypothesis that digital services have been a priority area at most agencies and that the widespread e-government strategies of the last decade have had effects. At the same time, it also displays that most agencies have not yet extended their focus from e-government to digital government with a holistic digital transformation plan.

4.2 Digital Strategy

Our Research reveals that digital strategies with clear, outcome-focused implementation plans are very often missing at the agency-level.

Digital strategies on the whole-of-government level are widespread among the countries, yet often limited to high-level goals that the governments would like to achieve within the next 5–10 years. At the same time, detailed implementation plans and metrics for how to measure success of operationalization are frequently missing in those strategies.

Thus, there is a need for public agencies to create their own digital strategies and roadmaps which translate the high-level goals of the government into concrete projects and initiatives with measurable outcomes and a clear governance structure. Despite this, our evaluation reveals that a range of assessed public agencies do not have published strategies at all, and that strategic plans are more wide-spread amongst the public employment services agencies than amongst the pensions agencies. Even amongst those agencies that have their own digital strategies, these are often lacking a detailed roadmap for implementation, assigned governance, milestones and metrics to track progress and success.

Example: Digital Strategy

In November 2012 **the UK government** published its ambitious Government Digital Strategy based upon one fundamental and overarching principle: 'digital by default'.[3] The UK government ambition is that by providing

(continued)

[3]UK Government, Government Digital Strategy, Nov 2012, https://www.gov.uk/government/publications/government-digital-strategy

convenient and user-friendly digital channels to users able to access them, that digital will become the preferred channel for accessing services for the citizen. For those who cannot access digital services for whatever reason, the government has explicitly stated that these citizens will not be excluded. **The Department for Work and Pensions (DWP) in UK**, one of seven large government departments obliged to undertake an end-to-end service redesign of all its large transactional services, has taken the principles and objectives of the Government Digital Strategy and applied these to the department context in its whole departmental Digital Strategy, published in December 2012.[4]

The strategy takes a holistic approach to digital transformation, with an emphasis on digital service transformation but including measures for workforce and internal process transformation also. Focusing on delivering 'services of the future', DWP has outlined clear principles upon which both the design and creation of digital services as well as whole business transformation are based. Whilst the DWP tracks a range of KPIs and publishes performance level outcomes in its corporate reports, much insight on the department's performance can be drawn from the UK government's performance tracker (a beta version product) available at gov.uk/performance. Annual transaction numbers, cost per transaction and even digital take-up can be accessed at the individual DWP service level.

4.3 Digital Service Delivery

The e-government strategies of the past have led to a transfer of the traditional services portfolio to online, yet a lack of innovative service delivery powered by digital is observed

Grades for Digital Services are in average higher than those of the other indicators, a positive outcome of the e-government strategies of the past years. However, the performance is still not convincing: Taking a closer look, one realizes that agencies perform the lowest in transformative solutions and experience the highest grades in Digital Service Fulfilment. This indicates that whilst agencies have successfully transferred their traditional services portfolio to online, they have taken only minimal next steps to exploit the potential of digital to innovate and offer smarter services. Data-mining and analytic techniques facilitate the development of such smarter services, as do open innovation platforms that can consolidate the best ideas both from internal and external stakeholders.

[4]Department for Work and Pensions, Digital Strategy, Dec 2012, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/193901/dwp-digital-strategy.pdf

Example: Innovation

In France, Pôle emploi is taking an innovative approach to delivering higher-value public employment services acting alongside a close network of actors in the wider employment ecosystem. In early July 2015, "L'Emploi Store" was launched, an open portal where both applications developed by Pôle emploi and big data will be available for download. The portal also serves as a collaboration platform for startups and other private partners to develop new applications with input from the agency. Additional innovative tools are being launched by Pôle emploi to deliver greater benefits to jobseekers, like online virtual interview simulators, serious games and MOOCs which allow users to simulate employment-related situations, develop some knowledge on some professional sectors, etc.

The establishment of "L'Emploi Store" complements the agency's current Open Innovation platform, InnovAction, which is intended to consolidate ideas and best practices received from a sample of internal staff and collaboration partners. The agency's Innovation Department selects the most promising initiatives sourced from this internal forum: several pilot initiatives of new digital services have already been launched and are being tested, including the "100 % Web", a remote yet personalized online interaction with Pôle emploi's counsellors which is gradually being rolled out.

Finally, Pôle emploi launched "Le Lab", an internal Innovation Center aiming at quickly designing new digital services through sessions and hackathons gathering job seekers, employers, counsellors and start-ups. It also serves as an incubator for new digital services proposed by Pôle emploi agents and/or start-ups (several projects currently incubated). Since his opening, "Le Lab" has already inspired several others French agencies who aim at replicating this approach.

4.3.1 Degree of User-Centricity Is Very Much Mixed

Interestingly, the grades for user-centricity display a polarization among the agencies: High grades of 4 and above, versus a group of agencies with a very limited user-centricity focus. The leading agencies in user-centricity offer a wide range of digital self-service tools, a personalized MyAccount with high functionality, conduct user-experience research (UX Research) to design services and focus on intuitive website navigation, an omni-channel approach and collaboration with other public/private institutions to increase customer service and compliance. Even more importantly, leading agencies recognize that user-centricity is a continuous effort that requires regular research and customer involvement. Most of the evaluated public agencies however still have to radically change their mind-set

from service-centric to user-centric and evaluate the right mix of online and offline channels for specific user segments.

Example: User-Centricity

The German agency responsible for public employment services, Bundesagentur für Arbeit (BA), has developed a BA Online 2020 Program—a program outlining how the agency aims to improve user-centricity of its services whilst realizing digital transformation of its enterprise.

BA takes a user-centric approach to its digital service delivery, tailoring its services to the digital capabilities of the individual customer in a multi-channel delivery model. For those digitally-literate customers who are closer to the labor market, BA seeks to promote self-service by providing professional e-services, thus releasing resources for personal interactions with those customer groups who require more support in accessing digital services.

BA has already started to deliver on its promises and has developed the client-focused 'BEN' online navigator tool which integrates all BA online services which support professional development (e.g. its Jobbörse, Kursnet, Berufenet, Berufety services, amongst others) into a single access point. BEN provides information on jobs, training, further education and labor market prospects. The service also supports professionals in the decision-making process regarding potential job or career changes or embarking on further education. BA is now exploring the potential of open innovation and envisages an open innovation platform to be supplied as a web application. Various topics should be defined on the platform and discussed in separate campaigns hosted by a moderator. Communities would then take the feedback and deliver ideas and implementation suggestions.

4.4 Digital Enterprise

Most digitalisation efforts have focused more on the customer access channel than on improving organisational efficiency.

The average grades for Digital Enterprise are lower than those for Digital Services for both Pensions and Public Employment Services. Agencies are active in facilitating (automated) data-sharing with other public authorities and organizations such as employers. However, many have not taken the next step of setting up capabilities to exploit data in a more systematic rather than ad-hoc way. IT-security and effective data privacy are pre-requisites for using data effectively and being trusted by the citizens.

Concerning their workforce, agencies overall struggle with building the digital skills among their employees and raising awareness of the positive impact of digital

transformation on the working environment. End-to-end digital internal processes would have a huge impact on effectiveness and efficiency of the agencies, yet they still tend to refrain from a complete overhaul of their IT infrastructure and internal processes and instead opt for incremental changes.

Example: Digital Enterprise

The Department of Work and Pensions (DWP) in UK has established a strong digital organisation with distinct 'digital' teams such as the Transformation Hub and Digital Academy Team, working to realise the department's business and digital transformation agenda. The Business Design Team transforms the department's operations, whilst the User Research Team draws insights on user-experience and the designing of services around the user. DWP is also making significant investments in growing its internal digital expertise through its DWP Digital Academy. Further, DWP has established a transformation hub in Leeds, bringing together digital specialists to collaborate on transformation projects.

The automation of processes is a key enabler of the department's business design, enabling employees to spend a higher proportion of their time assisting customers. The analytics department at DWP is exploring social media analytics as a means of improving customer service and has established a joint analytics program hub with HMRC to identify fraud and errors in welfare payments. DWP has further published an Open Data Strategy in 2012 outlining the department's collection and use of big data.

The PS Digitalisation index facilitates the identification of key trends among public agencies overall or in a particular policy field as outlined above. It is of particular interest for the individual public agency to be able to compare itself with peers both inside the country and internationally. It enables analysis of strength and weaknesses in digital maturity so far and supports identification of future areas of focus.

5 Looking Forward

The methodology outlined in this contribution has enabled Accenture to develop a framework with which to discuss the potential of 'digital' for public sector organisations—and possible ways to unlock this potential. As a purely outside-in methodology that analyses digital performance based on publicly available data, the results gathered can also serve as a helpful reality check for organisations that may already fulfil many prerequisites of a digital public agency—without using or communicating them adequately.

We are currently exploring additional and innovative ways to apply this analytical tool to other policy-fields and further countries, enabling deeper insights to compare agencies both within-country and internationally. So far, the framework assesses the supply side of digital government—what the public agencies currently offer to citizens and other stakeholders in their particular ecosystem. We see the rationale behind opening up the framework for the demand side of digital government, evaluating how the digital capabilities of public agencies are valued and taken up by citizens. This could be evaluated by measuring citizens' take-up of digital offerings and their satisfaction levels.

The objective of our work on a Public Sector Digitalisation Index is to contribute to the debate on the state and progress of digitalisation outside the private sector, to highlight new opportunities for delivering excellence in public service, and to help build state-of-the-art government organizations in the digital world. The disruptive power of digital has already changed the perception of security, with IT-security and data privacy being of highest importance for the public sector also. In the health sector, wearables and new ways of using data have started to revolutionize our understanding of wellbeing and have brought new players into the sector. Embracing digital technologies such as Cloud and applying new techniques of data-mining and analytics could unleash the disruptive power of digital for public service delivery. The public sector needs to keep up with the digital world to continue serving individuals, families and businesses, and to be an attractive employer for future generations.

Technology for Good: Innovative Uses of Emerging Technologies to Address Social Challenges

Svenja Falk and Giju Mathew

1 Abstract

The transformative impact of digital technologies continues to be proven in business and society across the world. The question is whether and under which circumstances digital technologies can be used to solve social problems that have existed for long and is widespread.

This paper attempts to identify the potential use of technologies such as 3D printing, robotics, sensors and analytics to prevent or solve problems in health, education, agriculture, housing and urban planning.[1]

2 Introduction

Arthur C Clarke once said that 'advanced technology is indistinguishable from magic'.[2] In a similar vein governments across the world are approaching new and emerging technologies as a potential 'magic pill' to solve the myriad of social challenges that they face. Digital technologies could indeed have the potential to work magic—whether it is a subsistence farmer in India or a homeless man in the

[1]The authors would like to acknowledge the support of Jonathan Anchen towards the research.

[2]Arthur C. Clarke, "Profiles of The Future", 1961 (Clarke's third law), http://www.quotationspage.com/quote/776.html

S. Falk (✉)
Accenture, Berlin, Germany
e-mail: svenja.falk@accenture.com

G. Mathew (✉)
Accenture, Bangalore, India
e-mail: giju.mathew@accenture.com

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_3

US. More than ever before, a mix of private, public and non-profit organizations are actively involved in the development and implementation of technologies to bring about lasting change in areas such as health, education, agriculture and urban planning. In addition to widespread activities by Governments and the not—for—profit sector we can observe an uptake in commercial activities by both established and startup companies to capitalize on emerging opportunities to monetize new applications. However, it is important to realize that the use of advanced technologies come with certain risks and challenges which need to be addressed or mitigated.

2.1 What Is Technology for Good?

Technology has evolved to an extent that it has changed the way we work, communicate and live. The next frontier is to radically transform social challenges that the world face in areas such as health, education and housing, among others. Technology also plays an important role in addressing international challenges such as disaster relief, the cause of refugees, energy and climate change.

Technology for good is the innovative application of emerging technologies to make a positive and lasting impact across various social issues. It includes the use of technology by governments, startups, non-profits, universities and companies to improve outcomes in sectors such as health, education and housing both in the developed and emerging world.

The Nominet Trust in the United Kingdom (setup in 2008 to fund internet based projects that make a positive difference to the lives of disadvantaged people) compiles a comprehensive list of people and organizations that are using digital technology to make a difference. Called the Social Tech Guide,[3] it covers 100 ventures across the world that address issues related to economic empowerment, access to knowledge, environment, community engagement, health, education, social inclusion and civic empowerment.

2.2 Addressing the Challenges

Challenges that the world faces today are more complex and urgent than they were before. Problems in areas such as health and education continue to persist even after massive efforts by government, non-profits and multilateral agencies globally. New challenges have now been added around outcomes and access. A direct consequence of these social challenges is the sense of increasing inequality which leads to a sense of dissatisfaction and unrest. The issue of inequality is a keen topic of

[3]Nominet Trust 100, http://www.socialtech.org.uk/nominet-trust-100/

discussion—from Thomas Piketty's bestselling book 'Capital in the twenty-first Century'[4] to Pope Francis tweeting that 'inequality is the root of social evil'.[5]

Depending on context, challenges that take different forms. If we take healthcare, rising costs and lack of access are key issues that confront a developed nation like the United States of America. In the same way, a lesser developed or poor nation continues to be besieged with problems relating to health infrastructure, lack of health professionals as well as issues around access. The quest across the world is for technologies or solutions that can provide a sustainable impact and truly transform health related outcomes. Good health is universally accepted as essential to human welfare and to sustained economic and social development. According to the World Health Organization constitution, 'reaching the highest attainable standard of health requires a new or continued drive towards universal coverage in many countries, and strong actions to protect the gains that have been achieved in others.'[6]

The global education sector is challenged by issues around infrastructure and systems that are overwhelmed, under-trained and poorly paid teachers, high drop-out rates and poor outcomes.[7] Governments and multi-lateral agencies for long have been engaged in reducing schooling costs, investing in educators and improve access and equality. And it is not only about money and budgets: our own research has shown that education outcomes do not depend on *how* much you spend but *how* you spend it.[8] The need now is for truly transformative solutions that can radically improve access to quality education to all citizens and improve outcomes. This is imperative given the fact that quality education is a fundamental driver of economic growth and societal change.

Inequality in terms of access to opportunities, education, health and jobs has seen the largescale migration of people to urban centers adding to the stress of city infrastructure and resources across the world. Rapid urbanization is often seen as the driver of economic growth in the emerging countries. Urban infrastructure is not entirely equipped to meet this challenge whether it is in terms of providing housing, electricity, water, transport or public security. Added to this is the need for sustainable development given the already high levels of pollution and depletion of vital resources. In this context, national and city governments alike are seeking solutions both in terms of technology and innovative funding that can provide relief to an overwhelmed infrastructure and ensure that the process of urbanization is sustainable.

---

[4]The Huffington Post, http://www.huffingtonpost.com/2014/04/24/thomas-piketty-income-inequality_n_5207358.html?ir=India&adsSiteOverride=in

[5]Twitter, https://twitter.com/Pontifex/status/460697074585980928

[6]World Health Report, World Health Organization, http://www.who.int/whr/2010/10_chap01_en.pdf

[7]Global Education Fund, http://www.globaleducationfund.org/what-we-do/the-challenge/

[8]Accenture Research: Measuring the Return on Investments in Education, unpublished white paper.

Another key focus area for governments is agriculture, both in developed and emerging economies. From issues of providing basic food security to resource depletion, each government is faced with unique challenges. Governments are working in tandem with non-profits and multilateral agencies to improve seed quality, better manage water resources, strengthen agriculture markets and create a better policy environment.[9]

2.3 Deciding on the Technologies

Technology research organizations and analysts continue to report on a wide range of transformational technologies that are being introduced and applied across various sectors. These technologies are in various stages of development and the potential impact of some of these is only being assessed. While some emerging technologies are expected to make a substantial impact within a few years of their introduction, there are a number of others which would take many years to become part of the mainstream. For the purpose of this paper, we have looked at essential four pillars of transformational technologies that are showing potential to address challenges in fields such as health, education, agriculture and urban planning (see Fig. 1).

2.4 Definitions

2.4.1 Data Sciences

Data sciences aims to make sense of large volumes of datasets to provide actionable insights and prevent or solve various complex challenges. This includes data collection, modeling and simulation and well as other analytical models. Identification of patterns in data could form the basis for predict future states by creating various scenarios. It also includes data mining, predictive analytics, applied analytics and statistics.

2.4.2 Internet of Things

The "Internet of Things" is the networked interconnection of objects-from the sophisticated to the mundane-through identifiers such as sensors, RFID (radio-frequency-identification) tags, and IP (Internet Protocol) addresses.[10]

[9]Bread for the World, http://www.bread.org/hunger/trade-agriculture/challenges-to-development.html

[10]EDN Network, http://www.edn.com/design/sensors/4363366/Sensors-empower-the-quot-Internet-of-Things-quot

	Data sciences *(analytics, cloud computing)*	Internet of things *(sensors)*	Robotics	3D printing
Health • *Lack of access* • *Increasing cost of treatment* • *Lack of health professionals*	◦ Nexleaf Analytics Coldtrace	◦ Mobile diagnostics (AliveCor, EyeNetra, Cellscope)	◦ Medical robots ◦ Zora Robotics	◦ Bionic arms (Limbitless Solutions) ◦ 3D printed organs
Agriculture • *Water scarcity* • *Weather uncertainties* • *Yield management*	◦ Intelligent irrigation systems ◦ Farm analytics	◦ Soil monitoring sensors	◦ VineRobot Project ◦ SwarmFarm weed spraying robots	◦ 640Drive (data device)
Education • *Lack of qualified professionals* • *Resource constraints*	◦ Khan Academy hybrid-learning model ◦ Learnmetrics	◦ iBeacon enabled schools	◦ Saya (robot in the classroom)	◦ 3D printed rats for dissection
Urban planning • *Migration, homelessness* • *Inadequate housing*	◦ Geolocation data for planning	◦ NA	◦ Brick laying robot	◦ 3D printed houses ◦ Designing cities

Fig. 1 Summary of selected technology for good applications. *Source*: Author's own illustration

2.4.3 Robotics

Robots are machines that designed to have a physical form and be to perform tasks and learn based on environmental conditions to solve a wide variety of problems that humans encounter.

2.4.4 3D Printing

3D printing is an additive technology in which objects are built up in a great many very thin layers. This additive process requires less raw material and each item is made differently without costly retooling since it is controlled by software.

2.5 Who Are the Stakeholders?

Governments, startups, large companies, universities and non-profits are involved in a range of activities to identify, develop and implement 'technology for good' initiatives. The technology for good field is unique it calls for close collaboration between a wide range of players with different entities playing the role of a 'bridge-maker' in terms of taking the technologies from the lab to the masses. There is a sense of fluidity in the roles played by each stakeholder based on the evolution of

the technology or the area of application. Stating that innovation should be left to the startups while governments finance would be a simplification. Based on where the technology resides and what the progress has been so far, each stakeholder plays a role in bringing it to fruition. A classic example is the Internet which started off as a US Defense project and then all stakeholders got involved. The government is in a sense the 'conductor' to ensure that the all the players work in harmony to whatever extent possible.

A recent example of government driven initiatives is the 'Robotics for Good' award instituted by the Prime Minister's Office in the United Arab Emirates.[11] The aim is to encourage innovation in robotics to meet challenges in the field of education, healthcare and social services. The award which is open to individuals, universities and companies aims to promote public awareness about the positive opportunities offered by these applications. In Japan, the government's "Robot Revolution Realization Council" has called for focused support of robotics in sectors suffering from labor shortages, such as nursing care, medicine and agriculture.[12]

3 Agriculture

The Marathwada region in Maharashtra (India) and California in the US are poles apart—and not just in distance. What brings the two together is that they are drought prone, leading to difficulties to farmers and reduced agricultural production. In early 2015, farmers in the Sacramento-San Joaquin River Delta[13] agreed to leave part of their land uncultivated and reduce water usage. Farmers in the Marathwada region live in constant fear of a failed monsoon and its disastrous impact on livelihoods.

Farming yields have increased across the world with the advent of high-quality seeds and advanced farming equipment. Digital technologies now have the potential to solve the water shortage problem with sensors and analytics that aid water conservation.[14] For example, sensors developed by Wellntel, a company based in Milwaukee (US), collects water level information from water wells and provides meaningful data in the form of graphs and charts through both a website and mobile

[11]UAE Robotics for Good, http://www.roboticsforgood.ae/

[12]Short on humans, Japan eyes big role for robots, Nikkei Asian Review, http://asia.nikkei.com/Politics-Economy/Policy-Politics/Short-on-humans-Japan-eyes-big-role-for-robots

[13]Farmers Agree to Water Cuts in California, New York Times, May 22, 2015, http://www.nytimes.com/2015/05/23/us/some-california-farmers-to-cut-water-use-to-ease-drought.html?_r=1

[14]How water technology can help farmers survive California's drought, Fortune Magazine, June 1, 2015, http://fortune.com/2015/06/01/water-drought-californias/

app to track usage and better prepare for the future.[15] These technologies also help to ensure that agriculture is sustainable in the long run.

Data sciences have had a profound impact on agriculture. Professor David Lobell of Stanford University is a 2013 MacArthur Genius Grant recipient who uses data to study the impact of climate change on crop production.[16] Professor Lobell has helped facilitate collaboration between researchers and farmers to work with data scientists to increase the efficiency of growing crops such as wheat, rice and corn. Given that climate change will continue to impact growing cycles and weather conditions, the agriculture sector will need to increasingly use data sciences in conjunction with other technologies to improve yields and help sustain global food security.

3.1 Farm Analytics

The lack of relevant information has for long been a major reason for misery in the farming sector—whether it is data on weather, soil or market conditions. The use of statistical analysis and machine learning ensures that farmers have access to precise, actionable information that will increase the efficiency and effectiveness of cultivated land. The '640Drive' for example was a wireless and fully automated farm information collection device. It enabled a farmer to run analytics in agriculture by collecting both machine and agronomic information in real time. Using this information, farmers are able to view and understand the numbers behind various farming activities and better evaluate operations.[17] '640Drive' was developed by 640 Labs, a farming data startup.[18] The uniqueness of this solution was that it brought together a wide range of emerging technologies. The '640Drive' was 3D printed and plugged into a port in a tractor and automatically collected data ranging from machine performance to GPS location. The device was then synced to a mobile phone app which provides a dashboard of the data analytics.

[15]Wellntel, http://www.wellntel.com/about-us/overview.html

[16]Meet A Data Scientist Who's Helped Revolutionize Agriculture, Forbes Magazine, http://www.forbes.com/sites/sciencebiz/2014/11/20/meet-a-data-scientist-whos-helped-revolutionize-agriculture/

[17]Tech Company Bringing 'Unique Data Science' to the Farm, Meredith Corporation, http://www.agriculture.com/news/technology/tech-compy-bringing-unique-data-science_6-ar46902

[18]640 Labs farm-data startup acquired by Climate Corp., The Chicago Tribune, http://www.chicagotribune.com/bluesky/originals/chi-640-labs-acquired-climate-corporation-bsi-story.html

3.2 Real-Time Soil Tension Monitoring

California-based company Hortau[19] developed one of the first web-based irrigation management systems which helps farmers take informed decisions that help improve yields and also reduce irrigation costs. Hortau uses patented soil tension sensors that allow farmers to detect plant stress which has a direct bearing on crop yield and quality. The company's solution combines wireless irrigation with cloud-based software to ensure farmers are updated in real time about the status of their crops. The potential of such technology is immense given the growing changing weather patterns and water-shortages across the world. Governments and multi-lateral agencies will have to play a leading role in getting similar technologies to farmers especially in areas where affordability is a concern given small land holding and historically poor conditions.

The use of sensor-driven technology is becoming more widespread in countries like the US. According to a survey conducted in 2014 by the "American Farm Bureau Federation", about 39 % of respondents across major corn and wheat growing regions in the US were using sensors and related technology on their farms. The MIT Technology Review quotes David Friedberg, CEO of Climate Corporation, 'Farming is moving from being an act of intuitive decision making to an act of analytical decision making'.[20] Climate Corporation helps farmers around the world protect and improve their farming operations with a combination of software, hardware and insurance products.

The adoption of sensors and related technology is aided by the ready availability of wireless networks in even the remotest part of the globe and the proliferation of mobile phones that can be used to send and receive information. Further building the case for investing in and promoting these innovative technologies in agriculture is the positive outcomes that are evident. Farmers responding to the American Farm Bureau Federation survey say that using these technologies has decreased their input costs by 15 % and increased crop yield by 13 %.[21]

3.3 Robots to Improve Agriculture and Wine Production

Robotics and precision agriculture provide farmers with powerful tools to improve the competitiveness of their farms. A pan-European project called VineRobot comprising of universities, companies and wine cooperatives is under development with the objective to monitor parameters such as grape yield, vegetative growth,

[19]Hortau, http://hortau.com/about-us/

[20]Internet of Farm Things, MIT Technology Review, May 21, 2015, http://www.technologyreview.com/news/537596/internet-of-farm-things/

[21]Internet of Farm Things, MIT Technology Review, May 21, 2015, http://www.technologyreview.com/news/537596/internet-of-farm-things/

vineyard water status and grape composition.[22] VineRobot has received over 2 million euros funding from the European Union's Seventh Programme for research, technological development and demonstration. The use of robotics is also intended to create an interest among the younger generation and get them involved in agriculture especially in the developed countries. According to the "Australian Centre for Field Robotics" at Sydney University, robotics has the potential to revolutionize farming and attract young people back to agriculture.[23] Australia-based "Swarmfarm Robotics", has developed a new robot to spray for weeds. The robot weighing about 200 kg, is self-propelled and can be powered by either an electric or diesel motor. The robots use infra-red beams to find small weeds among crops and then sends a message to the nozzle to eject a small dose of chemical spray against the weeds.[24]

3.4 Information Dissemination Through Digital Video

A not-for-profit development organization based in India called "Digital Green" uses a digital platform for community engagement with the aim of improving lives of rural communities in South Asia and Sub-Saharan Africa. The project involves the broadcast of useful agricultural information to small and marginal farmers in countries such as India using digital video.[25] Some of the unique features of the project are the use of participatory processes for content production and a human mediated instruction model for dissemination and training.

3.5 Digital Agriculture in Australia

"Digital Agriculture" is an initiative funded by "Regional Development Australia" which runs a website that provides updates on how 'agricultural organizations and businesses can prepare for and embrace the digital economy'.[26] "Regional Development Australia" is a government initiative that seeks to get all levels of

[22]VineRobot, http://www.vinerobot.eu/

[23]Robotics to revolutionise farming and attract young people back to agriculture says Australian Centre for Field Robotics at Sydney University, ABC, http://www.abc.net.au/news/2015-02-04/agricultural-robotics-future-jobs/6068450

[24]Andrew Bate's Swarmfarm Robotics finds a more efficeint way to spray weeds, The Australian, http://www.theaustralian.com.au/business/the-deal-magazine/andrew-bates-swarmfarm-robotics-finds-a-more-efficeint-way-to-spray-weeds/story-e6frgabx-1227267668599

[25]Digital Green: Participatory Video and Mediated Instruction for Agricultural Extension, Rikin Gandhi, Rajesh Veeraraghavan, Kentaro Toyama, Vanaja Ramprasad, USC Annenberg School for Communication, 2009, http://itidjournal.org/itid/article/view/322

[26]Digital Australia, http://digitalagriculture.com.au/about/ (accessed in June 2015).

government to work together to aid the development of Australia's regions.[27] The Digital Agriculture initiative covers the Loddon-Malle region, the Hume region and the Grampians region in Australia. A diagnostic tool has been developed by the initiative which helps business owners to assess their readiness to engage with the digital economy.

4 Health

The health ecosystem is undergoing rapid change with advances in health informatics, mobile technology, cloud platforms and digital diagnostics. The uses of technologies such as 3D printing and robotics in health and medicine is only being discovered with great potential to radically transform health outcomes and overall quality of life. The desired outcomes from the use of technologies could be explained by what the World Health Organization calls 'more money for health' and 'more health for the money'. Emerging technologies can play a key enabling role in both scenarios.[28]

Silicon Valley venture capitalist Vinod Khosla believes that over the next 10 years, 'data science and software will do more for medicine than all of the biological sciences together.'[29] He further adds that unlike traditional healthcare innovation, the rate of innovation will be much higher in digital health given that it has fewer safety effects.

Healthcare providers are also leveraging data-driven techniques to intelligently match physicians with patients. For example, the Kyruus platform developed by a company based in Boston, US, allows health providers to make doctor referrals based on criteria such as doctor's specialty, language skills, ratings, location and availability.[30] This data-based system is helping to reduce unutilized physician slots and reducing downtime. By tapping into disparate IT systems, the platform helps healthcare providers' better match supply and demand.

[27]Regional Development Australia, https://rda.gov.au/

[28]World Health Report, World Health Organization, http://www.who.int/whr/2010/en/

[29]Vinod Khosla shares thoughts on disrupting health care with data science, Stanford Medicine, http://scopeblog.stanford.edu/2015/05/11/vinod-khosla-shares-thoughts-on-disrupting-health-care-with-data-science/

[30]Kyruus is bringing data science to bear for smart patient referrals, Venture Beat, http://venturebeat.com/2015/06/22/kyruus-is-bringing-data-science-to-bear-for-smart-patient-referrals/

4.1 Microscale 3D Printing

3D printing that uses multiple materials to create objects such as biological tissue with blood vessels has the potential to transform medical research and therapeutics around artificial organs.[31] Organovo, a California based company, designs and creates functional human tissue using 3D bio-printing technology. The company now prints out liver tissue samples that are used for drug testing and research with plans to develop a functional liver in the near future. Organovo is also working with L'Oréal to 3D print human skin for cosmetic testing purposes.[32] Though not a medical application, it is quite possible that 3D printed skin could help burn or accident victims. Even with advances there are a number of challenges that hold back widespread adoption of 3D printed organs. This includes difficulties in finding the right materials to create body parts and also getting them to grow outside the body. Experts agree that real organs are complex and by just putting together printed cells may not be able to replicate how a real organ works.[33] 3D printed organ is viewed as a solution to the issue of shortage of donated organs. It is estimated that 18 people die in the United States each day waiting to receive an organ transplant.[34] US government agencies "Defense Advanced Research Projects Agency (DARPA) and the National Institutes of Health (NIH)" has provided funding to the Department of Biological Engineering at Massachusetts Institute of Technology to 'develop a technology platform that will mimic human physiological systems in the laboratory, using an array of integrated, interchangeable engineered human tissue constructs.'[35] This will be crucial in the efforts towards ensuring that 3D printed cells integrate with existing tissues during an organ transplant.

In India, a team of plastic surgeons from the Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) prepared to repair the deformed skull of a girl using 3D-printing technology. They created an exact sterilized replica of the child's skull better the chances of success during a complicated surgery.[36]

[31]Microscale 3-D Printing, MIT Technology Review, http://www.technologyreview.com/featuredstory/526521/microscale-3-d-printing/

[32]L'Oreal's Plan to Start 3D Printing Human Skin, Bloomberg, http://www.bloomberg.com/news/articles/2015-05-18/l-oreal-s-plan-to-start-3d-printing-human-skin

[33]What you need to know about 3D-printed organs, Endgadget, http://www.engadget.com/2014/06/20/3d-printed-organ-explainer/

[34]US Department of Health and Human Services, http://organdonor.gov/whydonate/index.html

[35]DARPA and NIH to fund 'human body on a chip' research, MIT News, http://newsoffice.mit.edu/2012/human-body-on-a-chip-research-funding-0724

[36]JIPMER doctors to use 3D printers to fix skull deformities, Live Mint, http://www.livemint.com/Politics/Zj6RkbtYINzUhcRNxzhUyI/JIPMER-doctors-to-use-3D-printers-to-fix-skull-deformities.html

4.2 Prosthetics and 3D Printing

In March 2015, Robert Downey Junior (aka Iron Man/Tony Stark) presented a prosthetic arm to seven year old called Alex. What was unique was not that the arm was Iron Man themed, but that it was 3D printed and cost just $350 in materials—which is much lesser than similar bionic arms.[37] The arm was designed by Albert Manero, a mechanical engineer at University of Central Florida. He founded Limbitless Solutions, which seeks to change lives through the design and distribution of 3D printed limbs, which are inexpensive compared to other options. Limbitless plans to develop bionic legs and elbow joints which like the arm will use electrical muscle signals to control movement. The team is bound by the desire to transform lives rather than make a profit. This points to the role that governments could play in mainstreaming such initiatives in partnership with groups like Limbitless. 3D printing of non-living medical devices such as prosthetic limbs, combined with a burgeoning population and insufficient levels of healthcare in emerging markets id projected to cause an explosion in demand for the technology.

4.3 Using Mobile Technology and Sensors to Preserve Vaccines

The United Nations Foundation campaign 'Shot@Life' estimates that one in five children lack access to life-saving immunizations that keep children healthy. Also, about 75 % of unvaccinated children live in just 10 countries.[38] Funding gaps continue to be a concern. Another major obstacle is the lack of a cold supply chain to preserve the efficacy of the vaccines. Nexleaf Analytics,[39] founded by two graduates of the University of California Los Angeles, is aiming to overcome this challenge by combining mobile phones and low-cost sensors. Nexleaf's ColdTrace solution transforms the cold chain infrastructure used to store and transport vaccines. Using a low-cost wireless sensor, the solution helps monitor vaccines remotely also transfer data to a global database that can aid collaborative decision making and ensures that the vaccines reach the neediest. The system is currently being deployed across sites in Kenya, Mozambique, India, Indonesia, Philippines and Laos.

[37]Watch Tony Stark Deliver A Real Bionic Arm To A Happy Fan, Tech Crunch, http://techcrunch.com/2015/03/12/watch-tony-stark-deliver-a-real-bionic-arm-to-a-happy-fan/

[38]UN Foundation Shot@Life Campaign, http://shotatlife.org/learn/problem/

[39]Nexleaf Analytics, http://nexleaf.org/project/real-time-transparency-vaccine-supply-chains

4.4 Robots to the Rescue

Hospitals (especially those in rural areas) are hard pressed in terms of availability of specialists. Telemedicine robots are being trailed at small remote hospitals to make up for the lack of trained doctors for emergency situations. These robots can serve a variety of purposes including emergency room stroke treatment, dermatology and specialty pediatrics.[40] Medical robots help to place remote physician specialists at the bedside of critically ill patients which has helped improve patient outcomes. With adequate funding and support, robotics has the potential to significantly increase access to high-quality medical care even in the remotest part of the world given that the ICT infrastructure is largely in place. Sanford Bemidji Medical Center in Bemidji and Essentia Health-St. Joseph's Medical Center in Brainerd are two rural Minnesota, US hospitals that have installed robotic surgical systems. The system has a camera that provides a multi-dimensional view inside the patient's body and a minimally invasive robotic arm with a pivoting wrist that can manipulate microscopic instruments in tiny areas inside the body while the surgeon navigates all aspects of the surgery from an exterior panel.[41]

Another healthcare area where robots are used extensively is among the elderly in retirement homes. It is estimated that over 6000 elderly people in Belgium, Netherlands and France are in direct contact with a humanoid robot.[42] Robots are used to demonstrate exercises to retirement home residents which they try to imitate. One such robot called Zora was created by a Belgian company called QBMT Creative Solutions.[43] The robots also serve the purpose of providing some form of companionship to the elderly who often suffer from loneliness. At present, the use of robots for elderly care is limited with a potential to expand in scope and usage over the next few years.

4.5 Digital Technologies for Medical Adherence and Wellness Monitoring

Technology is having a profound impact on how consumers view health and wellness. With the advent of wearables such as FitBit, JawBone, Microsoft Health Band and others, consumers are able to track physical activity, calorie intake and

[40]Robots save the day at rural hospital, Hays Post, http://www.hayspost.com/2014/06/03/robots-save-the-day-at-rural-hospital/

[41]Technology Widens Care Options for Rural Hospitals, Rural Assistance Center, https://www.raconline.org/rural-monitor/technology-widens-care-options/

[42]How a robot ended up teaching exercise classes in a Dutch retirement home, The Washington Post, http://www.washingtonpost.com/blogs/innovations/wp/2015/05/27/how-a-robot-ended-up-teaching-exercise-classes-in-a-dutch-retirement-home/

[43]Zora Robotics, http://zorarobotics.be/

sleep patterns. Wearable technology is a type of device that can be worn by a consumer and often relates to tracking information related to health and fitness. These tools have the potential to be used to nudge people towards desire behavior in terms of maintaining a healthy lifestyle which has positive implications for a country's healthcare costs. For example, in the US, the national cost of non-adherence for adults with diabetes, hypertension or dyslipidemia was $105 billion in 2010.[44]

Proteus Digital Health has received regulatory approval in the US and Europe for an ingestible chip that can be embedded in a pill.[45] When the pill is swallowed, the chip sends a signal that logged on to a server that the person or doctor can access on a phone or computer. The sensors work together to detect ingestions and physiologic data. By capturing objective information and providing actionable insights, you can take control, communicate with caregivers and clinicians, and stay healthy. With access to data, health professionals can allocate resources to those who need it most and also determine the best treatment for the patient. Medical adherence reduces total annual health care spend—savings are realized mainly through reduced inpatient hospital days and emergency department visits—which has positive outcomes for the social security sector.

4.6 Wearables for Good

UNICEF launched the 'wearables for good' along with private sector partners with the aim of developing innovative and affordable wearable technology that will help deliver life-enhancing and life-saving services. Two entries will be designated as winners, each receiving $15,000 funding along with incubation and mentoring from ARM and creative consultancy firm Frog.[46]

5 Education

Most reports on economic growth or competitiveness call upon countries to reform and transform the education system. The education system in developed countries is as much in need of reform as those in emerging or lesser developed countries. There have been numerous calls to improve access and outcomes by investing in

[44]Cost of Medication Nonadherence Associated With Diabetes, Hypertension, and Dyslipidemia, Kamyar Nasseh, PhD; Sharon Glave Frazee, PhD, MPH; Jay Visaria, PhD, MPH; Anna Vlahiotis, MA; and Yuhong Tian, PhD, The American Journal of Pharmacy Benefits, March/April 2012, http://s3.amazonaws.com/zanran_storage/www.ajpblive.com/ContentPages/2547764119.pdf

[45]Proteus Digital Health, http://www.proteus.com/

[46]UNICEF Wearables for Good, http://wearablesforgood.com/the-challenge/#about

additional learning infrastructure and training of teaching professionals. Governments and non-profits are focused on promoting early learning opportunities, advancing public education and improving college access and completion. The need is for an educated and equipped labour pool is amplified in times of low economic growth.

Technology is playing a major role in improving access to high quality learning resources—whether it is basic school curriculum from the Khan Academy or advanced fields of study through Massive Open Online Course (MOOC) platforms such as edX or Coursera. Khan Academy is a nonprofit with the mission of providing a free, world-class education for anyone, anywhere over the Internet. The rapid rollout of broadband technology and mobile connectivity lays the foundation for making learning resources available to people irrespective of location. Also, the use of data and analytics in education is growing rapidly with the power of big data being fundamental to improving student performance. The use of analytics can help teachers and educators design a smarter adaptive learning path for each student.

Technology has great potential in improving education in poor, rural and isolated communities around the world. For example, MobiStation is an innovative solution aiding education in and out of schools in Uganda. MobiStation is called a 'solar powered classroom in a suitcase'. It is essentially a multimedia tool built into a portable suitcase and comprises of a solar-powered laptop, a low power projector and an audio system. By providing specific offline content to compliment the school curriculum, it helps create an innovative learning environment that can be taken to various locations without internet access.[47] Interactive tools such as a touchpad with a pen and a wireless keyboard can also be used to more actively involve students in learning.

Mobile technology is also actively being used as a tool to promote literacy and learning and to support teachers. Teachers in remote locations are being provided access to teaching material through mobile technology. In Tanzania, the BridgeIT project provides access to digital video content in classrooms on demand via mobile technology. This project is an extension of the 'text2teach' project in the Philippines which began in 2003.[48] In Pakistan, students are sent short quizzes via SMS to their mobile phones to help them assess how well they are understanding topics being discussed in class.[49] For example, students at Asghar Mall College in Rawalpindi, Pakistan began participating on a voluntary basis in a daily vocabulary quiz exercise delivered by SMS.

[47]MobiStation—An innovation supporting education in and out of schools in Uganda, UNICEF Stories, http://www.unicefstories.org/2014/07/14/mobistation-an-innovation-supporting-education-in-and-out-of-schools-in-uganda/

[48]Checking in with BridgeIT in Tanzania: Using mobile phones to support teachers, The World Bank, http://blogs.worldbank.org/edutech/checking-in-with-bridgeit-in-tanzania

[49]SMS education in Pakistan, The World Bank, http://blogs.worldbank.org/edutech/sms-education-pakistan

5.1 Hybrid-Learning Model

The Los Altos School District in California, USA has partnered with Khan Academy to integrate online curriculum into traditional math classes.[50] The online tools from Khan Academy enables the provision of individualized instruction in math with the use of videos and assessment exercises. Teachers are also able track a student's progress using analytics made available by the Khan Academy website. All the video resources are made available freely to anyone anywhere in the world. As of February 2014, Khan Academy had about 10 million unique users per month indicating the strong demand for quality online education. Khan Academy continues work closely with schools to transform how education is delivered and experienced by both students and teachers. In a survey conducted by SRI Education among students using Khan Academy, 71 % reported that they enjoyed using the website and 32 % agreed they liked math more after using Khan Academy.[51] The study also found a positive association between the use of Khan Academy and student outcomes in terms of test scores and academic efficacy.

5.2 Analytics in Education

Colleges and universities have begun to realize that analytics can help significantly advance an institution in areas such as resource allocation, student success and finance. Many American educational institutions have used analytics successfully to make predictions as well as trigger action in a variety of areas.[52] Paul Smith's College in New York used analytics to improve its early-alert program to identify at-risk students and prioritize students for intervention and outreach. As a direct consequence of these efforts, the college experienced increased success, persistence and graduation rates for all students.[53] Western Governors University (WGU) in Salt Lake City, Utah, US, uses assessment based coaching reports to develop customized study plans for students. As an online university WGU has worked successfully with students from diverse background and ability in self-directed

[50]Los Altos School District, http://www.lasdschools.org/District/Department/26-Academics/3671-Khan-Academy.html

[51]Research on the Use of Khan Academy in Schools, SRI Education, http://www.sri.com/sites/default/files/publications/2014-03-07_implementation_briefing.pdf

[52]Analytics in higher education, Educause Center for Applied Research, http://net.educause.edu/ir/library/pdf/ers1207/ers1207.pdf

[53]Beyond Retention: Using Targeted Analytics to Improve Student Success, Educause Review, http://www.educause.edu/ero/article/beyond-retention-using-targeted-analytics-improve-student-success

study plan approaches including mass customization supported by an analytics driven solution.[54]

Real-time analytics platforms have been developed for K-12 schools also. US-based Learnmetrics (formerly known as Ontract) has developed a Family Educational Rights and Privacy Act compliant platform that connects fragmented educational systems like student information systems and learning management systems and provides teachers with greater insight into data metrics and analytics.[55] The Family Educational Rights and Privacy Act is a Federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education. Learnmetrics gives teachers real-time insight into student performance and make timely interventions.[56] Tools such as these can play a significant role in helping improve education outcomes and reduce dropouts.

