

Optimizing Online Government in Canada

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Abstract

Online technologies are changing rapidly, and internet users are coming to expect personalized and high-quality online services. Citizens are coming to expect higher-quality online services from their governments, presenting a challenge to public service departments who historically have not adopted new technologies quickly. Fortunately, developments in the open source and open data fields provide an opportunity for governments to jumpstart online innovation efforts. This paper explores several strategies for doing so, and details the recent success of gov.uk, a UK project at the forefront of online government innovation. These changes in approach to software development and procurement – and corresponding changes in culture and recruitment – are framed in the context of the Canadian federal public service's modernization effort, *Blueprint 2020*.

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Introduction

The online world changes at an extraordinary pace. A decade ago, broadband Internet was only beginning to reach many Canadian homes; the very first Blackberry smartphone had only just been released; touchscreen phones and tablets did not exist, and the social media revolution was not even in its infancy. Throughout the past ten years, these technological innovations have radically altered many aspects of our lives, our businesses, and our societies. Instant access to email connects citizens and businesspeople from across the world in real time; reporting via social media has altered the news media landscape and shed light on social revolutions and events even in closed societies. The creative design industry has exploded, as young experts able to bridge the worlds of technology, psychology, and art have created new devices, software and interfaces brilliantly in tune with the needs of everyday users. Large software companies fiercely compete for the brightest design minds, in order to win new users with online technologies that are easier than ever to use.

Meanwhile, the world of open-source software has matured. Software built by volunteers and small companies – building on each others’ best technologies – has come to rival the programs of the world’s largest commercial firms. And, the decreasing cost of storing and processing data has opened the door to a revolution in understanding the world we live in.

Where are governments in the midst of this online revolution? And, where could they be? That question forms the basis for this paper, as it explores the directions that the Canadian federal government should pursue in order to maximize the value-for-money of its online government efforts.

Provincial and national governments in North America and Europe adopted the Internet early on as an informational tool. Canada’s federal government, in particular, was an early adopter, and was recognized for its effort to bring every federal department online between 2001

and 2005¹. However, despite early successes, the Canadian federal government's online approach has been eclipsed by more recent online government efforts in other parts of the world. Largely, the online government efforts undertaken by Canada's federal public service have plateaued, or stayed still, while profound transformations in online, mobile, and social engagement technology took place.

At present, however, the Canadian federal public service is beginning a major effort to modernize the way it operates. The *Blueprint 2020* initiative is an effort to adapt the public service to the changing modern world. One of the drivers of this effort is the accelerating pace of technological change, which has heightened citizens' expectations of the services delivered by governments. For both external services (delivered to the public) and internal systems (used by public servants themselves), there is a tremendous potential that transformed online government services could yield – both to catch up to the efforts of other public services internationally, and to create innovative new ways of serving the public.

With that in mind, this paper will focus on the “how” of achieving modern online government: specific approaches that will enable government departments to develop valuable services more quickly and with lower costs than in the past. The possible services themselves – the “what” and the “why” of online government efforts – are not the focus of this paper. Instead, it concentrates on information technology (IT) project management within Canada's federal public sector, and the changes in approach that are likely to transform how such projects are undertaken. The three broad changes are: a focus on data and APIs as effective foundations; a stronger emphasis on open-source software; and a move towards iterative software development and related changes in procurement and departmental culture. The paper's argument – based on recent examples from the United Kingdom and elsewhere – is that these changes will increase the effectiveness of online government efforts while reducing their costs. The outcome is a public

¹ Brown, David. 2007. “The Government of Canada: Government On-Line and Citizen-Centred Service.” In *Digital State at the Leading Edge*, ed. Sandford Borins et al. University of Toronto Press, pp. 37–40.

service that is more nimble, can keep pace with the latest technological changes, and provides even higher-quality services to Canadians as a result.

Background

Modernizing the Public Service

On June 7, 2013, Wayne Wouters, the Clerk of the Privy Council and Canada's top civil servant, announced the launch of Blueprint 2020, a modernization effort for Canada's federal public service. His introductory message calls upon public servants to "innovate and meet new standards of excellence to address the demands of the modern world"². As his introduction states:

"We need to ask ourselves: Where does the Public Service need to be in five to ten years? How do we have to change to get there? What best practices should we adopt to help us do our job better?"³

The mission of the modernization effort, writ large, is excellence in public service. The delivery and design of policies, programs, and services, at a high-performance level, requires "engagement, collaboration, effective teamwork and professional development"⁴. These values are put into the context of a number of changes that are affecting how the public service operates.

The "drivers of change" listed in the Blueprint 2020 document all relate closely to the changing modern world. Increasing globalization and interconnectedness affects the relationship between government actors and the outside world, and the linkages between federal departments with various responsibilities. Accelerated changes in technology have, as the report states,

² Clerk of the Privy Council. 2013. "Blueprint 2020 – Getting Started – Getting Your Views." pp. 3. <http://clerk.gc.ca/eng/feature.asp?pageId=349>

³ Ibid.