5.3 *Robots in the Classroom*

Elementary schools in Tokyo, Japan are experimenting with humanoid robots as teachers. A robot named Saya was trailed at a primary school in 2009. Saya has a total of 18 motors enabling it to speak different languages, carry out roll calls, set tasks and make facial expressions.[57] Saya was created by Hiroshi Kobayashi, a science professor at the University of Tokyo after more than 15 years of extensive research. Japan continues to invest in robotics given a declining population and an ageing workforce In Australia, a new research project is bringing advanced technologies to Australian classrooms, with 20 schools rolling out robots as educational tools. The robots will be the subject of a 3-year joint research project by the Independent Schools Association and three interstate universities.[58] The aim of this project is to use the robots to improve student engagement and learning.

Concerns have been raised on the increasing use of machines in the classroom. According to Michael Osborne, associate professor of machine learning at the University of Oxford, teachers will be less important when transmitting knowledge with the increased use of robots.[59] However, there are others who believe that

[54]Coaching Reports Support Customized Study Plans, Educause Review, http://www.educause.edu/ero/article/coaching-reports-support-customized-study-plans

[55]Learnmetrics, https://learnmetrics.com/

[56]Learnmetrics: Making report cards obsolete, CITE World, http://www.citeworld.com/article/2304856/big-data-analytics/learnmetrics-helping-school-data-graduate-to-information.html

[57]Robot teacher that can take the register and get angry, The Telegraphy, http://www.telegraph.co.uk/news/4942136/Robot-teacher-that-can-take-the-register-and-get-angry.html

[58]Australian classrooms to employ robots as education tools, 9 News, http://www.9news.com.au/technology/2015/06/18/22/13/australian-classrooms-to-employ-robots-as-education-tools

[59]Robo-teacher is coming but don't expect to be inspired, The Telegraph, http://www.telegraph.co.uk/education/educationnews/11642622/Robo-teacher-is-coming-but-dont-expect-to-be-inspired.html

teachers will continue to play a major role in education even with advances in technology as they engage with students deeply and provide guidance and support which robots are presently unable to replicate.

5.4 What Next?

Technology use in education is more than ever before. According to the US Software and Information Industry Association, the sales of educational technology software for kids in kindergarten through high school reached nearly $8 billion in 2013–2014.[60] The internet of things could have a major impact on how the education sector works. It could transform a classroom setting with the use of sensors and wearables for things such as attendance authentication for monitoring and other learning dynamics.[61] The Clevedon School in Clevedon, UK, is leading the use of Apple iBeacons at schools. iBeacons use Bluetooth technology to make it possible for sensors to detect how close a phone is. The Clevedon School uses this technology to enable students to interact with their environment and classrooms by providing location specific resources and notifications.[62] Using the existing Clevedon Handbook App, the school integrates the iBeacon function so that teachers could set resources for their students to receive as they entered or exited a predefined region of the classroom. However, concerns around how much data should be collected from students in schools and what they can used for need to be addressed to increase adoption.

6 Urban Planning

The concentration of opportunities in urban areas has led to significant migration to urban centers especially in emerging economies putting a strain on city infrastructure. Cities across the world continue to grapple with issues around inadequate infrastructure—housing, power, water, security, transport and waste management.

Urban planning can benefit from data that is mined from social media and geolocation tags. This could potentially be used by cities to ensure better land use. For example, Enrique and Vanessa Frías-Martínez, computer science researchers at Telefonica Research and the University of Maryland (USA)

[60] A day in the life of a data mined kid, Marketplace, http://www.marketplace.org/topics/education/learningcurve/day-life-data-mined-kid

[61] Can the Internet of Things make education more student-focused?, Deloitte, http://government-2020.dupress.com/can-internet-things-make-education-student-focused/

[62] iBeacons at Clevedon School (Video), http://www.iclevedon.co.uk/ibeacons-launch-at-clevedon-school/

respectively, have suggested using geolocalized tweets for urban planning and land use. According to them, cities can capture information on urban land use more efficiently and for a much larger number of people than with questionnaires.[63] Geotagged social media data combined with analytical tools help urban planner and computer scientists understand how people use a city that can then be used to improve planning and quality of life in cities. This can also be an avenue to gain insight into problems faced by residents and potential opportunities to fix them.[64]

Data scientists are also exploring the use of Big Data to better understand migration. In a paper called 'Inferring International and Internal Migration Patterns from Twitter' published by scholars from New York City's Queens College, Doha's Qatar Computing Research Institute and Stanford University, an indicator of geographic mobility in OECD countries was developed, based on publicly available geolocated tweets.[65]

Rapid urbanization has in many ways increased homelessness in cities of both developed and emerging countries which is a constant challenge. It may appear that city administrations face a next to impossible task in finding adequate housing arrangements for all given the cost and complexity involved. However, if you take the results of a study by the Central Florida Commission on Homelessness, the cost to a community is much larger when chronically homeless people live on the streets than when they are provided with permanent housing.[66] The cost to community includes salaries of police personnel, cost of jail stays, emergency room visits or hospitalization. If on the other hand, governments actually provide permanent housing with case managers to supervise, it would lead to substantial savings. Digital technologies such as data analytics, cloud computing and 3D printing have the potential to address the issue of homelessness from the perspective of identifying people who need services most as well as in the design on cost effective housing options. Cities such as San Francisco in the US which face a persistent homelessness problem are seeing a number of social entrepreneurs using technology to address the issue. For example, HandUp is a company linking donors directly to homeless people or low-income households who need support.[67] The company also teams up with other social startups and web developers to give homeless people more access to technology. Another example from San Francisco is the

[63]What you tweet when you go party can be useful for improving urban planning, Science Daily, http://www.sciencedaily.com/releases/2014/12/141229081755.htm

[64]Using Social Media Data to Understand Cities, Dan Tasse, Jason I. Hong Human—Computer Interaction Institute, Carnegie Mellon University, https://dl.dropboxusercontent.com/u/35674979/CFP/proceedings/bduic2014_submission_26.pdf

[65]Using Big Data To Understand Migrations, Forbes Magazine, http://www.forbes.com/sites/federicoguerrini/2014/08/08/using-big-data-to-understand-migrations/

[66]Cost of homelessness in Central Florida, Orlando Sentinel, http://articles.orlandosentinel.com/2014-05-21/news/os-cost-of-homelessness-orlando-20140521_1_homeless-individuals-central-florida-commission-tulsa

[67]US: Social Startups Using Technology to Help Homeless People, Clapway, http://clapway.com/2015/07/06/us-social-startups-using-technology-to-help-homeless-people-123/#ixzz3i9fUiqbF

FeedingForward app which enables businesses to save money by connecting their excess edible food to feed communities in need, instantly. It uses technology to streamline the process of food recovery and distribution, giving businesses the power to eliminate food waste within minutes. Since the company was launched in 2013, it has already fed 576,580 people in the Bay Area.[68]

6.1 Data Sharing and Analysis to Address Homelessness

A challenge that confronts city administrations across the world is in identifying and providing homes to the most risky or urgent homeless cases. This is a difficult decision to make and hence adds to the costs incurred by city administrations. Distribution of housing subsidies and other related benefits are usually based on a first come first served basis. The United States Interagency Council on Homelessness through its 'Housing First' plan seeks to quickly provide supportive permanent housing to those in most need.[69] Here again there is a need to identify the most urgent cases and provide them with shelter and associated services. Homelink,[70] a web-based tool designed by Community Solutions and Palantir Technologies seeks to simplify the process of identification by collecting data on homeless persons such as income, medical history and substance-abuse problems and assigning a severity score.[71] The assessment results can be accessed by participating agencies from a centralized database. The neediest clients are identified for assistance using an algorithm that matches homeless people and available services.

6.2 Rapid Housing Solutions

Solving the housing problems in cities is a major challenge. Emerging technologies such as 3D printing combined with robotics have the potential to radically transform the provision of housing facilities. Fastbrick Robotics based in Perth, Australia has developed the first brick-laying robot called Hadrian. The robot is capable of laying 1000 bricks per hour and has the capacity to work day and night with the potential to make 150 homes a year. The robot works by creating a 3D computer-aided design (CAD) laying program of a house or structure, then calculates the location of every brick and creates a program that is used to cut and lay the

[68] FeedingForward, https://www.feedingforward.com/

[69] United States Interagency Council on Homelessness, http://usich.gov/usich_resources/solutions/explore/housing_first/

[70] Community Solutions, http://cmtysolutions.org/Datamanagement

[71] Just like Airbnb, The Economist, http://www.economist.com/blogs/democracyinamerica/2015/01/data-and-homelessness

bricks in sequence from a single, fixed location. Hadrian is expected to deliver accuracy to within one hundredth of an inch. It is carried by truck and powered by either a generator or local power sources. The project has received multiple federal government grants and has the potential to service the overwhelming demand for housing which is quicker and cheaper than before.[72]

Another major innovation is the idea of 3D printed houses. In May 2014, architects in Amsterdam, Netherlands, started building full-sized 3D printed houses using plastic heavily based on plant oil. It is being touted as a waste-free, eco-friendly way to design and construct cities of the future.[73] Similarly, a Chinese company used 3D printing to build 10 single-story houses in a day as a cheaper and faster alternative to traditional house construction methods. WinSun Decoration Design Engineering built the houses in Shanghai using four giant 3D printers, which are each 10 m wide and 6.6 m high. The construction used a mix of cement and construction waste to construct the walls layer by layer.[74] 3D printing and robots have the potential to make a lasting impact in addressing housing related challenges that cities across the world face.

6.3 3D Printing to Design Cities

San Francisco based urban design firm Steelblue built 3D printed model of the city to highlight several projects that a builder was undertaking. Creating this model using a 3D printer was possible at a fraction of the cost of making other prototypes. Such designs have the potential to be used for urban planning needs. The 3D printed model can also be used to assess the impact of different factors such as changing weather on city infrastructure and so on.[75] The city of Oslo, Norway has made 3D printing an integral part of future urban planning by creating a complex, small scale model of the city at the Agency for Planning and Building Services.[76]

[72]Fastbrick Robotics, http://www.asx.com.au/asxpdf/20150624/pdf/42zcrnj7yq2by9.pdf

[73]How Dutch team is 3D-printing a full-sized house, BBC, http://www.bbc.com/news/technology-27221199

[74]Chinese Company Builds Houses Quickly With 3D Printing, Mashable, http://mashable.com/2014/04/28/3d-printing-houses-china/

[75]3D Printing to Design Cities? Urban Planning Firm Makes Model of San Francisco, HNGN, http://www.hngn.com/articles/32620/20140530/3d-printing-to-design-cities-urban-planning-firm-makes-model-of-san-francisco.htm

[76]Oslo, Norway Makes 3D Printing an Integral Part of Future Urban Planning with 3D Printed Model of City, 3DPrint.com, http://3dprint.com/57272/oslo-3d-printed-city-model/

7 Risks and Challenges

As is the case with any new technology, there are a number of associated risks and challenges which the government and other stakeholders need to be aware of and strive to mitigate. These could range from incomplete information on the effects of a particular technology tool or considerations around data privacy. For example, researchers at the Illinois Institute of Technology identified that the use of 3D printers in locations without ventilation shafts and filters could potentially lead to health issues.[77]

A key concern for the public in the use of data sciences and sensors is around data privacy and security. The collection of personally identifiable data and its storage and uses are a major cause of concern. Addressing these concerns are essential to ensure wider adoption of new and emerging technologies. Safeguards need to be put in place to ensure that the data that is collected it not used as a surveillance tool or used against the best interests of the citizen. Concerns around data collection and its uses are more in fields such as health and education since most people may not be comfortable with the idea of sharing such information. Governments have begun the process of introducing legislation that safeguards data privacy. Therefore it becomes imperative for platforms using advanced technologies to conform to those standards especially around the storage, use and security of the data.

Other issues that need to be addressed relate to achieving open standards and interoperability. This is essential for the ecosystem of internet of things to function. Issues around proprietary restrictions could limit the adoption of technologies. Groups such as the Industrial Internet Consortium involves companies working together to integrate systems and interconnect proprietary networks.

8 How Governments Can Help

The Internet and GPS are two widely quoted examples of transformative inventions that started off in the government or military sector and then became mainstream changing the world we live in. Things have changed in the sense that startups and corporations have taken on the mantle of discovering and developing advanced technologies that have the potential to transform how the world lives. However, governments continue to have an important role to play whether it is in terms of putting in place the regulations or investing to take niche technologies to the masses.

[77] Ultrafine particle emissions from desktop 3D printers, Brent Stephensa, Parham Azimia, Zeineb El Orcha, Tiffanie Ramosa, Atmospheric Environment, November 2013, http://www.sciencedirect.com/science/article/pii/S1352231013005086

Governments across the world appear to be moving in the right direction, but more needs to be done. One key area is around the promoting startups that are increasingly the source of radical innovations that have the potential to transform various fields. Government could consider establishing a policy unit to see how they can subsidize startups through what is usually a long cycle from developing an idea to commercializing it. Some governments have understood the potential of such initiatives and are implementing policies and plans to help startups flourish. For example, in France, the fiscal environment rewards innovation and includes Europe's most generous tax credit for R&D. Labour laws also are becoming more flexible. In particular, a bill extends the scope for start-ups to give staff shares instead of cash salaries.[78] The atmosphere should be suitable for large companies also since many times regulation makes it difficult to actually implement the various plans that they have. In Italy, the Ministry of Economic Development, formed a task force to promote the creation and development of startups. This was then legislated into a set of reforms that simplified the setup of new companies and facilitated private investments. Key elements included a tax relief of 19–27 % on investments fueling startups, public guarantees on bank loans covering 80 % of the sum, fail-fast mechanisms, 35 % tax credit for the hiring of highly-skilled personnel and flexible labour laws. All these are notable initiatives from a government keen to tap into this emerging economy, but initiatives at top-level take time to trickle down and shape cultural behavior.[79]

8.1 Developing the Ecosystem

Government can play a major role in fostering the ecosystem initially by providing suitable incentives to startups and businesses such as seed capital, tax breaks and access to digital and physical infrastructure. This is not to suggest that governments over-subsidize startups but aim to boost local ventures addressing key social issues by providing the right environment conditions in terms of talent, finance and regulations. The aim should be to create an environment where companies can be created and accelerated. Governments should subsidize access to tools and technologies that serves as the backbone for any technology-led innovation whether it is broadband or related ICT infrastructure. Government should also work with all stakeholders including successful entrepreneurs who are usually the ones to mentor and invest in next-generation startups. Urban centers already have the density of people who can bring in new ideas, but they need that background support and facilitation from the government to take it to the next level.

[78]Gambling on success, The Economist, http://www.economist.com/news/business-and-finance/21638048

[79]Taking a bite out of Italy's startup ecosystem, http://tech.eu/features/2883/italy-startup-ecosystem-deep-dive/

8.2 Funding for Scale

Governments may consider to introduce regulations to facilitate innovative forms of financing development while ensuring protection of investors. This is essential since traditional forms of financing may not be readily available for technology innovations that address specific social challenges. Crowdfunding could be one of the options drawing in the power of the masses to make technologies mainstream and solve key issues. According to the World Bank, crowdfunding raised US$2.7 billion in 2012 through all business models and platform types. It is estimated that by 2025, the market potential could be US$90–96 billion per year.[80] Governments could explore providing simple tax incentives to channel household savings towards innovative startups, non-profits or universities via crowdfunding platforms. The risks associated with crowdfunding needs to be managed with government supervision given that the risk of default or investment failure in equity crowdsourcing is quite high. According to some experts, the UK has one of the best crowdfunding regulation—with the right balance of risk and regulation allowing it to thrive. In addition to sensible regulation that is in place, the industry has taken a responsible approach from the outset, committing to voluntary codes of practice, such as that drawn up by the UK Crowdfunding Association (UKCFA). Among other things, these require UKCFA members to put clear water between investors' funds and platforms' finances, maintain transparency and ensure security over information and investments."[81] Governments should also make provision for tax incentives and write-offs for enterprises that innovate and create jobs.

8.3 Regulatory Oversight

Regulation needs to address and facilitate a wide range of issues such as access to capital and other resources, getting permits and employing workers, when it comes to technology innovation. Regulation needs to focus on addressing data privacy issues. Regulation needs to think about how to simplify and facilitate appropriate funding into the open innovation ecosystem in a contemporary model which would involve a mix of university grant, wealthy philanthropic grant and large company support. Governments should also consider revising bankruptcy and liquidation legislation to reduce the consequences of failed businesses. This would involve innovative legislation around 'fail-fast' procedures to alleviate liquidation procedures and remove the stigma from failing to gain future access to finance.

[80]The World Bank, http://www.infodev.org/infodev-files/infodev_crowdfunding_study_0.pdf

[81]Crowd Fund Insider, http://www.crowdfundinsider.com/2015/06/68834-crowdbnk-ceo-the-uk-has-the-best-crowdfunding-regulation/

Regulation of Digital Government

Michael Silverman

1 Introduction

National governments have established broad strategic statements of digital and technological aspirations. The advent of new technologies, ranging from cloud computing, the Internet, mobile devices, social media to on-line collaborative tools, have enormous potential to transform traditional processes of governance. But these new technologies come with significant, complex and daunting issues such as privacy and security, censorship, ownership claims, and health and safety concerns. The global nature of these technologies transcends national boundaries and permits the transmission of information to a global audience in seconds. This technology poses significant oversight challenges for governments' national sovereignty that traditionally control the means and access of information within their borders. Similarly, for the private organizations that supply and maintain the infrastructure of digital government, the growing requirements pose significant new regulatory duties and obligations. This Chapter examines some of the key issues that governments will likely encounter as they embark upon their transition to digital governments as well recommendations to address these concerns.

2 Regulatory Oversight

A folksinger once said that you do not need a weatherman to know where the wind is blowing. Similarly, the emergent digital government movement is inevitably faced with a number of regulatory challenges and requirements that govern its

M. Silverman (✉)
School of International and Public Affairs, Columbia University, New York, NY, USA
e-mail: ms2735@columbia.edu

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_4

operations. Regulation is a powerful tool to control what government deems as risk. It can be used to control and influence data, determine access to information, decide which information is to be made public or held in secret, and where information is to be housed. It also plays a valuable role in enhancing transparency, predictability and the protection of citizens.

For modern organizations, whether in the public, private or non-profit sectors of the economy, the maze of regulatory demands imposes a significant requirement to ensure compliance with the letter and spirit of these obligations. Regulatory actions are in a constant state of movement. For modern organizations, it is often a constant struggle to understand and manage within this maelstrom of rules and regulations. The global emergence of the digital technologies has fostered an enormous growth of international, regional, and national regulatory oversight requirements. A former Chairman of a global European-based telecommunications corporation ruefully referred to this "universe of regulation" that his organization had to constantly struggle to manage within (Silverman 2008). Similar to its stellar counterparts, regulation is also forever evolving in form and fashion.

As governments move toward a digital future, they face a dual regulatory burden. While they are mandated to promulgate rules, regulations and guidance for non-governmental organizations, they are not exempt from the need to address the issues of regulatory duties within its own operations. The advent of the new digital technologies pose a particular challenge for governments who wrestle with the problems of governing Internet usage, social media, cloud computing, privacy and security concerns within their own operations.

2.1 Regulatory Tools

Modern regulation is a complex structure involving governmental and non-governmental players. The traditional concept of government "top down" rulemaking as the sole means for initiating and enforcing regulation must be seen in a changed context. Government regulations are now integrated with a variety of non-governmental regulatory bodies, e.g. professional groups (e.g. auditors, lawyers), standards–setting organizations and industry associations. Government regulations that encompass a range of mandates and obligations are often delegated to private organizations. These self-regulatory organizations (SROs) design rules and regulations governing their members' practices including setting standards, disciplinary practices, licensing requirements, and certifications.

This regulatory approach plays a key role in the administration of digital technologies and the Internet. Organizations[1] such the Information Systems Audit

[1]The diverse and fragmented governance of the internet include a number of other technical organizations responsible for coordination of the Internet infrastructure. In addition to the those named above there are IEFT (The Internet Engineering Task Force) which is a component of the

and Control Association (ISACA) and its COBIT framework for IT governance, or the International Organization for Standardization (ISO) and International Electrotechnical Committee (IEC) have issued numerous global standards for information technologies and to protect information assets. Probably the best-known non-governmental organization is the Internet Corporation for Assigned Names and Numbers (ICANN) who is responsible for registering Website domain names and IP addresses.[2] ICANN will be discussed later in this chapter.

3 Regulatory Challenges for Digital Government

The collection, storage and dissemination of electronic information associated with digital government is daunting. The trans-national character of most new technologies presents unique regulatory challenges. As governments increasingly focus on becoming, in the words of a government report, "information-centric, mobile enabled and collaborative digital environments," (Executive Office of the President of the United States 2012). The need to address these issues becomes even more challenging as the speed of new technological developments often outpaces the ability to regulate these technologies. One commentator wryly noted this challenge: "Trying to regulate the Internet . . . would be like trying to manage a transportation system in which not only new roads but new types of roads, and new types of vehicles, and new types of fuel, are invented each day. And the roads move, and hide. And some roads connect Alabama to Estonia, and are filled with invisible bandits" (Scholl 2012). Moreover, each of these technologies present their own particular challenges to government control and oversight.

3.1 Internet

In this era of Wi-Fi, broadband, email, cloud computing, social media, texting, mobile devices that are intrinsically part of so many of our daily lives, it is astounding to note that it was only in 1991, the first friendly interface to the Internet was developed at the University of Minnesota. The transformation has been staggering. In 2013, 44 % (3.1 billion people) of the global population was connected to the web (ITU 2014).

Never before has the wealth of information been so readily available. Digital technologies have transformed our lives—from access to medical information to

ISOC (Internet Society), IAB (Internet Architecture Board) RIRs (Regional Internet Registries), and W3C (World Wide Web Consortium).

[2]As of 2015 there are 156 countries, ranging from the United Arab Republic to Zambia who participate in ICANN's Country Code Names Supporting Organization (ccNSO).

personal relationships. Information on private and public sector performance, activities, and entanglements can be found sitting at a desk or on a train in almost any part of the world. Data that used to require hours, days or weeks to retrieve can now be found within minutes and then shared with others around the world shortly thereafter. The diverse access to this information is a staggering challenge for government regulators. No longer is access to Internet data limited to desktop computers with wired Internet connections. Laptops, smartphones, tablets permit Internet access often via wireless modems and fixed wireless Internet networks.

For governments wishing to pursue a digital future, the Internet, and its multiple means of access, are the backbone for new services and communications capabilities. While the Internet opened a new world of information and social communication, it also brought with it a plethora of major issues that will be discussed below: access to private information, fears of unauthorized intrusions, controversies over ownership and control of Internet content, and threats to national sovereignty and struggles with the best method to govern this new technology.

4 Social Media

The advent of social media, e.g. Twitter, Facebook, LinkedIn, YouTube, etc. has had a profound and transformational effect on activities ranging from commercial marketing to even the communication of official government information. Governments, from Prime Ministers, Presidents to local government officials, are using social media to communicate with their constituents. In 2015, there were more than 1.44 billion active monthly users of Facebook and 288 million Twitter users globally. One U.S. Congressman humorously summarized Twitter's virtues:

> "I know the overall importance of reaching out through the social media, because I have 31 grandchildren and they are on all of these things," said U.S. Rep. Buck McKeon, R-Calif. "This is mostly a young person's game and I'm an old person, but I'm young at heart ... the only advice I'd give is 'get involved' and then use it in the right way" (Sniderman 2011).

Social media presents government regulators with a host of issues ranging from privacy and cyber security to hijacking of computer systems (the latter concerns RATs, not the small furry types, but "remote administrative systems" that can remotely access and control computer technologies). Governments have responded to these social media risks in diverse ways. In Europe, concerns over individual privacy have promoted greater restrictions on social media providers. In the United States, there is no one overarching law that governs the actions of social media however there are myriad laws addressing diverse aspects of social media. These range from the Children's Online Privacy Protection Act (COPPA) to the Securities and Exchange Commission's concern (ultimately settled) over the use of Twitter by companies to announce forthcoming developments that might be in violation of U.S. law regarding the publication of market-sensitive information to the public.

5 Cloud Computing

One of the most important developments in digital technology has been the emergence of cloud computing for both the public and private sectors. In essence, cloud computing involves a large data center, which is typically managed by a third party, who holds and manages the client's information. Like an electric utility, data on the cloud is accessible by anyone, anywhere with access to the Internet and with the proper credentials. The advantages and potential offered by cloud computing are considerable: access to computer resources and data capacity at a cost far less than it would have to achieve if it used its financial resources. A computer executive aptly expounded on the potential that cloud computing services offer: "... an enterprise [can] expand its infrastructure, add capacity on demand, or outsource the whole infrastructure, resulting in greater flexibility, a wider choice of computing resources and significant cost savings" (Mohamed 2009).

While cloud computing technology offers enormous potential for expanding and improving government services, the cloud also presents a host of potential legal and regulatory issues:

- Establishes a new relationship between the owner of the information, its users, and the cloud provider—a third party relationship that creates a potentially complex set of governance issues, e.g. legal obligations for control of the information and adherence to regulatory obligations.
- As a global service, information may cross multiple governments each of whom may have their own regulations concerning privacy thus compounding the challenges for service providers and users. For example, both the European Union and United States have differing views on the nature of privacy and privacy protections provided.
- Privacy and security are the greatest challenges. By its very nature, cloud computing means that the physical infrastructure used to store information is shared among various users. How is sensitive information to be handled? Government agencies have used various strategies, from encryption to tokenization, to safeguard data; however, there still exists the threat of hacking and unauthorized third-party access to the cloud.

6 Mobile Devices

As never before, mobile devices (e.g. smartphones, tablets, iPads) provide consumers with access to e-mail, apps and video almost anytime and anywhere. A market research company (eMarketer 2014) reported that 4.55 billion people worldwide are expected to use a mobile phone in 2014. Between 2013 and 2017, mobile phone penetration will rise from 61.1 to 69.4 % of the global population.

Government regulations for mobile devices, esp. cell phones, have focused on several key issues:

- The oversight of mobile phone providers range from the technical (allocation of bandwidth, or smart phones have the ability to display emergency alerts, e.g. dangerous weather) to the terms and quality of customer service.
- Health and safety issues, e.g. concerns that radiofrequency energy (or radio waves) may be injurious to human health, and that mobile devices are distractions while driving. A number of states in the United States and EU member states have passed cell phone safety bills. In March 2014, Belgium passed a law that the specific absorption rate (SAR) has to be listed for every mobile phone sold. SARs are a measure of radio frequencies that may (or may not) cause brain cancer due to intensive use of a mobile phone.
- The transmission of sensitive information. As mobile devices are able to transmit and receive a greater range of information, concerns have been expressed about the safety and security of this information. Here are two examples:
  - The American banking regulator (Federal Deposit Insurance Corporation) warned that "security concerns present significant challenges for financial institutions providing mobile banking services, and each delivery channel [Text messaging/short message service (SMS), Mobile-enabled Internet browser, Mobile applications (apps)] poses unique risks for institutions and customers" (FDIC 2011).
  - ENISA (the European Union Agency for Network and Information Security) in a 2010 report on smartphone risks cited a number of potentially dangers. These risks included improper decommissioning of the phone without removing sensitive data, phishing, spyware that allows an attacker to access or infer personal data and surveillance of the targeted user's smartphones (Hogben and Dekker 2010).

7 Key Regulatory Challenges Facing Digital Government

While each component of digital government presents their own unique issues, there are six common areas that all digital governments will have to address. These areas pose significant challenges for digital government in that they touch on the most sensitive questions of national sovereignty, personal privacy, balancing national security and individual rights, protecting personal access to and transmittal of information, the challenges posed by the "internet of things", and governmental oversight and regulation in a rapidly changing governance environment.

8 Privacy

The vast collection of organizational and personal information by both public and private entities and the ability of new technologies to intrude into people's daily lives have prompted calls for greater vigilance and protection. Privacy covers a broad range of concerns: fears for the safety of children in chat rooms and on the Internet, the privacy of e-mail, the vulnerability of web users to having their Internet usage tracked, and the freedom of people to talk and post messages anonymously.

A 2012 report by the U.S. government entitled: "*Digital Government: Building a 21st Century Platform to Better Serve the American People*", expressed this concern:

> As the federal government builds for the future, it must do so in a safe and secure yet transparent and accountable manner. Architecting for openness and adopting new technologies have the potential to make devices and data vulnerable to malicious or accidental breaches of security and privacy. . . .moving forward we must strike a balance between the very real need to protect sensitive government and citizen assets given the realities of a rapidly changing technology landscape (Executive Office of the President of the United States 2012).

The United States is certainly not alone in this concern. Europe's desire to protect individual privacy is reflected in a 2014 ruling by the Court of Justice of the European Union in a Spanish case involving Google. The court stated the fundamental right of privacy "override[s], as a rule, not only the economic interest of the operator of the search engine but also the interest of the general public in having access to that information upon a search relating to the [individual's] name." In response to this ruling, on May 29, 2014, Google launched its official request process for removing search results. From May 29, 2014, through Feb. 13, 2015, Google received 216,810 requests from individuals for removal of URLs from search results. These 216,810 requests addressed 783,510 different webpages. As a result of the official request process, 59.7 % of the webpages have been removed from Google's search results (Feldman 2015).

For digital government, the issues of privacy touch on a number of complex, important and sensitive issues for both public and private entities. What is a sufficient level of consent when collecting personal information online from the person providing the data and when does it have to be provided? When does a person decide to "opt in" or "opt out" of providing information? What steps will be taken to protect information? With the trans-national flow of information, digital government will have to formulate policies on the transfer of information outside its national boundaries to protect citizen privacy. For example, the EU has stringent requirements on transferring personal data outside the European Economic Area. Who may receive this information and under what circumstances poses substantial issues. And even cookies deserve special mention. New EU Internet privacy laws require website providers must obtain consent from visitors before storing or retrieving any information on a computer, smartphone or tablet.

For digital governments, the need to address privacy is critical. A citizen's daily life is affected by technologies that can track and record an individual's most routine activities. The choices are stark and complex: the quest to balance the rights, security and privacy of its citizenry with the enormous potential these new technologies offer governments to protect its own self-interests.

9 Cybersecurity

The threat of unauthorized access to the tools of digital government is a serious issue. A 2015 global survey by the Internet Society reported that 86 % of the respondents said that cybersecurity is the most important issue facing the Internet community today (ISOC 2015). Hacking has been a repeated threat to the Internet. Repeated stories of foreign intrusions into US government systems have proliferated. In 2009, President Obama bluntly said of this problem: "it's now clear this cyber threat is one of the most serious economic and national security challenges we face as a nation" (Office of the Press Secretary 2009). Ranging from the North Korean hacking of Sony Pictures' email and digital information system in retaliation for a film it deemed offensive, to repeated stories of Russia and China hacking of US government systems,[3] including the President of the United State's private (unclassified) emails, In 2015, hackers attacked the German Bundestag lower house of parliament's computer system, and Chancellor Angela Merkel's mobile phone.

Other accounts[4] illustrate the scope and impact of cyber threats across the spectrum of digital technologies:

- In 2013, *Daily Mail* reported that security experts found a cache of two million pilfered passwords to popular social media websites including Facebook, Google, Twitter and Yahoo from Internet users across the globe. These included 326,000 Facebook accounts, 60,000 Google accounts, and more than 59,000 Yahoo accounts (Daily Mail Reporter 2013).

[3]In June and July, 2015 it was reported in various media that hackers had stolen a vast amount of data from the U.S. government's Office of Personnel Management (OPM) computer networks. It included information on 21.5 million people who had undergone background checks for security clearances. In a separate but related data breach, information on 4.2 million current and former U.S. workers were stolen. It was estimated that the total number of people affected by these actions represented almost 7 % of the U.S. population (Zengerie and Cassella 2015).

[4]In July 2015, the United States' National Highway Traffic Safety Administration was investigating a threat to the security of the Fiat Chrysler Jeep and a hacker being able to gain control over its dashboard connectivity system. A recall of 1.4 million cars was initiated to correct potential system flaws. One U.S. Congressman said of the issue, "cars today are essentially computers on wheels, and the last thing that drivers should have to worry about is some hacker along for the ride" (Kessler 2015).

- In April 2015, hackers acting in support of Islamic State extremists knocked out the global broadcast network of France's TV5, and then hijacked its website and social media to post warnings against French participation in air strikes against militants in Iraq and Syria.

To confront the need to protect against cyber threats, digital governments will have to consider a variety of measures to safeguard its citizens and assets. Given the nature of these threats, cybersecurity strategies must be interdisciplinary and comprise multiple stakeholders (public and private sectors, enhanced international cooperation). With these initiatives, digital government can improve its risk management capability to respond to vulnerabilities, threats, and fix potential weaknesses. These initiatives need to ensure that critical information infrastructures have the ability to prevent, detect and manage incidents, and that there is a coordinated response to incidents and recovery. Beyond strategy and policy, technology must be applied that can assist governments to monitor, collect and analyze information and identify patterns that indicate breaches or attempted breaches of cyber security. It is crucial that digital government have the trust and confidence of its citizens and institutions to protect the security of their information.

9.1 A Balancing Act

Yet in its quest to protect the security of information, digital governments must also respect the fundamental rights its citizens to freedom of speech and information. The OECD in its 2012 report on cybersecurity national strategies, *Cybersecurity Policy Making at a Turning Point*, remarked "all strategies place a strong emphasis on the need for cybersecurity policy to respect fundamental values, which generally include privacy, freedom of speech, and the free flow of information" (OECD 2012).

10 Control of Internet Content

With the extraordinary capabilities of the web, comes the equally extraordinary regulatory challenge presented by this global information device. Writing in the *Huffington Post*, a commentator said of the Internet: "[it] allows individuals and groups of individuals to speak directly to each other and to the world at large without the requirement or necessity of intermediaries moderating their content . . . To advocate or to disassociate with the collective views of other speakers, to associate locally and globally, and to allow for human creativity and innovation is unprecedented in history" (Brown 2015).

Yet this capability to share and disseminate information and ideas is not unlimited. Similar to other forms of telecommunications, nations have taken action to

regulate the use and content of the Internet, in such areas as privacy, national security information, child pornography. Control of Internet content reflects the cultural, religious, and political norms of the country. The diversity of prohibited speech can be staggering. For example, an ICANN official, pointed that "more than two-dozen countries, found everywhere from Western Europe to Asia to Africa, have laws or policies that penalize blasphemy" (Grogan 2015).

A growing number of governments have taken very restrictive measures to control Internet content. The *New York Times* reported in 2012 that the number of governments that censor Internet content has grown to 40 from about four in 2002 (Cerf 2012). In February 2014, the countries whose governments censored the most Internet content were North Korea, Myanmar, Cuba, Saudi Arabia, Iran, Syria, Tunisia, Vietnam and Turkmenistan (USA Today 2014). The Chinese has taken extreme proactive measures to control Internet content. It was reported that China has between 20,000 and 50,000 police to censor unwanted Internet content (Ken 2012).

10.1 Google and China

A classic example of the conflict between the Internet providers and government can be seen in the 2010 controversy that erupted between Google, the Internet search company, and China over the latter's desire to censor several of Google's features including its YouTube, search and email applications.

By way of background, China has taken a very stringent view of Internet content.[5] A 2010 White Paper issued by the State Council of the People's Republic of China issued a range of prohibitive items that included: "being against the cardinal principles set forth in the Constitution; endangering state security, divulging state secrets, spreading rumors, disrupting social order and stability, humiliating or slandering others." (Information Office of the State Council of the People's Republic of China 2010)

When Google initially launched its search engine site in January 2006 it had agreed to comply with the Chinese government's censorship laws and filter the site's search results. While Google was subject to considerable negative reaction to its accommodation with the Chinese government, it responded to the Chinese limitations by saying "While removing search results is inconsistent with Google's mission, providing no information (or a heavily degraded user experience that amounts to no information) is more inconsistent with our mission" (CNN.com, 2006).

[5]Since 2014, the Chinese government is using a broader interpretation of existing law to exercise stringent control over internet speech. As the New York Times reported, "Artists, essayists, lawyers, bloggers have been hauled into police stations and investigated or imprisoned for 'picking quarrels and provoking trouble'". The definition of picking quarrels now encompasses on-line activities. First time offenders can be sentenced up to 5 years in prison (Wong 2015).

However, in 2010, Google complained that it was the target of Chinese hacking operations (esp. with respect to human rights advocates), and it would no longer act in accordance with China's censorship laws. The Chinese government responded by blocking Google completely in Mainland China, but reversed the ban the following day. While Google still operates in China, it operates in compliance with the Chinese government's censorship requirements.

10.2 Other Examples

While China may be a dramatic example, other countries are not immune in seeking to control Internet content. Turkey has periodically censored Internet content. In 2015, the country banned access to Twitter and YouTube after images of a government prosecutor held hostage by militants were published. In 2014, the same networks were also blocked in advance of local elections. The government said that allegations of corruption by local officials were being shared online (Akkoc 2015). Russia, in August 2014, required all bloggers with 3000 daily readers to register with the country's Internet censor (Dewey 2015). The United States has taken controversial actions to access Internet information. It was revealed in 2013 that the United States' National Security Agency had secretly broken into the main communications links that connect Yahoo and Google data centers around the world. By its actions, the NSA could collect, at will, hundreds of millions of user accounts, many of them belonging to Americans (Gellman and Soltani 2013).

11 Ownership

Given the Internet's critical role in the future of digital government, a question keeps arising as to who "owns" the Internet. Regulation is only effective to the extent that there is an entity that can respond to the regulatory actions being mandated. In the case of Internet especially, the answer in a complex set of organizations (public, private and non-profit) and rules seeking to regulate technologies that often have no national boundaries. Indeed, reflecting the Internet's open and international operations, as well as its engineering origins, oversight of the Internet is split among a complicated structure of international and national governments, and self-regulating organizations, or "multi-stakeholders". The 2005 Tunis Agenda for an Information Society reflected this concept. It defined Internet governance as "the development and application by governments, the private sector and civil society, in carrying out their respective roles, of shared principles, norms, rules, decision-making procedures, and programs that shape the evolution and use of Internet." (World Summit on the Information Society 2015). Finally, there is the American origin of the Internet that has had enormous influence over Internet and the organizations that govern its operations.

As noted earlier, there are several key non-governmental organizations that oversee the technical global operations of the Internet. The Internet Engineering Task Force (The IETF) focuses on the myriad technical issues involved in Internet usage, such as Internet architecture, Hypertext Transfer protocols, and addressing operating and technical issues in the Internet. The second is the World Wide Web Consortium (W3C) that oversees the core standards and protocols of the Web. It is the third organization that is probably the most widely known, and controversial, the Internet Corporation for Assigned Names and Numbers (ICANN).

ICAAN's role is critical in the governance of the web. It is responsible for registering Website domain names and Internet Protocol (IP) addresses. The latter allows an email to reach its destination or for a web page to be sent to the right computer through the web. The controversy has centered about the American dominance of ICANN and encapsulates some of the concerns over the future governance of the Internet. ICAAN was originally created by the U.S. Department of Commerce to handle the technical tasks cited above. In March 2014, however, the U.S. government announced that it would end its long-running contract between the Commerce Department and ICANN, and open it to broader international management.[6] While one government official said, "[the move was] consistent with other efforts the U.S. and our allies are making to promote a free and open Internet, and to preserve and advance the current multi-stakeholder model of global Internet governance", others have a rather darker point of view. A former senior Congressional leader said, "What is the global Internet community that Obama wants to turn the Internet over to? This risks foreign dictatorships defining the Internet." (Timberg 2014)

Beyond the technical international governance of the Web, there is the growing role of the United Nations and one of its agencies, the International Telecommunications Union (ITU). Established in 1865 with the signing of the first International Telegraph Convention, the agency focuses on information and communication technologies. However, a 2012 World Conference on Information Technology (WCIT), hosted by the ITU, erupted in controversy as to the role of the ITU in Internet governance. It pitted country vs. country over governance issues and what the appropriate role of the ITU (if any) should be in this process.

In this conflict, the United States was adamantly opposed to the role of the United Nations in Internet governance. To illustrate this passion, the United States House of Representatives and the Obama administration (in a rare moment of joint agreement) opposed ceding any control of the Internet to the United Nations. A 2012 unanimous resolution by the House urged the Obama administration to fight efforts to give a United Nations agency control over the Internet. A member of congress said of the resolution, "Today's unanimous vote sends a clear and

[6]In August 2015 a draft proposal for the future governance of ICANN was published. Under the proposal, ICANN would be an independent entity without US government oversight and the transition would take place sometime in mid-2016. https://www.icann.org/en/system/files/files/ccwg-draft-2-proposal-work-stream-1-recs-03aug15-en.pdf

unmistakable message: the American people want to keep the Internet free from government control and prevent Russia, China and other nations from succeeding in giving the U.N. unprecedented power over Web content and infrastructure . . . we cannot let this happen." (Sasso 2012)

11.1 National Sovereignty and Net Neutrality

Governments have had a long history of regulating telecommunications within their national boundaries, and indeed often operating telecommunications systems themselves. A 2015 federal government decision in the United States perhaps illustrated the complexities facing national regulation. Up to that time, Internet service providers were subject to only limited federal government regulation. However, In November 2014, President Barack Obama asked the Federal Communications Commission (FCC) to implement regulations in the Internet sector comparable to those with respect to telephones. One of the goals was to prohibit broadband companies, such as Verizon and Comcast, from favoring some providers of Internet services or online media sources over others. Of this issue, President Obama was quite adamant, "I personally, [and] the position of my administration, . . . is that you don't want to start getting a differentiation in how accessible the Internet is to different users. You want to leave it open so the next Google and the next Facebook can succeed." (Obama 2014) Thus Obama succinctly framed the concept of "net neutrality". All data on the Internet deserve equal treatment by enterprises, including Internet service providers, and by governments. Major telecommunications providers who, among other concerns, feared not being able to charge different prices for different classes of Internet access met it with enormous opposition.

In February 2015, the FCC ruled in favor of net neutrality. The resultant reaction was vehement. The *Washington Post* noted of the decision that "It's not an exaggeration to say that this marks a turning point in the history of the Internet" (Fung 2015). Upon its passage, the FCC unequivocally stated, "The FCC's Open Internet rules protect and maintain open, uninhibited access to legal online content without broadband Internet access providers being allowed to block, impair, or establish fast/slow lanes to lawful content" (NewsOK 2015). Not unexpectedly industry reaction was not as enthusiastic. A telecommunications industry representative direly warned that ". . . now that it is a telecommunications service, it is by definition subject to the international treaty governing telecommunications." (Wilson 2015)

11.2 The Growing Debate Over Net Neutrality

The issue of net neutrality is not limited to the United State. In 2015, the European Council, which is made up of the 28 national governments of European Union

members, voted in favor of changing the rules to bar discrimination in Internet access but allowing the prioritization of some "specialized" services that required high quality Internet access to function. This is in contrast to the 2014 vote by the European Parliament that endorsed net neutrality (Geere 2015). India also is currently debating the virtues or faults of allowing some telecommunication companies to charge fees for faster access to the Internet (Soni 2015).

12 The Internet of Things and Big Data

The dramatic evolution of digital technology and its impact on both individual and corporate life is reflected in the concept of the 'Internet of Things" (IoT), This term, coined by Kevin Ashton in 1999, is used to describe embedded devices (things) with Internet connectivity, allowing them to interact with each other, services, and people on a global scale. Through the use of radio-frequency identification (RFID) tags and other types of sensors planted inside a physical object it gives it the power to be monitored and controlled remotely through the Internet. This connectivity is reflected in appliance ranging from smart watches to home thermostats, security systems, and even traffic lights. In 2014, the Gartner research organization forecasted that "4.9 billion connected things will be in use in 2015, up 30 % from 2014, and will reach 25 billion by 2020... the IoT has become a powerful force for business transformation, and its disruptive impact will be felt across all industries and all areas of society." (Gartner 2014)

This capability also has the ability to generate enormous sums of information ("big data"), both structured and unstructured, that can be used in an infinite variety of uses.[7] A German report succulently reported on the potential (and risks) for "smart products" that have embedded Internet connectivity devices: "Once they have left the factory, smart products are connected via the Internet. They exchange ever-larger volumes of data during use. It could be argued that these mountains of data (big data) actually constitute the most important raw material of the twenty-first century" (Acatech 2015).

12.1 Implications for Regulation

For digital government, this technology presents significant opportunities to improve and expand government service e.g. from enhanced health care to traffic

[7]On March 27, 2014, AT&T, Cisco, GE, IBM and Intel announced that they were forming the Industrial Internet Consortium (IIC), an open membership group to support better access to big data with improved integration of the physical and digital worlds (Industrial Internet Consortium 2014).

management, it also faces critical regulatory challenges and risks (the "disruptive impact" mentioned above) in a number of areas including data security and privacy, and intellectual property protection.[8] For example:

- Developing a policy framework to protect individual privacy. In a report commissioned by the President of the United States in 2014 on big data, the advisory panel cautioned ". . . how to balance the socially beneficial uses of big data with the harms to privacy and other values that can result in a world where more data is inevitably collected about more things" (Council of Advisors on Science and Technology). For example, how should the Fair Information Practice Principles ("FIPPs"), which include notice, choice, access, accuracy, data minimization, security, and accountability provisions, apply to the IoT? How do the geographic and political boundaries for data protection, such as in the EU, influence the use of big data? How do countries provide uniform standards for data protection and privacy?
- The essence of big data's potential is that it can be shared among various parties. This includes the sharing of the means of creation, compilation and analyses of the data. The challenge for big data and business falls into three key areas: patents, trade secrets, and copyright. The issues are daunting. A legal expert writing on the topic said, " . . . Intellectual property rights—who owns the input data companies are using in their analysis and who owns the output—in big data technologies are at least as important as data privacy issues which have perhaps been more widely reported." (Out-Law.com 2013). The legal questions pose unique and challenging problems for organizations, for example, how do governments harmonize copyright protections or can algorithms used to analyze the data be legally protected?

13 Regulatory Practices and Challenges

Transcending all the regulations cited above is the challenge that digital governments will confront in devising policies, rules and regulation in a dramatically changed environment. As mentioned earlier in the chapter (p. 3), in a world shaped by the desire to have "information-centric, mobile enabled and collaborative digital environments" government administrators will have to re-evaluate many of the traditional methods of rule making for a new reality. Change is a theme that is cited by proponents of digital government. Arnis Dauglis, the chief information officer of Lativa and a leading proponent of digital government, said of the transformative

[8] In 2015, the United States' Federal Trade Commission created the Office of Technology Research and Investigation (OTIR) to research issues on technology's impact on consumers including privacy, data security, connected cars, smart homes, algorithmic transparency, emerging payment methods, big data, and the Internet of Things.
https://www.ftc.gov/news-events/blogs/techftc/2015/03/booting-new-research-office-ftc

impact of digital technology on government operations, "... it is much more about change than technology—change of the mindset and skill set of public sector officials, change of business processes, of making public services user-friendly and accessible. If governments are really committed to the digital agenda, they should be committed to the above-mentioned changes. Otherwise they are cheating themselves and their people." (Dauglis 2014)

Change will have a profound impact on many of the issues confronting governance of the new digital government.

- What should be the structure and process for regulating these new technologies? Traditional methods of government control will have to be reformulated for technologies that have no national boundaries. The current "multi-stakeholders" process of using national and regional governments, non-profit private organizations to regulate the Internet may ultimately present the most pragmatic strategic direction. The question is always, "who owns the Internet" and how should it be managed in a country's self-interest.
- The balance of national sovereignty and "internationalization" of the Internet will be a major challenge. The desire of government to have greater control over Internet governance, from setting technical standards to the control of access and means of communication will shape the regulatory environment for digital governments.
- In creating a more collaborative form of government, how will regulations be developed and managed in a digital environment. An example is the introduction of "e-rulemaking" in the U.S. government. As part of its regulatory process, an on-line system is available for the public to comment on proposed regulations. It allows electronic participation in a process that until recently was largely prohibitive for the general public. A George Mason University report (Brito 2010) talked of a potential 'second generation" of e-rulemaking that would use social media, such as Facebook and Twitter and collaborative commenting systems, to enhance citizen participation in governance.
- With the increasing importance of digital tools in providing government services, a question arises as to whether its use should be made mandatory. This raises difficult problems for citizens who neither have access to the Internet nor adequate knowledge to use it. A British report (Chatfeld 2014) on the issue recommended "a caring system that accommodates people and does not force technology upon them".
- The speed of technological change is daunting. The ability of governments to regulate technologies that may be outdated by the time the usual regulatory process has been completed will be a major issue. Equally challenging for digital governments will be finding the technical expertise to understand and manage these technologies. The lure of private sector organizations, with more pay and other benefits, can be a major problem in recruiting staff with the requisite technical knowledge to lead the new digital government. The complexities of new technologies will be a major issue for governments to deal with unless it has the knowledge and expertise to fully understand the capabilities and limitations

of these technologies, and the willingness to adopt new management styles, such as the "agile" project development methodology used in technology organizations.

- How will digital government address the difficult issue of citizen privacy? The White House report published in May 2014 (Council of Advisors on Science and Technology) elegantly expressed the concern of new technologies being able to "pierce many spaces that were previously private." For the digital government, being able to balance its security needs with the right of individuals to not only have freedom of speech and access to information, but be protected from intrusion into their daily lives, will be a continuing challenge.
- Similarly, how does digital government address the emerging and complex issues of big data and the Internet of things? Challenges to privacy, intellectual property, data security pose daunting issues that government will have to confront.[9] The issues, as noted in the footnote below, are compounded by the early stage of technological development and the regulatory, legal and legislative strategies that need to be adopted.

14 Conclusion

The promise of digital government is extraordinary but challenging. The tools of digital government: Internet, cloud computing, social media, mobile devices, big data are incredible in their power to inform and transform. Indeed the future of the Internet is likely a convergence of these technologies. Never in human history have we had the ability to communicate on a global scale with a speed that transforms distant events into immediate concerns.

14.1 The Road Ahead

Yet, there are also major concerns for regulatory management by government. As we have seen, many of the traditional methods of government regulation are being challenged by these new technologies. This situation is acerbated by the fragmented, borderless, and mobile characteristics of these technologies that make defining a particular course of action, or object of a regulation extremely

[9]In a workshop hosted by the US Federal Trade Commission in 2013 on IoT), participants urged caution in regulatory actions. One participant noted that "we should be careful to kind of strike a balance between guiding companies in the right direction and enforcing". Another participant feared that the workshop "represents the beginning of a regulatory regime for a new set of information technologies that are still in their infancy" https://www.ftc.gov/system/files/documents/reports/federal-trade-commission-staff-report-november-2013-workshop-entitled-internet-things-privacy/150127iotrpt.pdf

difficult, at best. Writing in the *Harvard Journal of Law & Technology*, Kevin Werbach framed the issue: "the key challenge for the evolving Internet ecosystem is not competition, but cooperation. All participants in the market . . . participate in the same interconnected network of networks. The fundamental technical and economic question is how they can act independently, pursuing their own private ends, while still contributing to the health and stability of the global mesh"(Werbach 2009). For digital government how can it manage this "global mesh" to protect fundamental rights without hindering the growth of vital technologies, and yet ensure the stability of this multi-dimensional entity. How does the often laborious, fragmented framework and process for regulatory decision-making address this situation?

As digital government confronts these issues, it has several important strategic regulatory directions that it may consider:

- Maintain a traditional nationalist approach that adopts country law to the global network of information and technology. While it can address such country-specific issues as net neutrality or Internet content, it is often legally powerless to control technologies beyond its jurisdiction.
- Adopt either a regional or global approach to regulation. In the same 2015 survey by the Internet Society cited earlier in the chapter (p. 11), respondents suggested using regional entities, such as AfTLD (African Top Level Domain), to address country issues with the Internet and set regional standards. The EU is working on the creation of a Single Digital Market by 2020 to address similar issues. On a global level, non-governmental entities, e.g. World Wide Web Consortium (W3C) and ICANN continue to set standards for Internet operations. The UN and the ITU may ultimately play a key global role in Internet management. While these approaches address trans-national digital concerns, the need for individual countries to harmonize their national laws, or even agree to these regulations, is often a long, tedious process.
- Utilize a broad range of regulatory schemes, both nationally and internationally, to address the issue of public and private management of these technologies. No one single approach will be adequate. An eclectic combination of self-regulation, co-regulation, public-private partnerships, and international (or regional) standards setting and enforcement may ultimately be the most practical and pragmatic approach to addressing the challenges faced by digital government.

References

Acatech (National Academy of Science and Engineering). (2015). Smart service welt: Recommendations for the strategic initiative web-based services for business. http://www.acatech.de/fileadmin/user_upload/Baumstruktur_nach_Website/Acatech/root/de/Projekte/Laufende_Projekte/Smart_Service_Welt/BerichtSmartService_engl.pdf

Akkoc, R. (2015, April). Turkey blocks access to social media and YouTube over hostage photos. *The Telegraph*. http://www.telegraph.co.uk/news/worldnews/europe/turkey/11518004/Turkey-blocks-access-to-Facebook-Twitter-and-YouTube.html

Brito, J. (2010). The promise and limits of E-Rulemaking. *Mercatus Research*. http://mercatus.org/sites/default/files/publication/promise-and-limits-of-e-rulemaking_1.pdf

Brown, K. (2015). A ray of light shines on internet rights. *The Blog*. http://www.huffingtonpost.com/kathy-brown/a-ray-of-light-shines-on-_b_7026544.html

Cerf, V. G. (2012, May 24). Keep the internet open. *The New York Times*. http://www.nytimes.com/2012/05/25/opinion/keep-the-internet-open.html?_r=0

Chatfeld, T. (2014). Making digital government work for everyone. *Digital Government Review*. http://digitalgovernmentreview.readandcomment.com/wp-content/uploads/2014/11/EMBARGOED_CONFIDENTIAL_MASTER-Final-Report-20141124_CLEAN.pdf

CNN.com Google to censor itself in China. (2006). http://www.cnn.com/2006/BUSINESS/01/25/google.china/

Council of Advisors on Science and Technology. (2014). *Big data and privacy: A technological perspective*. https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_amr_sept_2014_final.pdf

Daily Mail Reporter. (2013, December 4). Hackers steal usernames and passwords for TWO MILLION social media accounts—and many of the log-ins were as easy as '123'. http://www.dailymail.co.uk/news/article-2518540/Facebook-Twitter-hackers-steal-passwords-2m-social-media-accounts.html

Dauglis, A. (2014). How digital technology can drive modernisation throughout government. *Delivering Public Service for the Future*. www.lisboncouncil.net/index.php?option=com_downloads&id=1070

Dewey, C. (2015, April 10). Russia just made a ton of mems illegal. *Washington Post*. Accessed July 27, 2015, from https://www.washingtonpost.com/news/the-intersect/wp/2015/04/10/russia-just-made-a-ton-of-internet-memes-illegal/

eMarketer. (2014). Smartphone users worldwide will total 1.75 billion in 2014. http://www.emarketer.com/Article/Smartphone-Users-Worldwide-Will-Total-175-Billion-2014/1010536

Executive Office of the President of the United States. (2012). *Digital government: Building a 21st century platform to better serve the American people*. https://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government.html

FDIC. (2011). Mobile banking: Rewards and risks. *Supervisory Insights*. https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin11/mobile.html

Feldman, J. (2015). Internet indelibility and the right to be forgotten. *Daily Report*. http://www.dailyreportonline.com/id=1202725862358/Internet-Indelibility-and-the-Right-to-Be-Forgotten

Fung, B. (2015). Your guide to net neutrality: Everything you need to know about today's FCC vote. *The Washington Post*. https://www.washingtonpost.com/blogs/the-switch/wp/2015/02/26/your-guide-to-net-neutrality-everything-you-need-to-know-about-todays-fcc-vote/

Gartner. (2014, November 11). Says 4.9 billion connected "things" will be in use in 2015. http://www.gartner.com/newsroom/id/2905717

Geere, D. (2015, March 7). Europe reverses course on net neutrality legislation. *Ars Technica*. http://arstechnica.com/business/2015/03/europe-reverses-course-on-net-neutrality-legislation/

Gellman, B., & Soltani, A. (2013, October 30). NSA infiltrates links to Yahoo, Google data centers worldwide, Snowden documents say. *The Washington Post*. https://www.washingtonpost.com/world/national-security/nsa-infiltrates-links-to-yahoo-google-data-centers-worldwide-snowden-documents-say/2013/10/30/e51d661e-4166-11e3-8b74-d89d714ca4dd_story.html

Grogan, A. R. (2015). ICANN is not the internet content police. *ICANN Blog*. https://www.icann.org/news/blog/icann-is-not-the-internet-content-police

Hogben, G., & Dekker, M. (2010). *European Network and Information Security Agency (ENISA)*. Smartphones: Information security risks, opportunities and recommendations for users.

Industrial Internet Consortium. (2014). AT&T, CISCO, GE, IBM and INTEL form industrial internet consortium to improve integration of the physical and digital Worlds tech. http://www.iiconsortium.org/press-room/03-27-14.htm

Information Office of the State Council of the People's Republic of China. (2010). The Internet in China. http://china.org.cn/government/whitepaper/node_7093508.htl

Internet Society (ISOC). (2015). *Internet Governance Survey 2015*. http://www.internetsociety.org/doc/internet-governance-survey-2015

ITU. (2014). *ITU releases 2014 ICT figures*. http://www.itu.int/net/pressoffice/press_releases/2014/23.aspx#.U2pey2RdVz1

Ken, M. (2012). Protests, not criticism, the target for China's internet censors, study says. *PCWorld*. http://www.pcworld.com/article/257707/protests_not_criticism_the_target_for_chinas_internet_censors_study_says.html

Kessler, A. M. (2015, July 25). Fiat Chrysler issues recall on hacking. *New York Times*.

Mohamed, A. (2009). A history of cloud computing. *Computerweekly.com*. http://www.computerweekly.com/feature/A-history-of-cloud-computing

NewsOK. (2015). Will 'net neutrality' make access fair for customers, or stifle growth? http://newsok.com/will-net-neutrality-make-access-fair-for-customers-or-stifle-growth/article/feed/812544

Obama, B. (2014). Net neutrality. https://www.whitehouse.gov/net-neutrality

OECD. (2012). *Cybersecurity policy making at a turning point*. http://www.oecd.org/sti/ieconomy/cybersecurity%20policy%20making.pdf

Office of the Press Secretary, the White House. (2009, May). Remarks by the President on Securing Our Nation's Cyber Infrastructure. https://www.whitehouse.gov/the-press-office/remarks-president-securing-our-nations-cyber-infrastructure

Out-Law.com (Pineset Masons). (2013). Big data: Privacy concerns stealing the headlines but IP issues of equal importance to businesses, says expert. http://www.out-law.com/en/articles/2013/march/big-data-privacy-concerns-stealing-the-headlines-but-ip-issues-of-equal-importance-to-businesses-says-expert/

Sasso, B. (2012, August 2). House urges Obama to fight UN web regulation. *The Hill*. http://thehill.com/policy/technology/242007-house-urges-obama-to-fight-un-internet-regulation-in-unanimous-vote

Scholl, A. (2012). The problem with internet regulation. *World Policy Blog*. http://www.worldpolicy.org/blog/2012/09/25/problem-internet-regulation

Silverman, M. (2008). *Compliance management for public, private or nonprofit organizations*. New York: McGraw-Hill.

Sniderman, Z. (2011). How governments are using social media for better and for worse. *Mashable*. http://mashable.com/2011/07/25/government-social-media/

Soni, A. (2015). How people power took on big business in the fight for net neutrality in India. *The Guardian*. http://www.theguardian.com/technology/2015/may/25/india-net-neutrality-people-power

Timberg, C. (2014). U.S. to relinquish remaining control over the Internet. *The Washington Post*. http://www.washingtonpost.com/business/technology/us-to-relinquish-remaining-control-over-the-internet/2014/03/14/0c7472d0-abb5-11e3-adbc-888c8010c799_story.htm

USA Today. (2014). Top 10 Internet-censored countries. http://www.usatoday.com/story/news/world/2014/02/05/top-ten-internet-censors/5222385/

Werbach, K. (2009, Fall). Higher standards regulation in the network age. *Harvard Journal of Law and Technology, 23*(1).

Wilson, C. (2015). US Telecom: FCC's move has global implications. http://www.lightreading.com/net-neutrality/us-telecom-fccs-move-has-global-implications/d/d-id/714049

Wong, E. (2015, July 27). In War on Internet 'Troublemakers', China turns to law on picking quarrels. *New York Times*.

World Summit on the Information Society. (2015). Tunis agenda for the information society. http://www.itu.int/wsis/docs2/tunis/off/6rev1.html

Zengerle Patricia and Megan Cassella. (2015, July 9). Millions more Americans hit by government personnel data hack. *Reuters*. http://www.reuters.com/article/2015/07/09/us-cybersecurity-usa-idUSKCN0PJ2M420150709

Part II
Country Studies

Mexico: Single Window for Foreign Trade

Andrea Schwaiger Calvo and Cristian Campos

1 Introduction

Mexico, the second largest economy after Brazilian Latin America, has worked to reshape digital governance since the year 2000, aiming to increase the efficiency of public administration and to improve public service delivery. The Mexican Single Window for Trade (VUCEM for its acronym in Spanish) is one example of Mexico's move towards a modern public administration. Other than Mexico, 71 economies around the world have implemented single-window systems of varying complexity.[1] VUCEM is an online platform created in 2012 that facilitates the exchange of information between the trading community and government by allowing parties involved in trade to submit standardized information and documents with a single entry point to fulfill all trade-related regulatory requirements. VUCEM is interesting due to the 12 government agencies involved, the technical complexity of the electronic platform and the significant investments, the latter adding up to USD$62 million. Today traders can submit all trade documents electronically in more than half of OECD high-income economies (including Mexico) with no need to provide hard copies, by contrast to Sub-Saharan Africa and Eastern Europe and Central Asia, where most economies have electronic systems that still require traders to submit hard copies.[2]

The evolution of digital governance in Mexico was similar to the experiences of other countries in the developed world, starting with Information Technology (IT) to automate the processing of information, essentially corresponding to back

[1]Doing Business. The World Bank. Retrieved May 7th, 2015 http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Topics/trading-across-borders.pdf

[2]ibid.

A. Schwaiger Calvo (✉) • C. Campos
School of International and Public Affairs, Columbia University, New York, NY, USA
e-mail: schwaiger.a@gmail.com; cc3620@columbia.edu

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_5

office improvements. Front office improvements followed, where e-government initiatives enabled by Information and Communication Technology (ICT) focused on the production and dissemination of information over the Internet. This resulted in a large number of institutional government web sites with static information. Finally, the government transitioned from processing and disseminating information to innovating public service delivery in form of transactional presence.

The process by which Mexico has developed its digital governance over the years has been the result of various factors, including the need for a more responsive and accountable government during the democratic transition since 2000.[3] It also reflects the shift from the provision of services from a supplier perspective towards a more citizen—centric policy and greater emphasis on citizen usage.[4] Adapting to the increased expectations of the citizens in a democratic Mexico requires not only more awareness of citizens' needs, but also greater accountability and more efficient use of fiscal resources. A driver for change and expansion of government digital service provision has been the proliferation of the internet and more specifically broadband access for businesses involved in trade, which are VUCEM's target users. Other important driving forces to promote VUCEM have been the support of the Mexican President and the Ministry of Finance and international organizations, such as the World Customs Organization (WCO), the United Nations Economic Commission for Europe (UNECE), the Organization of Economic Cooperation for Development (OECD), promoting best practices related to digital governance and single windows for trade.

Addressing the gap between design and implementation of digital governance projects is particularly interesting in that many countries are embracing digital governance programs. Given the considerable number of individual e-government programs under the expansive scope of Mexico's national digital strategy, this study provides an overview of one specific project, in this instance, VUCEM. It analyzes the gap between VUCEM's design and implementation and relates it to Mexico's national digital strategy. To better analyze VUCEM's implementation, the case study takes into account publicly available government documents as well as interviews with relevant stakeholders such as government officials and platform users.

The case study is organized as follows: it will start by discussing the evolution of digital governance and the national digital strategy in Mexico, including the most salient programs and institutions created to coordinate and implement them. The case study will then analyze the context and rationale of VUCEM in terms of its broad benefits and goals. Following the assessment of its implementation process, the obstacles and drivers will be discussed. These include digital knowledge, institutional capacity, digital divide, regulatory and legislative framework, budget and political backing. Before concluding with an overall assessment of VUCEM,

[3]Until 2000 Mexico was ruled for more than 70 years by the same political party.

[4]Kerby, R. (2014) 2014 UN e-government survey. UN Public Administration Programme. Retrieved on May 7, 2015 from http://css.escwa.org.lb/ICTD/3233/11p1.pdf

the case study will also address the question of how to measure the success of VUCEM and its rather unique characteristic of spanning two administrations and two National Digital Strategies.

2 National Digital Strategy

The evolution of Mexico's national digital strategy and the organizations created to implement e-government projects are critical in understanding the development and implementation of VUCEM. Definitions of national digital strategy can vary from being an umbrella term for a set of technologies and their application (for instance mobility, analytics, big data and cloud) to a new way of public service delivery or a more holistic concept of digital society (Accenture 2014). In Mexico's case the National Digital Strategy can be seen as being at the intersection of the latter two, namely a new public service delivery and an ambitious holistic concept of creating digital society. While the Mexican government was already making widespread use of information and communication technology (ICT) by the end of the 1990s, there was no overarching e-government strategy for the federal government until 2001 (OECD 2005). The National e-Mexico System, which is an important milestone in Mexico's e-governance evolution, was created in December 2000 by the newly-elected President Vicente Fox. This ambitious system's ultimate goal was to digitalize the delivery of most public services. Its primary objective was to eliminate Mexico's digital divide by focusing on expanding the country's communication infrastructure. E-government was included as one of the six pillars of the Good Government Agenda promoted by Fox in 2002.[5] This governance framework for the digitalization of public services was institutionalized in 2005 by the creation of the Commission for the Development of Electronic Government (CIDGE).[6] The CIDGE was assigned the important task of developing the guidelines for the implementation of Electronic Signature used in government operations, which would later be a key legal foundation for all procedures that require proof of legal identity, among others those procedures related to VUCEM.

Fox's administration significantly increased the number of online services available to citizens. However, they remained largely informational rather than transactional, due to the complexity of creating an adequate regulatory and legal framework. A lack of familiarization by public officials with e-government processes is another explanation. The RUPA (Single Register of Accredited Persons) and the creation of legal status for electronic procedures in 2000,[7] which provide

[5]Presidential Good Government Agenda, President's Office, Mexico (2002).

[6]Administrative Agreement to Create the Commission for the Development of Electronic Government (2005), published in Mexican Official Gazette in December 9, 2005.

[7]Reform to the Federal Law on Administrative Procedures, published in the Official Gazette on May 30, 2000.

the legal recognition of electronic transactions among government and citizens, were important steps. They allowed the creation of a coherent regulatory framework for e-government and an important precondition for VUCEM in the case of the later project.

President Calderon's administration enacted the Digital Government Agenda in 2009 through a ministerial decree, three years after coming into office.[8] One of the most important laws created under this administration was the advanced digital signature system (FIEL). Approved by the Congress in 2011, FIEL granted digital signatures the same legal recognition as written paper signatures. It was intended to ensure confidentiality and guarantee the authenticity in transactions to avoid falsification of data. President Calderon launched VUCEM in January 2012.

The continued commitment to digital government in Mexico is evidenced by the current administration of President Peña Nieto who took office in December 2012 and inherited VUCEM. This administration launched the National Digital Strategy in 2013, which has multidimensional objectives. Unlike the previous digital agendas, the National Digital Strategy is unique. It results from "cross-collaboration and coordination by government agencies and institutions through the National Digital Strategy Coordination Office of the President's Office, and it benefits from political commitment by the highest authority in the country".[9] The purpose of the National Digital Strategy is "to achieve a Digital Mexico in which the adoption and use of ICTs will maximize their economic, social and political impact on the quality of life".[10] To this end, the Strategy has five goals and five enablers that will allow Mexico's digitalization. The goals are government transformation, digital economy, quality education, universal, effective health, and public safety.[11] The enablers or cross-cutting tools proposed are: connectivity, digital inclusion and skills, interoperability, legal framework and open data. The Single National Window (not to be confused with the single window for trade known as VUCEM) is among the secondary objectives outlined in the National Digital Strategy. It is envisioned as a single point of contact for citizens to interact with the government to find information or execute any procedure.[12] According to this plan, VUCEM would ultimately be an integral part of this Single National Window.

[8]"Administrative Agreement to Create the Digital Government Agenda", published in Mexican Official Gazette in January 16, 2009.

[9]Mexico's National Digital Strategy (2013). p. 10. Retrieved on May 7, 2015 from http://embamex.sre.gob.mx/italia/images/pdf/national%20digital%20strategy.pdf

[10]Mexico's National Digital Strategy (2013). p. 9. Retrieved on May 7, 2015 from http://embamex.sre.gob.mx/italia/images/pdf/national%20digital%20strategy.pdf

[11]ibid.

[12]Chalico, C. (2015, February 10) Mexico's Long Overdue National Digital Strategy Finally on Track. Retrieved on May 7, 2015 from http://www.nearshoreamericas.com/mexicos-national-digital-strategy-overdue/

Country Info:

Estimated Population (2015): 121 million[1]

Population Density: 57 per km^2 (22 sq mi)[2]

Geographic area: 1,964,375 km^2 (758,449 sq mi)

Gross Domestic Product (2014): USD 1,282.5 bn[3]

GDP per capita (2015 estimate): USD 17,204[4]

Internet adoption rates per 100 people (2013): 43,5%[5]

Trade Balance (2014): USD - 2.4 billion [6].

Rank in ITU Fixed Broadband Penetration (2014): 70th

Rank in UN E-government Development Index (2014): 63rd (from 30 in 2003)

Rank in UN E-participation Index (2014): 45th (from 11th in 2003)

3 VUCEM: Context and Rationale

The evolution of the national digital strategy in Mexico, and in particular initiatives such as the legal status for electronic procedures and the Advanced Electronic Signature (FIEL), paved the way for the implementation of VUCEM. As an electronic platform launched in January 2012 VUCEM allows businesses to fulfill all import, export, and transit-related regulatory requirements by submitting and handling data on-line only once and through one single online portal. Such regulatory documents include application for import or export permits and other supporting documents. It can be accessed via www.ventanillaunica.gob.mx. The documents processed in VUCEM are sent electronically to several authorities for approval and stored on the portal for five years[13] They include all of the information exchanged by traders, government departments (including customs), and a range of other participants in the trade process, including freight forwarders, customs brokers, shipping agents, banks and insurance companies.

VUCEM is a complex system encompassing 198 formal procedures, which businesses select depending on the product they want to export/import. According to the most recent data VUCEM managed approximately 400,000 transactions from September 2013 to June 2014.[14] It has approximately 103 million subscribed users, of which 73 million represent all trade related businesses in Mexico.[15] It was

[13]VUCEM-Frequently asked questions (n.d). P.14. Retrieved on May 7, 2015 from http://www2.ventanillaunica.gob.mx/cs/groups/public/documents/contenidovu/mdaw/mde2/~edisp/portal162000016367.pdf

[14]Ministry of Economy's Second Annual Report (2014, p. 51).

[15]Ibid.

Agencies and Ministries	Number of Procedures
1. Federal Attorney of Environmental Protection (PROFEPA)	5
2. General Administration of Customs (AGA)	15
3. Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)	1
4. Federal Commission for the Protection against Sanitary Risk (COFEPRIS)	51
5. Ministry of Economy (SE)	72
6. Ministry of National Defense (SEDENA)	22
7. Ministry of the Environment and Natural Resources (SEMARNAT)	9
8. Ministry of Energy (SENER)	5
9. Mexican Association of Coffee Product Chain (AMECAFE)	2
10. National Institute of the Fine Arts (INBA)	3
11. National Institute of Anthropology and History (INAH)	1
12. Tax Administration Service (SAT)	Royalties/Taxes/Fees
TOTAL	198

Fig. 1 Agencies and ministries involved in VUCEM (authors' own illustration) (This information corresponds to the actual number of procedures accessible through the website (May 2015). This information may not include procedures for corporations since we accessed VUCEM with a regular citizen's digital signature. *Source*: VUCEM, www.ventanillaunica.gob.mx)

designed and implemented by the Tax Administration Service (SAT), through the Customs General Administration, in conjunction with 12 entities, 11 government agencies and one business organization[16] that deal with cross-border trade authorizations (see Fig. 1). The amount of procedures an agency or ministry administers (see Fig. 1) is not necessarily a good proxy for the amount of times it is used by businesses. Although only three Ministries, namely the Ministry of Economy (SE), the Ministry of National Defense (SEDENA) and the Federal Commission for the Protection against Sanitary Risk (COFEPRIS), together account for over 75 % of all procedures this does not imply that they deal with the largest amount of business transactions (i.e. the AGA administers five procedures but the number of time this procedure is used could be very high, surpassing the SEDENA for instance).

3.1 The Value of the Single Window

A single window for trade is seen by many as a solution to the large volumes of information governments require from companies. VUCEM serves as tool to conduct the following activities:

- Submitting electronically and thereby fulfilling requirements for any procedure related to import, export and transit of goods of foreign trade through a single electronic entry point.

[16]The Tequila Regulatory Council is also in the process of migrating its procedures to the VUCEM.

- Making electronic payments of royalties, fees and taxes necessary for the completion of procedures in trade related matters. Payments are automatically deducted from the user's bank account.
- Providing information about the requirements for licenses and permits, including all non-tariff regulations for trade related goods.

Fulfilling all trade-related regulatory requirements online consists of four simple steps for traders: sign in via www.ventanillaunica.gob.mx, file a specific request, attach documents in PDF format for each requirement, and electronically sign the request. The requisites for the use of VUCEM are broadband connection, an email, a federal taxpayer Number (RFC), and a valid Advanced Electronic Signature (FIEL).

VUCEM fulfills many objectives and benefits of single windows for trade, including the defined features in UN Recommendation 33 on Single Window, e.g. being a source of trade related government information, the possibility of paying duties and other charges, the deregulation and re-engineering of trade formalities, a one time submission of standardized information and documents under a single website, and the use of the Advanced Electronic Signature.[17] The single window seeks to eliminate many of the inefficiencies found in other countries without these capabilities. In those countries, traders turn to a large number of different agencies with different mandates (ranging from revenue collections, to protecting the health of people and ensuring food security), often presenting the same information several times and in different forms, in order to comply with national trade regulations, while goods spoiled in warehouses.[18] VUCEM addresses this major bureaucratic effort, and inefficiency of time and resources. As a single electronic entry point VUCEM offers several advantages for both government and the trading community besides reducing the use of paper. It provides an acceleration and facilitation of trade information through a single online gateway, simplified processes, faster clearance times, improved transparency, governance and even reduced corruption, due to fewer opportunities for physical interaction.[19]

An interesting feature of VUCEM is that its initial driver was not the National Digital Strategy. Nevertheless, it keeps with the intent and spirit of the National Digital Strategy under which it was launched and can be considered an ambitious e-government project with goal of providing sophisticated transactional electronic services between the public and private sector. VUCEM was the result of a broader long-term government strategy to improve foreign trade and competitiveness. It also serves implicitly as a measure to reduce the opportunity for corruption,

[17]United Nations Economic Commission for Europe. United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) (2005). Recommendation and Guidelines on establishing a Single Window. p. 10. Retrieved on May 7, 2015 from http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec33/rec33_trd352e.pdf

[18]Oliver (2013).

[19]United Nations Economic Commission for Europe (2012). Trade facilitation implementation guide. Retrieved on May 7, 2015 from http://tfig.unece.org/index.html

improve transparency, legal certainty and efficiency of customs services. As "bribes requested by customs officials to expedite the clearance of goods have become tacitly accepted as a trade transaction cost (that is routinely passed down to the clients or consumers), customs corruption remains an issue of international concern that strongly hampers the efficiency of customs administrations in many countries", mainly developing ones.[20] A lack of transparency and legal certainty can exacerbate corruption. Reducing transactional costs in trade as well as barriers to market entry for small and medium enterprises (SMEs) is explicitly mentioned in VUCEM's Decree for the Establishment of the Single Window for Trade.[21] According to the WTO, trade facilitation is "the simplification of trade procedures, understood as the activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade" (as cited in Moïsé et al. 2011). "Trade facilitation has been found to be critical to further international commerce, accelerate growth, and help alleviate poverty among trading nations".[22] The government support for VUCEM reflects the historical evolution and degree of the country's integration into the world economy, measured by trade volume and the number of free trade agreements. Although Mexico's trade integration has been driven largely by the North American Free Trade Agreement (NAFTA), VUCEM is viewed as one of Mexico's broader-based reforms to boost trade and enhance economic competitiveness.

4 Highlights of the Implementation[23]

VUCEM is a very complex project in terms of both the political coordination of 11 government agencies and full digitalization of trade procedures.[24] As mentioned above, ideally before creating an electronic platform, the formalities should be harmonized, simplified and digitalized. Harmonization, meaning the alignment of Mexican formalities, procedures, operations and documents with international standards and practices, had already taken place previous to the implementation

[20]Ndonga (2013) World Customs Journal 7,2. Managing the risk of corruption in Customs through single window system, p. 23. Retrieved on May 7, 2015 from http://www.worldcustomsjournal.org/media/wcj/-2013/2/WCJ_V7N2_Ndonga.pdf

[21]"Decree for the Establishment of the Single Window for Trade", published in Mexican Official Gazette in January 14, 2011.

[22]Alburo, F. (2008). Policy Coherence and Coordination for trade facilitation: integrated border management, single windows and other options for developing brunch. Retrieved on May 7, 2015 from http://www.econstor.eu/obitstream/10419/64272/1/578665069.pdf

[23]Most of the information used in this section draws from interviews with public officials from the ministries of Economy and Finance.

[24]"Decree to Grant Administrative Facilities for Customs and Foreign Trade", published in Mexican Official Gazette in March 31, 2008.

of VUCEM. In 2009[25] the Tax Administration System (SAT), and the Ministry of Economy established two consecutive broad stages, namely simplification and digitalization for implementation of VUCEM.

The first stage, also known as the simplification stage, was the process of eliminating all unnecessary requirements and duplications in trade formalities, processes and procedure as well as standardization of formats and reengineering of processes to increase government efficiency and reduce response time. In some cases the elimination of entire procedures and formalities was possible. This process was intended to avoid simply "digitalizing bureaucracy" as stated by one Mexican public official, that is, simply automating and digitalizing already burdensome and inefficient procedures. This might have otherwise lead to redundancy and delays, questioning any value of the digitalization. Not requiring paper submission of signed documents after they have been filed electronically is crucial. This work had to be translated into an adequate regulatory and legal framework, through reforming various administrative regulations. Since 2010, the Tax Administration Services (SAT for its acronym in Spanish) and the Ministry of Economy are responsible for the technical aspects of VUCEM, while the Ministry of Public Administration, through its internal control units (OICs) ensures the compliance of the project. The OICs are located within each government agency and are part of the Ministry of Public Administration's broader control and monitoring mechanism.

Once the simplification process was completed, the second stage was to migrate the streamlined processes and procedures to the new electronic platform. The SAT and Ministry of Economy decided to contract with a private vendor to design the electronic platform. This portion of the project demanded a major financial investment because it included not only the software and technological equipment for the electronic platform but also operating expenses since the private vendor was required to maintain the system and provide technical support on demand. The private vendor and the government agencies worked together to conclude this phase in different rounds.

In January 2011 President Calderon formally established VUCEM and its governance structure.[26] It essentially institutionalized coordination among agencies and created a high-level governance body in charge of the strategic decisions, the Inter-ministerial Commission for VUCEM. The presidential decree established the content and general functioning of VUCEM, and set up three phases to make trade procedures available for businesses through the electronic platform. The digitalization was staggered not only because it was difficult and impractical to digitalize all procedures simultaneously but also because some agencies were more advanced

[25]According to the Ministry of Economy's Second Annual Report (2008) they started working immediately after the 2008 Decree, but for some reason the 2009 Annual Report, which covers from May 2008 to May 2009, omits information about the continuity of their works.

[26]"Decree for the Establishment of the Single Window for Trade", published in Mexican Official Gazette. Retrieved on May 7, 2015 from https://www.ventanillaunica.gob.mx/cs/groups/public/documents/contenidovu/mdaw/mdaw/~edisp/stkmexvudb2000515.pdf

in their simplification process than others. Phase 1 included the SE and SAT-AGA and needed to be concluded by September 2011. Phase 2 had to finish 4 months later, in January 2012, and included Ministry of National Defense (SEDENA), Ministry of the Environment and Natural Resources (SEMARNAT), Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) and Federal Commission for the Protection against Sanitary Risk (COFEPRIS). Finally, in phase 3 Ministry of Energy (SENER), National Institute of the Fine Arts (INBA) and National Institute of Anthropology and History (INAH) had to be set up until June 2012.

5 Analysis and Findings

Overall VUCEM has achieved considerable success in providing benefits for both the government and users while having to overcome obstacles on the way. Factors that were indispensable for making it function include political commitment and leadership, proper technical support, institutional coordination and an appropriate legal framework. However, this success required overcoming various obstacles including institutional change, public sector coordination and collaboration, and meeting the deadlines established in the Decree for the Establishment of the Single Window for Trade. Recent experience suggests that a number of other critical preconditions need to be in place to launch an effective single window program, including: "(1) a strong business case based on a pragmatic assessment of risks, challenges and capabilities; (2) clear and unambiguous mandate from government backed by genuine political will; (3) a realistic future vision owned by all stakeholders; (4) an agreement on governance structures, including which agency will lead the initiative, with clear roles and responsibilities for all key stakeholders, and obligations and accountabilities for success; and (5) a practical work program with key milestones matched by appropriate human and financial resources."[27] The next section will examine whether Mexico met these preconditions.

6 Obstacles and Drivers

There were many challenges to implementing VUCEM, ranging from achieving collaboration and coordination among the large number of stakeholders, strengthening institutional capacity, to overcoming digital knowledge gaps within and outside of government.

[27]McLinden, G. (2013) Single Window Systems: What We Have Learned. Retrieved on May 7, 2015 from https://blogs.worldbank.org/trade/single-window-systems-what-we-have-learned

Given the large number of stakeholders involved, and their required buy-in, collaboration, and institutional capacity, the risk of delay or failure of the project was considerable. It was necessary to coordinate all government agencies to work towards a common goal, agreeing on governance structures, including clear roles and responsibilities for all key stakeholders. This proved challenging and was reflected in the fact that none of the government agencies met the original deadlines, not even the lead agencies. By the first deadline in 2011, businesses were only able to register data and upload digital documents and did not have access to complete transactional services.[28] In January 2012, when President Calderon officially inaugurated VUCEM, the SAT-AGA finally made its 15 procedures available online,[29] and since then transactional procedures from different agencies has been gradually introduced. Part of the problem was that the VUCEM system did not have adequate security filters and user conditions. For instance, originally a user could upload digitized documents up to 10 Megabytes in size. This massive uploading of data eventually collapsed the system, which was not prepared this amount of data. The remedial measure was to reduce the permitted size of digital documents to three Megabytes. It also wasn't until July 2012 that VUCEM was operating at full capacity and according to interviewees the system then collapsed on one occasion for half a day due to the volume of traffic. Ironically, this collapse reflected how VUCEM had become a victim of its own success. It was trying to keep up with the massive uptake that it had generated. According to business organizations and customs brokers, these technical issues were promptly resolved by the government and recurrence has been minimal.

Managing the broad scope of VUCEM and its numerous stakeholders, can at the same time, present a great opportunity to achieve significant benefits and synergies. Procedures are continiously added to the VUCEM, some of which had originally not even been contemplated. As shown by the experience of AMECAFE, a non-profit organization that offers certificates of origin for coffee exporters and who joined after the launch of the system, VUCEM is seen as an attractive government service. Similarly, another non-profit organization that offers certificates of origin for tequila exporters, is considering joining.

VUCEM presents a strong business case based on a pragmatic assessment of risks, challenges and capabilities with regards to the digital divide and technological change. Single windows for trade may not achieve their expected benefits if users cannot access the service. Internet penetration and more importantly broadband penetration are key indicators to understand if citizens can have access to services and take advantage of the expected benefits. While internet adoption among citizens at large is important for Mexico's National Digital Strategy, for the target users of VUCEM which are businesses involved in trade, broadband capability is crucial. In Mexico, broadband penetration is still generally limited (only 11.5 % in 2014)[30] but the use of broadband among businesses with 20 or more

[28]Ministry of Economy's Sixth Annual Report (2012, p. 69).

[29]Fifteen more are pending.

[30]OECD Broadband Portal (2015, February 19). Retrieved on May 7, 2015 from http://www.oecd.org/internet/oecdbroadbandportal.htm

employees in Mexico has increased from 45 % in 2003 to 51.5 % in 2011.[31] Nevertheless, even those businesses that do not have broadband access are expected to invest in it, given the many expected benefits of VUCEM, which would compensate for the cost of broadband access. Some might have subcontracted their trade compliance tasks to another specialized subcontractor who already uses broadband. Broadband access was thus not considered an obstacle.

Rapidly changing technologies, and the fear of obsolescence, can be challenge for any government program. It is not foreseen that any technological changes will significantly affect VUCEM's system except for a need for updating internet browsers to access the website. Related to the issue of technology, it is crucial that there is adequate digital knowledge and institutional capacity within both government and system users. VUCEM was able to respond to this challenge by training stakeholders. According to some there was initially a considerable amount of resistance from public officials who lacked the digital skills and system capacity to handle an electronic system like VUCEM. For this reason in 2011 and 2012, before VUCEM became operational, training sessions were organized for the public officials in charge of the VUCEM operations as well as workshops with system users, mainly through business organizations.[32]

Despite some significant initial business costs, including those of new software to help businesses comply with the system's technical and personnel requirements, customer brokers agreed that the costs were worthwhile given the potential of cost- and time savings from VUCEM. The government designed an interactive learning program, including online tutorials, videos, chats and a mailbox to submit comments and recommendations. The Ministry of Economy also conducted a training session for its 51 offices spread throughout the country.[33] By 2013 the Ministry of Economy had provided the technological tools and existing databases, such as the Electronic Signature, Taxpayer Identification (IDC) and RENAPO (National Registry and Personal Identification) and participated in 25 workshops, organized by business organizations, to educate and answer any questions regarding the VUCEM system.[34] These training initiatives reflect the importance of training both users and government staff to attain all the expected benefits from this e-government project.