⁴ Ibid.

“revolutionized” how everyday life and business is conducted⁵. Demographic changes have brought calls for more responsive, customized services for segments of the population with different needs and interests.

Citizens today expect more openness and transparency from the government, and efficient results. Public servants, on their part, expect to be able to work more flexibly and efficiently as they serve the government. All of these require changes in the public service’s mode of operating.

Why e-Government

Software and electronic systems have played an important role in the delivery of government services, since the early use of business information systems. The rise of the internet has substantially changed how governments and the public they serve interact, and new online innovations continue to present challenges and opportunities for public services. For governments, software systems play an important role in the following: disseminating information, providing services, and engaging citizens. As technology continues to develop, citizens will expect their governments to adapt to new methods of interacting and communicating in kind.

Providing information to citizens is an essential role performed by government. The internet is an optimal means to do so, as information can be relayed easily and inexpensively, and updated quickly as details change. Websites allow government departments to communicate information about their responsibilities and programs; perhaps more importantly, websites also allow departments to communicate broader information about the environment, the economy, or society as a whole as a service to citizens. Government information helps facilitate markets, protect customers, and assist citizens in need⁶ – from weather information, to geographic maps,

⁵ Clerk of the Privy Council, 2013. pp. 4.

⁶ Eggers, William D. 2007. *Government 2.0: Using Technology to Improve Education, Cut Red Tape, Reduce Gridlock, and Enhance Democracy*. Rowman & Littlefield. pp. 19.

to the contact information of embassies for citizens travelling abroad. Online systems allow governments to deliver this information instantaneously.

Online systems also allow governments to provide interactive services to the public, often much more quickly and inexpensively than through telephone and in-person channels. Various governments have developed a range of online services: renewing drivers' licenses and government identification cards, submitting immigration and visa applications, or registering new businesses. The development of online services often helps governments streamline or simplify the processes citizens must undergo, making life easier for both citizens and public servants in the process. This is particularly the case for services that involve more than one government agency, or more than one level of government – a frequent source of confusion for citizens⁷. Creating single point of service websites, for a particular need or subject area, can help citizens navigate complex processes, and receive the services they need more easily.

Well-designed internal software systems can also make public servants working within government departments more productive and effective. Online systems allow public servants to communicate and share important information across departmental barriers – with counterparts working in a different building or across the country⁸. Information management systems, when well implemented, can also be an essential means of transferring acquired knowledge from outgoing to incoming employees.

Finally, online systems allow governments and the public they serve to communicate and interact much more closely. The rise of social media systems in particular open the door to new ways for governments to engage their citizens⁹, from informally assessing opinions on government activities, to formally consulting with the public online on policy proposals, to yet more significant means of involving the public in the decision-making processes of government.

⁷ Eggers, 2007. pp. 16.

⁸ Ibid., pp. 38.

⁹ Harrison, Teresa M. et al. 2012. "Open government and e-government: Democratic challenges from a public value perspective." *Information Polity* 17(2). pp. 85.

Online technology can be adopted as the infrastructure for a more open approach to government. For many governments around the world, this is promising but uncharted territory. More significant “e-democracy” efforts – official petitions, commentary on proposed legislation, and more – can bring into question the often-delicate relationship between public service departments and political leaders¹⁰. Although navigating this relationship may become more challenging for government departments, the possibility of interacting more closely with the public is full of opportunities – and may be something the public is coming to expect, whether governments are prepared or not.

Throughout the range of government work, technology plays an important role. As it changes – particularly rapidly, in the case of online software systems – governments must adapt with it, in order to work as effectively as possible and in order to remain in tune with a rapidly changing society. By investing in new and innovative systems, governments are often able to improve the speed and effectiveness at which they deliver services – to a public with growing expectations. Modern online systems provide governments with the option of developing customizable and choice-based services, personalized for the needs of individual users¹¹. The outcome is a streamlined and more positive citizen experience.

Practitioners in the software-in-government field use a variety of terms to describe the topic: “e-Government”, for the use of electronic systems by governments¹²; “online government”, for services and information delivered to the public via the internet; or “networked government”¹³, often used to describe both technology-enabled government as well as efforts to connect government actors with each other, across departments, or with other related actors and organizations. This paper focuses primarily on online systems, and so will generally use “online

¹⁰ Harrison et al., 2012. pp. 88.

¹¹ Eggers, 2007. pp. 21-22.

¹² Angelopoulos, Spyros et al. 2010. “Emerging Barriers in E-Government Implementation.” In *Electronic Government*, Lecture Notes in Computer Science, eds. Maria A. Wimmer et al. Springer Berlin Heidelberg, pp. 216. http://link.springer.com/chapter/10.1007/978-3-642-14799-9_19

¹³ Eggers, William D., and Stephen Goldsmith. 2003. “Networked government.” *Government Executive* 35(7). pp. 33.

government”. It also refers to government information technology (“government IT”) when describing internal and non-online systems. Although the term “e-government” was of particular importance as electronic software systems were being introduced to governments, these have now become the norm rather than a specialized case, and so this paper avoids the use of that term. As will be explored in detail below, the most innovative governments today are moving away from specialized, government-specific systems – and towards new systems used by companies and fast-moving organizations alike.

Although software systems are often credited with improving services and lowering costs, they are not guaranteed to always have such positive outcomes. Governments in particular often struggle with the creation or implementation of software systems, and there are frequent cases of failed government IT projects – where despite large financial investments or expensive contracts to software vendors, systems do not work as expected, or contain software errors that make them unreliable and frustrating for public servants to use. An additional challenge for governments today is that many of their early IT systems are becoming obsolete and must be replaced – but that the information contained in these “legacy” systems cannot be easily moved to a new system, or to a solution from a different software vendor. More broadly, technology evolves very rapidly; in many cases, government policies for software development and procurement have not kept pace.

The following sections of this paper explore some proposed strategies for addressing these challenges, for governments to consider as they update their software systems either through in-house software development, or external contracting and procurement. They are: a focus on data and APIs, an emphasis on open source software, and a transition towards iterative software development instead of complex, procured software packages. Changes in the software field have made new approaches to online and software development possible, and governments that can adapt in kind are more likely to develop more innovative online services – and avoid expensive failures along the way.

Building solid foundations: data and APIs

When starting an e-government project, it can often be unclear what the first steps are. Project leaders may have a particular vision for what an initiative should do, what it should look like, who the target audience is and what the expected reach of the project should be. From here, managers and project staff develop a plan as well as visuals for the project, and set out gathering requirements and completing the required approvals¹⁴. Managers will then assemble contracts for outside developers, or consult with in-house development teams, to create a website or a software tool as similar as possible to that envisioned by the project leaders.

This approach – starting with an intended outcome and perhaps a set of visuals – is intuitive, and similar to the methods by which non-IT government projects are completed: here is the plan, to be built by in-house teams or outside contractors. For the construction of a new roadway or office building, the traditional approach makes sense. But within the e-government field, there are innovations taking place that are the result of a very different approach.

The change is in the fundamental approach to e-government efforts: an emphasis on the *substance* of the information or service being provided, rather than the software interface. Rather than a focus on the vision and visuals of a specific project, innovative leaders ask: what is the *information* behind the scenes, and how can it be delivered to the public as widely and easily as possible? Opening that data, without restriction, is nothing short of a revolution in how e-government services are delivered to the public.

Open data and the public sector

Governments and public institutions are among the largest collectors and generators of information, across a wide variety of fields¹⁵. Governments collect and provide geographic data,

¹⁴ Angelopoulos et al, 2010. pp. 219.

¹⁵ Janssen, Katleen. 2011. “The influence of the PSI directive on open government data: An overview of recent developments.” *Government Information Quarterly* 28(4). pp. 446.

tourist information, statistical and census data, weather updates, economic indicators, health and crime data, and more. Data is essential for the development of public policy and effective services within government¹⁶, but it also acts as an important resource for everyday citizens, companies, and organizations.

Traditionally, most data collected by governments was held and used internally, and not distributed to the public. The general exceptions were sets of data with commercial value (census information, or directories of postal codes) which were sold to companies and research groups. Freedom of information laws, enacted throughout North America and Europe beginning in the 1980s, opened the door for greater public access to other realms of government information¹⁷.

Since the early 2000s, a growing movement calls upon governments to publish the information they gather openly, and in easily-reusable basic formats. The “open data” movement argues that publicly publishing government data – and allowing citizens to reuse it in new ways – can transform the relationship between governments and their citizens:

“Opening up government data enables the citizens to learn about the activities of their government, to hold their government accountable for its actions and its spending and to participate in the political process. In addition, public bodies hold a large number of data sets that may play a crucial role in innovation through the development of new applications, products and services, either by the commercial sector or by non-profit initiatives.”¹⁸

As public enthusiasm for open data has grown, governments have struggled to understand what, exactly, open data is. Proponents emphasize that, to be considered open data, information released by governments must be in a format where it can be re-used by citizens, companies, and organizations – and that they must also be given explicit permission to do so. The Open

¹⁶ Janssen, 2011. pp. 446.

¹⁷ Ibid., pp. 453.

¹⁸ Ibid., pp. 446.

Knowledge Foundation, the international non-profit body that provides technical resources to support open data efforts, defines open data as follows:

“A piece of data or content is open if anyone is free to use, reuse, and redistribute it — subject only, at most, to the requirement to attribute and/or share-alike.”¹⁹

The latter optional condition, “share-alike”, is the requirement that others reusing the data in conjunction with other content must also share the new content openly in kind.

Using government-provided open data, then, citizens have been able to create new online services: real-time traffic information²⁰, public transit planning software, geographic visualizations of education and health indicators. By building on sets of government information, citizens themselves are able to build unique new services and tools that benefit the public good.