The effective implementation of VUCEM would not have been achieved without strong political commitment and support by senior Mexican government officials, including President Calderon, who issued two decrees, one in 2008 to instruct

[31] OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises (2012). Retrieved on May 7, 2015 from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.oecd.org%2Fsti%2Fieconomy%2FFinal_6.c_Broadband%2520Households_2012.xls&ei=LGolVc2OHomAsQTh_4CgDA&usg=AFQjCNF3KSQcZ5y4pxNOJFlP3HwFmtxXtg&sig2=G1bN3t96NOTnLuy7TSV1hA&bvm=bv.90237346,d.cWc

[32] Ministry of Economy's Sixth Annual Report (2012, p. 69).

[33] Ministry of Economy's Sixth Annual Report (2012, p. 69).

[34] Ministry of Economy's First Annual Report (2013, p. 60).

the creation of the VUCEM, and one in 2011 to establish and institutionalize VUCEM. The leadership of other key governmental officials within the administration was also critical to ensuring effective implementation of VUCEM and the buy-in of the Mexican bureaucracy. The concerned government ministries and agencies were mandated to comply. Especially important in this regard were the roles of the Ministries of Finance, Economy, and Public Administration. Thus, VUCEM had a clear and unambiguous mandate from government backed by genuine political commitment.

Reinforcing the value of VUCEM were international organizations that advocated for digital governance and single windows for trade. The wave of market-oriented economic reforms, including VUCEM, continues to be pushed by numerous international organizations concerned with trade facilitation, such as the United Nations Economic Commission for Europe (UNECE), the World Bank (WB), the World Customs Organization (WCO) and many others.[35] Countries devoted to trade facilitation like Mexico are guided by the international standards and incentives developed by these international organizations who provide background awareness and learning materials, policy recommendation, documents and analyses of the current status of single windows for trade facilitation and identify best practices.

The 2011 decree to formally establish VUCEM, its general features and the governance structure assured adequate functioning over time. This was an important driver, as were the clear political mandate and two important regulatory instruments (legal status for electronic procedures and the Advanced Electronic Signature). They contributed to its long-term vision and its legal certainty. Equally important was the long-term financing of VUCEM. Budget restrictions including uncertainty about the future flow of funds can hinder or delay e-government projects. Despite VUCEM's need for significant financial resources, this was not an obstacle. The SAT has financed the cost of the project since the beginning, which amount to USD 62 million according to government data. It avoided potential complications by not having shared agency IT budgeting arrangements. This funding framework facilitated coordination and collaboration within and across government. It also contributed to sustaining the efficient implementation and long-term financial viability of VUCEM, which had already launched a second public tender to guarantee continuous technical assistance for another five-year period.[36]

[35]Other international organizations involved and pushing this topic are the Organization for Economic Cooperation and Development (OECD), the World Trade Organization (WTO), the United Nations Commission on International Trade Law (UNCITRAL), the United Nations Conference on Trade and Development (UNCTAD), and its Centre for Trade Facilitation and Electronic Business (UN/CEFACT).

[36]The first 5-year contract was signed in 2011.

7 Measuring Success

Although National Digital Strategies have a vision and plan, this is not always sufficient to define success of an e-government project. Not collecting baseline data to which the outcomes of the digital project can later be measured against, and not defining measurable performance metrics can limit the ability to allocate resources effectively, track progress and address potential gaps between policy aspiration and project implementation. It is important that measurements are in place to assess the "value produced by the public investments in e-government projects both in term of the process (e.g. coordination) and the outcomes (e.g. provision of services)".[37]

One way to measure the success of VUCEM is by assessing its actual performance against the written goals and metrics set forth in the Decree for the Establishment of the Single Window for Trade. Another way is to establish links between VUCEM and its contributions to general aspirations in the National Digital Strategy. VUCEM is a unique case in that it is a project spans two government administration and two National Digital Strategies, one dating from 2009, and the current one announced in 2013, In light of evident success of VUCEM as trade facilitation tool, which is discussed below, it can be argued that the electronic platform contributes to both National Strategies, which explicitly mention improving competitiveness as their main goal.

Improving competitiveness is understood as reducing transaction costs, reducing barriers to entry to small and medium size firms, and enhancing legal certainty.[38] The actual impact of trade facilitation on trade volumes and cost has been analyzed by Moïsé and Surescu (2013) and Moïsé et al. (2011). In both cases they find that among facilitation measures, simplification of formalities in terms of documents, automation, and procedures have the greatest effect on both trade flows and trade costs, which in turn improve competitiveness. This general finding supports the benefits of initiatives such as VUCEM since it includes those three measures. Specific to VUCEM, findings based on answers of the Ministry of Economy of Mexico to an OECD questionnaire found an overall 60 % elimination of the number of formalities related to trade (from 54 to 22), 41 % reduction of requirements (from 104 to 61), and a 44 % decrease in registered data (from 770 to 435) in 2012 (OECD, 2014). This evidence indicates that VUCEM's outcomes did in fact reinforced trade facilitation and competitiveness of the Mexican Economy.

According to the Doing Business (DB) 2014 report, Mexico ranks 43rd with regards to the indicator of *Trade Across Borders*, compared to Portugal (29th),

[37] OECD (2011) Towards more Effective and Dynamic Public Management in Mexico, OECD Public Governance Reviews. Retrieved on May 7, 2015 from https://books.google.com/books?id=wn1ar36zmz0C&pg=PA134&lpg=PA134&dq=usage+of+the+MExican+single+window+for+trade&source=bl&ots=ngDPMmW2-u&sig=RUNsPBUdd5EM264zWMYmUY4IBb8&hl=en&sa=X&ei=gpNJVbLNLsfvtQWEx4DQCg&ved=0CD0Q6AEwBQ#v=onepage&q=usage%20of%20the%20MExican%20single%20window%20for%20trade&f=false

[38] "Decree for the Establishment of the Single Window for Trade", published in Mexican Official Gazette in January 14, 2011.

Benin (121st) and Uzbekistan (189th), all of which also introduced single windows for trade in 2011/2012.[39] While in Mexico the documents to import and export (4) and the time to export and import (11.5 days) remains below the Latin America and Caribbean average of (6.5 and 17 respectively), the cost to import and export in Mexico are higher than the regional average by around 11 % for Mexico City. Contrary to the 2012 expectations of the Mexican Ministry of Economy, the country was not able to climb 26 places to 32nd place in the sub-index Border Trade of the World Bank's DB report.[40] While the DB ranking does not show an improvement in the number of required documents and time of exports/imports between 2011 and 2015, its methodology does not capture or fully reflect the effectiveness of VUCEM's benefits in improving the country's trade processes.

The Mexican Government itself also utilized various tools to analyze specific e-government projects in order to optimize the use of ICTs and evaluate their effectiveness.[41] One of these, the Federal Regulatory Improvement Commission (COFEMER), conducted a preliminary impact assessment of VUCEM.[42] According to their study, in the case of the Ministry of Economy's procedures, their streamlining and automation accounted for estimated benefits of 166 million pesos, equivalent to 13.8 millions USD dollars. Roughly 70 % of the value of these benefits resulted from reduced deadlines and 30 % from fewer requirements. As comparison, the Korea Customs Service estimates that the introduction of its Single Window system brought some USD 18 million in benefits in 2010.[43] Given that procedures of the Ministry of Economy account for around one third of the total number of procedures currently uploaded on the VUCEM, by means of extrapolation we could roughly estimate that total amount of benefits of the project would amount to 498 million pesos (equivalent to 43.3 million USD). Depending on a number of variables, namely the chosen timeframe, the estimated materialized benefits and the total cost of the project from 2011 to 2016 (which amount to 712 million pesos, equivalent to 62 million USD), VUCEM's costs could outweigh

[39]World Bank Group. Doing Business. Trading across borders (2014). Retrieved on May 7, 2015 from http://www.doingbusiness.org/data/exploretopics/trading-across-borders

[40]Ministry of Economy. Nafta Works. Monthly newsletter of NAFTA and related issues (2012). Retrieved on May 7, 2015 from http://www.naftamexico.net/wp-content/uploads/2012/01/jan12.pdf

[41]In more detail, the Maturity Evaluation Model appraises the level of agencies' public value maturity (public value importance, public value performance, public value ICT contribution and public value maturity) and services and processes maturity (maturity of services provided to citizens, maturity of services provided to staff, maturity of ICT management and maturity of the ICT management process).

[42]The results of the study were presented during the 5th Latin American Regional Meeting about Single Windows for Foreign Trade, Mexico City, October 2013. Further evidence of the figure: http://www.usmcoc.org/new.php?id=115

[43]United Nations Economic Commission for Europe (n.d.) Trade Facilitation Implementation Guide. Retrieved on May 7, 2015 from http://tfig.unece.org/contents/single-window-for-trade.htm

its benefits.[44] However, it remains too early to conduct a final cost-benefit analysis given that some expected future benefits as well as future operating and maintenance costs have yet to be taken into account. Furthermore, while the correlation between VUCEM and trade facilitation improvements might be established, it is more complicated to prove causation. This analysis is not intended to discredit any e-government project but rather to ensure that in effective and efficient e-government project implementation there is always a need for ongoing, institutionalized impact assessments of digital projects that should be a critical component of any digital national strategy.

Quantifying and measuring benefits of reduced corruption, increased transparency and legal certainty are even more difficult than trade facilitation. According to Transparency International, Mexico continues to struggle with corruption.[45] International agencies, such as the WCO, IMF and UNCTAD, have recognized that a key strategy in resolving customs corruption is by implementing single window systems. For example, the Philippines, Georgia and Qatar Customs have successfully decreased the opportunity for corruption through single windows for trade by substantially reducing face-to-face contact between customs officials and clients, and increasing customs transparency. Singapore, which established the world's first national single window for trade (TradeNet), also claims big gains in government productivity (for every $1 earned in customs revenue it spends only 1 cent).[46] With the introduction of single window, Mexico has reduced corruption in a similar way as Philippines, Georgia and Qatar: "improving the accessibility of relevant information and tightening customs accountability by providing an electronic audit trail of all processes".[47] Heighten transparency was likely reached as the result of automating the trade processes that avoids arbitrary decisions of public employees, and allows for better risk control. VUCEM also increased legal certainty through the approval and clarity of the requirements for compliance with all obligations of foreign trade.[48]

Measured against the objectives of the current National Digital Strategy, VUCEM indeed appears to contribute to its goal of "facilitating access to and promote the use of ICTs in everyday life of society and government so that they contribute to economic and social development, and improve people's quality of life".[49] Arguably VUCEM seeks to fulfill the promise of government transformation, which is the first objective of the National Digital Strategy: VUCEM has

[44]Tax Administration System's Transparency Portal. Retrieved on May 7, 2015 from http://portaltransparencia.gob.mx/pot/contrataciones/consultarContrato.do?method=consultaContrato&id.idContrato=CS-309-LP-P-083/10&_idDependencia=06101

[45]Transparency International. Corruption Perception Index (2014). Retrieved on May 7, 2015 from http://www.transparency.org/country#MEX

[46]United Nations Economic Commission for Europe (n.d.) Trade Facilitation Implementation Guide. Retrieved on May 7, 2015 from http://tfig.unece.org/contents/single-window-for-trade.htm

[47]Ndonga (2013).

[48]Velazquez (2012).

[49]Mexico's National Digital Strategy (2013). Retrieved on May 7, 2015 from http://embamex.sre.gob.mx/italia/images/pdf/national%20digital%20strategy.pdf

standardized procedures and regulations, uses the Advanced Electronic Signature as a means of authentication for procedures and services, has expedited the adoption of standards in government agencies through guides, digital tools and training materials, and has developed an interoperability of systems and provides digital services, not just electronic portals. Given that VUCEM has only been launched in 2012, it is too early to conclude whether it will help achieve the ultimate goal of Mexico's National Digital Strategy, which is "to achieve the average for OECD countries in the digitization index established in the "Program for a Close, Modern Government"[50] by 2018 and achieve the indicators of the leading Latin American country by 2018".[51]

8 Conclusion

VUCEM's has been very effective in the reducing time, cost and documents needed for trade transactions. With respect to its implementation, the analysis of obstacles and drivers provides evidence that a combination of elements made VUCEM successful. These included political commitment, guaranteed funding and addressing technological challenges with training and stakeholder involvement. The legal status of electronic procedures and the Advanced Electronic Signature were important regulatory building blocks. VUCEM achieved a 100 % service adoption among businesses, which is consistent with an OECD finding that the adoption rate of digital services targeted to businesses is higher than those targeted at the population at large (see OECD 2009). One reason for achieving this was the mandatory nature of the platform, decided and implemented by the government. Although businesses are still able to submit their filings for trade procedures personally at the corresponding governmental agency, the latter simply manually input their information into the VUCEM database, thus creating many of the benefits mentioned in this study. The government bureaucracy and users have a vested interest in a highly effective and efficient single window for trade that was critical to the country's economic wellbeing.

However, like many projects, VUCEM encountered difficulties in achieving some goals of the project, such as meeting all its internal deadlines (e.g. the number of procedures available online by a certain date). While this issue has been solved and probably is not unique to Mexico, it is a common challenge for all single windows given the technical complexity.

[50]The mainstreaming strategy of the National Development Plan 2013–2018, "Close, modern government," cites as one of its lines of action: "Establishing a National Digital Strategy to encourage the adoption and development of information and communication technologies and promote an effective government that will insert Mexico into the Knowledge Society." Retrieved on May 7, 2015 from http://embamex.sre.gob.mx/italia/images/pdf/national%20digital%20strategy.pdf

[51]Mexico's National Digital Strategy (2013). Retrieved on May 7, 2015 from http://embamex.sre.gob.mx/italia/images/pdf/national%20digital%20strategy.pdf

Despite the fact that Mexico's National Digital Strategy was not the initial driver for VUCEM, it fulfills the broader aspirations of both, the National Digital Strategy, which existed when the platform was launched, as well as the current one. VUCEM clearly contributes to the goal of improving competitiveness, stated in both Strategies. Given that VUCEM has only been launched in 2012, it is too early to reach a final conclusion on its success from a cost-benefit-analysis point of view. Mexico has embarked upon a new stage of transactional delivery of digital public services. This type of digital service requires significant financial resources that mandate rigorous cost-benefit analysis to validate the investments. As a more democratic government, Mexico needs to be held accountable for the cost of e-government projects. In keeping up with new technologies, the country has demonstrated its commitment to innovation through e-government. It remains to be seen how the Mexican government will achieve synergies between different e-government projects and initiatives under the aegis of the National Digital Strategy, such as integrating VUCEM into the National Single Window. It is also still unclear how the concept of a regional (such as the ASEAN-window single window) and/or global system of interoperability between single windows for trade will unfold in Latin America and worldwide. These are challenges that Mexico will confront as it continues its quest to becoming a leading digital government.

Bibliography

Accenture. (2014). Digital government. Pathways to delivering public services for the future. A comparative study of digital government performance across 10 countries. Retrieved May 6, 2015, from http://nstore.accenture.com/acn_com/Accenture-Digital-Government-Pathways-to-Delivering-Public-Services-for-the-Future.pdf

FocusEconomics. (2015, January 27). Retrieved May 7, 2015 from http://www.focus-economics.com/news/mexico/trade/trade-deficit-doubles-2014

Ministry of Economy's Second Annual Report (2014).

Moïsé, E., Orliac, T., & Minor, P. (2011). Trade facilitation indicators: The impact on trade costs. *OECD Trade Policy Papers*, No. 118, OECD Publishing. doi:10.1787/5kg6nk654hmr-en

Moïsé, E., & Sorescu, S. (2013). Trade facilitation indicators: The potential impact of trade facilitation on developing countries' trade. *OECD Trade Policy Papers*, No. 144, OECD Publishing. doi:10.1787/5k4bw6kg6ws2-en.

National Institute of Statistics and Geography (INEGI) (2015, February 9). Retrieved May 7, 2015, from http://www3.inegi.org.mx/sistemas/temas/default.aspx?s=est&c=17484

Ndonga, D. (2013). World Customs Journal 7, 2. Managing the risk of corruption in Customs through single window system. P.23. Retrieved May 7, 2015, from http://www.worldcustomsjournal.org/media/wcj/-2013/2/WCJ_V7N2_Ndonga.pdf

OECD. (2005). OECD e-Government studies: Mexico 2005. OECD Publishing, Paris. doi:10.1787/9789264010727-en.

OECD. (2009). Rethinking E-Government services. User-Centered Approaches. *OECD E-Government Studies*, OECD publishing, Paris. doi:10.1787/9789264059412-en.

OECD. (2011). Towards more effective and dynamic public management in Mexico. *OECD Public Governance Reviews*, OECD Publishing, Paris. doi:10.1787/9789264116238-en.

OECD. (2014). Regulatory policy in Mexico: Towards a whole-of-government perspective to regulatory improvement. *OECD Publishing*. doi:10.1787/9789264203389-en.

Oliver, J. (2013, April 2). Notes from the field: Making trade more efficient in Tunisia. Retrieved May 7, 2015, from http://blogs.worldbank.org/trade/node/598

The Economist Intelligence Unit. (2015, March 17). Annual data and forecast. Retrieved May 7, 2015, from http://country.eiu.com/article.aspx?articleid=1602972944&Country=Mexico&topic=Economy&subtopic=Chartsandtables&subsubtopic=Annualdataandforecast

The World Bank. (2015). Internet users for 100 people. http://data.worldbank.org/indicator/IT.NET.USER.P2

Transparency International. Corruption Perception Index (2014). Retrieved May 7, 2015, from http://www.transparency.org/country#MEX

United Nations Economic Commission for Europe. United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). (2005). Recommendation and guidelines on establishing a Single Window. Retrieved May 7, 2015, from http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec33/rec33_trd352e.pdf

Velazquez, M. (2012). Requirement for exporting to Mexico: Single window for Trade/Ventanilla Unica para el Comercio Exterior (VUCEM), p. 2. Retrieved May 7, 2015, from http://www.export.gov/mexico/static/VentanillaUnica_Latest_eg_mx_050491.pdf

VUCEM-Frequently asked questions. (n.d.). Retrieved May 7, 2015, from http://www2.ventanillaunica.gob.mx/cs/groups/public/documents/contenidovu/mdaw/mde2/~edisp/portal16200016367.pdf

USA: Broadband Access and Adoption in New York State

Myer Freimann and Joel Putnam

1 Introduction

The United States' federal government is placing increasing importance on broadband Internet access. In 2015, the Federal Communications Commission (FCC) classified broadband as a utility, in much the same way as electricity and telephones were classified in an earlier era. This is an explicit acknowledgement of the central role high-speed Internet plays in a modern economy and society, as well as the increased regulatory role the government plays in its development and oversight.

High-speed Internet access has become an integral part of the American economy for both consumers and businesses. Internet access via a broadband connection provides individuals with access to an ever-growing suite of online digital government services and enables participation in the transition to e-commerce and online entertainment. For businesses, particularly small and medium-sized enterprises (SMEs), broadband Internet access is key to increasing competitiveness both domestically and internationally. It reduces transaction costs and enables businesses to actively participate in a global marketplace.

In the U.S., private companies commonly referred to as Internet Service Providers (ISPs) typically provided broadband Internet service. Historically, they were the sole providers and because of the substantial fixed costs involved in the sector, there are few, large telecommunications companies. With the increasing importance of broadband today, government regulation and fiscal policies are increasingly important in ensuring a competitive market to provide universal broadband access and promote adoption. Broadband *access* refers to the physical availability of high-speed Internet service and *adoption* refers to the percentage of people who subscribe to broadband service.

M. Freimann (✉) • J. Putnam
School of International and Public Affairs, Columbia University, New York, NY, USA
e-mail: myer.freimann@columbia.edu; jrp2186@columbia.edu

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_6

In 2009, the United States Congress instructed the FCC to develop the National Broadband Plan (NBP). The NBP was one of the first digital strategy documents published by the U.S. federal government. It was released on March 17, 2010 with an overriding goal of providing high-speed Internet access at 100 Megabits per second (Mbps) to 100 million Americans by 2020. This expansive document also outlines the role that broadband services can play in promoting healthcare, education, energy and environment, government performance, civic engagement, public safety, and economic opportunity. Specifically in relation to economic opportunity, the plan outlines goals for increasing the levels of access and adoption that will help businesses compete in a global marketplace and employees participate in a mobile workforce, be it working remotely or while mobile. The plan consists of recommendations for states to act upon and while it does not explicitly require them to take action, federal funding is conditional upon the states implementing these recommendations.

This case study reviews the effectiveness of the NBP's implementation in the State of New York (NYS), in light of the Plan's expectations for the expansive role that the state plays in its implementation. Specifically, it reviews the policies and actions undertaken by both state and local agencies (public and private) to meet the objectives of the NBP to improve access and adoption levels. It also examines the successes as well as challenges that state governments must confront to do so.

2 Broadband Technology

Broadband deployment differs from the construction of other infrastructure in that the standards of what qualifies as "broadband" can shift rapidly. A water line today will still be a water line for the duration of its existence, but broadband connections installed only a decade ago are often obsolete and require upgrading to meet current technological standards of what constitutes "broadband." The evolving definition of broadband proves problematic when assessing broadband projects both in the U.S. and internationally.

Digital data is stored as 'bits' in the form of 1 s and 0 s. Internet speeds represent the bandwidth of the connection and are measured in Megabits per second, with one megabit equal to one million bits. As the size of digital media being produced and consumed increases, so too must the bandwidth required to send and receive it over the network. This need for greater bandwidth is amplified by an increasing number of connected devices, such as mobile phones and tablets, utilizing the connection. A 2015 FCC report[1] concluded that an average household requires a connection of 25 Mbps for all members to be able to realise broadband benefits simultaneously, such as adults performing work-related tasks, children completing school work and entertainment usage.

[1] https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-10A1.pdf

The definition of broadband has changed greatly in a relatively short span of time. In 1999 the U.S. FCC defined broadband service as speeds greater than or equal to 200 kbps (0.2 Mbps) for both downloads and uploads. In 2009, the FCC definition was increased to 4 Mbps for downloads and 1 Mbps for uploads. Most recently, the definition was increased again to 25 Mbps down and 3 Mbps up and it is likely that these will be increased further over time. Each change significantly impacts the percentage of the population that had previously been considered to have access. Under the new requirements of 25 Mbps down and 3 Mbps up, many households that previously qualified as having broadband access no longer do—nationwide access levels effectively dropped from 95.4 to 85.3 %[2] in an instant. In 2012 NYS set target specifications for a high-speed connection of 6 Mbps up and 1.5 Mbps down, which were more stringent than the FCC specification at the time. NYS increased its target service speeds again in January 2015, when Governor Andrew Cuomo announced that every resident of the State should have access to at least 100 Mbps connections no later than 2018[3] and New Yorkers considered as having broadband by the federal government may not be considered as such by NYS. This evolution of broadband speeds and NYS's ambitious target are indicated in Fig. 1.

Together with the varied definitions of broadband, the technology and its installation presents many layers of complexity. The exact nature of the construction differs depending on the technology employed. The two dominant technologies are coaxial cable and dedicated Fiber To The Home/Premises (FTTH or FTTP). In both cases cables are run from a local service hub to locations called "nodes" (the

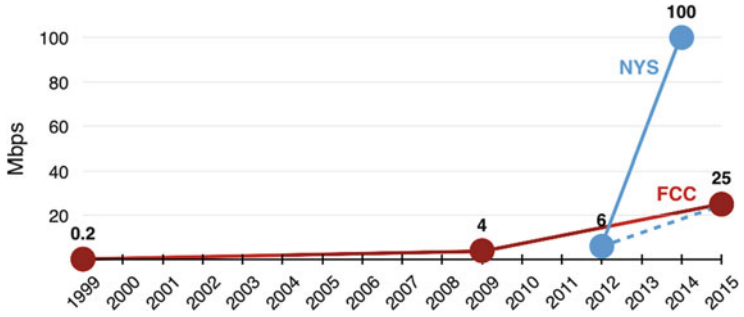


Fig. 1 Minimum FCC Defined and NYS Target Download Speeds. Figure illustrates the disparity in definitions of broadband even within the U.S. by showing the national (FCC) and New York State (NYS) definitions of "broadband" in terms of download speed in megabits per second over time, starting with the FCC's definition of 200 kbps (0.2 Mbps) in 1999

[2]Summarize Nationwide Data- National Broadband Map. (n.d.). Retrieved March 20, 2015, from http://www.broadbandmap.gov/summarize/nationwide

[3]2015 Opportunity Agenda: Restoring Economic Opportunity. (2015, January 16). Retrieved April 20, 2015, from https://www.governor.ny.gov/news/2015-opportunity-agenda-restoring-economic-opportunity-1

exact nature of this location differs depending on whether it is a cable or fiber connection and also the type of cable or fiber connection). Wire is then laid from the node to the home. A device that translates the raw signal into an electronic signal that is recognisable to personal computing equipment must then be installed at every home or building. Laying the physical connections therefore requires running wires and cables to individual households, which are sometimes contained in multi-family buildings. This differs from many infrastructural provisions such as electricity, gas, and clean and wastewater plumbing which are typically installed at the time of construction. Installing the new broadband connections may require significant access to streets and roads, and remodelling to older buildings.

Country Info:

Estimated Population (2014): 318,400,000

Population Density: 35 people/sq. km

Geographic area: 9,161,923 sq. km

Gross Domestic Product (2014): US$17,700,000,000,000

GDP per capita (2014):[1] US$55,590

Internet access (2014)[2]: 85.3%

Internet adoption (2013)[3]: 73.4%

Rank in UN E-government Development Index (2014)[4]: 7 of 193

Rank in UN E-participation Index (2014): 9 of 193

Rank in ITU Fixed Broadband Penetration (2013)[5]: 24 of 183

2.1 The United States and Internet and Broadband Services

The United States has historically been the global leader in Internet services. The very first Internet connection was established in the U.S. as part of a cold-war era defense department program called ARPANET and the first transmission occurred between two universities in California in 1969.[4] The technology to expand access on a commercial level developed through the mid to late 1980s until the formal definition of the Internet by the Federal Networking Council in 1995.[5] Since then, the 'network of networks' has had a transformative impact on telecommunications and digital services in both the United States and globally. A defining characteristic

[4]Leiner et al. (2012).

[5]ibid.

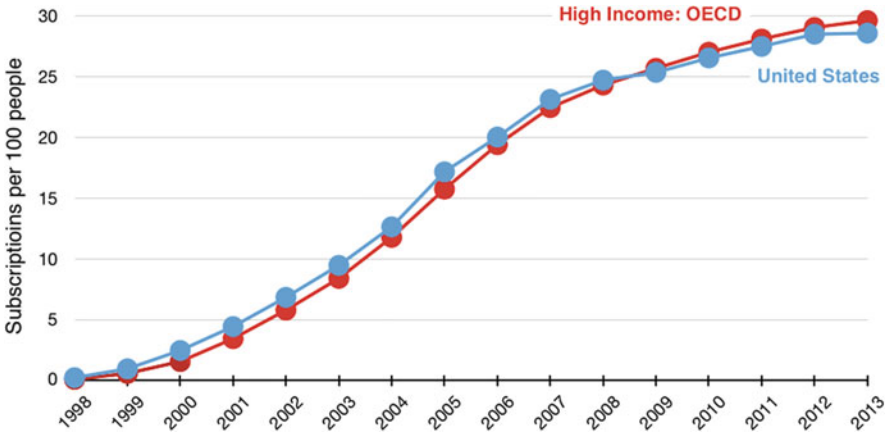


Fig. 2 Internet Subscriptions per 100 People (World Bank (2014)—The World Bank utilizes data from the International Telecommunications Union (ITU). ITU reports household subscriptions per 100 people, rather than subscriptions per 100 people. Multiplying the number of household subscriptions per 100 people by the average number of people in a household yields numbers typically reported in national statistics for broadband penetration). Figure shows the broadband subscription rate (per 100 people) between the United States and the average among all high-income OECD countries over time

of the Internet is the extraordinary speed of its development and the plethora of applications that have been created. It continues to evolve at a pace far beyond those of previous communication technology.

The rapid, early adoption of broadband was not unique to the U.S. and other economically developed countries advanced at a similar rate. According to World Bank data however, starting in 2009 the U.S. fell behind other high income OECD countries in terms of fixed broadband Internet subscribers per 100 people[6] and by 2010 the U.S. was ranked 15th in global broadband adoption levels.[7] Figure 2 shows the adoption trends from 1998 to 2013. Adoption in the U.S. leads other high-income OECD countries until 2009, after which it trails by an ever-widening margin.

Even considering a transition to mobile access over fixed connections, the diminished growth of fixed connection subscribers in the U.S. and lower rate in absolute terms compared to other high-income OECD countries is notable. The widening gap between the U.S. and other OECD countries is represented in Fig. 3, which shows the gap as the difference in adoption levels in percentage point terms.

[6]World Bank (2014). Fixed broadband Internet subscribers per 100 people [Interactive online dataset] Retrieved from http://data.worldbank.org/indicator/IT.NET.BBND.P2

[7]Shields and Campbell (2010).

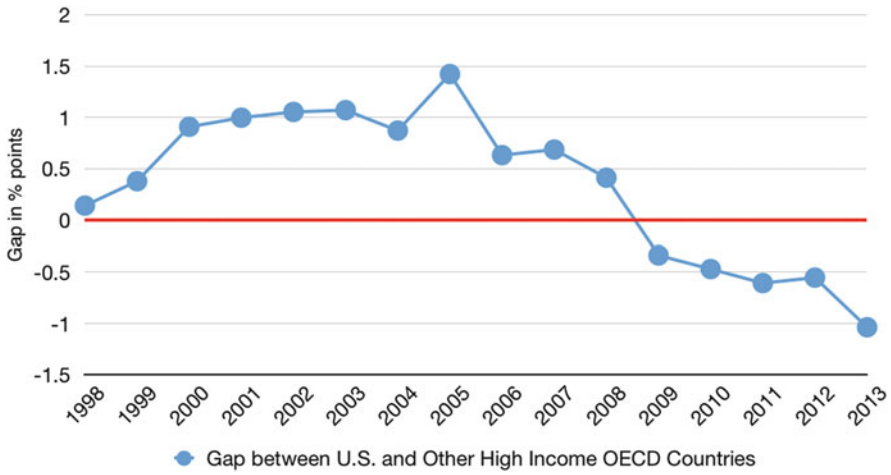


Fig. 3 Adoption Gap Between U.S. and High Income OECD Countries. Figure repurposes the data from Fig. 2 to illustrate how far ahead (or behind) the U.S. is in terms of broadband subscriptions per 100 people. Above the *red line* (zero) indicates being ahead of the average among high-income OECD countries, below it indicates behind, and the distance indicates the magnitude of the gap

2.2 *Broadband the Economic Crisis of 2008*

This negative and declining trend presented a challenge to the U.S. As early as May 5, 2007, the Congress passed the Broadband Data Improvement Act with the goal of improving "the quality of federal and state data regarding the availability and quality of broadband services and to promote the deployment of affordable broadband services to all parts of the Nation [sic]."[8] However, in 2008 the U.S. experienced a severe economic downturn. To address this situation, in 2009 the Congress undertook a major financial stimulus program to help the states—The American Recovery and Reinvestment Act[9] (ARRA). The stimulus package totalled $840 billion, of which close to $275 billion has already been disbursed. The legislation contained provisions for three significant broadband related initiatives listed in Table 1. NYS secured a significant amount of funds from the stimulus package.

The Broadband Technologies Opportunity Program[10] (BTOP), which is administered by the National Telecommunications and Information Administration (NTIA), has three categories of projects: comprehensive community infrastructure, public computer centers and sustainable broadband adoption. Community

[8]Broadband Data Improvement Act (2008—S. 1492). (n.d.). Retrieved April 20, 2015, from https://www.govtrack.us/congress/bills/110/s1492

[9]Recovery.gov—Track the Money (2015).

[10]About | BroadbandUSA—NTIA. (n.d.). Retrieved March 20, 2015, from http://www2.ntia.doc.gov/about

Table 1 Broadband Components of ARRA (Data collected from interactive repository:Recovery.gov—Track the Money. (n.d.). Retrieved April 15, 2015, from http://www.recovery.gov/arra/espsearch/Pages/advanced.aspx?data=recipientAwardsList&AwardType=CGL)

Name of Provision	US	NYS
10.787 Broadband Initiatives Program	$3,290,157,834	$55,531,443
11.557 Broadband Technology Opportunities Program	$4,051,992,867	$92,461,218
11.558 State Broadband Data and Development Grant Program	$318,780,997	$8,923,532

infrastructure projects focus on laying fiber and increasing access whereas the sustainable adoption programs "include digital literacy training and outreach campaigns to increase the relevance of broadband in people's everyday lives." Examples of the latter included a now-defunct New York State program in which old computers were refurbished and provided to economically disadvantaged schoolchildren who were then provided with Internet access at discounted rates.

The State Broadband Data and Development Program[11] aims to facilitate the integration of broadband and information technology into state and local economies. Through this program, the NTIA awarded over $293 million to 56 grantees, one from each state and territory, tasked with supporting "the efficient and creative use of broadband technology to better compete in the digital economy."[12] In conjunction with this requirement, The NTIA also provides funds to assist states in gathering accurate and current data on the availability, speeds and location of broadband services.

2.3 *Economic Benefits of Broadband*

A 2007 study of the U.S. labor market identified a positive association between nonfarm private employment and broadband penetration. Specifically, the study concluded that, "for every one percentage point increase in broadband penetration in a state, employment is projected to increase by 0.2–0.3 % per year"[13]; on a national level this would result in approximately 300,000 additional jobs. The study further concluded that, "The effect of broadband is most significant in explaining employment growth in education, healthcare, and financial services."[14]

In September 2011, former FCC Chairman Julius Genachowski remarked that, "broadband creates 2.6 new jobs for every one job lost. A 7 % increase in broadband penetration could create an additional 2.4 million new jobs".[15]

[11]Ibid.

[12]State Broadband Data and Development Program (2010).

[13]Crandall et al. (2007).

[14]Ibid.

[15]Genachowski, J. (2011, September 27). Fact Sheet: Broadband, Creating Jobs and Driving Economic Growth. Retrieved from http://www.fcc.gov/document/fact-sheet-broadband-creating-jobs-and-driving-economic-growth

With a clear understanding that broadband adoption positively impacts economic growth and development, the American Recovery and Reinvestment Act instructed the FCC to develop The National Broadband Plan[16] (described above). President Barack Obama highlighted the significance of the Economic Opportunity and Growth section of the plan in a memorandum published on June 28th 2010: "Few technological developments hold as much potential to enhance America's economic competitiveness, create jobs, and improve the quality of our lives as wireless high-speed access to the Internet".[17]

Most recently, on April 13th 2015 the NTIA released an impact study which found that, "on average, in only 2 years, BTOP grant communities experienced an estimated 2 % greater growth in broadband availability than non-grant communities. That growth is estimated to generate increased annual economic activity of between $5.17 billion and $21 billion. The additional broadband infrastructure could also be expected to create more than 22,000 long-term jobs and generate more than $1 billion in additional household income each year."[18]

2.4 New York State

New York State established the Broadband Program Office (BPO) in 2008 operating under the aegis of the Empire State Development (ESD) agency, New York's primary economic development agency. BPO is tasked with implementing the state's broadband strategy and its objectives. Its stated goal is that, "every New Yorker will have access to affordable broadband at speeds of 100 Mbps download [and] 50 Mbps upload" and similarly with respect to adoption that, "New York State will achieve high rates of broadband adoption rate of 80 %."[19]

The BPO has several mandates to oversee New York's goal of expanding its Broadband program. It is required to publish annual reports documenting progress and upcoming objectives; the latest report issued is from 2012 to 2013. It has also established four taskforces[20] comprised of community leaders and government and industry stakeholders. The taskforces were established to assess the needs of the communities before enacting state policies. The BPO's most important mandate is the allocation of federal and state funds for broadband development, especially in underserved and unserved communities. The federal funds are principally from the American Recovery and Reinvestment Act mentioned above. The BPO then

[16]United States Federal Communications Commision (2009).

[17]Presidential Memorandum: Unleashing the Wireless Broadband Revolution (2010).

[18]Taxali (2015).

[19]NYS Goals for Broadband Development and Adoption (n.d.). Retrieved April 3, 2015, from http://nysbroadband.ny.gov/broadband-goals

[20]NYS Broadband Task Forces. (n.d.). Retrieved April 3, 2015, from http://www.nysbroadband.ny.gov/nys-broadband-taskforces

redistributes these funds across the state with the goal of achieving local results consistent with the objectives of the National Broadband Plan (for example, grants to private firms who build broadband infrastructure for unserved areas). While 93 % of New York State's population live in urban environments, the state's large population of 19.7 million inhabitants[21]—fourth largest in the country—means there are still 1.4 million residents living in rural regions.[22]

In January 2015 New York's Governor, Andrew Cuomo, released the *Opportunity Agenda: Restoring Economic Opportunity*. The strategy document focuses heavily on infrastructural projects particularly in upstate New York, where the population density and average income per capita are considerably lower than in New York City, making it far less attractive for private telecommunications investment. Broadband is the third component of the agenda and Governor Cuomo announced the plan saying, "We're launching the largest state broadband investment in the nation in order to make [our] goal a reality. This is a truly bold undertaking that will improve the lives of New Yorkers in every corner of the State, and I am proud to make it a priority of our administration's second term agenda".[23] The program, *Broadband for All,* which will cost $500 million in government spending (matching $500 million in private investments), is funded by state funds received from bank settlements following the economic turmoil several years earlier. It is exclusively aimed at incentivising ISPs to expand service to unserved and underserved areas by promising a 1:1 match of private investments. In addition to attracting private investments it is hoped that the availability of funds will also increase competition where little currently exists, thereby improving affordability and quality of service. Priority for receiving funds is assigned to those ISPs offering speeds of at least 100 Mbps at the lowest costs.

Finally, the plan relies heavily on local communities' input to "guide development". In a similar manner to previous initiatives, Regional Economic Development Councils (REDC), "will submit a comprehensive plan to the State that: (1) identifies unserved and underserved areas; (2) aggregates demand across residential, institutional and business sectors; (3) details the most cost-effective means to provide universal access; and (4) leverages state-owned assets where possible."

3 The New York State Broadband Initiative

This case study focuses primarily on the efforts of New York State and its municipalities to increase broadband access and adoption levels. It uses quantitative data to visualise trends in levels of access and adoption over time, as well

[21]Population—New York City Department of City Planning (2014).
[22]USDA ERS—State Fact Sheets New York (2015).
[23]Cuomo (2015).

as qualitative data and extensive interviews with various stakeholders to examine broadband policy formulation and implementation.

The case study set out to understand the broadband landscape in New York State. After an initial period of literature review, interviews were conducted with government employees at the state and local level as well as industry experts with extensive experience in the telecommunications industry.

There is considerable documentation detailing the current state of access both nationally and at the state level. The FCC[24] and BPO[25] both administer mapping projects that aim to show which communities and geographic areas have access at what Internet speeds. NYS Broadband Map is not current and the data is accurate as of June 30th 2014, this results in some discrepancies between the data available via the map and that included on the Governor's website regarding access levels. Figures 4 and 5 show data from New York State's mapping project indicating the percentage of households served by broadband according to the FCC defined speed of 25 Mbps and the NYS target of 100 Mbps: the vast majority of residents have access at 10 Mbps but this decreases considerably for 25 Mbps and further yet for 100 Mbps.

Figure 5 clearly shows how urban areas are much better served at the new higher speed targets. Particularly notable is the sprawling New York City region in the southeastern corner of the state. Other cities in NYS with considerable access are, the capital region (Albany and surrounding cities), the university city of Syracuse, and Buffalo on the western border with Canada.

The FCC also produces biannual reports on Internet usage in households. These studies provided adoption level data that were useful in determining the adoption growth trend in New York State and comparing it to the national average. Figure 6 shows adoption levels for the U.S. and NYS from 2009 to 2013. NYS adoption

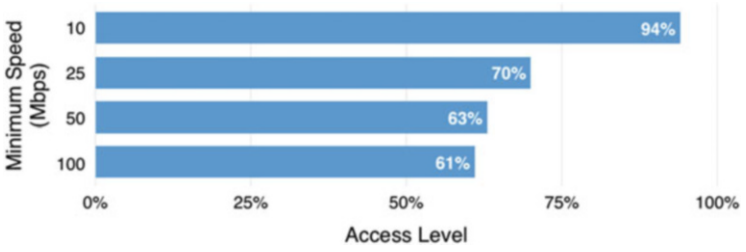


Fig. 4 Percentage of NYS Housing Units with Access at Different Speeds (New York State Broadband Map. (2014, June 30). Retrieved from http://www.broadbandmap.ny.gov/map/. Figure shows the level of access that is available for NYS residents at each of the broadband speed tiers. Prior to the recent increase to the minimum speed requirements for broadband, 94 % of NYS residents had access

[24]Broadband Map—Technology—National Broadband Map (2014).

[25]NYS Broadband—In Depth (2014).

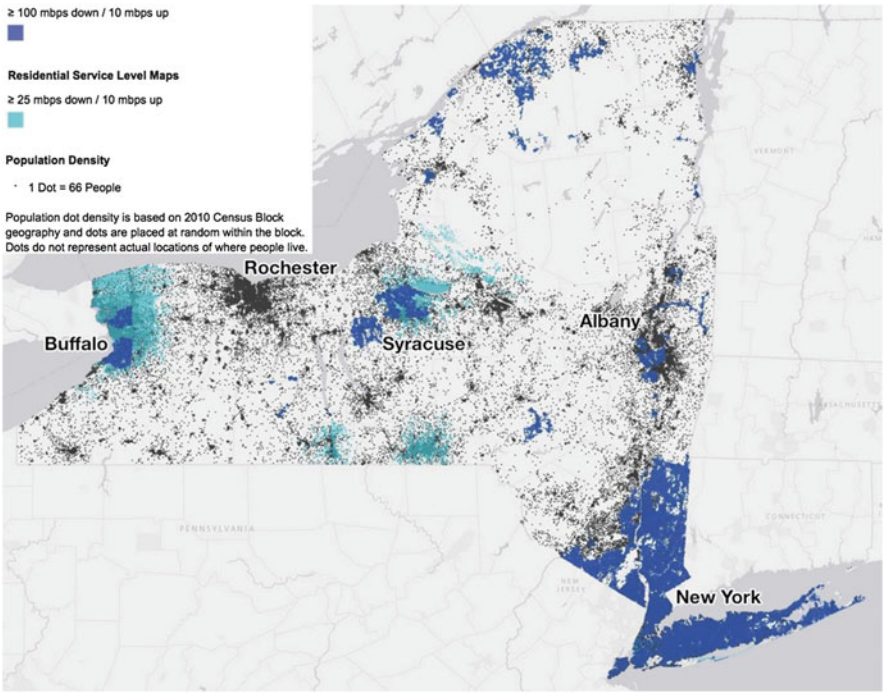


Fig. 5 Areas of NYS with Access Speeds Above 25 Mbps and 100 Mbps. Figure shows areas where residents can subscribe to broadband service at FCC defined speeds of 25 Mbps in *light blue*, NYS target speeds of 100 Mbps in *dark blue* and population density indicated in *black*. Source is in the public domain

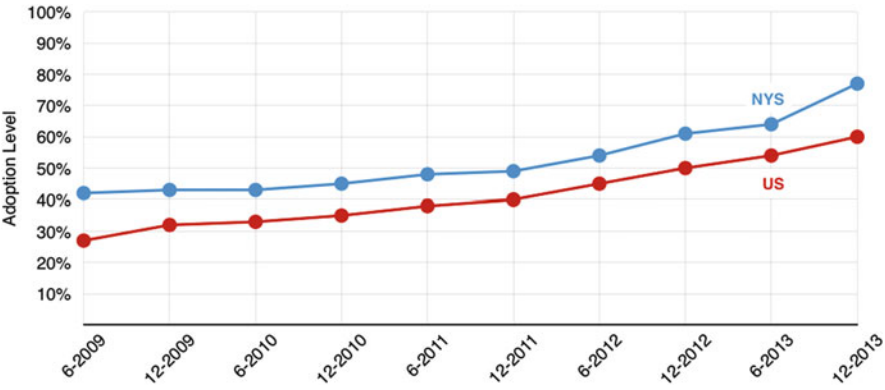


Fig. 6 Adoption in USA and NYS (Data collected from ten biannual FCC reports, all available here: Internet Access Services Reports. (n.d.). Retrieved April 10, 2015, from http://www.fcc.gov/reports/Internet-access-services-reports. Figure shows the adoption rate of broadband Internet in the United States and in New York State over time. New York generally tracks national rates until the final period measured (December 2013) when it jumps considerably

levels are higher than the U.S. average although the growth rates are similar. This is true until 2013, when NYS experienced a sharp increase in adoption.

3.1 The Findings

On balance, New York State broadband initiative has been effective. New York State is ranked 5th nationally for broadband access measured at the current FCC specification of 25 Mbps.[26] However, NYS drops significantly in the rankings for higher broadband speeds, ranking only 25th nationally at the target speed set in 2015 by Governor Cuomo's *Opportunity Agenda* and *Broadband for All* campaign.

Table 2 shows how New York State ranks among the 50 states for providing different download speeds (higher ranking meaning greater percentage of population having access to Internet at that speed).

New York State's success at access (based on current FCC standards) is the reflection of the availability of considerable sums of federal and state funds, a proactive state strategy encouraging broadband access and adoption, and New York City's focus on technology. However, its success is tempered by two factors: the continued need to provide broadband in underserved communities, especially rural areas, and the influence of New York City and its populous and wealthy metropolitan area, on the state broadband performance averages. NYC has a history of embracing technology, especially under the administration of former Mayor Michael Bloomberg (2002–2013). Bloomberg's administration sought to attract technology start-ups to the city and a fundamental requirement for these companies was advanced Internet connectivity. Today, access is predominantly an issue in the city's outer boroughs. In the central parts of the city, where access is less a significant problem, technology initiatives in NYC are focused more on adoption and wireless Internet access. For instance, the LinkNYC Program seeks to convert disused payphones throughout the city into wireless Internet hotspots, free for all to access.

Table 2 New York State's National Ranking for Broadband Availability by Speed (National Broadband Map, Analyze Rank. (2014, June 30). Retrieved from http://www.broadbandmap.gov/rank)

Minimum speed (Mbps)	National ranking
10	11
25	5
100	25
1000	18

[26]Reese and Anderson (2015).

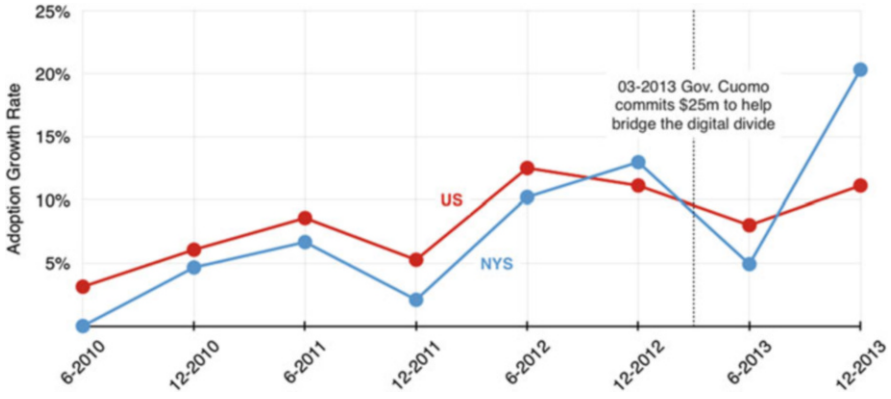


Fig. 7 Adoption Growth Rates in U.S. and NYS. Figure illustrates the rate of growth of broadband adoption both nationally and in New York State and more clearly emphasises the spike in NYS in 2013

A number of rural and urban government officials cited the state funded Connect NY Broadband Program as a probable cause for the spike in state-wide access and adoption numbers in 2013—a trend that can be clearly identified on Fig. 7 showing biannual broadband adoption growth rates for the U.S. and NYS.

The program disbursed grants via Regional Councils and the Empire State Development agency "to promote and expand high-speed Internet access in rural upstate and underserved urban areas of the State [sic]".[27] The program has awarded 70 million dollars in grants and was hailed as "the largest state-level broadband funding commitment in the nation and the first step in strengthening our state's broadband capacity. The Connect NY Broadband Program has enabled an additional 160,000 New York households, 8000 businesses and 400 community anchor institutions to harness the power of broadband". A full evaluation of this program is pending completion by the governor's office in Albany but the *Opportunity Agenda* released by the same office refers to its success and borrows key elements to aid with the implementation of the upcoming $500 million investment matching program.

Along with the state level programs, New York City has shown remarkable aptitude for finding innovative ways to provide broadband access and adoption to its unserved and underserved residents. Many of these programs have only recently been announced and will be evaluated at a later date. The creativity of these proposals is impressive. Two of the most noteworthy programs involve converting disused telephone booths to gigabit Wi-Fi hotspots (the LinkNYC program detailed below) and the New York Public Libraries providing wireless Internet access

[27]Connect NY Broadband Program. (n.d.). Retrieved April 11, 2015, from http://nysbroadband.ny.gov/ConnectNY2012

devices for free to patrons who enroll in their afterschool education and adult literacy programs and who do not have Internet at home.[28]

LinkNYC is expected to generate $500 million in revenue for the government over the next 12 years,[29] a feature that distinguishes it from the majority of broadband programs, such as ConnectNY and Broadband for All, that typically require large sums of government spending. Electronic displays on disused telephone booths will serve as an advertising platform managed by a consortium composed of government and private firms known as CityBridge, with the NYC government receiving a share of revenues. The program has been criticised for promoting inequality; the argument is that advertisers strive to locate the booths in areas with high disposable incomes, precisely the sector of society that does not need free broadband access. Government officials have responded by saying the revenue would be spent improving access in other underserved areas of city. In response to this criticism an amendment to the plan relocated some booths to lower income communities. NYC's ability to earn income from LinkNYC is somewhat unique. Midtown Manhattan, where the first, and majority of the booths will eventually be located, has high pedestrian traffic and is a prime location for advertisements. While potentially highly lucrative, it would be a challenge to replicate this program outside of major metropolitan areas.

City officials who were interviewed for the case credited the successful development of innovative ideas to two practices: listening to residents and paying attention to new and exciting technologies. One city official noted that when sourcing ideas for new ways to expand broadband, their traditional feedback process (issuing an official 'request for comment') was often of limited value. Community groups can use it to lobby for tangentially related issues and vendors might use the process to promote their tangentially related services. Instead of relying solely on these requests, city officials have adopted a proactive strategy of idea generation, attending tech-focused social gatherings such as hackathons and informal 'meetups' of like-minded individuals interested in technology. They have also initiated design competitions in which the public is invited to propose ideas for improving broadband access. The city selects the best ideas and creates traditional requests for proposals (RFPs) asking private firms to submit plans and cost estimates as to how the idea can be turned into a reality. A number of these projects, including the conversion of phone booths and the Internet hotspots on loan from libraries, are now underway. While it is too soon to tell whether such projects will be successful, the originality and inventiveness of these concepts, especially for a city the size of New York, is impressive. It also demonstrates the continuing need to adapt new technologies to meet the complex tasks envisioned for digital governance.

[28]Library HotSpot (2014).

[29]City Bridge, New York City (2015).

4 Challenges

Despite the fact that broadband penetration in New York State is among the highest in the U.S. in percentage terms, the absolute number of people without access is larger than the entire population of Vermont and Wyoming combined (as well as the population of ten other states).[30] There remains considerable work to be done in connecting those who remain without broadband and many complex challenges both internal and external to NYS's actions. Internal challenges are posed by government operations and capacity concerns, while stakeholders such as ISPs, landowners and local communities pose external challenges. These issues are explored in the sections that follow.

4.1 Data Acquisition

The 2007 Broadband Data Improvement Act (p. 8) recognised the importance of accurate and current data prior to the creation of the National Broadband Plan. For example, it is very difficult to design a program that gets broadband to unserved populations if you do not know which populations are unserved. Much of the federal, state and city's work is focused on gathering this data but significant challenges remain. While there is considerable information at the macro level, at the micro level it is comparably imprecise. It is worth noting that at the city level, innovative approaches such as crowdsourcing the data are improving the situation in specific locations. For example, the NYC Broadband Map solicits building tenants to contribute information regarding the Internet services in their building.[31]

Every 6 months, the FCC publishes statistics on broadband subscriber levels across the country broken down by geography and connection speed. The statistics take roughly 1 year to gather, process and publish. Yet numerous government sources from outside the FCC point out that even that effort can only record connections at the "census tract" at the lowest level. One "census tract" can cover between 1200 and 8000 people, and if one of their homes has a connection, they are all recorded as having that connection for the purposes of this survey. Because of the geographic nature of census tracts, this might not be as wildly inaccurate as it may seem on the surface, but it is still far from ideal.

One obvious solution is to collect this information from Internet Service Providers, but these companies are not obligated to share this data with the government. In local projects, smaller ISPs have been willing to do so, but the major telecommunications providers have not.

[30]Salway, D. et al. (2013). The State of Broadband in New York. In *New York State Broadband Program Office Annual Report* 2012-13 (p. 25).

[31]Frequently Asked Questions-NYC Broadband Map [New York Economic Development Corporation]. (n.d.). Retrieved April 7, 2015, from https://www.nycbbmap.com/#/faq

4.2 Pace of Technological Change

A shift to wireless access also marks a significant change to the telecommunications industry that could have far-reaching consequences. One rural ISP provider noted that wireless broadband access, either satellite or cellular, could make his industry redundant. Currently, range issues and high cost of service limit wireless technology. Mobile technology is not sufficiently fast or reliable to replace fixed connections and meet the needs of businesses—a wired broadband connection is currently between 20–100 times faster than a 4G LTE mobile connection,[32] and the caps on data usage are a hindrance for consumers. According to Susan Crawford of the Harvard Kennedy School of Government, the only way for this to change would be for wireless service providers to acquire a significant amount of wireless spectrum (most of which has already been allocated to other users) or construct cellular towers in many more places at enormous expense, neither of which she expects to happen.[33]

However, among average users there is increasing evidence that mobile access is the sole point of access for a growing share of users, and mobile connections utilizing 4G LTE technology can meet or exceed the new minimum required speeds of broadband.[34] Even if today such speeds are only available in dense urban areas and capped at a batch level of data so as to make it practically unworkable as a substitute for wireline connections, there is significant potential for wireless broadband to be an effective substitute for consumers in the future. This transition to mobile will undoubtedly continue and likely accelerate. If users are content with one, convenient point of access at speeds below those classified as broadband, it affects both access and adoption. The demand for high-speed fixed connections at broadband speeds would decrease and so would investment by Internet service providers in broadband infrastructure. Additionally, in places where access exists, users will choose not to adopt, instead settling for below-broadband speed via wireless connections.

While NYC recognises the transition to wireless and is well positioned to be a forerunner in broadband connectivity, a valuable question is whether the expensive infrastructural investments in the rest of the state will be redundant much sooner than anticipated. This should be a cause for concern for governments aiming to implement digital strategies. Digital technologies advance at a rapid pace, if government implementation does not keep up, strategies may be out-dated before they are implemented. One government employee affirmed this concern and noted

[32]Noam (2011).

[33]Crawford (2013).

[34]Aside from Sprint, all major U.S. Carriers exceeded both 25 Mb/s down and 3 Mb/s up in an independent test where all carriers had active networks, San Jose, CA—La, L. (2014, August 5). 4G LTE showdown: How fast is your carrier?—CNET. http://www.cnet.com/news/4g-lte-showdown-how-fast-is-your-carrier/

that technology procurement procedures are particularly slow, which delays implementation and exacerbates the situation.

4.3 Economic Incentives for Rural Communities

ISPs are often reluctant to serve sparsely populated rural areas rather than densely populated urban areas for two reasons: low population density means that more miles of cable must be laid to reach the same number of people and areas with low population densities tend to have a lower level of income per square foot. With private companies responsible for building the broadband infrastructure, the business decision of whether to build is determined by the profitability of a proposed project. This was confirmed by a rural ISP CEO, who despite being a staunch proponent of free markets and limited government intervention, commented that without subsidising the broadband access to rural areas it simply would not happen. It was also noted that the subsidies must be carefully targeted toward capital expenditures and not used as supplemental income for local telecommunication companies. The ability to subsidise the ISPs' operations in rural areas is a driving force in providing broadband access in these regions of New York State. This need was confirmed by the State Rural Resources Committee, a research body serving the NYS legislature, which explained that a primary goal is securing funds for broadband infrastructure investments in their rural districts, both from federal and local sources.

4.4 Community Buy-in

Community buy-in takes many different forms. Effective broadband implementation requires the cooperation of the diverse communities involved, and especially the property owners who control access for broadband installation. In urban areas, one of the challenges to broadband implementation is obtaining cooperation from owners of multi-family dwellings whose reluctance to allow ISPs to build on their properties was frequently cited as an obstacle to the installation of broadband infrastructure. As of February 2015,[35] broadband is classified as a public utility by the FCC and as such landlords will be legally obliged to grant service providers unhindered access to install required equipment in their buildings. Discussions with city officials revealed a common dispute concerns not whether the connection is installed but rather how the connection is installed. Landlords prefer the cables to

[35]FCC Adopts Strong, Sustainable Rules to Protect the Open Internet. (2015, February 26). Retrieved from http://www.fcc.gov/document/fcc-adopts-strong-sustainable-rules-protect-open-Internet

be underground and out of sight while utilities companies prefer to connect to homes via wires linked to communications towers and poles, thereby avoiding the high cost of digging. This conflict can lead to long delays and difficult negotiations between landlords and ISPs.

To promote community access and building owner cooperation, the New York City's "franchise agreements" allow Internet service providers (ISPs) to build fiber connections to areas that are potentially highly profitable on condition that they also build infrastructure to areas that they otherwise would not serve, typically areas with low income households. While in the short term the ISPs profits may be offset by the added expense, in the long run they stand to benefit from increased revenues over an extended period. However, one major impediment in this program is the 'last mile' stage wherein the city only has the legal authority to make ISPs build to the front door of a building, beyond which the interest of each individual property owner or resident is necessary. In the case of fiber optic, this decision could include the willingness to fund installation. According to the not-for-profit New York City Economic Development Corporation, one way to confront this challenge is to incorporate provisions into the franchise agreements that require the ISPs to finance installations. In contrast, the State Rural Resources Committee noted that in rural areas this has been less of an issue since they are able to use easements, legally obliging a landowner to allow the construction of necessary infrastructure on their property.

City and state employees frequently cited the importance of community buy-in. It was highlighted repeatedly as being critical to any broadband initiative's success. An official at a NYC organisation charged with driving economic growth and creating jobs illustrated this point. The official commented that in the outer boroughs of NYC, SMEs are reliant on local business development organisations for assistance. By working directly with ISPs and these local business development organisations, the city was able to reach a large number of local businesses and provide them with the education and information regarding broadband, its utility, and potential benefits. It was specifically noted that the trust SMEs place in these business development organisations proves extremely valuable and is far more effective than the ISPs marketing the same materials to businesses in a less strategic fashion.

At the state level, the taskforces recently formed by the BPO have devoted their time to engaging with local communities and Regional Economic Development Councils (REDC). The REDCs are headed by prominent community leaders[36] and work with the taskforces to assess and convey the needs of their communities, both residents and businesses. The role of the taskforce is to evaluate where investments

[36]Each Regional Council is made up of approximately 20 members appointed by the Governor, drawn from a broad spectrum of regional stakeholders representing private business, including small businesses; minority- and women-owned business enterprises (MWBEs); non-profit organizations; chambers of commerce and trade organizations; organized labor; higher education; community-based organizations; and the agricultural community. https://www.ny.gov/sites/ny.gov/files/atoms/files/2015REDCGuidebook_FINAL1.pdf

in expanding broadband access will be most beneficial. An important role is also developing close relationships with the communities, with the belief that involving them in the process at an early stage and ensuring their cooperation will help lessen the challenge posed by any potential community opposition.

4.5 Barriers to Adoption

Access and adoption are inextricably linked. There cannot be adoption without access, but demand, a determinant of adoption levels, is likely to be lower in areas without access due to less familiarity with the technology and its benefits. NYS acknowledges this interconnected nature by integrating adoption requirements in the grants it provides to ISPs for infrastructure expansion. Additionally, approximately 10 % of the $500 million earmarked by the state for broadband expansion will be devoted to adoption programs. However, ISPs admittedly will only implement the required adoption component once they have laid the infrastructure and customers are able to subscribe. This results in investments in adoption being dependent on investments in access. NYC, with substantial access in place, has progressed further with adoption initiatives than the rest of the state.

There are a number of commonly identified reasons for users not adopting broadband services. Among them are cost, lack of perceived utility, low levels of digital literacy, and security and privacy concerns. One determinant of cost is competition (or the lack of it). Two companies currently dominate the broadband market in the U.S.[37] with a combined market share of 57 %. In a nationally televised interview, the CEO of one firm stated that they have effectively divided the country into designated areas so that they do not compete.[38] The FCC overtly expresses its concern over the lack of competition within the service footprint of these companies and FCC reports document the number of providers available to consumers in an effort to monitor the competitive nature of the broadband market. In September 2014, FCC Chairman Tom Wheeler said, "three-quarters of American homes have no competitive choice for the essential infrastructure for twenty-first century economics and democracy"[39] and on April 23rd 2015, FCC opposition was cited as the reason for the proposed merger of the two largest ISPs being cancelled.[40] The NBP explicitly addresses the issue of competition and prescribes policies to encourage a healthy marketplace.

[37]Ramachandran (2015.

[38]Roberts (2014).

[39]Reardon (2014).

[40]Garrahan et al. (2015).

Cost factors are also reflected in other ways. Residential service at 500 Mbps in NYC costs $299.99 per month according to a December 2014 report[41] issued by the New York City Comptroller and other government officials indicate that in NYC a 1 Gbps (1000 Mbps) connection costs approximately $8000 per month. To provide access to economically disadvantaged communities, ISPs offer special discounted plans but these programs have limitations. For example, entry requirements are limited to those with at least one child in public school eligible for reduced price lunches, approximately 1.85 times the national poverty level, $35,158 in 2015.[42] New York City officials were quick to point out that a significant portion of these families do not live in the service areas of these companies. Even for families who both qualify and live in a serviced area, the speeds are only 5 Mbps, one-fifth the current definition of broadband speed.

While the high cost of installation and service is the most intuitive obstacle to broadband adoption, recent studies have cited digital illiteracy and a lack of perceived utility as possibly more instrumental in influencing consumers' behaviour. Price is a more significant factor in commercial grade connectivity, where gigabit connections cost upwards of $8000 per month. Small and medium sized businesses have difficulty affording these high prices. To effectively reduce the cost of accessing high-speed Internet, the NYC Economic Development Corporation operated a program called ConnectNYC[43] that allowed companies to receive free fiber build-out to their business, valued at $50,000, on condition of obtaining a signed landlord agreement and committing to a service contract with a provider. The equivalent of $12 million of funding was distributed over the 2 years of the program.

One proposed reason for a lack of adoption initiatives, particularly outside of the urban setting, is the idea of "technological arrogance." This refers to the failure of early adopters and 'tech savvy' individuals to foresee that consumers would not avail themselves of the opportunity to subscribe to broadband Internet services as soon as they had access. Without an understanding of the perceived benefit there might not be demand even if the cost is low. Subscription rates in rural, previously unserved, areas are currently 50 %. Half of those now with broadband access choose not to subscribe. Connect NY grants expire after 3 years and contain an explicit requirement for the ISPs to implement an adoption component. As of now, the adoption initiatives are at the planning stage with discussions being held with public libraries and other community institutions on how best to drive adoption higher. Ideas being considered include, subsidising the cost of hardware (chromebooks and iPads) for school children without broadband at home and

[41]Internet Inequality: Broadband Access in NYC. Office of the New York City Comptroller. (2014, December 1). Retrieved from http://comptroller.nyc.gov/wp-content/uploads/documents/Internet_Inequality.pdf

[42]Income Elegibility Guidlines for School Meals. USDA (2015).

[43]ConnectNYC Fiber Challenge. (n.d.). Retrieved April 13, 2015, from http://nycfiberchallenge.challengepost.com/

establishing weekly classes for elderly residents to improve digital literacy. All the initiatives being pursued focus on residential service as opposed to businesses. It was noted that NYS considered utilising the services of a private firm (SNG) that communicates the benefits of broadband to businesses by presenting data showing increased revenues on a progressive scale as a company's level of technology integration and adoption increased. After evaluation, NYS chose not to proceed with that initiative but other states have and they have seen successful outcomes.

5 Conclusion

New York State's focus on broadband expansion to underserved communities and increasing broadband adoption through innovative programs are prime examples of how states are seeking to achieve the United States' national goal of expanding broadband access to its citizens. A number of factors have emerged as being influential in New York State's relatively successful broadband rollout.

A critical element in successfully implementing its broadband strategy is active governmental support. Government leaders for both New York State and New York City have clearly and repeatedly stated that broadband access and adoption will be a priority during their tenure. The willingness of local leaders to prioritize political capital and resources to this cause undoubtedly has had a significant impact on broadband funding and established it as a priority for the departments under their aegis. While state and local officials have occasionally admitted that federal policy can have a limited influence (at least without funds to back it up), there is little question that such policy stances demonstrate the critical focus placed on the importance of broadband access and adoption.

Not surprising, financial resources are extremely important in installing broadband infrastructure, both in the form of grants and investment matching programs. Government policies that provide financial incentives are a primary tool to be used in incentivising firms to expand to less lucrative markets—primarily rural and low-income regions. New York is a wealthy state, largely considered the financial hub of the world. The financial crisis of 2008 ironically provided a silver lining for the future broadband agenda by furnishing the state with extensive settlement funds from banks that had acted irresponsibly. The government agencies that administer the monies to ISPs are able to set the conditions of these grants to maximise their effectiveness. The Connect NY program's requirement that ISPs implement an adoption component following the expansion of broadband infrastructure is a positive example of how the state can productively use its influence and power. Similarly, Governor Cuomo's Broadband for All initiative, announced in early 2015, will prioritise the granting of funds to those ISPs who will provide the fastest Internet service at the lowest cost to consumers.

New York State's relative success is also the result of it being a highly urbanized environment, with 93 % of its residents living in an urban setting. Dense urban environments have better broadband service because of the lower cost per capita to

ISPs to install infrastructure. Yet challenges remain. More than a million residents of the state do not have access to broadband and even New York City, with its high rates of accessibility, still has 27 % of its households without broadband.[44]

When asked directly for advice, officials involved in these new innovative programs offered three practices that they expected would help communities improve their broadband access and adoption: find creative ways to get the opinions of your citizens, pay careful attention to what is happening in the technological space, and spend time meeting with other governments who are facing similar issues, as even if their circumstances are different, they may have a solution that can be adapted to fit your needs.

At this stage of technological development, evaluating the success of broadband initiatives focuses principally on assessing output in terms of increased access and adoption rates. However, the NBP views increasing access and adoption rates as a means to an end—having a potentially significant positive impact on economic growth and opportunity. New York State is not currently measuring these outcomes. It is critical that government not lose sight of the National Broadband Plan's ultimate goal.

References

2015 Opportunity Agenda: Restoring Economic Opportunity. (2015, January 16). Retrieved April 20, 2015, from https://www.governor.ny.gov/news/2015-opportunity-agenda-restoring-economic-opportunity-1

About|BroadbandUSA—NTIA. (n.d.). Retrieved March 20, 2015, from http://www2.ntia.doc.gov/about

Biggs, P. (2014). The State of Broadband 2014: Broadband for All (p. 96). Geneva: International Telecommunications Union (ITU) Broadband Commission for Digital Development. Retrieved May 4, 2015, from http://www.broadbandcommission.org/Documents/reports/bb-annualreport2014.pdf

Broadband Data Improvement Act (2008—S. 1492). (n.d.). Retrieved April 20, 2015, from https://www.govtrack.us/congress/bills/110/s1492

Broadband Map—Technology—National Broadband Map. (2014, June 30). Retrieved from http://www.broadbandmap.gov/technology

Central Intelligence Agency. (2014). United States. *The World Factbook*. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/us.html

City Bridge, New York City. (2015). LinkNYC: Gigabit Wi-Fi, And that's just the beginning [Press Kit]. Retrieved from http://www.link.nyc/assets/downloads/LinkNYC-Media-Kit.pdf

Connect NY Broadband Program. (n.d.). Retrieved April 11, 2015, from http://nysbroadband.ny.gov/ConnectNY2012

Connect NYC Fiber Challenge. (n.d.). Retrieved April 13, 2015, from http://nycfiberchallenge.challengepost.com/

[44]Internet Inequality: Broadband Access in NYC. (2014, December 1). Office of the Comptroller, City of New York. Retrieved April 23, 2015, from http://comptroller.nyc.gov/wp-content/uploads/documents/Internet_Inequality.pdf

Crandall, R., Lehr, W., & Litan, R. (2007). The effects of broadband deployment on output and employment: A cross-sectional analysis of U.S. data. *Issues in Economic Policy* (6). Retrieved from http://www.brookings.edu/views/papers/crandall/200706litan.pdf

Crawford, S. (2013). *Captive audience: The telecom industry and monopoly power in the new gilded age* (p. 161). New Haven, CT: Yale University Press.

Cuomo, A. (2015, January 16). 2015 opportunity agenda: Restoring economic opportunity. Retrieved from https://www.governor.ny.gov/news/2015-opportunity-agenda-restoring-economic-opportunity-1

Data collected from interactive repository:Recovery.gov—Track the Money. (n.d.). Retrieved April 15, 2015, from http://www.recovery.gov/arra/espsearch/Pages/advanced.aspx?data=recipientAwardsList&AwardType=CGL

Data collected from ten biannual FCC reports, all available here: Internet Access Services Reports. (n.d.). Retrieved April 10, 2015, from http://www.fcc.gov/reports/Internet-access-services-reports

FCC Adopts Strong, Sustainable Rules to Protect the Open Internet. (2015, February 26). Retrieved from http://www.fcc.gov/document/fcc-adopts-strong-sustainable-rules-protect-open-Internet

File, T., & Ryan, C. (2014). Computer and internet use in the United States: 2013. *American Community Survey Reports*. Retrieved from http://www.census.gov/history/pdf/2013computeruse.pdf

Frequently Asked Questions-NYC Broadband Map [New York Economic Development Corporation]. (n.d.). Retrieved April 7, 2015, from https://www.nycbbmap.com/#/faq

Garrahan, M., Bond, S., & Fontanella-Khan, J. (2015, April 24). Comcast walks away from $45bn TWC deal—FT.com. Retrieved from http://www.ft.com/intl/cms/s/0/70d92f0a-e9d4-11e4-ae1c-00144feab7de.html

Income Eligibility Guidelines for School Meals. USDA. (2015, March 31). Retrieved April 17, 2015, from http://www.fns.usda.gov/school-meals/income-eligibility-guidelines

Internet Inequality: Broadband Access in NYC. (2014, December 1). Office of the Comptroller, City of New York. Retrieved April 23, 2015, from http://comptroller.nyc.gov/wpcontent/uploads/documents/Internet_Inequality.pdf

Internet Inequality: Broadband Access in NYC. Office of the New York City Comptroller. (2014, December 1). Retrieved from http://comptroller.nyc.gov/wp-content/uploads/documents/Internet_Inequality.pdf

Leiner, B. et al. (2012, October 15). *Internet Society*. Retrieved April 10, 2015, from http://www.Internetsociety.org/Internet/what-Internet/history-Internet/brief-history-Internet

Library HotSpot. (2014, December 4). Retrieved from http://hotspot.nypl.org/

National Broadband Map, Analyze Rank. (2014, June 30). Retrieved from http://www.broadbandmap.gov/rank

New York State Broadband Map. (2014, June 30). Retrieved from http://www.broadbandmap.ny.gov/map/

Noam, E. (2011). Let them eat cellphones: Why mobile wireless is no solution for broadband. *Journal of Information Policy, 1*, 470–485.

NYS Broadband Task Forces. (n.d.). Retrieved April 3, 2015, from http://www.nysbroadband.ny.gov/nys-broadband-taskforces

NYS Broadband—In Depth. (2014, November 28). Retrieved from http://www.broadbandmap.ny.gov/content/in-depth.html

NYS Goals for Broadband Development and Adoption. (n.d.). Retrieved April 3, 2015, from http://nysbroadband.ny.gov/broadband-goals

Population—New York City Department of City Planning. (2014, July 1). Retrieved from http://www.nyc.gov/html/dcp/html/census/popcur.shtml

Presidential Memorandum: Unleashing the Wireless Broadband Revolution. (2010, June 28). Retrieved from http://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution

Ramachandran, S. (2015, January 29). New FCC Broadband Benchmark Lifts Comcast's Share to Nearly 60%. Retrieved April 17, 2015, from http://blogs.wsj.com/corporate-intelligence/2015/01/29/comcast-bulks-up-on-broadband/

Reardon, M. (2014, September 4). FCC chief: Broadband competition doesn't exist—CNET. Retrieved from http://www.cnet.com/news/fcc-chairman-broadband-competition-doesnt-exist/

Recovery.gov—Track the Money. (2015, March 31). Retrieved from http://www.recovery.gov/arra/About/Pages/The_Act.aspx

Reese, N., & Anderson, D. (2015, April 1). New York's broadband: Stats and figures. Retrieved April 10, 2015, from http://broadbandnow.com/New-York

Roberts, B. (2014, May 28). Comcast Chairman & CEO Brian Roberts Speaks with CNBC's "Squawk on the Street" Today. Transcript available at http://www.cnbc.com/id/101710851

Salway, D. et al. (2013). The State of Broadband in New York. In *New York State Broadband Program Office Annual Report* 2012-13 (p. 25).

Shields, T., & Campbell, M. (2010, June 2). U.S. Falls From Internet Elite, Aims to Catch Hungary. Retrieved April 10, 2015, from http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aShA_ZpBnvD4

State Broadband Data and Development Program. (2010, September 27). Retrieved April 10, 2015, from http://www2.ntia.doc.gov/node/19

Summarize Nationwide Data-National Broadband Map. (n.d.). Retrieved March 20, 2015, from http://www.broadbandmap.gov/summarize/nationwide

Taxali, S. (2015, April 13). Broadband Infrastructure Case Studies Released – How Broadband Changes the Game. Retrieved from http://www.ntia.doc.gov/blog/2015/broadband-infrastructure-case-studies-released-how-broadband-changes-game

United States Federal Communications Commission. (2009). *National Broadband Plan*. Accessed at http://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf

UNPAN. (2014). UN e-Government Survey 2014. E-Government for the Future We Want. New York: UNPAN. Retrieved April 20, 2015 from http://unpan3.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf

USDA ERS—State Fact Sheets New York. (2015, April 2). Retrieved from http://www.ers.usda.gov/data-products/state-fact-sheets/state-data.aspx?StateFIPS=36&StateName=NewYork#.U8A9GPldUeo

World Bank. (2014). Fixed broadband Internet subscribers per 100 people [Interactive online dataset] Retrieved from http://data.worldbank.org/indicator/IT.NET.BBND.P2.

Brazil: The Transparency Portal of the Federal Government

Marcus Vinicius Tenente Ahmar and Guilherme Alberto Almeida de Almeida

1 Introduction

For the past 15 years, Brazil has achieved a prominent position in the international community by strengthening its economy and as a founding member of the BRICS (with Russia, India, China, and South Africa) group of significant emerging global economies. During this time, the country has also been moving towards expanding its policies on information technology, transparency and accountability to provide better services for its citizens. This change has been mostly driven by legislation implemented by the federal government. The Brazilian Transparency Portal is the primary example of such institutional evolution and of the challenges it embodies.

The Portal is a website that provides detailed information on the revenues and expenditures of the Brazilian Federal government and it is available at the URL transparencia.gov.br. It was created by the Office of the Comptroller General (in Portuguese "Controladoria Geral da União" or CGU)[1] in 2004 and consolidated in 2005 through the enactment of a legislation that mandated the online publication of detailed information concerning certain federal public expenditures. The Portal provides information on all federal government agencies and reached the mark of more than one million accesses per month. Following the national movement, the Portal has evolved over the last 10 years due to both the enhancements of policy and regulation, and the introduction of new technologies.

This case study focuses on the implementation of the Brazilian Transparency Portal and its relevance to the country's digital government strategy. Through the study, we provide an overview of the Portal's development process, investigate the

[1]For additional information on the context of the creation of CGU in 2002 and the change in institutional paradigm it represented, see Vieira (2013).

M.V. Tenente Ahmar (✉) • G.A.A. de Almeida
School of International and Public Affairs, Columbia University, New York, NY, USA
e-mail: mt2983@columbia.edu; gad2129@columbia.edu

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_7

Portal's relationship with the broader e-government strategy, and address the challenges concerning the Portal's implementation process. To better understand and report differing views, usage patterns, and implementation of related policies, we reviewed available documents, analyzed the current use of the Transparency Portal, and conducted interviews with relevant stakeholders such as scholars, activists, government officials, and NGO representatives.

2 Context

2.1 Brazil: Economic and Political Background

To understand Brazil's movement towards transparency and accountability, it is critical to understand the country's recent economic and political history. Brazil is currently the seventh largest economy in the world,[2] a significant achievement for a country that lived under a military dictatorship until 1985 (information on Brazil's current context from the economic and e-government perspectives are presented in Fig. 1). The re-democratization process followed by the country's New Constitution of 1988 was the turning point for re-establishing economic and social rights, and building the basis for a lasting democracy. During this transition in the late 1980s and early 1990s, Brazil had to cope with issues inherited from its military dictatorship: a closed economy, low credibility in the international community, a scrapped industrial sector, and hyperinflation.

Starting in 1994, Brazil implemented major economic, monetary, and fiscal policy reforms, which were consolidated under President Fernando Henrique Cardoso's administration (1995–2002). These actions regained the trust of the international community and managed to stabilize the country's economy. Part of this process included transparency as a tool to contribute to macroeconomic adjustment, particularly by imposing fiscal responsibility to all levels of government as a way to reduce public debt and by ensuring public accountability on the revenues and expenditures (Alves and Heller 2013). In 2002, following the election of President Luiz Inácio Lula da Silva, the Brazilian government instituted several public policies focused on social development, inequality reduction, and promoting mechanisms to increase citizen's participation. These changes enhanced government transparency, participation, and accountability, and became the general orientation for the development of public policies during the presidential terms of da Silva and his successor, Dilma Rousseff.

[2]The World Bank. (n.d.). Brazil Overview. Retrieved April 21, 2015, from http://www.worldbank.org/en/country/brazil/overview

Estimated Population (2014)[1]: 202,656,788
Population Density (2014)[2]: 23.8/km^2 (62/sq. mi)
Geographic area[3]: 8,514,877 km^2 (3,287,597 sq. mi)
Gross Domestic Product (2014 estimate)[4]: US$ 2.246 trillion
GDP per capita (2014 estimate)[5]: US$ 11,067.47
Internet users per 100 people (2013)[6]: 51.6.
Rank in ITU Fixed Broadband Penetration (2013)[7]: 73 of 190.
Rank in UN E-government Development Index (2014)[8]: 57 of 193.
Rank in UN E-participation Index (2014)[9]: 24 of 193.

[1] Central Intelligence Agency. (2015, April 10). The World Factbook. Retrieved April 21, 2015, from https://www.cia.gov/library/publications/the-world-factbook/geos/br.html
[2] *Ibid.*
[3] *Ibid.*
[4] The World Bank. (n.d.). Data by Country - Brazil. Retrieved April 21, 2015, from http://data.worldbank.org/country/brazil
[5] *Ibid.*
[6] The World Bank. (n.d.). Internet users (per 100 people). Retrieved April 21, 2015, from http://data.worldbank.org/indicator/IT.NET.USER.P2
[7] Biggs, P. (2014). The State of Broadband 2014: Broadband for All (p. 96). Geneva: International Telecommunications Union (ITU) Broadband Commission for Digital Development. Retrieved May 4,2015 from http://www.broadbandcommission.org/Documents/reports/bb-annualreport2014.pdf
[8] UNPACS. (2014). EGOVKB | United Nations Data Country Information. Retrieved April 21, 2015, from http://unpan3.un.org/egovkb/en-us/Data/Country-Information/id/24-Brazil
[9] *Ibid.*

Fig. 1 Information on Brazil's current context from the economic and e-government perspectives (*Source*: prepared by the authors with information provided by CIA (2015), The World Bank (n.d.), Biggs (2014) and UNPACS (2014). Map of Brazil with flag (Oliveira Junior and others 2007) provided under a Creative Commons CC-BY-SA 2.5 license)

Brazil has a complex political structure composed of 26 states and a Federal District, more than 5500 municipalities, 39 federal ministries,[3] 81 senators,[4] and 513 congressmen.[5] As a federal republic, states and municipalities have considerable autonomy and their own legislative branches. With this sovereignty, the mandated integration of information technology systems across different levels of government would not be possible (any such ruling would likely be considered unconstitutional by the Brazilian Supreme Court). Therefore, integration of federal and subnational government initiatives, which is a critical aspect in the implementation of e-government policies, depends on stakeholders' commitment and collaboration.

[3]Palácio do Planalto. (n.d.). Precedência—Ministros. Retrieved April 21, 2015, from http://www2.planalto.gov.br/presidencia/ministros

[4]Senado Federal. (n.d.). Conheça o Senado. Retrieved April 21, 2015, from http://www.senado.gov.br/senado/

[5]Câmara dos Deputados. (n.d.). Conheça a Câmara. Retrieved April 21, 2015, from http://www2.camara.leg.br/a-camara/conheca

2.2 The National E-Government Policy

The Brazilian Federal e-Government Program officially started in 2000, under the Cardoso administration, with the creation of the Executive Committee on Electronic Government,[6] which had the mission of "formulating policies, drafting guidelines, and coordinating the electronic government implementation activities", and was directly subordinated to the Brazilian Presidency. The Committee focused on rendering services and information to citizens through procurement rationalization, guidelines determination, and quality standards for e-services definition.[7] In general, this first institutional phase of the Brazilian e-government strategy was characterized by the creation of a governance system and by an emphasis on technology as a tool for a state reform, focused in reducing expenses and increasing efficiency (de Laia et al. 2010).

Starting in 2003, during the da Silva administration, the general e-government strategy was implemented through the development of an e-government program with clearly identified principles, such as: democratizing information access, amplifying public debates, and enhancing public service delivery. The e-government program defined priority areas for policy development, such as responsiveness to citizens, improvement of internal management, and integration with service providers and other policy stakeholders. Also, seven guidelines were established to inform e-government policies: (1) e-government should prioritize promoting citizenship; (2) digital inclusion is inseparable from e-government; (3) free software is a strategic resource for e-government implementation; (4) knowledge management is a strategic tool to the integration and management of e-government public policies; (5) e-government should rationalize the use of resources; (6) e-government should be based on a common and integrated set of policies, systems, standards and rules; (7) e-government initiatives should be integrated with initiatives both at state and municipal levels and with initiatives developed by the legislative and judiciary branches. Despite the absence of a document formally titled a "national digital strategy", the definition of goals, axes and guidelines for digital initiatives changed the way the federal government interacted with citizens, companies, and subnational governments by improving the quality of the services delivery, promoting better integration, and strengthening civic participation.[8]

This second phase of e-government also focused on the promotion of openness and civic participation. Digital inclusion became an important element of the government's digital strategy. It encompassed a national broadband plan that aimed at improving connectivity. The result was an 82 % increase in the number

[6]Executive Order of October 18, 2000. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/dnn/Dnn9067.htm

[7]Ramos Medeiros and De Aquino Guimarães (2005).

[8]Portal de Governo Eletrônico do Brasil. (n.d.). Conheça o Programa de Governo Eletrônico Brasileiro. Retrieved April 21, 2015, from http://governoeletronico.gov.br/o-gov.br

of fixed broadband subscribers and a 936 % increase of mobile broadband subscribers in a 5-year period, by the end of 2014.[9]

During the 2011–2014 period, the Brazilian e-government program was augmented by new initiatives and subject-specific policies implemented by government agencies. For example, standards for the visual identity of websites were defined by the Office of Communications of the Presidency; information security guidelines were established by the Institutional Security Cabinet; transparency and open government directives were proposed by the CGU. While these policies were broadly inspired by the e-government program and by the prior waves of e-government policies, they added new layers of regulations and guidelines to be widely implemented by new initiatives, thus complementing the broader national digital strategy. In particular, general principles of transparency and open government had a strong influence in this third phase of e-government policies.

2.3 The Evolution of Transparency Policies

Contemporaneously to the creation of the national e-government policy, the institutional scope of transparency activities evolved over time as a result of improvements in Brazil's legal and regulatory framework. In this context, transparency means making information available to the broader public through various means and serving as a tool for greater public accountability and fighting corruption.[10]

Starting in 2000, the national legislature approved a series of measures to expand fiscal transparency in various government operations, e.g. budgeting, procurement. The responsibility law[11] mandated fiscal austerity and transparency at all federative levels, and through an amendment,[12] it also required the real time publication of detailed information on government's budget and spending. Finally, in 2011, the Brazilian Freedom of Information Law[13] completed the Brazilian legal framework for transparency and promoted the enhancement of transparency policies, which were expanded both in range (i.e., the law is applicable to states and municipalities within the country as well as to the Judiciary and Legislative branches) and in scope (i.e., the law imposes explicit provisions on open government data, mandates active transparency, and establishes procedures for freedom of information requests). In the same year, the National Action Plan on Open Government was proposed including several initiatives concerning increased transparency, enhanced public governance, broader access to public information, and greater public integrity.

[9]Coimbra de Oliveira (2014).