There are, however, a number of barriers that have challenged governments’ efforts to publish open data. The foremost is limitations in the quality or consistency of data, particularly in large data sets. “Big data is messy,” explains Edd Dumbill²¹. Data experts report that ‘cleaning up’ data sets – removing inconsistent entries, or properly formatting related sets – requires considerably more effort than any other step in data analysis or publishing²². As David Eaves points out, different branches of a government similarly often struggle to coordinate and share data among themselves:

“...the capacity of a government to do open data may be a pretty good proxy for their ability to share information and coordinate across different departments. If your government can’t do open data in a relatively quick time period, it may mean they simply don’t have the infrastructure in place to share data internally all that effectively either.”²³

¹⁹ Open Knowledge Foundation. “Open Definition.” <http://opendefinition.org/>

²⁰ Janssen, 2011. pp. 446.

²¹ Dumbill, Edd. 2012. “What is big data?” <http://strata.oreilly.com/2012/01/what-is-big-data.html>

²² Ibid.

²³ Eaves, David. 2011. “It’s the icing, not the cake: key lesson on open data for governments.” *eaves.ca*. <http://eaves.ca/2011/07/12/its-the-icing-not-the-cake-key-lesson-on-open-data-for-governments/>

Before government departments can successfully achieve open data efforts, they must become able to produce high-quality, reusable data internally.

Uncertainty surrounding the licensing of government data – permission to re-use data, and the conditions under which one could do so – also complicate open data efforts. Government departments are unaccustomed to the large-scale reuse of their data championed by the open data movement²⁴. The reuse of government data by commercial ventures is yet more controversial. Some government departments – statistical agencies, in particular – have historically relied on the sale of data as a source of income²⁵. Moreover, there are also political risks involved in releasing data sets that frame governments in an unflattering light – poverty or correctional statistics, for example²⁶. Governments that embrace open data principles are expected to release information indiscriminately of whether it makes the government look good or bad – but this requires a strong commitment by both public servants and political leaders, and makes understandable the traditional tendency of government departments to operate in “obscurity, if not secrecy”²⁷.

“Government as a platform”

The reuse of government data by the public is part of a much larger transformation of the relationship between citizens and governments, brought on by technological change. Governments are responding to this change by investing in social media and other technologies that allow them to connect and communicate more quickly and directly with citizens. Open data opens the door to a more profound change, to what technology publisher Tim O’Reilly terms “government as a platform”²⁸: where governments are not just providers of services, but enabling agents that allow citizens to build useful services for each other.

²⁴ Janssen, 2011. pp. 453.

²⁵ Martin, Chris. 2013. “Understanding Barriers to Open Government Data.” *Open Knowledge Foundation Blog*. <http://blog.okfn.org/2013/06/26/understanding-barriers-to-open-government-data/>

²⁶ Eggers, 2007. pp. 128.

²⁷ McDermott, Patrice. 2010. “Building open government.” *Government Information Quarterly* 27(4). pp. 402.

²⁸ O’Reilly, Tim. 2011. “Government as a Platform.” *Innovations: Technology, Governance, Globalization* 6(1). pp. 13.

The traditional model of government, O'Reilly suggests, could be framed as a vending machine²⁹: citizens pay taxes, and in turn are provided with services. The options available are quite firmly limited to those 'in the vending machine'. Modern online technology, however, has the potential to change this model significantly:

“Citizens are connected like never before and have the skill sets and passion to solve problems affecting them locally as well as nationally. Government information and services can be provided to citizens where and when they need them. Citizens are empowered to spark the innovation that will result in an improved approach to governance. In this model, government is a convener and an enabler rather than the first mover of civic action.”³⁰

The essential idea that underlies this model is the 'platform': the infrastructure and information on which ideas and services are built. Within the computing field, the most dramatic innovations of each era were the frameworks on which other things could be built: the creation of personal computers, for example, created an ecosystem on which a whole range of software could be built – by many different companies. The internet allowed anyone to publish web pages – the infrastructure for almost limitless sharing of ideas. Personal computers and the internet both succeeded because they became platforms on which a wide range of new tools and ideas could be created.

Likewise, smartphone application frameworks – Apple's iOS and Google's Android as the most visible examples – led to the creation of large communities of developers who create new software for each framework³¹. Previous smartphone developers – and Apple, initially – only allowed a limited set of internal and external software programs to run on their phones. By instead allowing software developers to easily create programs on top of their smartphone

²⁹ O'Reilly, 2011. pp. 15.

³⁰ Ibid., 14.

³¹ Ibid., 15.

platforms, the two companies fostered the creation of an entirely new software industry, and transformed the idea of a smartphone along the way.