[10]Controladoria Geral da União. (n.d.). Portal da Transparência do Governo Federal. Retrieved April 21, 2015, from http://www.portaldatransparencia.gov.br/sobre/

[11]Complementary Law 101/2000.

[12]Complementary Law 131/2009.

[13]The Brazilian Freedom of Information Law was proposed in 2009, enacted in 2011, and entered in force in 2012. The law is available at http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/lei/l12527.htm

3 The Transparency Portal

The evolution of the Brazil's transparency regulation is closely related to the evolution of the Transparency Portal itself. The Transparency Portal was initially launched in November 2004 and later ratified, in June 2005, by Executive Order 5482, which acknowledged the Transparency Portal of the Federal Executive Branch as a "website available on the Internet with the goal of providing detailed data and information on the budgetary and financial execution of the Union, comprising, among others, the following procedures: (i) expenses incurred by federal government agencies and entities; (ii) transfers of federal financial resources to the States, to the Federal District, and to the Municipalities; (iii) transfers of budgetary resources in the benefit of natural persons or nongovernmental entities of any kind, and (iv) credit operations performed by official development financial institutions".[14]

The Federal Data Processing Service (SERPRO) developed the Portal. After the development phase, CGU's officials assumed responsibility for the Portal's management and administration. After this incorporation, there is no specific budget line concerning the Transparency Portal's activities, therefore the Portal's implementation costs related to hardware, personnel, and data link are absorbed by the CGU. One person coordinates the Portal with two managers to help the administration. Additionally, periodical meetings with a multidisciplinary group, composed of representatives from the information technology, communication, accounting, and strategic information offices of CGU, are conducted to determine future strategies, new demands, and other aspects of the future of the Portal.

3.1 Portal Goals and Structure

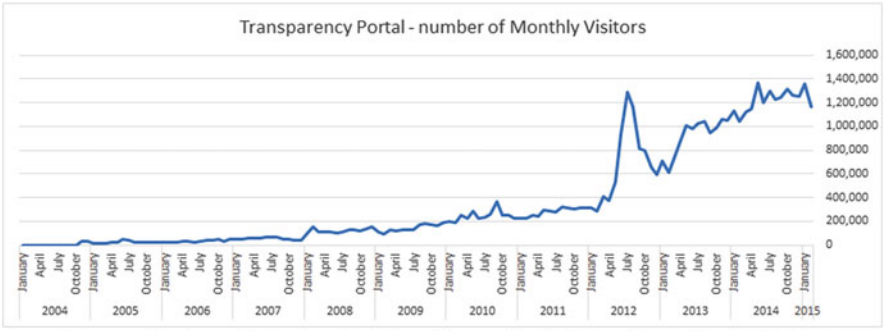
The initial goal of Brazilian Transparency Portal was to provide accurate information on public expenditures by publishing data on direct spending by federal government agencies and transfer of financial resources to states, municipalities and non-governmental entities. The scope of the Portal has evolved, however, from a strictly financial to a broader strategic approach that takes into consideration how public resources are utilized. The Portal allows a person to query and filter federal databases to obtain information on procurement, payments, transfer of resources and other financial liabilities incurred by the federal government. The system offers an expansive array of information, such as the salaries of public officials (including those working abroad), public properties being used by public officials as dwellings, not-for-profit entities debarment list, registry of expulsion penalties, and other relevant information. Figure 2 illustrates the range of available information.

[14]Executive Order 5,482, of June 30, 2005. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2005/Decreto/D5482.htm

Database	Description	Source (Agency/database)	Updated	Date Added
Detailed Daily Expenses	Detailed information on budgetary/financial execution	Treasury Office (STN)/SIAFI	Daily	May/2010
Transfer of Financial Resources	Financial transfers to States, Municipalities, Companies, NGOs, individuals, and multilateral institutions	STN/SIAFI	Monthly	November/2004
Direct Expenses incurred by Federal Government	Expenses concerning construction contracts, government procurement, per diems paid, and government credit cards	STN/SIAFI	Monthly	June/2005 (December/2005 for credit cards)
Revenues	Estimated and realized revenues, including tax-related revenues.	STN/SIAFI	Daily	December/2009
Partnerships with NGOs and/or public entities	Financial transfers in the context of partnerships enacted between the federal government, NGOs and public entities.	STN/SIAFI and Ministry of Planning/SICONV[1]	Monthly	December/2008
National Debarment List	List of companies sanctioned with the prohibition on entering into contracts with the public administration.	CGU / CEIS-CNEP[2]	Daily	December/2008
National Debarment List / NGOs	List of not-for-profit entities sanctioned with the prohibition on contracting with or receiving financial transfers from the public administration.	CGU/CEPIM[3]	Daily	March//2012
Public Servants	List of active civil and military public servants for the Executive Federal Branch, including information regarding position, function, and remuneration.	Ministry of Planning/SIAPE[4] and other sources	Monthly	December/2009 (June/2012 for remuneration)
Removals from the civil service	List of civil servants expulsed sanctioned with the removal from their positions.	CGU/CEAF	Monthly	September/2012
State-owned real estate/residencies	List of state-owned residencies destined to occupation by civil servants, as well as their current occupants.	Ministry of Planning	Monthly	October/2012
Beneficiaries of conditional cash transfers	List of the persons receiving conditional cash transfers in Federal Programs, such as *Bolsa Familia*, eradication of child labor, fishing closure periods and discontinued programs, including name, amount received, and further related information.	*Caixa Econômica Federal*[5]	Monthly	Various dates, since 2006
Beneficiaries of Political Amnesty	List of the persons who received indemnifications or stipends from the Brazilian government derived from the recognition of political persecution during the military dictatorship.	Ministry of Planning	Monthly	January/2015
Beneficiaries of *Garantia Safra*	List of farmers who received a harvest insurance payment due to the loss of their harvest caused by climate reasons.	*Caixa Econômica Federal*	Monthly	December/2004
World Cup '14 and Olympic Games Rio '16	Estimated expenses of the 2014 World Cup and the 2016 Olympic Games	Various sources	Monthly	May/2010

[1] SICONV is the acronym for Resource Transfer Agreements and Contracts System, the e-government management platform that centralizes the covenants and resource transfer agreements executed by the Federal Government.
[2] CEIS is the acronym for the National Registry of Ineligible and Suspended Companies, a database maintained by CGU to consolidate a list of companies and individuals that suffered penalties that hinder the participation on procurements and the execution of contracts with the Public Administration. By its turn, CNEP is the acronym for the National Registry of Punished Companies, which consolidates information related to penalties based on the Anti-Corruption Law enacted in 2013.
[3] CEPIM is the acronym for National Registry of Ineligible Not-for-profits.
[4] SIAPE is the acronym for the Integrated System of Management of Human Resources, the federal government information system that centralizes the management of personnel-related information.
[5] *Caixa Econômica Federal* is the Brazilian state-owned bank in charge of implementing cash transfer programs.

Fig. 2 Datasets available at the Transparency Portal as of April, 2015 (*Source*: prepared by the authors with information provided by Controladoria Geral da União. (n.d.). Portal da Transparência do Governo Federal)



Source: authors' own illustration with information provided by Controladoria Geral da União. (n.d.).

Fig. 3 Number of monthly visitors to the Transparency Portal (*Source*: authors' own illustration with information provided by Controladoria Geral da União. (n.d.))

In addition to the databases, the Portal provides direct links to transparency pages and transparency initiatives sponsored by other ministries, by states, and by municipalities. Through the Portal, a user can utilize data visualization tools, download databases in open data formats, and even signup to receive customized emails with information on the financial transfers to their municipalities. As of April 2015, the Portal holds nearly two billion data entries concerning expenditures, totaling an amount of more than 15 trillion Brazilian Reals (nearly five trillion U.S. dollars) in payments and transfers, since its inception. This corresponds to payments to nearly 35 million people (including 29.5 million beneficiaries of federal government programs), as well as to more than 660,000 legal entities. It also provides information on 1.13 million public servants, including civil and military personnel. The pattern of monthly visitors is illustrated in Fig. 3.[15] The Portal has shown steady growth in the number of monthly visitors, with spikes caused by the inclusion of new databases (for instance, the peak in June 2012 corresponds to the publication of public servants' salaries database). Notably, the Portal has kept an average of more than one million visitors per month for the latest years. The case examines further usage patterns of the Portal in Sect. 4.2.5.

3.2 Portal Management

The Secretariat of Transparency and Corruption Prevention, which is an office directly subordinated to the CGU, manages the Transparency Portal. Federal agencies are legally obligated to provide any requested information or databases, and facilitate the negotiation and inclusion of new databases by the Portal

[15]Controladoria Geral da União (2015). Portal da Transparência do Governo Federal. Retrieved April 21, 2015, from http://transparencia.gov.br/sobre/Estatisticas_visitacao/fevereiro-2015.xls

managers. The Portal's team establishes the format, frequency, and method of data transmission with relevant agencies to facilitate the process, as well as the future consolidation of databases.

As presented in Fig. 2 above, information comes from different sources: mainly, but not exclusively, from core government information management systems controlled by various federal offices. For instance, information on personnel and bidding procedures are sourced from databases managed by different offices within the Ministry of Planning; information on expenditures is sourced from the Treasury Secretariat, which is subordinate to the Ministry of Finance.[16] There are two main processes in acquiring data for the Portal. The first is based on the automated extraction or communication of information from internal structural government payment and information systems, such as those related to public expenditures and partnerships with NGOs and subnational governments. The second is implemented through manual extraction, transmission and upload of relevant databases. To ensure reliability, the Portal's management team checks each dataset's consistency through randomized tests before publishing data.[17]

Other than the Transparency Portal, the Brazilian federal transparency system also includes individual Transparency Pages, which are created by each federal government agency under the guidelines and standards provided by the CGU. The Transparency Portal provides mainly financial information on expenditures for the entire government. In turn, each agency's Transparency Page presents additional information on the corresponding programs and daily activities, such as detailed information on bidding procedures, agreements, and partnerships with civil society organization. Therefore, Transparency Pages complement the Transparency Portal; the former provides contextual information on the expenditures, the latter focuses on financial transactions.

Lastly, CGU also coordinates Brazil's participation in the Open Government Partnership (OGP), which is a "multilateral initiative that aims to secure concrete commitments from governments to promote transparency, empower citizens, fight corruption, and harness new technologies to strengthen governance".[18] In that capacity, the CGU coordinates the dialogue with the civil society in order to guide the implementation of open government policies and to decide on the Portal's evolution.

[16]Secretaria de Prevenção da Corrupção e Informações Estratégicas, Souza, J., Augusto, C., Souza, L., & Kodama, R. (2013). *Guia de implantação de Portal da Transparência* (1a ed.) (L. Felix, O. Neves, & M. Costa, Eds.). Brasília, DF: Controladoria Geral da União (CGU). Retrieved April 18, 2015 from http://www.cgu.gov.br/Publicacoes/transparencia-publica/brasil-transparente/arquivos/guia_portaltransparencia.pdf

[17]Castro Neves (2015).

[18]Open Government Partnership. (n.d.). About—What is the Open Government Partnership? Retrieved April 21, 2015, from http://www.opengovpartnership.org/about

4 Findings

In many respects, the Transparency Portal is a classic example of digital governance in Brazil. It encompasses information from all federal government agencies and represents the Brazilian government's efforts to promote transparency. The case study established two approaches to anchor the research. The first was to review the relationship of the Portal to Brazil's broader digital strategic planning, also taking into consideration the challenges of implementing the website, and the second was to examine the utilization of the Portal by civil society. These two foci provide a holistic understanding of both the supply side and the demand side of transparency-related information.

The case also examines the Transparency Portal from two other perspectives: *drivers*, which describe the main motivations to the implementation of the Transparency Portal both from within the government and from external agents, and *challenges*, describing obstacles faced by the government's implementation team.

4.1 Drivers

Internal drivers correspond to incentives to government activities in promoting the transparency policy. These include:

4.1.1 Legal Framework

Several governmental officials mentioned that the legal framework was crucial to the success of the initiative, because it gave legal support to the transparency initiative and it granted the CGU the necessary mandate to coordinate the gathering of information and the standardization of other agencies' transparency pages. As previously demonstrated, legislative evolution also promoted some breakthrough changes, such as the publication of the salaries of all federal executive government officials in 2012.[19] Furthermore, regulation also determined that transparency measures should be implemented proactively through the publication of data in open, machine-readable format, which has led to the implementation of a Federal open data portal (dados.gov.br) and information provision for download at the Transparency Portal.

[19]This publication was determined by the Executive Order 7,724/2012, which detailed the necessary aspects in order to ensure the full enforceability of the Freedom of Information Law.

4.1.2 Accountability and Open Government

The Portal is demonstratively a tool to promote government fiscal accountability. By providing data of all federal government expenditures in a proactive manner and independent of any requests, the government provides users with an effective instrument to monitor and to report governmental mismanagement. Moreover, because users may check any funds transferred to local governments, the Portal is also promoting state and municipalities' accountability.

A founding member of the OGP, Brazil has implemented an Open Government Action Plan, with transparency, social participation and accountability related activities proposed by several national agencies. Because of its transparency component, The Transparency Portal is a key initiative in this context. The CGU also coordinates the Inter-Ministry Committee on Open Government created to further implement such policies in a coordinated manner.

4.1.3 Fighting Corruption

Transparency should be considered in the context of corruption prevention policies. By making public expenditures more transparent, the CGU openly encourages the help of other organizations and citizens in its corruption prevention activities. The Portal has been used by civil society organizations, citizens, and media outlets, to uncover the misuse or misappropriation of public funds, to spot potential corruption scandals, and to question government expenditures. For instance, a minister was fired in 2008 because of the inappropriate use of a federal government corporate credit card for personal purchases. This case led to changes in transparency-related regulations, specifically to create further mechanisms to prevent unaccounted expenses and to enhance the transparency of smaller amount expenditures.

Accordingly, the Portal has been used by government officials to calculate the average price of goods and services to be acquired or hired by the government. Using such procedures, procurement agents were able to spot potential signs of inappropriate procurement activities, due to highly divergent prices. To foster similar control initiatives, the CGU has been providing training to Prosecution Attorneys to help them to identify signals of corruption and fraud.

Beyond the drivers related to the Brazilian government itself, there were other forces at play that promoted the need and utility for Transparency Portal:

4.1.4 Citizen and Private Sector Demands

The implementation of open government policies has been debated within consolidated channels of citizen participation. There are a number of national and local non-governmental entities focusing their activities directly on public transparency and accountability. Moreover, there is a burgeoning development of civic tech

applications that are mostly focused on addressing the problems of municipalities. Finally, the Brazilian media has learned to use the Transparency Portal as a source for investigative journalism. Enhanced media coverage of scandals uncovered by consultation of the Portal has led to greater attention to transparency data and to the Portal.

Datasets published in the Transparency Portal have also attracted the interest of private companies. For instance, since 2008, the Portal publishes a list of companies that have been banned from participating in bidding processes or entering into agreements with government entities due to contract breach or other administrative sanctioned behavior. Private companies have been using this information as a proxy to identify untrustworthy companies. Publicly available information has also been used by companies to analyze the performance of their competitors, or to verify if any notices have been issued by the Federal government concerning overdue payments.

4.1.5 State and Municipal Governments

State and municipality public officials have also used the information provided by the Portal as a tool for their internal financial management. Because the information posted on the Portal is provided in a complete and clear fashion, some local government officials prefer to use the Portal to check if transfers have already been performed, as well as to obtain direct information on the current standing of federally implemented regional policies.

4.1.6 International Commitments

Brazil has committed itself internationally with respect to the implementation of transparency and corruption prevention policies. Brazil is a party to the United Nations Convention against Corruption, and is also a founding member of the OGP. Brazilian transparency initiatives have been recognized by international organizations. In 2014, Brazil was ranked first in government budget transparency and third in government spending transparency in the Global Open Data Index, organized by the Open Knowledge Foundation, together with Mexico, India, the U.S., and other 12 countries.[20]

[20]Open Knowledge. (n.d.). Global Open Data Index—Government Budget. Retrieved April 21, 2015, from http://index.okfn.org/dataset/budget/

4.2 Challenges

While the Transparency Portal has had many champions and drivers for meeting the Brazilian goal of a more transparent, accountable and open government, it has faced, and continues to face, a number of challenges. The concerns range from political disputes to technical issues.

4.2.1 Political Disputes and Constant Negotiation

The difficulty in resolving political conflicts may delay the inclusion of new datasets in the Portal. In most cases, these inclusions require additional work by the agencies whose databases are to be extracted. The time and expense required to undertake this additional task can lead to some opposition for disclosure of information.

These additions are based on an analysis of the frequency and the kind of information requests made under the Freedom of Information Law. However, in order to implement new datasets, the CGU has to negotiate the format of databases and the provision terms with each corresponding agency. These inter-agency negotiations that may slow down the implementation process.

Additionally, the Transparency Portal focuses only on information from federal government entities that utilize the main central government management systems, such as SIAFI. Therefore, information from state-owned companies, which are not managed through those systems, and information originated from states or municipalities are not included.

4.2.2 Technology Standardization and Procurement

As long as information is produced and stored differently across various ministries, the standardization process is a bottleneck to the data uploading process: additional work is required in order to check the information, clean up databases, and cross-reference information before its publication. Data integration processes are not fully automatic. This has led to significant delays in the supply of information to the Portal. In some cases, such as in the microsites concerning the expenditures related to the World Cup 2014 and Olympic Games 2016, the process is even more complex because it requires the merging of information originated from the states and municipalities.

Future plans include restructuring the Portal, by implementing a data warehouse—a more integrated and reliable data center with additional capabilities. This would allow the unification of information that is only marginally connected now, such as the financial information provided in the Transparency Portal and the detailed transactions presented in the Transparency Pages. Such actions would provide stronger reporting and data analysis capabilities, enabling dynamic and

integrated processing and handling of large data volumes. This would also lead to the development of new visualization and audit tools—thus making the Portal more interactive and accessible, and facilitating navigation to its users. However, implementing the data warehouse has proven to be a challenging task, particularly due to data standardization issues. Finally, the Portal is faced with several other technological issues: it is still pending integration with social media, such as Twitter and Facebook, and its design is not responsive to mobile devices, a critical failure to the Portal's goal of promoting accountability through enhanced social engagement.

With respect to procurement of services to support the Portal, its team has oscillated between outsourcing and insourcing experiences. Generally, complex software development requirements are outsourced and the corresponding maintenance activities are later insourced. The direct involvement of the Office of Communications of the Presidency, which is responsible for the definition of standards for governmental portals, has led to an improved scope of activities, including architecture and layout redesign. However, this process has also led to further procurement issues and implementation delays.

4.2.3 Jargon Complexity

For the Portal to be effective, it must be able to make its information understandable to the clientele that is trying to access the information. This is a constant challenge because the Portal provides complex information mostly related to budgeting (its original intent) that is not easily interpreted by individuals without technical knowledge. In most cases, the information details relate more to the particularities of the budget process than to the context of its execution, such as the project that it belongs to. The gap created by these issues excludes several stakeholders such as those with lower education levels or without proper budgetary knowledge. As mentioned, the process of implementing adaptations to solve these new demands is underway, but still pending conclusion.

4.2.4 Difficulty in Measuring Impact

There is no measurement and evaluation of the impact generated by the Portal. Measuring outputs (the website itself, or the number and size of available datasets) and outcomes (the number of visits) is relatively easy, but tracking impact (i.e., transparency itself) is less obvious because it is difficult to establish a causal relationship between the information posted and its impact on society. Currently, the proxies for success are the number of visits per month and the number of subscribers to periodicals from the Portal. Secondary measurements could possibly include the number of media reports and articles produced with information from the Portal, criminal complaints based on information from the Portal, and prizes that the Portal has received. Regardless, these are still only indirect measurements

of the Portal's impact. The current transparency policy is not measured in terms of outcomes (i.e. how much it has contributed to reduce corruption) but rather in terms of outputs (i.e. the number of datasets, accesses per month, and other objective indicators).

4.2.5 Difficulty in Defining and Reaching All Users

In 2014, the CGU conducted an extensive survey on the Portal usage.[21] In general, most respondents had at least a college degree, and users were mostly public officials (41 %) and students (14 %). Most popular searches were related to "how much and in what government spends" (56 %). Criticism with the Portal concerned "difficulty in retrieving information" and "difficulty in understanding information". Anecdotal evidence reports a diverse usage pattern. For example, civil and military officials keeping track of career plans or information about peers; journalists looking for inconsistencies in expenditures; and the general public trying to obtain information on construction occurring in their neighborhoods. An on-going challenge is making Portal information easily understood by the general public. This difficulty is reflected in the number of information requests made under the Freedom of Information Law requiring data that was supposedly in the Portal, but was not discovered by the users. This may mean that part of the information may be out of reach and therefore not as accessible to citizens as expected.

5 Conclusion

With the evolution of national legislation and technology, and the strategy of increasing transparency, accountability, and public participation, the Transparency Portal has gained importance in the Brazilian vision for e-government. Through the Portal, citizens can monitor the financial implementation of the federal government programs and verify where and how public funds are being applied—an enhanced civic control of public spending.

The Brazilian Federal Government Transparency Portal is a successful example of digital government policy: it allows for government accountability, promotes effective operational integration, and incorporates relevant transparency trends, such as open data. The Portal has achieved both political and technical relevance. It is constantly referred to in presidential speeches as one of the key initiatives in combating corruption. Similarly, citizens and civil servants from municipalities are using the Portal to monitor government spending and to hold local governments accountable.

[21] Batista and Freire (2014).

The relevance of the Portal and the information published there is not only recognized nationally,[22] but also internationally. Nationally, several Brazilian states have used the website as a guideline for their local implementations. Internationally, recognition has come in the form of awards earned by the Portal, such as the United Nations Office on Drugs and Crime (UNODC) award,[23] mention of the successful case to be followed and benchmarked, such as Brazilian leading position in the 2010 Revenue Watch Index[24] and in the 2014 Government Budget Global Open Data Index,[25] and the provision of technical assistance for the implementation of transparency portals by CGU in other countries, such as El Salvador.[26] Additionally, Brazil's co-foundation of the OGP gave the Transparency Portal further international visibility.

However, there are several challenges concerning the Portal's future development that are related to its internal functioning, management, and redefinition of scope and goals. First, there is still considerable work to be done on the technical integration and adequate management of datasets. Standardizing information collection, automatizing data transfers, and reorganizing and integrating databases in a data warehouse are goals that have been sought for a long time but not yet fully implemented. These processes would improve the management of both the Transparency Portal and all the Transparency Pages. However, their accomplishment relies on political coordination and partnership formation with the Legislative and Judicial branches, as well as with state and local governments, to create a comprehensive tool that will engage Brazilian society in fighting corruption and holding its public authorities accountable in all levels.

Secondly, in communicating information to its users, the Portal could be more accessible in language, visual, and interactive aspects. These changes should include the provision of data mining, data analytics, data visualization, and business intelligence tools, and should include a reformulation of the Portal's language, as information is currently based on budgetary language, which is often too cryptic to the broader population not allowing for public accountability. Furthermore, intensifying direct social participation in the definition of the Portal's activities and scope, through the engagement of the developer community, would bring the tool from an e-government perspective to that of a strong open government practice; thus increasing citizen participation in the governance process.

[22]Controladoria Geral da União. (n.d.). Portal da Transparência do Governo Federal—Sobre o Portal—Portal Premiado. Retrieved April 21, 2015, from http://www.portaldatransparencia.gov.br/sobre/Premios.asp

[23]UNODC (n.d.). United Nations Office on Drugs and Crime. Retrieved April 21, 2015, from http://www.unodc.org/lpo-brazil/en/corrupcao/acoes.html

[24]Revenue Watch Institute and Transparency International. (2010). The Revenue Watch Index. Retrieved April 21, 2015, from http://www.revenuewatch.org/rwindex2010/pdf/RevenueWatchIndex_2010.pdf

[25]Open Knowledge. (n.d.). Global Open Data Index—Government Budget—Brazil. Retrieved April 21, 2015, from http://index.okfn.org/place/brazil/budget/

[26]Controladoria Geral da União (2014).

A third challenge is determining whether the Portal could serve as a tool to assist in the management of public policies, or if any similar initiative could be implemented by the federal government. In the former, specific tools for public officials could be developed, making the Portal more instrumental in procurement, planning, and management activities by adding public policy information. For instance, information concerning the results of policy implementation could be appended to the information related to the expenditures, thus providing more accurate information on the impact of public spending. In the latter, open data sections should be enhanced through the creation of application programming interfaces (APIs) that allow the direct use of information from the Portal in external applications, facilitating its integration with other systems. This would enhance significantly the accountability goal of the Portal, and potentially increase its use by society as a whole.

References

Alves, J., & Heller, P. (2013). Accountability from the top down? Brazil's Advances in budget transparency despite a lack of popular mobilization. In *Open budgets—The political economy of transparency, participation, and accountability* (pp. 76–104). Washington, DC: The Brookings Institution.

Batista, C., & Freire, F. (2014, August 1). Pesquisa de Avaliação do Portal da Transparência do Governo Federal. Retrieved April 21, 2015, from http://transparencia.gov.br/sobre/Boletim/Especial_Pesquisa-de-Avaliacao2014.pdf

Biggs, P. (2014). The State of Broadband 2014: Broadband for All. Geneva: International Telecommunications Union (ITU) Broadband Commission for Digital Development. Retrieved May 4, 2015, from http://www.broadbandcommission.org/Documents/reports/bb-annualreport2014.pdf

Brazilian Presidency. (2000). Executive Order of October 18, 2000. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/dnn/Dnn9067.htm

Brazilian Presidency. (2000). Complementary Law 101, of May 4, 2000. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/leis/LCP/Lcp101.htm

Brazilian Presidency. (2005). Executive Order 5,482, of June 30, 2005. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2005/Decreto/D5482.htm

Brazilian Presidency. (2009). Complementary Law 131, of May 27, 2009. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/leis/LCP/Lcp131.htm

Brazilian Presidency. (2011). Law 12,527, of November 18, 2011 (Freedom of Information Law). Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/lei/l12527.htm

Brazilian Presidency. (2012). Executive Order 7,724, of May 16, 2012. Retrieved April 21, 2015, from http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/decreto/d7724.htm

Brod, C. (2013). The promise of open data in Brazil: Fostering participation, building local capacities. In R. Zambrano & R. Seward (Eds.). Retrieved April 21, 2015, from http://www.undpegov.org/sites/undpegov.org/files/Brazil-OD-2013-05-29.pdf

Câmara dos Deputados. (n.d.). Conheça a Câmara. Retrieved April 21, 2015, from http://www2.camara.leg.br/a-camara/conheca

Castro Neves, O. (2013). Evolucao das Politicas de Governo Aberto no Brasil. Retrieved April 1, from http://consadnacional.org.br/wp-content/uploads/2013/05/092-EVOLU%C3%87%C3%83O-DAS-POL%C3%8DTICAS-DE-GOVERNO-ABERTO-NO-BRASIL.pdf

Castro Neves, O. (2015, April 8). Brazil Case Study—The Brazilian Federal Government Transparency Portal [Online interview].

Central Intelligence Agency. (2015, April 10). The World Factbook. Retrieved April 21, 2015, from https://www.cia.gov/library/publications/the-world-factbook/geos/br.html

Controladoria Geral da União. (2014, December 12). Brasil Auxilia El Salvador a Desenvolver Portal de Transparência. Retrieved April 21, 2015, from http://www.cgu.gov.br/noticias/2014/12/brasil-auxilia-el-salvador-a-desenvolver-portal-de-transparencia

Controladoria Geral da União. (n.d.). Portal da Transparência do Governo Federal. Retrieved April 21, 2015, from http://www.portaldatransparencia.gov.br/sobre/

Controladoria Geral da União. (n.d.). Portal da Transparência do Governo Federal—Sobre o Portal—Portal Premiado. Retrieved April 21, 2015, from http://www.portaldatransparencia.gov.br/sobre/Premios.asp

Coimbra de Oliveira, A. (2014, November 04). Programa Nacional de Banda Larga: principais ações e resultados. Retrieved May 5, 2015, from http://www.mc.gov.br/doc-crs/doc_download/2286-apresentacao-do-diretor-de-banda-larga-do-ministerio-das-comunicacoes-artur-coimbra-em-audiencia-publica-na-comissao-de-ciencia-e-tecnologia-do-senado-federal-brasilia-df-04-11-2014

Comitê Executivo do Governo Eletrônico, A. (2004, May 1). Oficinas de Planejamento Estratégico—Relatório Consolidado. Retrieved April 21, 2015, from http://www.governoeletronico.gov.br/biblioteca/arquivos/diretrizes-de-governo-eletronico

Felix, L. (2011, Fall). PROACTIVE TRANSPARENCY: What has been done in Brazil. Retrieved March 29, 2015, from http://www.gwu.edu/~ibi/pesquisa.html

Khagram, S., & Fung, A. (2013). *Open budgets the political economy of transparency, participation, and accountability*. Washington, DC: Brookings Institution Press. Retrieved April 21, 2015, from http://site.ebrary.com/lib/columbia/detail.action?docID=10682528

Martins de Laia, M., Alexandra Viegas Cortez da Cunha, M., Roberto Ramos Nogueira, A., & Afonso Mazzon, J. (2010, November 30). Electronic government policies in Brazil: Context, ICT management and outcomes. Retrieved April 21, 2015, from http://rae.fgv.br/sites/rae.fgv.br/files/artigos/10.1590_S0034-75902011000100005.pdf

Oliveira Júnior, M. E., & others. (2007). File:Map of Brazil with Flag.svg. Retrieved April 22, 2015, from https://commons.wikimedia.org/wiki/File:Map_of_Brazil_with_flag.svg

Open Government Partnership. (n.d.). About—What is the Open Government Partnership? Retrieved April 21, 2015, from http://www.opengovpartnership.org/about

Open Knowledge. (n.d.). Global Open Data Index—Government Budget—Brazil. Retrieved April 21, 2015, from http://index.okfn.org/place/brazil/budget/

Palácio do Planalto. (n.d.). Precedência—Ministros. Retrieved April 21, 2015, from http://www2.planalto.gov.br/presidencia/ministros

Portal de Governo Eletrônico do Brasil. (n.d.). Conheça o Programa de Governo Eletrônico Brasileiro. Retrieved April 21, 2015, from http://governoeletronico.gov.br/o-gov.br

Ramos Medeiros, P., & De Aquino Guimarães, T. (2005, September 29). A Institucionalização do Governo Eletrônico no Brasil. Retrieved April 21, 2015, from http://www.scielo.br/pdf/rae/v46n4/v46n4a07.pdf

Revenue Watch Institute and Transparency International. (2010). The Revenue Watch Index. Retrieved April 21, 2015, from http://www.revenuewatch.org/rwindex2010/pdf/RevenueWatchIndex_2010.pdf

Saldanha, S. (2001, Fall). Open government and social control. Retrieved March 29, 2015 from http://www.gwu.edu/~ibi/pesquisa.html

Senado Federal. (n.d.). Conheça o Senado. Retrieved April 21, 2015, from http://www.senado.gov.br/senado/

Secretaria de Prevenção da Corrupção e Informações Estratégicas, Souza, J., Augusto, C., Souza, L., & Kodama, R. (2013). Guia de implantação de Portal da Transparência (1a ed.). In L. Felix, O. Neves, & M. Costa (Eds.).

The World Bank. (n.d.). Brazil overview. Retrieved April 21, 2015, from http://www.worldbank.org/en/country/brazil/overview
The World Bank. (n.d.). Data by Country—Brazil. Retrieved April 21, 2015, from http://data.worldbank.org/country/brazil
The World Bank. (n.d.). Internet users (per 100 people). Retrieved April 21, 2015, from http://data.worldbank.org/indicator/IT.NET.USER.P2
UNODC. (n.d.). United Nations Office on Drugs and Crime. Retrieved April 21, 2015, from http://www.unodc.org/lpo-brazil/en/corrupcao/acoes.html
UNPACS. (2014). EGOVKB|United Nations Data Country Information. Retrieved April 21, 2015, from http://unpan3.un.org/egovkb/en-us/Data/Country-Information/id/24-Brazil
Vieira, J. B. (2013). The impact of public transparency in fighting corruption. *eJournal of* eDemocracy *and Open Government* 5.1 (2013).

India: Unique Identification Authority

Sonalika Chaturvedi and Hariharan Sriram

1 Introduction

India is using digital technology to meet the challenges of its massive size and diverse population of 1.2 billion people. It is the third largest global economy and the second most populous country in the world. India is also a country where the government still needs to play a critical role through provision of subsidies for essential commodities (e.g. petrol, kerosene, rice, wheat) and welfare programs (e.g. rural employment). One of its major challenges with the delivering of services is identifying the correct beneficiaries for the subsidies and welfare programs. This basic task is especially difficult when there is no universal identification document. Presently, different forms of ID cards serve different purposes: the passport is largely used for travel purposes, the ration card is used to purchase essential food commodities like rice, cooking oil etc. in fair price shops run by the government, the national population registry card is used for special government services and benefits, and the voter id is also used to open bank accounts.[1] The goal has been to create and ensure universal usage of single identification document, which can be employed for multiple functions. The Indian government initiated the unique identification program called Aadhaar—meaning "support" or "foundation" in Hindi, in 2009. Its implementation and management are in keeping with India's national digital strategy of enhancing its ability to effectively provide services through the use of advanced digital technologies.

[1](2013). India's identity crisis: Between Aadhaar, passport, PAN and . . . Retrieved April 16, 2015, from http://www.dailymail.co.uk/indiahome/indianews/article-2297714/Indias-identity-crisis-Between-Aadhaar-passport-PAN-NPR-struggling-prove-identities.html

S. Chaturvedi • H. Sriram (✉)
School of International and Public Affairs, Columbia University, New York, NY, USA
e-mail: sc3498@columbia.edu

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_8

Country Info:

Estimated Population (estimated in '000, 2012): 1,236,687
Population Density (2014): 376.2/km^2
Geographic area: 3,287,263 km^2
Gross Domestic Product (2012 estimate): US$ 1.87 trillion
GDP per capita (2012 estimate): US$ 1516.3
Internet users per 100 people (2013): 15.1 [1]
Fixed broadband internet subscribers per 100 people (2013): 1.2
Rank in UN E-government Development Index (2014): 118 of 193.
Rank in UN E-participation Index (2014)[2]: 40 of 193.

Sources: UNData[3]; UN E-Governments survey

[1] (2014). E-Government Survey 2014 - here - the United Nations. Retrieved April 20, 2015, from http://unpan3.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf
[2] (2014). E-Government Survey 2014 - here - the United Nations. Retrieved April 20, 2015, from http://unpan3.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf.
[3](2010). UNdata | country profile | India. Retrieved April 20, 2015, from https://data.un.org/CountryProfile.aspx?crName=INDIA.

1.1 Aadhaar and UIDAI

Aadhaar was designed to create a unique 12-digit identity document for each resident of India. It was envisioned as a tool for inclusive tracking, monitoring, and usage of government programs by individuals to ensure the effective delivery of program services. In its initial conceptualization, it was aptly titled "Unique ID for Below Poverty Line (BPL) families." With biometric, demographic, and other personal information, Aadhaar aimed to be linked not just to government services but become an important proof of identification for Indian citizens. To be successful, it needed to be adopted by a large proportion of the Indian population.

2 National Digital Strategy

"Digital India" was developed by the Department of Electronics and Information Technology, and provides the overarching digital strategy for India. Its vision is to be an "A programme to transform India into a digitally empowered society and knowledge economy". The program began with the need to provide a digital identity along with a digitalization of government documents, records of residents and real-time online transaction platform for various government programs and services (e.g. social sector services, health programs). The initiative also looked at providing high-speed internet network in the rural areas. The three main

components of the Digital India plan include delivering government services digitally, creating and maintaining digital infrastructure and spreading "digital literacy."[2] The idea is to create an umbrella program that stretches across departments and will combine existing programs, restructure and refocus them and implement them in a synchronized manner. The strategy is based on nine pillars for a digital India:

- Broadband highways
- Universal access to phones
- Public internet access program
- E-governance—reforming government through technology
- eKranti—electronic delivery of services
- Information for all
- Electronics manufacturing—target net zero imports
- IT for jobs
- Early harvest programs

The massive UIDAI program receives a single reference under the "e-Governance" pillar that is tasked with assisting in the integration and reform of government services and platforms.

3 The Aadhaar Project Structure and Technology Used

The Aadhaar project is unparalleled in its scope for any country. Its goal is to provide a unique identification card and a system that uses, for the first time, an extensive and compulsory biometrics for identification. It covers more than 1.2 billion people, dwarfing the populations of the U.S. and Europe combined. To administer this new project, the Indian government created, in 2009, a new public entity, the Unique Identification Authority of India (UIDAI) under the aegis of the Planning Commission of India (recently disbanded and reconstituted as 'Niti Aayog'). The Chairman of UIDAI commented that by embarking upon a digital platform for India the country was "starting on a clean slate and reconfiguring the structure, we have opened up a whole new set of possibilities,"[3] to provide services, efficiently monitor, implement and track programs and in the larger scheme, to combat the issues of corruption and fraud.

The Aadhaar program is a complex structure of multiple layers of government, public and private organizations, and new and existing technologies.

[2](2014). Digital India's Presentation | Government of India . . . Retrieved January 25, 2015, from http://deity.gov.in/content/digital-indias-presentation-0

[3]Retrieved from http://www.bbc.com/news/world-asia-india-18156858 on March 9, 2016.

3.1 Program Administration

The UIDAI is administered by the central government and with offices located in various Indian states. For example, the UIDAI office in the state of Andhra Pradesh would send its field officers across districts to administer and oversee functions mandated by the state or national UIDAI office. Aadhaar also leverages existing technology and infrastructure of both central and state governments, and includes partnerships with several private sector companies (as 'Registrars') for administering the program, collecting data and "de-duplicating" information of residents. (More about de-duplicating on page 18).[4] The software technology for Aadhaar was outsourced to private organizations,[5] however, the final database which is the most critical aspect, was created and handled solely by a team at the UIDAI.

Similarly, for card enrollment, the government has used a combination of private and public resources. The central government identified vendors by geographic area who could manage the technical aspects of creating the Aadhaar—handling the software, the photographing of enrolled, the biometrics for enrolling people. The list of these vendors was then distributed to local delivery centers, which were usually ubiquitous government offices, such as post offices. The post offices would then invite bids from the authorized vendors for their localities. The advantage of this method was twofold:

- Leasing office space, which would have been extremely expensive, was taken care of by utilizing the space in existing government offices, and
- The equally expensive and time-consuming aspect of training the government employees to perform a function they were not skilled with was avoided. This allowed the Aadhaar project to meet most of their internal targets for distribution of cards.

3.2 Process for Getting a Card

The figure below (Fig. 1) illustrates the steps involved in obtaining an Aadhaar card. It is a relatively simple and easy process by which local residents are enrolled. People were instructed to visit a local government office, generally a post office, where an employee of the private company would take the person's fingerprints and have their eyes scanned. The data is then sent to the UIDAI where enrollee's personal information is verified and a card and with its unique identification number

[4]De-duplication is the process by which any new entry is compared to all old ones on unique parameters to ensure that there is no duplication. In the case of Aadhaar the biometrics were used to ensure that an individual did not obtain two different cards.

[5]Such as IBM, Reliance General Insurance Company Limited and others.

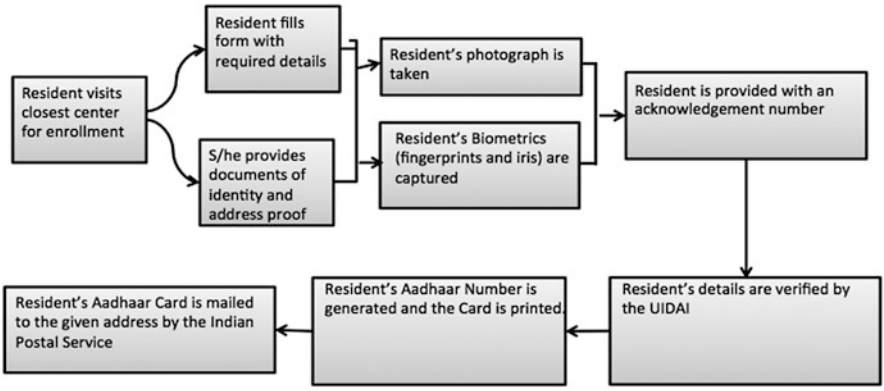


Fig. 1 A flow chart that describes the steps to be followed to get an Aadhaar card (The information was retrieved from the UIDAI website https://uidai.gov.in/)

generated and then returned back to the enrollee via the local post office. In general, the process to obtain the card takes 60–90 days after the resident's information has been received at the central repository at the UIDAI. The website https://resident.uidai.net.in/check-aadhaar-status is a portal for the applicants to connect with the UIDAI to determine their enrollment status, the dispatch of the cards etc. This on-line process makes it easier for those with internet access to obtain information without visiting a field location.

3.3 Data and Information Management

A critical component of Aadhaar is the collection of extensive biometric information to ensure the integrity of the identification process. The raw images, biometric and personal data of card holders are stored in the centrally controlled repository called the Central ID Repository (CIDR), which is under the control of the UIDAI. The UIDAI is also responsible for issuing the unique Aadhaar number, updating of information of the residents and for authenticating the identity of residents.

Data processing for the Aadhaar is done both at a local and national level. An individual enrolls at their local enrollment center (described above). The information on the individual (biometrics, fingerprints, etc.) is then uploaded into the CIDR by the logistics team (the private contractors hired to collect the information), always tracking the movement of the information being sent to the CIDR. At the CIDR, the data is manually uploaded and the DMZ, a technology system, adds an additional layer of security applied to this information within the repository. After a unique randomly- generated 12-digit number has been created for the enrollee, the UIDAI, returns that information, through the local logistics team, back to the applicant.

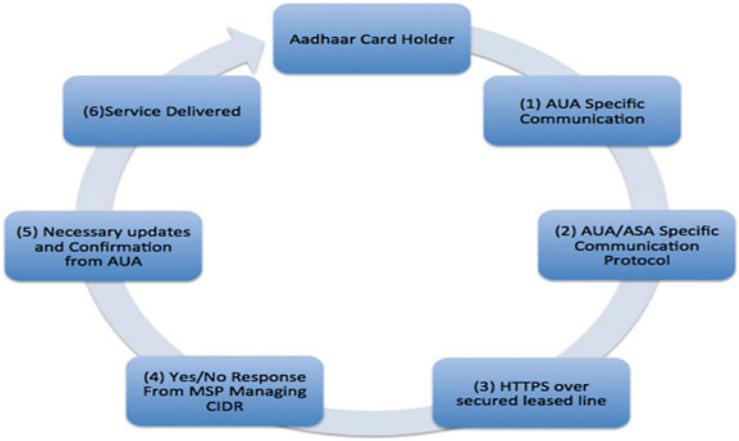


Fig. 2 A brief overview of the steps involved in using Aadhaar card for third party authentication

3.4 Aadhaar Used as an Authenticating Card

The Aadhaar card operates as an authentication mechanism for an agency that requires individual authentication before offering or enabling their services to potential clients. To utilize this service, the agency is required to sign with the UIDAI and enter into agreement as an 'Authentication User Agency' (AUA) (see Fig. 2). The agency wishing to use the authentication services of the card however does not have a direct connection with the UIDAI for verification of client information. Rather it must go through a private vendor, an 'Authentication Service Agency' (ASA). The ASA has established a secure leased line connectivity to the Central Information Data Repository (CIDR) and transmits authentication request on behalf of AUAs and receive response back from CIDR."[6] The ASA is required to maintain and build secure connectivity with the CIDR according to defined guidelines, specification and standards that are set by the UIDAI.