The platform concept applies to many existing government endeavours, where governments create the infrastructure that *enables* citizens to accomplish the tasks they decide to pursue. In the U.S. context, O'Reilly points to the interstate highway system, as a platform built by government – but used by the factories, farms, and businesses that connect to it³². In Canada, the early national railway played a similar (and essential) economy-enabling role. Weather-prediction systems and GPS satellites similarly benefit citizens through a combination of underlying government infrastructure, and private investment built upon it. By providing the platform, the government created an environment full of possibilities for private sector investment³³.

Similarly, with open data – reusable government information – a much wider range of the work done by governments can become a platform for innovation by companies and citizens. Rather than publishing information in a single, non-reusable format, if governments provide valuable data about society and allow it to be reused, this could spark the creation of an ecosystem of applications built by citizens for each other, on par with the myriad of applications created for smartphone platforms. For government information, this is a new and significant change. Citizens benefit from the range of services created by individuals and companies from government data, and the cost to governments themselves is fairly minimal. As O'Reilly asks,

“How does government become an open platform that allows people inside and outside government to innovate? How do you design a system in which all of the outcomes aren't specified beforehand, but instead evolve through interactions between government and its citizens, as a service provider enabling its user community?”³⁴

³² O'Reilly, 2011. pp. 16.

³³ Ibid.

³⁴ Ibid., 15.

This is a distinctly different philosophy towards the use of government data, but it makes a compelling argument: that opening up data for reuse will benefit citizens in new and unexpected ways.

Technical implications

What does this mean for IT project managers within the government? Primarily, that carefully identifying the data required by an e-government project should be a very early step. For informational projects (websites to communicate, for example, regulatory information, or databases of statistical data), this data should be reviewed for errors and made available in non-proprietary formats – ideally before the project even begins.

Secondly, IT project managers should ensure that this data is available through Application Programming Interfaces, or APIs. APIs are software elements that allow one application (a computer program or website) to interact directly and automatically with another. ‘Web services,’ APIs that connect web servers, are a popular example. By using APIs, a software program can request data from another source in real time: for example, a transit planning smartphone application that automatically ‘pulls’ updated bus schedules from the transit agency’s computer systems³⁵. In this case, the transit agency’s servers provide an API that smartphone applications can connect to – and receive information in a standardized, consistent, and reusable format. APIs allow software developers to create new interfaces for the same set of information, making the information potentially much more useful in the process. By making information available through APIs, governments maximize the reusability of the information, and increase the benefits to citizens in the process.

³⁵ Roche, Kelly. 2012. “Ottawa developer sending OC Transpo app on the road.” *Ottawa Sun*. <http://www.ottawasun.com/2012/12/02/ottawa-developer-sending-oc-transpo-app--on-the-road>

In Canada, a number of federal government departments had begun open data efforts several years ago, particularly Natural Resources Canada³⁶. A pilot federal government -wide open data program was started in March of 2011, and on June 18, 2013, the federal government prominently announced the relaunch of data.gc.ca, its open data portal, in conjunction with similar announcements by other G8 governments³⁷. The site consolidates sets of open data from across federal government departments, and provides access via APIs to developers hoping to integrate this data with their own systems. Equally importantly, it includes a significantly-revised license that permits unrestricted commercial and non-commercial reuse of the data³⁸. The June announcement also declared Canada's commitment to the international Open Data Charter, which commits the government to making data open 'by default'. The principles of the charter – “Quality and Quantity, Useable by All, Releasing Data for Improved Governance, and Releasing Data for Innovation” – set a promising direction for federal open data efforts in Canada³⁹. Reaching these goals will depend on how effectively departments can identify, clean up, and publish the various sets of data that they are responsible for.

Open source and governments

The open data movement is, in many ways, a philosophical descendent of the open source movement within the computer programming world. Open source software harkens back to the earliest days of hobbyist computer programming, when programmers wrote computer code and shared it freely in order to learn from each other. As programs were commercialized throughout the 1970s and 80s, this approach fell by the wayside – only to be reinvigorated as the formal open

³⁶ Natural Resources Canada, Government of Canada. 2012. “Geomatics Achievements in Action.” *Natural Resources Canada*. <http://www.nrcan.gc.ca/media-room/news-release/2012/59a/6213>

³⁷ “Federal open data portal revamp aims to encourage apps.” 2013. *CBC News*. <http://www.cbc.ca/news/technology/story/2013/06/18/technology-g8-open-data-charter.html>

³⁸ Ibid.

³⁹ Eaves, David. 2013. “The Real News Story about the Relaunch of data.gc.ca.” *eaves.ca*. <http://eaves.ca/2013/06/19/the-real-story-about-the-relaunch-of-data-gc-ca/>

source movement by the programming enthusiasts who created Linux, the Apache web server software, and other programs, beginning in the early 1990s⁴⁰.