To manage the authorization process, more than 12 billion fingerprints, 2.4 billion iris scans and 1.2 billion photographs can be accommodated in the UIDAI system. This provides enhanced biometric security that reduces the chances of this number being guessed. The use of finger biometrics, iris scans and a photograph assures considerable accuracy.

The Aadhaar authentication system, however, has some caveats. For example, the UIDAI database cannot be searched for specific personal information on an individual or group of individuals. The UIDAI website succinctly outlines some of the key

[6](2012) Aadhaar Enabled Service Delivery. Unique Identification Authority of India. Planning Commission, Government of India. Accessed at https://uidai.gov.in/images/commdoc/whitepaper_aadhaarenabledservice_delivery.pdf

tasks that authorization system can and cannot do. Authenticating a resident's information in the repository is the most important tasks along with initiating requests over landline and mobile networks. However, tasks such as authentication using data in smart card is not done. Resident identification is not allowed to be released and strict restrictions on using specified broadband network is outlined.

3.5 Linkage Capability with Government Programs

One of the most valuable features of the Aadhaar is its ability to link to other government services. Through this program, government and private services (e.g. TELCO or other telecommunications and financial services) can use the Aadhaar for authentication purposes. However, as shown in the table above, while agencies can use it for authentication purposes, they may not view personal identity information thus maintaining a degree of individual privacy (additional concerns regarding privacy are discussed later in the case study). This multiple step procedure makes it easy for the Aadhaar card holders to enroll for government programs and benefits.

The importance of the Aadhaar's linkage capabilities can be illustrated in a simple example: with a Aadhaar enabled welfare program, a mother and daughter from a below poverty line will be able to access, in full value, all the cash and subsidy benefits available to them at the various stages and events of their life. Aadhaar can also benefit those who were earlier unidentified for obtaining public health and rural employment services.[7] The UIDAI also works with other government ministries to develop key applications that can potentially leverage existing government entitlement programs such as the NREGS (National Rural Employment Guarantee Scheme) and PDS (Public Distribution System) The NREGA and PDS are Indian government programs designed to help the rural poor with employment and food security solutions.[8] For instance, an integrated health system of monitoring and tracking individuals along with logistical support is expected to help in the antenatal check-up coverage of the roughly 27 million pregnant women. Similarly with respect to rural employment, guaranteed wage payments to workers are being enabled through biometric capture of their regular attendance at work.

The linkage capability of Aadhaar to government and even private services is one of its key features. A recent study[9] on Aadhaar found that the card can help facilitate three important things: "access to eligible benefits, access to full benefits,

[7]UID and Public Health. Accessed at https://uidai.gov.in/UID_PDF/Working_Papers/UIDandPublicHealth.pdf

[8]Ibid.

[9](2012) India's Unique Identity (UID) Reaching Underprivileged Households That Have No Existing ID. Retrieved May 06 2015 http://www.stern.nyu.edu/experience-stern/faculty-research/sundararajan-uid-results

and access to benefits when it is due." Equally important, the study found that there is evidence that the Aadhaar project is inclusive in its applicability and will in future be applied to government programs that will include the sections of the population currently excluded from the economic mainframe of India.

4 Current State and Analysis of the Project

The Aadhaar project provides a unique opportunity to explore and understand the planning and execution of digital governance strategies by a government. The latest target for enrollment is to complete one billion Aadhaar enrollment by the end of 2015.[10] Currently, the project is close to completion in terms of basic enrolment and at the starting stages of its strategic mission of linking of government services.

4.1 Status Update: Reaching the Target for Card Distribution

The scope and breadth of the Aadhaar project is staggering. In less than a decade, the Indian government was able to create and implement a unique identity program targeted at 1.2 billion people. Since 2009, more than 800 million people—a population greater than all of Europe—have been enrolled in Aadhaar and received a card. Distribution of the Aadhaar cards and enrolment of citizens is still an on-going project but with unequal results.

As of April 2015, the following projection has been made for the enrollment status (see Fig. 3).[11]

Of the 29 states of India, Andhra Pradesh, Maharashtra and Karnataka have lead in enrollment, especially with early adopters of Aadhaar being the underprivileged in these states.[12]

A quick look at the state-wide enrollment provides the list of top and bottom five states in terms of status of enrollment. To display accountability, the UIDAI website is frequently updated with current status of enrollments. A glance at the

[10](2014). Government asks UIDAI to generate 100 crore Aadhaar . . . Retrieved May 07, 2015, from http://articles.economictimes.indiatimes.com/2014-09-10/news/53770196_1_uidai-uid-project-uid-scheme

[11]Aadhaar Generation Progress in India Retrieved April 29 2015, from https://portal.uidai.gov.in/uidwebportal/dashboard.do?lc=h

[12](2012) India's Unique Identity (UID) Reaching Underprivileged Households That Have No Existing ID. Retrieved May 06 2015 http://www.stern.nyu.edu/experience-stern/faculty-research/sundararajan-uid-results

Country/State	Population	Aadhaar issued	Percentage
India	1,210,601,445	805,490,743	66.54%

Fig. 3 The projected enrollment status in Aadhaar of the Indian population highlighting the fact that more than 800 million individuals had already been issued the card. The table is a self-illustration based on data available on the UIDAI portal:

Rank	State	Completion rate for Aadhar
Top 5	Delhi	106%
Top 5	Andhra pradesh	99%
Top 5	Himachal Pradesh	96%
Top 5	Kerala	95%
Top 5	Puducherry	93%

Rank	State	Completion rate for Aadhar
Bottom 5	Bihar	38%
Bottom 5	Mizoram	27%
Bottom 5	Arunachal Pradesh	11%
Bottom 5	Assam	1%
Bottom 5	Meghalaya	1%

Fig. 4 A summary of the best and worst achieving states in terms of Aadhaar enrollment. The data was retrieved from the UIDAI website as per the then available update of April 11th. The figure is a self-illustration based on the information available on the portal. *Note*: The more than 100 % rate of completion in Delhi could be indicative of high migrant population in the city. Another point to note is the very low percentage completion in the north-eastern states. These states suffer from low population density and highly mountainous terrain making implementation harder.

data (updated April 11th, 2015) is revealing terms of state completion rates (see Fig. 4).[13]

As claimed by a senior UIDAI official, "Aadhaar enrollment is an indicator of well-governed States. These States take the lead irrespective of politics or political parties."[14] In fact it is claimed that those states with some of the highest Human Development Index (HDI)[15] seem to have faster enrolments. "Andhra Pradesh took the lead and was one of the first few states to realize the potential of Aadhaar. Besides, big and small states have made huge progress. It is in the interest of state governments and their understanding of how Aadhaar can be leveraged,"[16] the official added. It is possibly no coincidence that low enrollment states such as Uttar

[13](2015) State-wise Aadhaar Enrolment Ranking Retrieved April 29th, 2015, from http://uidai.gov.in/state-wise-aadhaar.html

[14](2013). Top States on HDI take the lead on Aadhaar enrolment - The ... Retrieved May 06, 2015, from http://www.thehindu.com/news/national/top-states-on-hdi-take-the-lead-on-aadhar-enrolment/article5333465.ece

[15]Some states have better standard of living and human development (economic and social standards of living) as measured by the HDI of the UNDP.

[16](2013). Top States on HDI take the lead on Aadhaar enrolment - The ... Retrieved May 06, 2015, from http://www.thehindu.com/news/national/top-states-on-hdi-take-the-lead-on-aadhar-enrolment/article5333465.ece

Pradesh, Chhattisgarh and Bihar also have lower per capita income (per capita state domestic product) compared to the national average (approximately $1440 for the year 2012). This analysis also notes that these low performing states also ranked lowest on the Human Development Index.[17]

The total expenditure incurred by UIDAI program till August 31st 2014 was INR 49 billion (approx. $80 million).[18] While it had targeted 600 million enrollments by the end of 2014, even with a lull during the transition of the central government in India, the UIDAI has managed to surpass that number by a considerable margin.[19] In lieu of this, the current government, which was initially skeptical of continuing Aadhaar,[20] has allocated INR 20396.4 million (approximately $320 million) to the project in the 2014–2015 financial budget. This has been done to hasten the enrollment of one billion people.[21]

5 The Drivers for Aadhaar

The driver for Aadhaar is the fundamental need for any government to be able to properly identify its citizenry to be able to service them effectively and efficiently. In the case of India, this could only be accomplished by using modern digital technology that provides a capability heretofore non-existent.

5.1 Improving Individual Identity

Problem of identifying citizens has been a challenge in India. It has always been ambiguous. Most households in India use various identity cards that have been created for some specific government program and have limited portability beyond its limited intent. However, these do not provide universal coverage. A report prepared in the initial stages of the Aadhaar program showed that only 50 % of India's population is covered by the four major identification programs—passports,

[17] Ibid.

[18] (2014). Government asks UIDAI to generate 100 crore Aadhaar . . . Retrieved April 15, 2015, from http://articles.economictimes.indiatimes.com/2014-09-10/news/53770196_1_uidai-uid-project-uid-scheme

[19] As can be seen from the table above, about 800 million enrollments have already been done.

[20] (2014). Centre plans to scrap Aadhaar—Deccan Chronicle. Retrieved May 06, 2015, from http://www.deccanchronicle.com/140615/nation-current-affairs/article/centre-plans-scrap-aadhaar

[21] (2014). Nandan Nilekani impresses Narendra Modi & Arun Jaitley . . . Retrieved May 07, 2015, from http://articles.economictimes.indiatimes.com/2014-07-24/news/51982210_1_uidai-project-uidai-official-aadhaar

voter IDs, pan cards (issued for tax records purposes) and ration cards.[22] Non-portable ID cards can be a major roadblock to utilizing the broad range of government programs and participating more fully in Indian society. For example, the rate of illiteracy is four times higher for those without portable ID.[23]

The Aadhaar card is a critical component of a universal identity system in India. In the future, the biometrics and other socio-economic information collected from individuals will serve as the sole identity parameter, with applicability across various government schemes. It will hasten the inclusion of previously excluded and under-privileged citizens into the economic mainframe of India and its future economic and social growth. A preliminary cost-benefit analysis conducted by the National Institute of Public Finance and Policy identified the manner in which Aadhaar is expected to benefit the country. This included both tangible and intangible benefits. Labor mobility and impact on inclusion are two key intangible benefits while reduction in leakages and efficiency improvements in government programs is the standout tangible gain.[24]

The importance and potential of Aadhaar cannot be underestimated. As an observer commented, "the UID (Aadhaar) rollout seems clearly on track to fulfilling its intended goal, of bringing entirely new segments of the population into the mainstream economic system. What's important here is that we are not simply seeing people with pre-existing portable ID adding yet another one to their repertoire. Rather, millions of Indians who had no modern form of ID now have one, and this number is growing every month".[25]

In terms of tangible benefits, taking into account benefits which will be derived by integrating select key programs with Aadhaar, the study estimates a real rate of return of 52.85 % for Aadhaar over a 10 year time frame from 2010–2011 to 2020–2021.[26] With service linkages just beginning, it is too early to evaluate the project's outcomes against its expectations. However, in terms of execution of enrollments, it appears that the program is meeting its objectives.

---

[22]Inclusive India: How Project Aadhaar Can Drive Growth and Social Change. Accenture. Accessed at http://www.accenture.com/sitecollectiondocuments/pdf/inclusive-india-how-project-aadhaar-can-drive-growth-and-social-change.pdf

[23]Aadhaar Attendance Management System. Accessed at https://uidai.gov.in/aadhaar-applications/aadhaar-attendance-management-system.html

[24]A cost-benefit analysis of Aadhaar. National Institute of Public Finance and Policy. Nov 9, 2012. pp 3.

[25](2012) India's Unique Identity (UID) Reaching Underprivileged Households That Have No Existing ID. Retrieved May 06 2015 http://www.stern.nyu.edu/experience-stern/faculty-research/sundararajan-uid-results

[26]A cost-benefit analysis of Aadhaar. National Institute of Public Finance and Policy. Nov 9, 2012. pp 16.

5.2 Linkage of Services

On the topic of linking of services, the government has been continually running pilots to test both the institutional capacity as well as the effectiveness of using the Aadhaar to coordinate with the services. One such service is the provision of cooking gas subsidies. To protect the citizen against high prices of Liquefied Petroleum Gas (LPG), the government provides the LPG at subsidized prices for household use. In 2009–2010, the government spent a total of INR 160 million ($2.4 million) on subsidies.[27] However, LPG cylinders are periodically diverted to the black market where it is sold at a price higher than the market price. A study detailed the impact of using Aadhaar to help reduce the misuse of cooking fuel subsidies provided by the government.[28] During the course of the study, the use of Aadhaar to obtain the fuel subsidy was mandated and then withdrawn. The study then compared the prices of cooking gas in the black market, before, during and after the implementation of the service linkage to Aadhaar. The study concluded that there was a significant decrease in effective prices of cooking gas during the period that Aadhaar was mandated. When the government withdrew the mandate, the prices immediately went up, confirming the effectiveness of the program in curbing theft and keeping prices in check.

Another study dealt with the identification of false ration cards. As *The Hindu* reported[29] in September, 2014, "In the second phase of the Food Security Scheme, the (Food and Supplies) department had received applications from 21 lakh (*2.1 million*) families having 74.09 lakh (*7.4 million*) members. Of these, 65.22 lakh (*6.5 million*) had submitted their Aadhaar (UID) number while the rest had submitted their Aadhaar Enrolment Number (EID).[30] During verification through the Aadhaar server, as many as 4.43 lakh (*0.4 million*) UIDs and 8.5 lakh (*0.85 million*) EID numbers were found to be suspicious." This has tremendous implications in terms of reducing the misuse of funds from the program. One of the justifications for the high cost of the project was that it could be recovered through the savings that it would engineer in other government schemes. The above study is illustrative of the positive impact of Aadhaar in curbing misuse of funds.

[27] Ibid, pp 21.

[28] Barnwal (2014).

[29] "Aadhaar helps to weed out fake ration card applications . . ." 23 Apr. 2015 http://www.thehindu.com/todays-paper/aadhaar-helps-to-weed-out-fake-ration-card-applications/article6396001.ece

[30] Aadhaar Enrolment Number would be the acknowledgment number provided at the time of registering for Aadhaar.

5.3 De-duplicating

An important task of the private sectors companies was to manage the de-duplicating task. De-duplicating is the process by which each new entry in the system is checked with all the previous entries on a unique parameter (biometrics) to ensure that the same individual does not obtain two different cards. An UIDAI official commented that, "UIDAI will de-duplicate three times over, providing accuracy that is vital in a country which has had a massive population migration in the past decade and welfare programs that now total US$60 billion in value."[31] UIDAI has been able to introduce biometric identification in India with the support of the latest innovations in Wi-Fi connectivity and cloud computing for the transmission and storage of data. One UIDAI official gleefully described the Aadhaar database structure as "Google-meets-Facebook scale out."[32] In addition to the authenticating identity of card holders, the private sector companies were used to enlist the services of organizations and people involved in training, device supplies, letter delivery (for delivery the Aadhaar card by post) etc.

6 Aadhaar Implementation

No program the size of Aadhaar can experience its implementation without its share of successes and controversies. These issues run the gamut of issues from technology to government policies.

6.1 Success of Aadhaar: Key to Implementation

With more than 800 million enrollments[33] across the country, India has achieved an incredible feat. It is considered to be the biggest biometrics backed identity card system in the world based on just sheer numbers. The project is considered a success in several states in India where the enrollments to Aadhaar are close to a 100 %. While it is suggested that inadequate infrastructure, low education rates and limited awareness levels have reduced the pace of enrollments across some states, the states that have finished the process faster attribute it to the political commitment of local governments, efficient governance standards and an effective local government administrators. An alignment with local and subnational goals by the

[31](2012). Why India's identity scheme is groundbreaking . . .—BBC.com. Retrieved May 01, 2015, from http://www.bbc.com/news/world-asia-india-18156858

[32]Ibid.

[33]Aadhaar Generation Progress in India. Retrieved April 29 2015 https://portal.uidai.gov.in/uidwebportal/dashboard.do?lc=h

political and legislative forces of these states helped obtain the high levels of enrollments. Each state government may have different sub-national goals specific to the political party in power there. These goals can be more effective by linking to Aadhaar. Moreover, better education and awareness levels of the residents of these States, higher social economic standards and an effective infrastructure network (such as roads, internet and Wi-Fi access) aided the process of enrollments. Therefore, states such as Andhra Pradesh, Himachal Pradesh and Kerala, which are considered to have higher standards of living and education rates, have had successful implementation of the project.

The role of individual state governments in ensuring a fast roll out was also critical. Taking advantage of initial ambiguity over the legality of making Aadhaar mandatory for obtaining government program services many state governments made usage of Aadhaar compulsory for specific programs. For example Maharashtra made Aadhaar compulsory to obtain benefits from 11 education-related programs.[34] This provided the much-needed initial momentum for enrollments. While the Supreme Court would later intervene and deem it illegal to make Aadhaar mandatory to obtain government benefits, the objective of speeding up enrollments had already been achieved. As the first Chairperson of UIDAI said, "We felt speed was strategic. Doing and scaling things quickly was critical. If you move very quickly it doesn't give opposition the time to consolidate".[35]

Moreover the impetus for enrollment was aided by the support that Aadhaar had from private sector companies ranging from the Reserve Bank of India (RBI) to the oil companies. For the RBI, using Aadhaar meant being able to provide financial inclusion for hundreds of millions who were unbanked. The oil companies could use Aadhaar driven identification and verification to reduce the number of individuals making fraudulent claims for subsidy.[36]

6.2 Challenges to Aadhaar

While the Aadhaar program has observed considerable success, it has also encountered a variety of challenges ranging from logistical, technical to legal and regulatory issues in its implementation. For example, eroded fingerprints of manual workers have been reported, along with accidental damage to hands and fingers from burns, chemicals and other agents.[37] A former UIDAI official acknowledged

[34]"States and Aadhaar—All you want to know about UID and NPR …" 25 Apr. 2015 http://economictimes.indiatimes.com/slideshows/economy/all-you-want-to-know-about-uid-npr/states-aadhaar/slideshow/18832328.cms

[35]"How Nandan Nilekani Took Aadhaar Past The Tipping Point." 25 Apr. 2015 http://forbesindia.com/article/big-bet/how-nandan-nilekani-took-aadhaar-past-the-tipping-point/36259/3

[36]"How Nandan Nilekani Took Aadhaar Past The Tipping Point." 25 Apr. 2015 http://forbesindia.com/article/big-bet/how-nandan-nilekani-took-aadhaar-past-the-tipping-point/36259/3

[37]Sao (2013).

that capturing fingerprints, especially of manual laborers, is a challenge. The challenge in authentication is accentuated by the fact that the quality of fingerprints is inadequate because of the rough exterior of fingers caused by hard work.[38] According to a prominent Indian researcher, people above 60 years and children below 12 years have difficulties in enrolling with fingerprints. This failure to enroll could be as high as 15 % in India, which translates to 180 million individuals.[39]

6.2.1 Privacy and Legal Issues

Aadhaar raised concerns regarding privacy. As recently as March 2014, the Indian Supreme Court blocked a request for access to Aadhaar data coming from other government agencies.[40] This came as a result of a Bombay High Court order directing forensic experts to run fingerprints relating to a gang rape case through the Aadhaar system to look for possible matches. This case had been heard after a plea by the Aadhaar authorities that such orders would open the floodgates for more such orders. The UIDAI claimed that it was committed to protecting the individual's privacy terming it as a basic human right.

There are also legal issues pertaining to false data collection. In 2011, the Home Minister of India stated that data collected under the program was not secure and that "the possibility of fake identity profile in the Aadhaar data was (is) real."[41] In fact, recent reports in the state of Andhra Pradesh suggested that 384,000 fraudulent Aadhaar cards have been issued.[42] Even the fingerprint technology has raised concerns. Some commentators have said that certain techniques may be used to fool the fingerprint reader.[43] This raised concern about the validity and authenticity of data collected.

A study published by the School of Media and Cultural Studies at Tata Institute of Social Sciences suggested that the absence of laws dealing with data protection would make it difficult to deal with misuse of personal information, profiling, tracking and linking of databases.[44] Additionally, the report suggests that national security may be affected adversely using "the provision of verification of

[38]Sao (2013).

[39](2011). "Intrusion plus Retreat: Questions on the Unique ID Project in India". London School of Economics. Retrieved April 20 2015 http://www.lse.ac.uk/collections/informationSystems/newsAndEvents/2011events/ramakumar.htm

[40](2014) "Withdraw instruction to make Aadhaar mandatory—articles . . ." Retrieved 20 Apr. 2015 http://articles.economictimes.indiatimes.com/2014-03-25/news/48558932_1_aadhaar-card-unique-identification-authority-uidai

[41](2011). "UID data not secure, says Chidambaram. . ." Retrieved Apr 15 2015 http://ibnlive.in.com/news/uid-data-not-secure-says-chidambaram/203267-3.html

[42]"UIDAI cancels 3.84 lakh fake Aadhaar numbers." Retrieved 23 Apr. 2015 http://www.hindustantimes.com/newdelhi/uidai-cancels-3-84-lakh-fake-aadhaar-numbers/article1-980634.aspx

[43]Sao (2013).

[44]Sao (2013).

information of individuals by the registrars [private contractors] to ensure that no fake residents get enrolled into the system."

6.2.2 Conflict with Other Government Agencies

In 2013, conflict arose between the Ministry of Home Affairs and UIDAI. The National Population Register is a comprehensive identity database maintained within the Ministry of Home Affairs. The objective of the program, which seemed to be similar to that of UIDAI, was to help in the better utilization and implementation of the benefits and services under government programs. It appears at first glance that it would be detrimental having two such massive exercises, with similar objectives, running side by side. More so because the National Population Register was being managed by another branch of the government, the Home Ministry. The fundamental difference between UIDAI and NPR is that constitutionally, while NPR is mandatory, UIDAI is not and has to be legally initiated by the individual. Since the NPR was mandatory, the government had to ensure that the registry was complete. However, since the data and the biometrics collected were largely similar, there was a case to be made for one time collection of data which would be added to both databases. Therefore, the initial plan by the government was that both these programs would be carried out simultaneously but for exclusive groups thereby avoiding wasting resources. Targets were set for each of these programs. In 2012, when a proposal was suggested to increase the mandate of UIDAI from initially allotted 200 million, the MHA was not in favor. The point of conflict was the collection of biometrics. The Ministry of Home Affairs (MHA) raised concerns regarding security and specifically over biometrics being collected by multiple agencies. NPR requires that officials double-check data by revisiting a household.[45] This conflict between the Home Ministry and the UIDAI led to a temporary halt in progress.[46] Ultimately, the targets for UIDAI were increased.[47] The resulting agreement was that UIDAI and NPR would exchange data. This was to ensure that members in one program would be enrolled in the back end of the other program.[48] This would also avoid duplication.

[45](2013). MHA jittery over UIDAI mandate|Latest News and Updates at ... Retrieved Apr 20, 2015, from http://www.dnaindia.com/india/report-mha-jittery-over-uidai-mandate-1641875

[46](2014). Chidambaram red flags Nilekani: 'UIDAI brought NPR to ... Retrieve April 18, 2015, from http://daily.bhaskar.com/news/NAT-TOP-chidambaram-red-flags-nilekani-uidai-brought-npr-to-standstill-3381183.html

[47](2012). Row over UIDAI data collection resolved—Livemint. Retrieved April 18, 2015, from http://www.livemint.com/Politics/b8YC6QC4lB6TtczQKeUcxO/Row-over-UIDAI-data-collection-resolved.html

[48](2013). How Nandan Nilekani Took Aadhaar Past The Tipping Point. Retrieved April 18, 2015, from http://forbesindia.com/article/big-bet/how-nsandan-nilekani-took-aadhaar-past-the-tipping-point/36259/1

6.2.3 Conflicts with Individuals, Organizations and the Courts

While controversy had been generated by other arms of the government, additional opposition came from individuals and smaller organizations. As early as 2009, an NGO, Beghar Mazdoor Foundation, based in Mumbai filed a lawsuit in the local court against the Aadhaar project claiming that it engendered breach of privacy by collecting data from the citizens. They claimed that this was a violation of the right to dignity and privacy as enshrined in Article 21 of the Indian constitution. Similarly in September 2013, another petition filed by a private citizen with the Karnataka High Court claimed that the UIDAI project was unconstitutional and arbitrary. It said that the bill, which originally created UIDAI, the National Identity Authority of India Bill, had been rejected by the Parliamentary Standing Committee and therefore the government chose to continue the project through executive action. The Supreme Court declared that the government could not make the Aadhaar card compulsory for taking advantage of government services, as it was not constitutionally ratified.[49] This would however not be the last time that the court would intervene on the issue. Just a few months later in March 2014, acting on complaints that there were cases where Aadhaar was being made a basic requirement.[50] The Supreme Court drew on its earlier judgment and directed the government to withdraw all notifications which made Aadhaar compulsory. At present, the implementation of Aadhaar continues unabated with the understanding that enrollment in the program was voluntary not mandatory.

6.2.4 Issue with Biometrics Collection, and Other Concerns

One of the biggest concerns regarding the project has surrounded the use of biometrics. The Biometrics Standing Committee, which was established by UIDAI, questioned the reliability of de-duplication (see p. 7) using biometrics. The Committee was established to frame the biometrics standards for use by UIDAI and its partners. The Committee was composed of members from UIDAI, government ministries and representatives from industry and educational institutes. In its report, the Committee stated that in a global context, a de-duplication accuracy had been achieved for a database up to 50 million. However, this cannot be compared in scale to more than one billion that UIDAI hopes to reach and thus called into question the efficiency and effectiveness of a system intended to cater to such a size. Further, the other concern related to whether this system was reliable in India or not, had not been studied in depth.[51]

---

[49](2014). Supreme Court demolishes Aadhaar card: Judges rule card . . . Retrieved April 18, 2015, from http://www.dailymail.co.uk/indiahome/indianews/article-2588303/Supreme-Court-demolishes-Aadhaar-card-Judges-rule-card-NOT-mandatory-government-subsidies.html

[50](2014). Withdraw instruction to make Aadhaar mandatory: Supreme . . . Retrieved April 18, 2015, from http://articles.economictimes.indiatimes.com/2014-03-25/news/48558932_1_aadhaar-card-unique-identification-authority-uidai

[51]Forty-second report, The National Identification Authority of India Bill, 2010, Standing Committee on Finance (2011–2012), Fifteenth Lok Sabha, Ministry of Planning, December 2011.

While the government has continued to use the biometric technology for Aadhaar, other concerns have also been raised challenging the project:

- People have obtained Aadhaar cards on the basis of false affidavits.
- The value of the project is questionable: this refers to the United Kingdom's abandoned ID project. That project had been terminated citing a range of reasons, including "high cost, unsafe, untested and unreliable technology, and the changing relationship between the state and citizen."[52]
- Finally, whether Aadhaar was as an effective enabler for other government benefits. An Indian Parliamentary on Finance Committee concluded that the reason for the services not reaching their target demographic was not to do with the lack of identification but because of loopholes in eligibility determination process.

7 Future of Aadhaar

India has a massive population that still has limited access to basic services ranging from healthcare to economic and financial inclusion. A common reason that citizens face limited financial inclusion is that they often lack of proof of identity. With the introduction of Aadhaar, while the Indian government and banking sector would certainly benefit, the Indian citizenry would be the main beneficiary. It would be easier with a legal Aadhaar card to include the population, which has so far not been able to be served on account of their lack of identification documents. An Aadhaar-based payment system is in development and is being piloted in 50 districts across the country."[53] The Aadhaar card also serves as an authentication card. Using the individual's biometrics information from the Aadhaar card, it can authenticate users who do not have smart banking cards such as that required for the ATM machines.

The potential for expansion into the commercial sector was expressed in a recent study that said "The early adopter profile [of Aadhaar users] validates Aadhaar's potential beyond its use for welfare disbursements and suggests considerable promise for early UID-enabled commercial services, in which numerous pioneering corporations (like ICICI and Visa) are investing."[54]

Current projects such as the Digital India program would utilize Aadhaar's services to link the UID/Aadhaar number with SIM cards, with the aim of using

[52]Forty-second report, The National Identification Authority of India Bill, 2010, Standing Committee on Finance (2011–2012), Fifteenth Lok Sabha, Ministry of Planning, December 2011.

[53](2013). Aadhaar-based payment system in 50 districts|Business ... Retrieved April 18, 2015, from http://www.business-standard.com/article/economy-policy/aadhaar-based-payment-system-in-50-districts-112041902005_1.html

[54](2012) India's Unique Identity (UID) Reaching Underprivileged Households That Have No Existing ID. Retrieved May 06 2015 from http://www.stern.nyu.edu/experience-stern/faculty-research/sundararajan-uid-results

mobile phones for services. One of the important applications under Prime Minister Modi is Aadhaar associated bank accounts, which are to be linked to the newly launched Pradhan Mantri Jan Dhan Yojana (Prime Minister's People's Wealth Scheme, 2014),[55] and offer financial inclusion for the Indian population. It will help a resident to either link their existing bank account or open a new bank account.[56] The Aadhaar card can be used to authenticate accounts, transaction etc. through several ways such as using the Aadhaar Enabled Accounts (AEA)—which is an "electronic opening of accounts at the time of Aadhaar enrolment in partnership with banks through an electronic process".[57]

Another financial opportunity is the Aadhaar Payments Bridge System (APBS) which "enables payments to be credited to end beneficiaries' Aadhaar-enabled accounts (AEA) on the basis of Aadhaar number being unique identifier. The Aadhaar Payments Bridge will facilitate the processing of payments file from the Government departments received via the sponsor banks (assigned bank), and subsequently routing of the payments file to the beneficiaries bank."[58]

Another important future application of the Aadhaar card can be found in the Right of Children to Free and Compulsory Education Act. "A UID (Aadhaar) based system would allow the government of India to accurately assess enrollment needs across all areas"[59] and this would enable monitoring school attendance and admittance to school for children between ages 6–14 under the Act.[60]

8 Conclusion

India's unique ID project is massive in its scale and has potential for huge impact. The fundamental achievement of UIDAI has been its success in enrolling more than 800 million individuals in less than 4 years. It was the pace of enrollment, which proved to be a significant factor in winning the confidence of the government to support the program in its inter-departmental disputes with other ministries. Moreover, the success to date of the program demonstrates the importance of Aadhaar in meeting the goals of the country's national digital strategy. Using the latest digital technologies to achieve one of the pillars of the Digital India strategy (e-governance)

[55]PM Modi's financial inclusion program with services such as zero balances accounts with banks to enroll under-privileged sections in the banking system.

[56](2012) Aadhaar Enabled Service Delivery. Unique Identification Authority of India. Planning Commission, Government of India. Accessed at https://uidai.gov.in/images/commdoc/whitepaper_aadhaarenabledservice_delivery.pdf

[57]Ibid.

[58]Ibid.

[59]Zelazny (2012).

[60](2014). Meet the man who built the awesome online attendance . . . Retrieved April 18, 2015, from http://qz.com/277897/meet-the-man-who-built-the-awesome-online-attendance-system-for-indias-government-officials/

shows that the marriage of these new technologies, careful planning and execution, and political commitment can help achieve the future vision of Indian government.

A key component for the project's success has been the support of country's political leadership. Be it the initial push from the UPA government or the renewed vigor displayed by the Bharatiya Janata Party led National Democratic Alliance government, it is evident that the continual backing of the political leadership has played a key role in UIDAI's accomplishments.

Beyond the support of government leaders, the program has garnered the support of the country's senior most judicial body in limited areas. The Indian Supreme Court has had to intervene multiple times acting on issues filed by the public. While the Supreme Court has questioned the legality of making Aadhaar compulsory for government services, it has also agreed with the UIDAI on the issue of data privacy. The Supreme Court provides the critical legal checks and balances required for a project of this magnitude.

The last and most crucial aspect in the importance of the UIDAI project is that it is future looking. The Modi government, which was elected in May 2014, has endorsed the project emphatically and has made it the central component piece its program for linking financial services with Aadhaar through mobile technology, called the JAM trilogy (Jan Dhan—financial inclusion, Aadhaar and Mobile).[61] The Economic Survey of India, which accompanies the annual budget presentation by the Finance Minister, states that "If the JAM Number Trinity can be seamlessly linked, and all subsidies rolled into one or a few monthly transfers, real progress in terms of direct income support to the poor may finally be possible."

Bibliography

A cost-benefit analysis of Aadhaar. National Institute of Public Finance and Policy. (2012).

Aadhaar Enabled Service Delivery. Unique Identification Authority of India. Planning Commission, Government of India. (2012).

Barnwal, P. (2014). Curbing leakage in public programs with biometric identification systems: Evidence from India's fuel subsidies.

Forty-second report, The National Identification Authority of India Bill, 2010, Standing Committee on Finance (2011–12), Fifteenth Lok Sabha, Ministry of Planning (2011).

Inclusive India: How Project Aadhaar Can Drive Growth and Social Change. Accenture.

Intrusion plus Retreat: Questions on the Unique ID Project in India. London School of Economics. (2011).

Sao, P. C. (2013). The Unique ID project in India: An exploratory study. http://subversions.tiss.edu/wp-content/uploads/2013/12/Prakash_Sao_Subversions_pdf.pdf

Zelazny, F. (2012). *The evolution of India's UID program*. Center for Global Development.

[61] JAM—linking of financial services to the excluded strata of the population through Aadhaar and mobile technologies.

Germany: The Path to Open Data Leadership

Björn Fleischer and Yolanda Rother

1 Introduction

> Digitization offers tremendous opportunities and potential for synergies to develop. Policymakers therefore must actively support this structural change and adopt a framework in which we can all live, learn, work and do business in the digital world, and in which everyone can participate in the digital transformation.
>
> Digital Agenda 2014–2017, August 2014

The Federal Republic of Germany is a nation to look to when it comes to global leadership—a world leader in exports,[1] one of the strongest economies in the Eurozone,[2] the world's champion in soccer. In the realm of digital innovation, however, the picture is more ambiguous. In its Digital Agenda 2014–2017, the German government has emphasized that digital leadership plays a significant role for Germany's future political, social, and economic development (Digital Agenda 2014–2017). However, according to the Digital Economy and Society Index published by the European Commission, Germany merely ranks 10th in comparison to the 28 EU member states (European Commission Digital Agenda Scoreboard 2015).[3] Similarly, the UN's e-government ranking exposes that Germany's progress

[1] https://www.cia.gov/library/publications/the-world-factbook/rankorder/2078rank.html

[2] http://www.weforum.org/content/top-10-most-competitive-economies-europe-2

[3] "DESI 2015 - Digital Single Market - European Commission." Digital Single Market. European Commission, 19 Feb. 2015. Web. 23 Aug. 2016.

B. Fleischer
Ministerium für Inneres und Kommunales des Landes Nordrhein-Westfalen, Düsseldorf, Germany

Y. Rother, M.P.P. (✉)
Hertie School of Governance, Berlin, Germany
e-mail: y.rother@mpp.hertie-school.org

S. Falk et al. (eds.), *Digital Government*, DOI 10.1007/978-3-319-38795-6_9

has significantly fallen in its most recent ranking in 2014 (United Nations e-Government Survey 2014).

A similar ambiguous picture exists with regard to Germany's efforts to establish itself as a prospective leader of digital and open government. Thus, in June 2013, the German government agreed to adopt the G7 (previously G8) open data charter.[4] The basic idea of open government and open government data is to establish a modern cooperation among politicians, public administration, industry, and citizens by fostering transparency, democracy, participation, and collaboration through the use, reuse, and redistribution of data (Bauer and Kaltenböck 2012; Open Definition 2014). Alongside the U.K., the U.S., Canada, France, Italy, Japan, and Russia (which exited the group in 2014) Germany adopted the G7 open data charter with the following five principles:

1. Release of public data in open and machine-readable formats;
2. High quality and quantity of data;
3. Usability of data by all;
4. Release of "key data sets";
5. Release of data for innovation.[5]

In a "National Action Plan to Implement the G8 Open Data Charter," Germany has announced the following four commitments to integrate the five G7 principles:

Commitment 1: Sending a clear signal in favor of open data in Germany
Commitment 2: Publishing datasets
Commitment 3: Publishing the data on a national portal
Commitment 4: Consultation, engagement, and experience-sharing.

With the G7 charter's termination on 31 December 2015, the purpose of this paper is to track where Germany stands in its commitments, and how Germany implements the G7 open data principles by drawing on government documents and conducted expert interviews. The paper is structured as follows: First, it reviews the development of the current open data ecosystem in Germany in Part 1. This section also establishes an overview of political actors involved in the open data policy development. Part 2 introduces Germany's federal open government data portal *GovData*. Part 3 conducts a qualitative examination of Germany's commitments to identify the extent to which the G7 principles have already been adopted. Ultimately, this study reviews the progress that Germany has made towards each of its four commitments to the five principles in the Open Data Charter.

[4] http://www.verwaltung-innovativ.de/SharedDocs/Publikationen/Pressemitteilungen/nationaler_aktionsplan_open_data_englisch.pdf?__blob=publicationFile&v=1

[5] https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex

1.1 Part One: The Digital Development of Germany

1.1.1 Germany: Economic Background and Political Structure

Population	80,900,000[6]
GDP in USD	3,730,260,571,356.5[7]
GDP per Capita in USD (2013)	46,268.64[8]
Number of wireless broadband subscriptions (2014)	51,828,819[9]
Households with Internet	89%[10]
Enterprises with Internet	98%[11]
Individuals using the internet at least once a week	82%[12]
… for obtaining information from public authorities	52%[13]
…for downloading official forms from public authorities	32%[14]
UN E-government Development Index (2014)	21 of 193[15]
UN E-participation Index (2014)	24 of 193[16]
EU Digital Economy and Social Index (2015)	10 of 28[17]

1.2 Digital Development of Germany in Numbers

Few countries have had such an international impact as the Federal Republic of Germany. The high-income country[6] is globally acknowledged as a leader and role model for its efficiency and economic stability. Germany is one of the largest national economies in Europe. It is a founding member of the European Union and the Eurozone.[7] At the federal level, legislation is exercised by the parliament[8] with respective legislative and executive bodies at state level. Institutionally, the federal German political structure presents challenges that have been prominently described as 'Joint-Decision Trap' (Scharpf 1988). Comprehensive reform in the German federal system requires the assent of multiple veto-players at the local, state, and federal level. Thus, the successful implementation of new digital strategies requires an effective consensual approach that is supported by suitable institutions across all layers of government. As a result, digital reform in Germany has been accompanied by institutional reform as well.

[6] http://data.worldbank.org/country/germany

[7] http://europa.eu/about-eu/eu-history/1945-1959/index_en.htm

[8] https://www.bundestag.de/htdocs_e/bundestag/function/legislation

1.2.1 Three Waves of Digital Government: From eGovernment to Digital Agenda

To understand the development of open data policy in Germany, a look to the country's prior digital journey is indispensable. The first wave of digital government transformation took place from 1996 to 2006 and paves a decade of beginnings. In 1996, public officials looked to information and communication technology (ICT) to bring about change in public administration. In 2000, chancellor Gerhard Schröder announced the *eGovernment Initiative BundOnline 2005*, the first federal e-government program for modernizing public administration by the year 2005. The strategy called for making all web-enabled administrative service provisions accessible via the website *Bund.de*. This effort was followed up in 2003, when Schröder and the heads of state adopted the *Deutschland-Online* strategy, providing a framework for all administrative layers to enhance coordination and cooperation for unified eGovernment policy-making.

The second wave of digital development in German public administration consisted of a number of legislative efforts between 2006 and 2012. On 1 January 2006, the federal Freedom to Information Law went into effect, giving citizens the right to access official federal information. Eleven states have adopted corresponding Freedom to Information laws. In June 2006, chancellor Angela Merkel and the ministers of all federal states signed the *Deutschland-Online Action Plan*, giving new impetus to the adoption of electronic procedures in public administration. On 18 February 2009, the Federal Cabinet adopted a new broadband strategy of the federal government, which aims at providing both households and businesses high-capacity broadband connections. Today, 98 % of German enterprises use the Internet, while 89 % of households have access to the Internet (Eurostat 2013).

The third wave of digital government transformation began in 2013. The federal open data portal *GovData—The Data Portal for Germany* (original: GovData—Das Datenportal für Deutschland) was launched in February 2013, making government-held data available to the public for re-usability in machine-readable format. The E-Government Act came into force on 1 August 2013. The E-Government Act will transform a number of administrative practices until coming into effect completely in 2020, inter alia making it obligatory for authorities to offer citizens and businesses an electronic payment option, electronic access to documents, electronic files management, and extensive online information. With this law, administrative matters will become more accessible, granting citizens a new channel to contact authorities, regardless of location or opening times. A Eurostat study from 2014 shows that more than half of the citizens use the Internet to obtain information from public authorities, while one third of the citizens download official forms from public authority websites (Eurostat 2013).

On 20 August 2014, the Federal Cabinet approved the *Digital Agenda for 2014–2017*. The Federal Ministry of the Interior, the Federal Ministry of Economic Affairs and Energy, and the Federal Ministry of Transport and Digital Infrastructure

formulated the strategy. On 17 September 2014, the Federal Cabinet adopted the *Digital Agenda's* companion program *Digital Administration 2020*, which provides in-depth measures to the policy area *Innovative Public Administration*. The aim of *Digital Administration 2020* is to fundamentally transform administrative practices through digital measures. Open data plays a fundamental role in achieving this target.

1.2.2 Digital Government Actors

In order to establish digital reform across all layers of government, the IT Planning Council was established in 2009. Because digital issues cut across the division of responsibilities between the federal and state governments as originally established in the German Basic Law (Grundgesetz), it had to be created through a formal treaty between the federal and the state governments and was accompanied by an amendment of Article 91c of the Basic Law.[9]

The main tasks of the IT Planning Council (see Fig. 1) are:

- Coordinate the cooperation between federal and state level in all questions concerning information and communication technologies;
- Convene and decide on independent and multi-disciplinary standards of IT interoperability and security standards;
- Steer eGovernment projects in the realm of the National eGovernment Act;
- Plan and develop the infrastructure of public administration.[10]

The IT Planning Council works on annual steering projects of significant impact and value to federal, state, and municipal level. Since 2014, open government has been a central steering project, as well.[11] The IT Planning Council established an open government working group with representatives from federal and state to facilitate communication and share best practices in biannual meetings. Thus, according to the international barometer of the Open Data Institute,[12] Germany has been classified as a high capacity country that has established its open data policy with strong political backing.