What is open source? ‘Source’ refers to the source code of a software program – the programming instructions that define a program and how it works. This is the behind-the-scenes matter that makes up a program – rather than, for example, the data that a user might input into it⁴¹. ‘Open source’ indicates that these programming instructions can be viewed, modified and redistributed. Users can, for example, ‘tweak’ the code of a program in order to make it work exactly how they would like. Equally importantly, other programmers can take an open source program, and combine it with other programs or new code in order to quickly create new and innovative software⁴². Formally, open source software can be defined as:

“a model of computer software development where the source code is available for programmers to view, read, modify and re-distribute without the property right restrictions of proprietary software. This model allows constant innovation by individuals who may be geographically widely distributed. The resulting Open Source programs may be available free of charge, although depending on licensing arrangements this does not always hold true.”⁴³

In one sense, the existence of open source software is “paradoxical”⁴⁴. Volunteer programmers, working together and building off previous open source programs, have created software packages that are free, widely used, and that are considered of equal or higher quality than

⁴⁰ Bessen, James E. 2005. *Open Source Software: Free Provision Of Complex Public Goods*. Rochester, NY: Social Science Research Network. SSRN Scholarly Paper. <http://papers.ssrn.com/abstract=588763>

⁴¹ Burton, Matthew. 2012. “The Consumer Financial Protection Bureau shares code built for the people with the people.” *O’Reilly Radar*. <http://radar.oreilly.com/2012/04/cfpb-government-open-source-software.html>

⁴² The conditions under which other programmers can reuse an open source program depends on the licensing agreement. Many of the most popular open source licenses specify that the program in question can be reused within new programs, as long as those new programs are also released as open source – much like the “share-alike” condition for open data sets.

⁴³ Waring and Maddocks, 2005. pp. 412.

⁴⁴ Bessen, 2005. pp. 1.

software produced by commercial firms⁴⁵. This is surprising to some observers, who would expect that without the prospect of financial returns, programmers would not be motivated to invest the time and effort to produce free software⁴⁶. However, open source programmers benefit by being able to build programs using already-existing high quality code – making it easier to create complex new programs quickly. By contributing their own new code as open source, programmers also tend to gain a high reputation within programming communities – although the motivation for creating open source software differs from programmer to programmer⁴⁷. Interestingly, many commercial software firms have begun creating or sponsoring open source software within the past two decades⁴⁸. These firms create software that is freely released as open source – usable for free, and modifiable – and sell support contracts or customization services. This may also seem unintuitive, but is partly the result of clients wishing to purchase software that they can continue to modify – not possible with most commercial, proprietary software – and a growing body of evidence that open source is an inherently more effective model for building complex software programs⁴⁹.

Context in Government

Governments around the world have tended to approach open source software with some hesitation – a tendency that has only begun to change within the past few years. In the United States, early support for open source software emerged within the scientific research community in the early 1990s⁵⁰; culturally, the collaboration and information-sharing of the academic community is very similar to the open source movement. The prospect of open source software

⁴⁵ Bessen, 2005. pp. 1.

⁴⁶ Ibid.

⁴⁷ Waring and Maddocks, 2005. pp. 413-4.

⁴⁸ Ibid., 415.

⁴⁹ Bessen, 2005. pp. 21.

⁵⁰ Metheny, Matthew. 2013. “Chapter 3 – A Case for Open Source.” In *Federal Cloud Computing*, Boston: Syngress, pp. 55. <http://www.sciencedirect.com/science/article/pii/B9781597497374000034>

as a benefit to government IT efforts more broadly only began around the year 2000. At that time, the U.S. government began providing federal subsidies to the development of open source projects for high-end computing, and within a few years European governments were also considering how to effectively foster open source development and standards⁵¹. Several years later, the U.S. Department of Defence prominently endorsed the use of open source software, and its use of open source has grown widely since then⁵². Although open source software has traditionally been more prevalent in back-end or behind-the-scenes applications (web servers and database systems, for example), a number of front-end open source programs have recently become popular in the content management and business intelligence software fields⁵³.

For governments and businesses alike, the most visible benefit of open source software is the lower cost. Almost all open source programs are available for free on the internet⁵⁴. Indeed, studies indicate that 70% of business users are motivated by the cost savings associated with open source software⁵⁵. In most cases, the main cost savings comes after the software is acquired, since open source software does not have the ongoing licensing fees typical of commercial software. Governments in developing countries – as well as schools and non-profit organizations worldwide – have switched to open source solutions in order to lower their long-term software licensing costs⁵⁶. There are upfront costs – sometimes significant – associated with switching from a commercial solution to an open source one⁵⁷, and although these are often a significant

⁵¹ Lerner, Josh, and Jean Tirole. 2004. *The Economics of Technology Sharing: Open Source and Beyond*. National Bureau of Economic Research. Working Paper. pp. 21. <http://www.nber.org/papers/w10956>

⁵² John Dingman. 2011. “Tech Views.” *DACS SoftwareTech News* 14(1): 3.

⁵³ Marsan, Josianne, Guy Paré, and Michael D. Wybo. 2012. “Has open source software been institutionalized in organizations or not?” *Information and Software Technology* 54(12). pp. 1313.