A key innovation resulting from the IT-Planning Council was the creation of the public sector Chief Information Officer, or CIO. Public sector CIOs are the drivers behind the digital transformation. Thus, the respective federal and state delegates to the IT-Planning Council are usually the CIOs of the respective states, mostly

[9]The Treaty ("Staatsvertrag" is available at http://www.it-planungsrat.de/SharedDocs/Downloads/DE/ITPlanungsrat/Staatsvertrag/Staatsvertrag.pdf?__blob=publicationFile).

[10]http://www.it-planungsrat.de/DE/ITPlanungsrat/itPlanungsrat_node.html

[11]http://www.it-planungsrat.de/DE/Projekte/Steuerungsprojekte/Steuerungsprojekte_NEGS/OpenGovernment/opengovernment.html?nn=1308406

[12]Open Data Barometer.

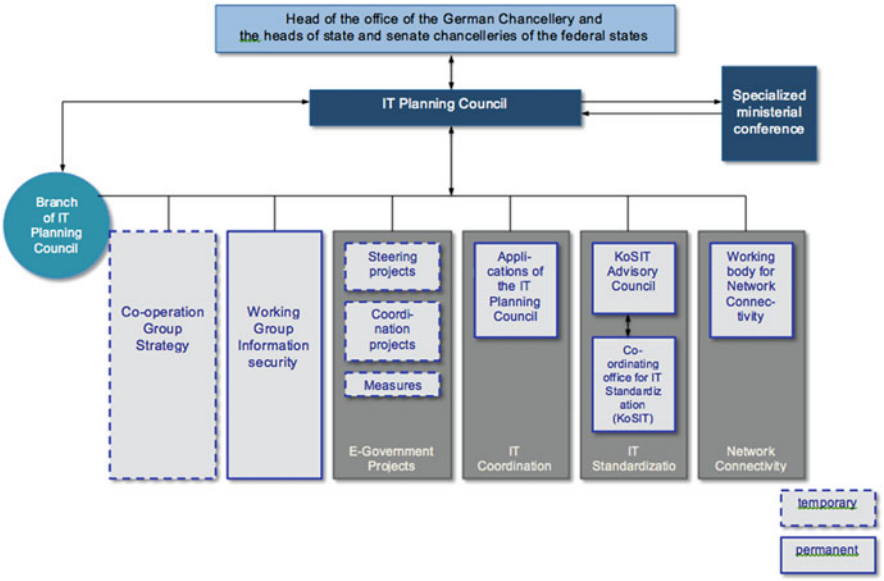


Fig. 1 The Structure of the IT-Planning Council (*Source*: Adapted from http://www.it-planungsrat.de/DE/ITPlanungsrat/itPlanungsrat_node.html;jsessionid=188BD73FB185D6197CECEA8DE8048C8D.2_cid321. Retrieved on September 18th 2015

located within the respective Ministry of the Interior. Since 2015, state secretary Klaus Vitt is the federal Chief Information Officer.

1.3 Part Two: The Development of Germany's Open Data Policy

1.3.1 Open Data Policy in Germany

> The federal administration and all its executive agencies must take the lead, on the basis of legislation, in providing open data in standard, machine-readable formats and under open licensing conditions. We want to provide an open data portal for the federal, state and local governments.
>
> *Shaping Germany's Future*, November 2013[13]

The initiation of Germany's federal open government data policy is closely linked to visible efforts for open data from the U.S. Shortly after entering office in January 2009, U.S. President Barack Obama signed the "Memorandum on

[13]http://www.verwaltung-innovativ.de/SharedDocs/Publikationen/Pressemitteilungen/nationaler_aktionsplan_open_data_englisch.pdf?__blob=publicationFile&v=1

Transparency and Open Government."[14] In an attempt to maintain internationally competitive in the policy-making arena, Germany initiated political discussions for a national open data strategy in 2009. On 24 September 2010, the IT Planning Council highlighted the importance that "public administration cooperates with business and the research community" in order to achieve open government and government transparency (IT Planungsrat, National eGovernment Strategy 2010–2015).[15] This resulted in the Dresden Agreement at the fifth annual IT summit in 2010, with the objective of creating a centrally accessible web-based open government data platform, which resulted in the federal portal *GovData—The Data Portal for Germany*.[16]

On 8 August 2012, the German Federal Ministry of the Interior announced its intent to create an open government data portal to make public sector information available to citizens and government agencies. The law on Access to Geodata (GeoZG) from 7 November 2012 established the terms of use for the provision of federal geodata (GeoNutzV), which has been a significant step towards open government data in Germany. On 19 March 2013, the federal geodata executive decree (GeoNutzV) makes geographical government data publicly available. The Freedom to Information law from August 2013 cleared a substantial legislative way for the establishment of an open data portal. As a result, Germany launched its federal open data portal *GovData—The Data Portal for Germany* in a public beta phase just 4 months prior to adopting the G7 open data principles. Today, *GovData* is Germany's central federal portal for open government data. Initiated on 19 February 2013, it has been in regular operating service since 5 January 2015 and released its 10,000th dataset in February 2015. To provide for its regular maintenance, an administrative agreement (GovData Verwaltungsvereinbarung 2014) was put into effect on 30 May 2014.[17]

Originally, the launch of *GovData* was accompanied by substantial criticism as it was decided to remove the word "open" from the portal's name. In response, members of the open data community established the counter-website www.Not-Your-GovData.de arguing that: "Up until now, a lot of the relevant datasets have still not been made available or at least are not released under an open license."[18] Revisiting the allegations 2 years later demonstrates that *GovData* took significant steps to combat these concerns. Today, *GovData* hosts more than 15,000 datasets and documents from federal, state, and local governments, many of which are classified as "high value" datasets, government datasets of high relevance.

Moreover, the portal's operating unit was relocated to the city-state of Hamburg. Hamburg is the most advanced city-state when it comes to transparency and open

[14] https://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment

[15] http://www.it-planungsrat.de/SharedDocs/Downloads/DE/Strategie/National_E-Government_Strategy.pdf?__blob=publicationFile

[16] IT-Gipfel Dresdner Vereinbarung.

[17] https://www.govdata.de/neues/-/blogs/verwaltungsvereinbarung-govdata-tritt-in-kraft

[18] http://not-your-govdata.de/en/

government, and plays a symbolic role as a transparency champion throughout the nation. The Hamburg Transparency Law (HmbTG) was put into effect on 6 October 2012, replacing Hamburg's Freedom of Information Act. It presents a significant paradigm shift for public administration by placing government agencies under the obligation to make documents and data available online and without cost. Together with the Fraunhofer-Institut for Open Communication Systems FOKUS, the new *GovData* office is situated in an exceptionally innovative legislative environment.

2 Part Three: Analysis of German Commitments to the G7 Open Data Charter

2.1 Germany and the G7 Open Data Principles

> *Open data are an untapped resource with huge potential to encourage the building of stronger, more interconnected societies that better meet the needs of our citizens and allow innovation and prosperity to flourish.* G8 Open Data Charter

In June 2013, eight nations including Germany adopted the open data charter at the G7 (previously G8) summit in Lough Erne, Northern Ireland. The charter agreed on a set of open data principles that lay the foundation for the release and reuse of government data. The countries that signed the charter argued that, "access to data allows individuals and organizations to develop new insights and innovations that can improve the lives of others and help to improve the flow of information within and between countries" (gov.uk 2013). The charter addresses five principles for the implementation of open data by 31 December 2015:

1. Open Data by Default: Foster expectations that government data be published openly while continuing to safeguard privacy;
2. Quality and Quantity: Release quality, timely, and well-described open data;
3. Useable by All: Release as much data in as many open formats as possible;
4. Releasing Data for Improved Governance: Share expertise and be transparent about data collection, standards, and publishing processes;
5. Releasing Data for Innovation: Consult with users and empower future generations of innovators.[19]

2.2 How Germany Implements the G7 Open Data Principles

In a National Action Plan, Germany announced four commitments to implement the principles of the G7 open data charter (National Action Plan to Implement the G8

[19]https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex

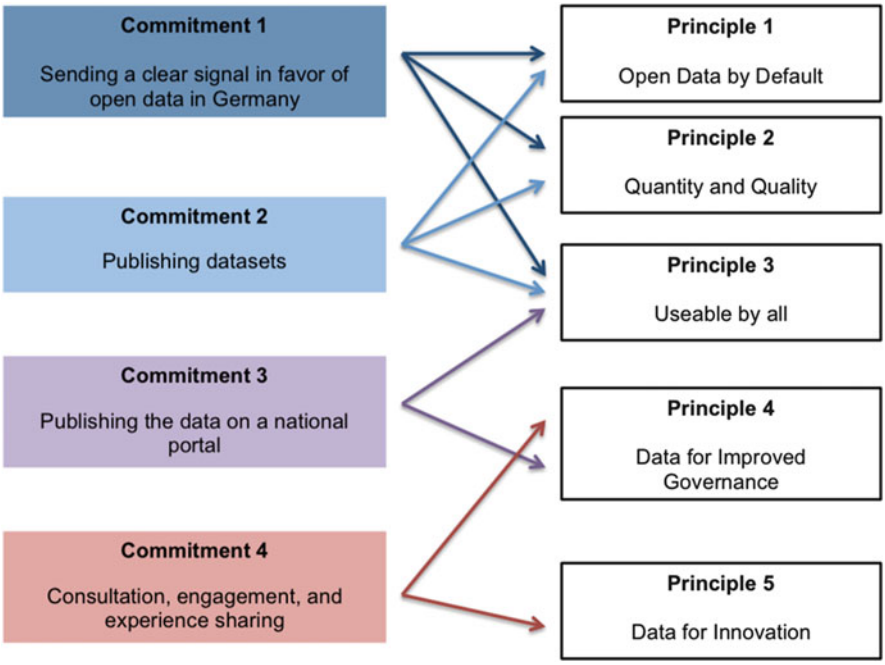


Fig. 2 Germany's Commitments to the G7 Open Data Principles (author's own illustration)

Open Data Charter 2014). Each commitment builds on at least two of the G7 principles, which has been made visible in Fig. 2.

2.3 Commitment One

The first commitment aims to send a clear signal in favor of open data. There are five measures to reach the first commitment. The first measure affirms the release of government data as a voluntary commitment, whereas the principle "open by default" guides any future release of government-held datasets. The second measure points to previous legislation such as the Act on Access to Geodata and the Freedom to Information Law having paved the way to publishing government data. A third measure discusses the release of a government study on the significance of open data. In July 2012, the Ministry of the Interior commissioned a 572-page study on *Open Government Data Deutschland* (Bundesministerium des Innern 2012). A fourth measure designates federal open data contact persons in higher government departments by the end of the third quarter in 2014. The last measure commits to publishing a guide to open data issues through IT systems procurement, which is particularly relevant in light of the increasing growing open data portals in Germany.

A central principle of the G7 open data charter is that open data is free and usable by all. To this end, open datasets require licensing. On *GovData,* there are more than 20 different license models that are classified as "open content that can be freely used, modified and shared by anyone for any purpose," in accordance with the *Open Definition* set forth by the Open Knowledge Foundation.[20] The most frequently used data license is "Germany Version 2.0" for nearly 6,000 datasets. After the open data community criticized *GovData's* limited first license, the Federal Ministry of the Interior developed *Data license Germany—attribution—version 2.0* in July 2014. This license permits reusability without restrictions or other limiting conditions and has been approved by the Open Definition Advisory Council of the Open Knowledge Foundation, ensuring to meet international standards of open data.

The agreement for the mutual maintenance of *GovData* was put into effect on 30 May 2014, satisfying the second measure to meet the first commitment. The agreement safeguards mutual coordination and maintenance of *GovData* by apportioning the costs evenly amongst the federal level and the states. There are eight signing parties: the Federal Republic of Germany, and the states Baden-Württemberg, Berlin, Brandenburg, Hamburg, North Rhine-Westphalia, Rheinland-Pfalz, and Saxony. Mecklenburg-Vorpommern and Schleswig-Holstein have expressed their interest in joining the administrative agreement. Six states have yet to sign the administrative agreement. On why the remaining non-member states haven't yet signed, Jan-Ole Beyer from the Ministry of the Interior[21] states, "open data bears a paradigm shift for these administrations, and hasn't yet been placed as a priority on the political agenda." Further, he states, "Providing public access to data that was previously in government proprietorship may lead to unintended consequences. Governments fear that numbers may be misinterpreted, power could be shifted, and data could be manipulated." A recent study by the National Academy of Public Administration and ICF International confirms that "many federal CIOs fear that the pace and scope of digital transformation at their agencies is too much, but also acknowledge the value that those changes can bring to their organizations."[22]

In a third measure to meet the first commitment, designating federal contact persons for open government data sends a clear signal in favor of open data. In accordance with this commitment, 18 federal departments have designated individuals as contact persons for open data.

Concluding, Germany meets its first commitment of signaling open data well before the charter's termination on 31 December 2015. Several preconditions were met long before the G7 charter was adopted. Germany has implemented the first three principles of openness, quantity and quality, and reusability through its portal, encouraging a high amount of datasets released and through an open license. Initial troubles have been overcome over time through structural and legislative adaption.

[20]See http://opendefinition.org/ on September 18th 2015.

[21]Telephone-interview with Jan-Ole Beyer on March 20, 2014.

[22]http://www.fiercecio.com/story/federal-cios-want-fear-digital-transformation/2015-02-02

One central measure is Germany's agreement with eight member states for the maintenance of *GovData*. The relocation of the portal's office to the transparency-pioneer Hamburg sends a signal in favor of open data. Lastly, each federal department named one or two contact persons. Ultimately, Germany is on the right path to send a strong signal in favor of open data, and has thus achieved to meet the first commitment of its national action plan.

2.4 Commitment Two: Publishing Datasets

The second commitment of the national action plan is the aim to publish datasets. This commitment is threefold: it sees the release of "key" datasets, the release of additional datasets, as well as the release of a minimum two datasets from each higher authority. This commitment integrates the G7 principle "open by default" by encouraging governments to release as many datasets as possible. Moreover, it reinforces the G7 principles two and three, in that it aims for high quantity and quality as well as usability by all.

In accordance with the G7, Germany has identified datasets of high value. The national action plan identifies 13 key datasets of high relevance for release on *GovData* that stem from five core policy areas: the federal budget, geodata, election results, and federal statistics. In a simple query on *GovData*'s search function, each of the five core policy areas is represented on *GovData*.

The second part of the commitment seeks to release "additional" datasets. Additional datasets may have not been categorized as "high value" datasets in the realm of the G7, but are of equal importance to meet the goals of collaboration, participation, and transparency for Germany's open data efforts. The additional datasets stem from 11 policy areas, such as the Federal Foreign Office, the Federal Ministry of Food and Agriculture, or the Federal Ministry for Economic Affairs and Energy. A quick query indicates that all 11 policy areas are represented on *GovData*. A more in-depth query reveals that all specified additional datasets have been uploaded to *GovData*.

A third measure to enforce the publication of datasets is the obligation of each higher federal authority to release at least two datasets by the end of the first quarter 2015 on *GovData*. The Federal Foreign Office, for instance, has uploaded two files. One of them is a list of state names. This list is available as a PDF (non-reusable), as an excel file (reusable), and as a CSV document (reusable). This example validates that government departments are abiding by their time schedule, and are meeting the commitments laid out by the national action plan, while integrating the principles laid out by the G7.

In sum, Germany is on track for incurring its second commitment, which seeks to release a wide variety of datasets. The growing amount of datasets available on *GovData* is remarkable, with new datasets uploaded on a daily basis. When *GovData* first launched its platform, it barely hosted 3500 data sets, mostly from readily available datasets from the Federal Agency for Cartography and Geodesy and the Federal Statistical Office. In February 2015, *GovData* reached its 10,000th

dataset.[23] In July 2015, the national portal soared above 15,000 datasets and documents. Committing federal agencies to publish at least two datasets is a significant move towards more open data in public administration. Moreover, it fosters a paradigm shift that encourages public administration to actively engage with open data, while bearing in mind the principles of open data. The remaining challenge lies in a more simplified search function for finding datasets at first attempt. It appears that the search engine on *GovData* reacts sensitively when an exact title is entered, and the subsequent "error message" is discouraging. Since a redesign of the website is already planned, these changes will certainly be incorporated.

2.5 *Commitment Three: Publishing the Data on a National Portal*

The third commitment of the national action plan aims to publish data on a national portal. There are two measures to meet this commitment: first, the federal portal *GovData* acts as a central open data portal for datasets from federal, state, and local government, while secondly, a unified metadata structure is provided. This commitment incorporates the G7 principle "usable by all," by fostering that all government levels upload datasets to a federal portal. Moreover, it enforces the release of as much data in as many usable formats. This commitment further integrates the principle of releasing data for improved governance, a principle that aims to share expertise and be transparent about data collection, standards, and publishing processes.

With *GovData*, the national action plan meets its third commitment to have an active national portal that serves as a central connecting portal for federal, state, and local level, as shown in Fig. 3. Open data initiatives are emerging at a promising speed on state level throughout Germany. On *GovData*, about one third of the datasets are directly from the federal level, while two thirds stem from state and municipal levels. In order to integrate datasets from one portal to another, a so-called harvesting-principle is required. Harvesting feeds readily accessible datasets from a local portal into the federal portal in a unified manner for re-use—seamlessly, automatically, and with little to no delay in time. Harvesting makes it possible to dock data from one portal to another. Moreover, when creating a national open data library, a common language that describes data must be disseminated. Metadata is the structure that ensures the semantic interoperability of datasets. The federal portal *GovData* published a guideline on how to go about its metadata structure in 2013.

In order to report on the progress of this commitment, a closer look at the interaction between federal, state, and local portals is required. To this end, this article presents two case studies. The first case examines the largest financial

[23] https://www.fokus.fraunhofer.de/e644d4801f446a2a

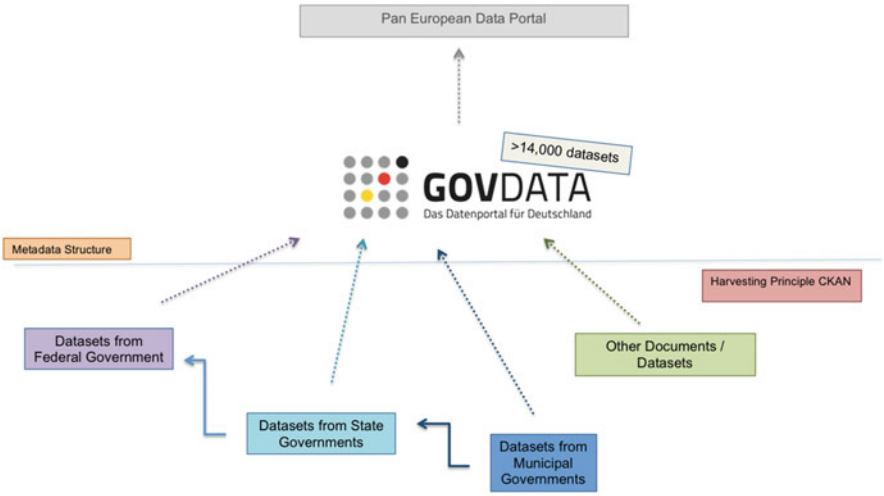


Fig. 3 How GovData interacts as the Federal Data Portal (author's own illustration)

contributor to *GovData*, the state of North Rhine-Westphalia (short: NRW). The second case examines the city of Bonn, a city that is located within North Rhine-Westphalia.

Case Study: Open.NRW

North-Rhine Westphalia is the largest contributor to *GovData*, shortly following the contributions of the Federal Government. The largest state in Germany, NRW is home to 17.614 million inhabitants. It is the largest conurbation in Europe, and most of its population lives in urban cities with more than 500,000 inhabitants.

2.6 Development of Open Data Policy in NRW

On 27 May 2014, the Open.NRW strategy of the state parliament was adopted (Open.NRW 2014). The strategy itself has evolved in a process of co-creation with the public in a series of workshops with representatives from Civil Society and the public sector throughout 2013 and 2014. Its main feature is that is seeks to address every aspect of Open Government, namely the goal of increasing government transparency as well as participation and collaboration between the citizenry and the public sector (e.g. Lathrop and Ruma 2010). Conceptually, it is based on the following three pillars: the first is the Open Data pillar, which aims to increase the transparency of government by actively publishing an array of data concerning life in North Rhine Westphalia. The second pillar aims to expand the involvement of citizens in the formulation of laws and policies using digital forms of public participation and online civic engagement. The third pillar seeks to bring innovative forms of distributed collaboration into government by exploring the use of online expert networks to crowd source expertise and thus to improve the quality and efficiency of decision-making.

The key challenges in NRW are the same as on the federal level: implementing reform of such magnitude requires patience and the cooperation and consent of key actors from multiple branches of the public sector. In order to coordinate the activities of the different government sectors and to consult on all aspects of the development of open government projects, the Open.NRW Office (Open.NRW Geschäftsstelle) was established under the auspices of the NRW Chief Information Officer (CIO) Hartmut Beuß. Its role is to provide the different ministries with expertise and to support them with the necessary means and resources to develop and implement new projects in the three thematic pillars. Its key responsibility is the development and maintenance of the open data platform in NRW, the Open.NRW Portal.[24] Thus, the Open.NRW Portal serves as the central open data hub in NRW currently providing more than 800 open datasets supplied by the 13 ministries of the government of North-Rhine Westphalia. At the same time, it ensures that available open data from the municipalities in NRW can be collected and supplied to the federal data portal, *GovData*. By relying on a similar data management system—CKAN—as GovData as well as most local open data initiatives, the Open.NRW portal ensures that its data can easily be shared via the CKAN API. Moreover, there are no compromises with regard to data openness available on the Open.NRW Portal. All datasets available in the Open.NRW portal conform to the ten principles of Open Government Data as put forth by the Sunlight Foundation in 2010.[25]

A central feature of the strategy adopted in NRW is the effort to keep key actors engaged in an ongoing conversation about the best way to proceed with the implementation of open government projects. For example, when the Open.NRW portal was launched (https://open.nrw) on 16 March 2015, a group of 100 expert stakeholders from public administration, civil society and the business community were invited to discuss the portal and the current state of the implementation of the Open.NRW strategy.[26] At the same time, the Open.NRW office coordinates the activities of numerous interministerial working groups in an effort to allow all engaged actors in the respective ministries to share information, best practices and thus to build a learning network structure that is able to maintain an effective consensus about the direction taken. Thus, Christian Dinnus, head of the Open.NRW office thus explained in an interview: "Especially in the beginning, the personal exchange was the most important." This approach yields remarkable success. Apart from the comparatively high number of datasets that has been made available within a short time on the Open.NRW Portal, the public has scrutinized two large-scale laws in 2015 alone in an online consultation process: first, the online consultation concerning the reform of regional public television (the

[24]The Open.NRW Portal is available at https://open.nrw/

[25]See https://sunlightfoundation.com/policy/documents/ten-open-data-principles/. Last accessed on September 18th 2015.

[26]See the documentation of the event at available at https://open.nrw/de/content/dialogwerkstatt-bringt-viel-feedback. Last accessed on August 19th 2015.

so-called 'WDR Law') and second, the online consultation of the new E-Government law for North-Rhine Westphalia.[27] Finally, a number of remarkably successful projects have been started as pilots: in order to improve safety at the working place, a highly successful expert platform has been launched that links experts in labor law with employees in the public and private sector.[28] Moreover, in an effort to crowd source expertise and the collection and processing of information, two recent web-based applications have been piloted that allow citizens to register with the public authorities areas in NRW that they deem worthy of benefiting from higher standards of environmental protection.[29] On the basis of these experiences and lessons, a new application is in development that extends their functionalities and improves their efficiency and effectiveness.

2.7 *The Open Data Exchange Between* GovData *and* Open.NRW

A key to the successful implementation of Open Government principles in NRW is successful cooperation between the state and the local level. In order to institutionalize effective ways to reach consensus, the CIO Hartmut Beuß has called for a working group of representatives of the major municipal associations—i.e. the German Association of Cities and Towns (DST), the Association of German Counties (DLT) and the Federation of German Cities and Communes (DStGB)—and representatives of the government of North-Rhine Westphalia to work out an Open Government Pact that stipulates a number of key goals and associated measures to improve the transparency and openness of governance within the state. True to the inclusive approach of the Open.NRW Strategy, the group, in a first step, devised a working paper and gathered public feedback in an online consultation process in order to enrich the paper with new ideas and approaches from civil society and the scientific community.[30] The next step will consist in distilling key inspirations from the public feedback in order to finalize an Open Government Pact that provides effective guidance for the both the NRW state government and its municipalities for the next 5 years.

The case study of *Open.NRW* shows that the open data portal is still at an early stage. The *Open.NRW* strategy states the political will to publish all government data in an 'open by default' manner, which in the same stride integrates the

[27]For the 'WDR Law' see https://wdrgesetz.nrw.de (Last accessed on August 19th 2015). For the E-Government Law see https://egovg.nrw.de (Last accessed on August 19th 2015).

[28]See the homepage of the Network at http://www.komnet.nrw.de/ (Last accessed on August 19th 2015).

[29]See http://alleen.naturschutzinformationen-nrw.de/ and http://www.altbaumfinder-nrw.de/ (Last accessed on August 19th 2015).

[30]See the homepage of the consultation process at https://open-pakt-gov.nrw.de/. Last accessed on August 20th 2015.

principle that data shall be usable by all (Open.NRW 2014). The principle of quantity and quality is indirectly a goal of *Open.NRW* as it aims to build a full catalogue of datasets, including datasets from the municipal level. Lastly, the principles of improving governance through the release of data and encouraging data for innovation lay at the fundament of the Open.NRW strategy that aims for innovative collaboration with its citizens. On a federal-to-state level, the open data portal *GovData* and *Open.NRW* successfully integrates the fundamental G7 principles.

Case Study: *OpenData.Bonn*

Located in North-Rhine Westphalia, Bonn was the capital of Germany from 1949 to 1990. Today, a multitude of government agencies still operate from Bonn, collecting a plethora of public information and data. *OpenData.Bonn* is the open data portal of the city of Bonn. Found at http://opendata.bonn.de/, *OpenData.Bonn* is an interesting case for evaluating the local-to-federal interaction process. Bonn is one of four municipalities in North-Rhine Westphalia that harvests its data on the federal portal GovData. Bonn also cooperates with the open data portal of NRW (https://open.nrw).

2.8 Development of Open Data Policy in Bonn

On 18 November 2013, Bonn's city council agreed on a set of open government data guidelines. Five months later, on 28 May 2014, the open data portal OpenData.Bonn.de was launched. Bonn is one of the first municipalities to implement an open data portal in Germany. The OpenData.Bonn strategy is built on the three pillars of transparency, collaboration, and participation, like *GovData* and *Open.NRW*. The strategy was agreed on 30 January 2014. In June 2014, *Open Data Bonn* was launched.

In an interview with Sven Hense from the office of *Open Data Bonn*, he notes, "the goal of open data is to involve citizens wherever possible—from political decision making processes to everyday requests". Since OpenData.Bonn's launch in May 2014, the portal has grown to 124 accessible datasets (on July 19 2015 at http://opendata.bonn.de/dataset). The majority of the datasets are accessible for immediate use and reuse, while one fifth of datasets are available in PDF format. All of *Open Data Bonn*'s datasets can be found on the federal portal, *GovData* as well as on the state portal of North-Rhine Westphalia.

The citizens of Bonn play an active role when it comes to placing public requests for improving their city with open data, the city's mobile app *Stadt Bonn* and the website *Anliegen.Bonn.de* (see Fig. 4). Requests include fixing a broken streetlight, the removal of graffiti, or reporting an owner-less bike or vehicle. Both *Stadt Bonn* and *Anliegen.Bonn.de* use the international standard client-to-server terminal *Open311*. The *Open311* terminal creates a so-called *georeport* (image), which automatically processes each request on the city council's server and visualizes it in real-time on a map. With more than 4000 completed requests, the city of Bonn has fostered an innovative service design and delivery that encourages citizens to

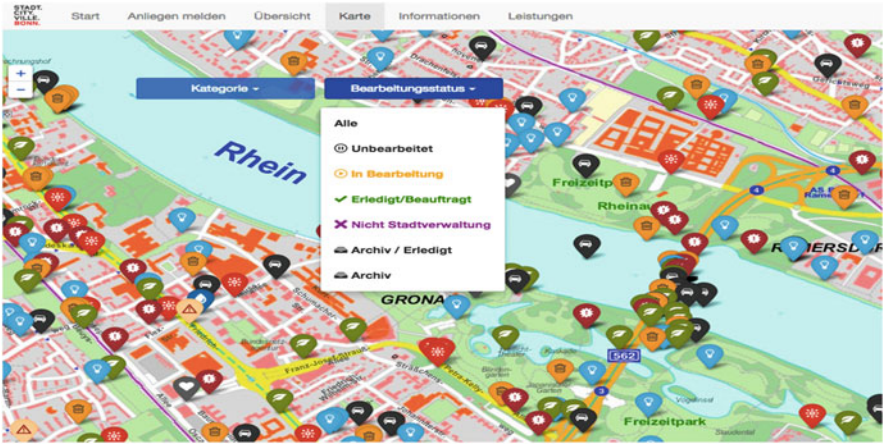


Fig. 4 Screenshot of Anliegen.Bonn.de (http://anliegen.bonn.de/)

participate and collaborate. The service is based on the free Open Source software "Mark-a-Spot" that provides "a fully responsive mobile and desktop tool for public civic issue reporting and crowd-mapping."[31] Thus far, Bonn is among a small number of cities in Germany to offer this service, and has offered to become a reference for other municipalities throughout Germany, as the potential capabilities for internal organization are very high.

Open data has fundamentally transformed the interaction between citizen and administration in the city of Bonn. Government administration itself profits from open data by increasing the effectiveness and efficiency. However, Sven Hense notes that there remain fundamental challenges for the municipality of Bonn. A challenge lies in the cultural change with public administration, which Hense notes may lead to "a loss of administrative ownership." The simple fact that a previously internal dataset is publicly published with color codification leads to an improvement of the quality of data, as codification has to be understandable for a large public. Sven Hense notes, "open data does not run on its own," which is critical to keep in mind.

In sum, the two case studies on *Open.NRW* and *Open Data Bonn* demonstrate that Germany has successfully initiated a process across all layers of government to publish administrative data from the local, state, and federal level on a national data portal, *GovData*. Cooperation with the federal portal has successfully fostered standardization of meta-data structures and enabled effective harvesting methods that link data portals across the administrative levels.

[31] See http://www.markaspot.de/en. Last accessed on September 18th 2015.

2.9 Commitment Four: Consultation, Engagement, and Experience-Sharing

The fourth commitment of Germany's national action plan is consultation, engagement, and experience-sharing. It aims to conduct regular dialogue with civil society, business, the media, and the research community. This commitment integrates the G7 principle of releasing data for improved governance. By engaging in a regular dialogue with all stakeholders, expertise can be shared, leading to increased transparence about data collection, standards, and publishing processes. Moreover, the commitment integrates the principle of releasing data for innovation. By conducting regular dialogue with stakeholders, the commitment consults with users and empowers future generations of innovators.

Several measures have been identified to incur this commitment. First, close involvement with data users must be sought. In preparation of the launch of *GovData* as well as *Open.NRW,* both initiatives saw an extensive consultation with several stakeholders. In the case of OpenData.Bonn, feedback is regularly sought on social media platforms like Twitter. Secondly, the national action plan encourages state and local commitment to the G8 principles. In the case studies *Open.NRW* and *Open Data Bonn*, the principles were not explicitly noted in their strategies, yet included the principles indirectly. In a third measure, the national action plan aims to release relevant data for innovative services. These include transport and mobility, renewable energy sources, climate change, demographic change, infrastructure, public revenues and expenditures. In a quick query, *GovData* provides datasets from these six policy areas in machine-readable format that are up-to-date. The fourth measure seeks to identify the demand of data on *GovData*. To this end, the Federal Ministry of the Interior launched the Open-Data-Action-Plan, a complex process integrating an online process to gather ideas for open data projects and a series of thematic workshops with representatives from Civil Society in order to specify these ideas in order to generate new initiatives.[32] The fifth measure aims to foster developer days and open data competitions. Germany plans to host its second code week in October 2015 that seeks to bring developers together. In a sixth measure, the national action plan seeks to promote open government data through public-community partnerships. Lastly, the goal of cooperating internationally plays a large role in meeting this commitment.

The final commitment is an ongoing process that seeks further cooperation with civil society and other stakeholders. In sum, Germany has fared reasonably well in meeting its commitments to integrate the G7 principles. For any nation-wide open data ecosystem to grow and fulfill its potential, it must continue to connect with open data portals on other layers, in particular the European level and persist in reaching out to committed actors from Civil Society.

[32]See https://www.open-data-aktionsplan.de. Last accessed on September 18th 2015.

3 Conclusion

> *The world is witnessing the growth of a global movement facilitated by technology (. . .) and fuelled by information. Open data sits at the heart of this global movement*.—G7 Open Data Charter 2013.

In 2013, the most powerful countries in the world adopted key principles for advancing the global open government movement. Germany adopted the five G7 principles by announcing four ambitious commitments in a national action plan. This commitment to a new paradigm of government openness saw the integration of core open government principles. Their implementation required political commitment, a shift away from old traditions, and a multidisciplinary management approach.

While the process of implementing open government principles was certainly accompanied by significant challenges, a novel institutional environment—such as the IT Planning Council—allowed for more effective coordination and thus paved the way for successfully putting the National Action Plan into effect. The IT-Planning Council played a crucial role by facilitating a working group of federal and state actors that launched the central data *GovData*. Thus, while the country's governance structure plays a substantial role, federalism offers a chance as well as a challenge: federalism in Germany allows individual states considerable leeway in implementing digital reform, which may be pivotal for being able to adapt to local circumstances. The interaction between federal and local level has shown that creating an infrastructure for open data that encourages more openness and transparency is a challenge in itself, but one that the government must focus on. Thus, in a federalist governance mode, coordinating the implementation of a policy bears its challenges as well as its opportunities. Integrating all three levels equally ultimately enhances the values of cooperative federalism, and can lead to further transparency, accountability, and economic growth.

Second, a key lesson to be drawn from Germany is the necessity of cooperation and an effective dialogue, both across all layers of government as well as between civil society and the public sector. Thus, the public criticism that emerged with the early launch of *GovData* could have been avoided by taking the widely accepted principles and standards of open government data more seriously.

Last but not least, continued efforts are necessary as well. The creation of a European open data portal has already begun to affect the national open data policy agenda. With a look to the implementation of Germany's open data commitment, the country aims to play an active role. A European open data portal strengthens the relationships amongst member-states and fosters accountability and transparency. Especially in light of financial constraints in Europe, an open data portal brings about digital advancement within public administration that seeks to empower citizens as well as public administrations, in order to create a long-lasting value for all.

In 2014, the G20 largest industrial economies followed a pledge to advance open data as a tool against corruption, and the UN recognized the need for a "Data

Revolution" (http://www.undatarevolution.org/) to achieve global development goals. Information has been considered "the lifeblood of a robust democracy and productive economy," (McMillan 2013) whereas the tools, resources, and responsibility for managing public information lie in the hands of government. Germany's policymakers are actively supporting this transformative change in order for all to be included in the digital world. Because ultimately, governments that embrace digital transformations will make better policies, better decisions, and serve their public better.

Works Cited

A Peaceful Europe—the Beginnings of Cooperation. *EUROPA*. Web. 31 July 2015. http://europa.eu/about-eu/eu-history/1945-1959/index_en.htm

Accenture. *Recherche zum Umsetzungsstand Open Data Portale der Bundesländer*. March 2015.

Angela Merkel. *Angela Merkel*. Web. 31 July 2015. http://www.angela-merkel.de/pers%C3%B6nlich.html

Bauer, F., & Kaltenböck, M. (2012). *Linked open data: The essentials: A quick start guide for decision makers*. Wien: Ed. Mono/monochrom.

Beyer, Jan-Ole. (2014, March 20). Federal Ministry of the Interior. Telephone Interview.

Bonn Startet Open Data Portal. (2015, July 31). *Behoerdenspiegelde RSS*. Web. http://www.behoerden-spiegel.de/icc/Internet/sub/97a/97a50705-2cbb-5641-d8c9-3b677b988f2e,,,aaaaaaaa-aaaa-aaaa-bbbb-000000000011&uMen=f6810068-1671-1111-be59-264f59a5fb42&page=16&pagesize=10&startmon=06&startyear=2014&attr=.htm

CDU. Coalition Contract between CDU, CSU and SPD. https://www.cdu.de/sites/default/files/media/dokumente/koalitionsvertrag.pdf

Central Intelligence Agency. (2015, July 31). Central Intelligence Agency, Web. https://www.cia.gov/library/publications/the-world-factbook/rankorder/2078rank.html

DESI by Components. (2015, July 31). *Digital Agenda Scoreboard*. Web. https://digital-agenda-data.eu/charts/desi-components#chart={"indicator":"DESI_5_DPS","breakdown-group":"DESI_TOTALS","unit-measure":"DESI_SCORE","time-period":"2015"}

Eurostat—your key to European statistics. European Commission. Accessed July 31, 2015, from http://ec.europa.eu/eurostat/web/information-society/data/database

European Commission (2015, June 1). Web. 23 August 2016.

Federal Cabinet. (2014). Digital Agenda 2014-2017. Berlin: Federal Cabinet. Retrieved April 3, 2015, from http://www.digitale-agenda.de/Content/DE/_Anlagen/2014/08/2014-08-20-digitale-agenda- engl.pdf?__blob=publicationFile&v=6

Federal CIOs Want, but Fear, Digital Transformation. *FierceCIO*. Web. 31 July 2015. http://www.fiercecio.com/story/federal-cios-want-fear-digital-transformation/2015-02-02

Federal Ministry of the Interior. *BundOnline 2005—Umsetzungsplan für die eGovernment Initiative*. http://www.bmi.bund.de/SharedDocs/Downloads/DE/Themen/OED_Verwaltung/Geoinformation/BundOnline_2005_-_Die_Id_17060_de.pdf?__blob=publicationFile

Fraunhofer FOKUS. *Fraunhofer FOKUS*. Web. 31 July 2015. https://www.fokus.fraunhofer.de/e644d4801f446a2a

From OpenGovData to GovData: Why Germany Needs the OGP (and the OGP Needs Germany). (n.d.). *Open Government Partnership*. N.p., Web. 31 July 2015. http://www.opengovpartnership.org/blog/maria-schroder-and-christian-heise/2013/02/15/opengovdata-govdata-why-germany-needs-ogp-and-ogp

G8 Open Data Charter and Technical Annex. *GOV.UK*. Web. 31 July 2015. https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex

Germany. *Germany*, Web. 31 July 2015. http://data.worldbank.org/country/germany

Information Society Statistics—Eurostat. (2013). *Information Society Statistics—Households and individuals*.

Informationsfreiheitsgesetze in Den Bundesländern. Transparency International Deutschland. Web. 16 July 2015. http://www.it-planungsrat.de/DE/NEGS/NEGS.html

IT Planungsrat. http%3A%2F%2F.www.it-planungsrat.de%2FSharedDocs%2FDownloads%2FDE%2FStrategie%2FNational_E-Government_Strategy.pdf%3F__blob%3DpublicationFile

Joint Statement: Finally Setting the Standard to "open"!. *Not Your GovData*. Web. 31 July 2015. http://not-your-govdata.de/en/

Khan, S., & Foti, J. (2015, May). *Aligning demand and supply for better governance*. Independent Reporting Mechanism: Open Government Partnership.

Lathrop, D., & Ruma, L. (Eds.). (2010). Open government. Collaboration, transparency, and participation in practice. Cambridge: O'Reilly (CC BY-NC-ND 3.0).

McMillan, J.: Open public sector information: from principles to practice. Office of the Australian Information Commissioner. 2013. Accessed July 31, 2015, from http://apo.org.au/research/open-public-sector-information-principles-practice

Navigation Und Service. *IT Planungsrat*. Web. 31 July 2015. http://www.it-planungsrat.de/DE/ITPlanungsrat/itPlanungsrat_node.html

Navigation Und Service. *IT Planungsrat*. Web. 31 July 2015. http://www.it-planungsrat.de/DE/Projekte/Steuerungsprojekte/Steuerungsprojekte_NEGS/OpenGovernment/opengovernment.html?nn=1308406

Navigation Und Service. *IT-Beauftragte Der Bundesregierung*. Web. 31 July 2015. http://www.cio.bund.de/Web/DE/Politische-Aufgaben/Rat-der-IT-Beauftragten/rat_d_it_beauftragten_node.html

Open Data Barometer Data. (2013, October 23). *The Open Data Institute*. Web. 13 July 2015. http://theodi.github.io/open-data-barometer-viz/

Open Government Data Deutschland. Germany. Ministry of Interior, 27 July 2012. Web.

Open.NRW. (2014). *Die Open.NRW-Strategie*. Düsseldorf: Ministerium für Inneres und Kommunales des Landes Nordrhein-Westfalen. Part I available at https://open.nrw/sites/default/files/asset/document/open_nrw_t1_web.pdf. Part II available at https://open.nrw/sites/default/files/asset/document/open_nrw_t2_web_0.pdf

Scharpf, F. W. (1988). The joint-decision trap: Lessons from German Federalism and European Integration. *Public Administration, 66*, 239–78.

Service-Navigation. *German Bundestag*. Web. 31 July 2015. https://www.bundestag.de/htdocs_e/bundestag/function/legislation

Top 10 Most Competitive Economies in Europe. *Top 10 Most Competitive Economies in Europe*. Web. 31 July 2015. http://www.weforum.org/content/top-10-most-competitive-economies-europe-2

Transparency and Open Government. *The White House*. The White House, Web. 31 July 2015. https://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment

United Nations e-Government Survey. United Nations Public Administration Country Studies. Web. 31. Jul 2015. Retrieved at http://unpan3.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2014

Verwaltungsvereinbarung GovData Tritt in Kraft. *GovData.de*. Web. 31 July 2015. https://www.govdata.de/neues/-/blogs/verwaltungsvereinbarung-govdata-tritt-in-kraft

Wandel Erfordert Kooperation Zwischen IT Und Controlling. *Die IT-Chefs Der Bundesländer: Klaus Vitt, Designierter Bundes-CIO*. Web. 31 July 2015. http://www.cio.de/g/die-it-chefs-der-bundeslaender,10567

Wirtschaftsleistung Der Europäischen Union (EU). *Wirtschaftsleistung Der Europäischen Union (EU)*. Web. 31 July 2015. http://www.crp-infotec.de/02euro/wirtschaft/wirtschaftskraft.html

Worldbank. http://data.worldbank.org/country/germany

Your Key to European Statistics. *Database*. Web. 31 July 2015. http://ec.europa.eu/eurostat/web/information-society/data/database

Erratum to: Digital Government

Svenja Falk, Andrea Römmele, and Michael Silverman

S. Falk et al. (eds.), *Digital Government*,
DOI 10.1007/978-3-319-38795-6

DOI 10.1007/978-3-319-38795-6_10

In the Copyright page IV and the Chapter Opening page of Chapter 1, Dr. Michael Silverman's affiliation reads as:

Michael Silverman
School of International and Public Affairs
Columbia University
Brooklyn, NY, USA

This should read as:
Michael Silverman
School of International and Public Affairs
Columbia University
New York, NY, USA

The updated online version of the original book can be found at
http://dx.doi.org/10.1007/978-3-319-38795-6