⁵⁴ There are some exceptions depending on licensing agreements; some open source software is only licensed for non-commercial reuse, and commercial users must pay a licensing fee similar to typical commercial software. In other frequent cases, companies pay for the initial development of an open source product, which is then released as open source to the public – often in an effort to make it a *de facto* industry or community standard.

⁵⁵ Waring and Maddocks, 2005. pp. 414.

⁵⁶ *Ibid.*, 415.

⁵⁷ *Ibid.*, 417.

barrier to adopting open source software, these costs also exist for organizations that switch from one commercial product to another.

Alongside cost savings, open source software is often considered more reliable than commercial equivalents. Reliability, for software, indicates “the absence of faults that lead to incorrect operations, loss of information or system failures”⁵⁸. The reliability of open source software is enhanced by the visibility of the source code, which allows other programmers to review it, find errors, and suggest fixes and improvements. Open source software can also be customized, much more easily than commercial software, without needing to rely on the original software creator⁵⁹. Organizations using the software can modify it to meet unique needs, a particular benefit for governments who may need to translate a piece of software into new languages⁶⁰.

Specific to the government context, there are three particularly notable benefits to open source software: that it can be reused by various departments, that it tends to be more secure, and that it avoids long-term dependence on a single vendor. These advantages are discussed below; for governments, these may be more important yet than the lower costs and heightened reliability of open source software. There are also still a number of barriers to open source adoption by governments, examined further below.

Interdepartmental reuse

What fundamentally distinguishes open source software from commercial software is its reusability. This is of tremendous value to governments and their various departments and agencies, who usually share similar IT needs and have historically pursued commercial software solutions in isolation. With open source software, either produced in-house by government

⁵⁸ Waring and Maddocks, 2005. pp. 414.

⁵⁹ Ibid.

⁶⁰ Oram, Andrew. 2011. “Promoting Open Source Software in Government: The Challenges of Motivation and Follow-Through.” *Journal of Information Technology & Politics* 8(3). pp. 242.

departments, or acquired from open source contractors and companies, a government can acquire a software solution, perfect it incrementally, and then scale it across an entire series of government departments without additional cost.

Because it can be reused and shared without licensing fees, open source software is inherently scalable. Small pilot projects can be conducted, and if a given software system works well, it can then be scaled to larger groups⁶¹. This is a particularly practical instance of the principle that best practices should be shared between agencies and departments of a given government⁶². With interdepartmental sharing of open source solutions, governments avoid “reinventing the wheel” multiple times⁶³. Both software code and best practices for implementation can be shared at once – leading to much higher efficiency and lower costs.

The large scope of IT development within most governments also means that open source approaches can benefit the public in unexpected ways. As Matthew Burton, the acting CIO of the U.S. Consumer Financial Protection Bureau, explains:

“When we build our own software or contract with a third party to build it for us, we will share the code with the public at no charge ... We’re sharing our code for a few reasons:

First, it is the right thing to do: the Bureau will use public dollars to create the source code, so the public should have access to that creation.

Second, it gives the public a window into how a government agency conducts its business. Our job is to protect consumers and to regulate financial institutions, and every citizen deserves to know exactly how we perform those missions.

Third, code sharing makes our products better. By letting the development community propose modifications, our software will become more stable, more secure, and more powerful with less time and expense from our team. Sharing our code positions us to

⁶¹ Waring and Maddocks, 2005. pp. 421.

⁶² O’Reilly, 2011. pp. 36.

⁶³ Ibid., 39.

maintain a technological pace that would otherwise be impossible for a government agency.”⁶⁴

Open source and security

Security is a paramount concern for government IT departments, and has traditionally been an area where established policies discourage the use of open source software. Ensuring that software programs are not vulnerable to outside hackers or unauthorized users is a particular concern in any software that deals with the private information of citizens, and this is the case through much of government. Open source software, with its roots in hobbyist volunteer programming, has tended to be seen with some suspicion by IT managers as a potential security threat.

More recent assessments indicate that the opposite tends to be the case: that open source software is more secure – or at the least, easier to determine if it is secure or not. The security benefits of open source software are the result of being able to access and see the source code – the programming instructions that, for commercial software, would not be available. Various studies indicate that open source software is more reliable because of the high level of “peer review” involved in creating it⁶⁵. This also applies to a software’s level of security; scrutiny from any interested security expert means that open source software is likely reviewed for security issues much more carefully than commercial equivalents⁶⁶. To a certain extent, the open source movement has framed high security as a selling feature as it tries to outpace commercial software; one consequence of this is that the open source movement “has earned a respected reputation in the software industry which means it faces fewer Internet-based security attacks”⁶⁷. Finally, on a topic of much recent focus, the use of open source software is a means of guaranteeing against

⁶⁴ Burton, 2012.

⁶⁵ Waring and Maddocks, 2005. pp. 415.

⁶⁶ This tends, however, to only apply to open source projects that are well-known enough to attract expert attention. Smaller and hobbyist projects would not tend to receive the same expert scrutiny.

⁶⁷ Ibid.

hidden “espionage software”⁶⁸ that could be hidden by intelligence agencies in commercial and non-open-source software. Because the source code of open source software is visible, espionage or tracking code could not be easily hidden within it.

The other security benefit of open source software is that, when security problems or vulnerabilities *are* identified, they can be addressed quickly – without waiting for a specific commercial vendor to produce a software fix. Open source software can be updated to prevent security issues much more quickly than commercial software; users “can even fix it themselves”⁶⁹ depending on the complexity of the issue. This is not the case for commercial software:

“...private firms can insert features into software that may be detrimental to safety or organizational practices. Many private software solutions, for instance, use fragile encryption mechanisms and other poor security features; the users cannot even assess the vulnerabilities without access to the source code, and cannot fix them because they lack the legal right to alter and redistribute the program.”⁷⁰

With access to the source code, governments and businesses can also apply their own risk assessments and code reviews to the software they purchase – something of particular importance in the banking industry⁷¹ and a model that government IT departments could follow.

Despite these practical advantages, the implementation of open source software is often held back by confusion around official security evaluation processes and how these relate to open source software – partly since software security processes in government tend to predate the rise of open source software. Official software risk-management frameworks or accountability mechanisms designed to interact with commercial vendors cannot easily be translated to open source equivalents. The term ‘open source’ itself confuses some officials, who misinterpret it as

⁶⁸ Waring and Maddocks, 2005. pp. 415.

⁶⁹ Mansfield-Devine, Steve. 2008. “Open source: does transparency lead to security?” *Computer Fraud & Security* 2008(9). pp. 12.

⁷⁰ Oram, 2011. pp. 242.

⁷¹ Ibid.

the use of software code that any member of the public could edit⁷² – rather than the practical reality that both software developers and implementers alike are able to carefully control what pieces of code are added to a program.

Avoiding vendor lock-in

For governments, software tools often become an essential element in providing public services: databases of client information, information management systems storing best practice records, case-handling software for inquiries or emergencies. Often, these systems will be developed by a commercial software vendor or contractor – and then used for years and years as they become central components of some standardized operating procedure. As policies change slightly, the software tools must be updated – but this can often only be done by the original vendor, who may then charge inflated prices or cause long delays before making the required changes⁷³. The government agency is ‘locked’ to the original vendor, since only that vendor has access to the original source code (and, usually, the exclusive legal right to modify it). In other cases, the vendor may have gone out of business, making it impossible for the government agency to improve business-critical processes⁷⁴.

For government agencies, avoiding vendor ‘lock-in’ is as important a benefit as the lower costs of open source software⁷⁵. Changes to government processes or policies, as happens over time, frequently requires software changes for implementing agencies, and so researchers argue that being able to access software source code and make changes is “essential” for the public sector⁷⁶.

Finally, most governments have important legal requirements for the archiving of government documents, for time durations reaching into decades. With the transition to electronically

⁷² Burton, 2012.

⁷³ Lerner and Tirole, 2004. pp. 29.

⁷⁴ Oram, 2011. pp. 242.

⁷⁵ Waring and Maddocks, 2005. pp. 419.

⁷⁶ *Ibid.*, 421.

archived documents, the dependence on commercial document file formats is a long-term risk. As Andrew Oram explains,

“A vendor, at its own discretion, can stop supporting a format at any time. Even vendors who commit to supporting their formats can upgrade them in ways that render old documents unmanageable.”⁷⁷

The cost and effort regularly expended to migrate documents from one file format to the next is something many government departments are familiar with. Although open source formats may also change slightly over time, it always remains legally and practically possible to create software that can read such formats. For documents that must be archived for decades, beyond the possible lifespan of a given commercial software provider, this is an important consideration.

Past barriers

Proponents of open source may question why governments are often slow to adopt open source software, despite the benefits above. Learning about potentially-useful open source software to begin with may frequently be an issue, since most projects lack marketing staff and resources⁷⁸. Commercial software companies, in contrast, have extensive marketing and lobbying efforts, often applied to defending products currently in use against arguments to migrate away. Within government agencies, however, there are a number of barriers. Oram lists familiarity with current software, fear of failure, lack of knowledge about open source, and concerns about the maturity of newer open source projects as the main cultural barriers against the adoption of open source software⁷⁹.

Open source software that is developed by volunteers does present a set of risks; one is that there is often no single person responsible for the software product to contact to resolve

⁷⁷ Oram, 2011. pp. 242.

⁷⁸ Oram, 2011. pp. 248.

⁷⁹ Ibid., 249.

problems⁸⁰. The customizability inherent in many open source software packages is also sometimes “bewildering”⁸¹, which can discourage non-technical users.

Finally, however, licensing complications in government contexts continue to be a major barrier. As David Eaves points out,

“...many governments are locked out of open source projects and communities. Since, by policy, many governments require that they own any code they, or their contractors develop, they cannot contribute to open source projects (in which the code is by definition, not owned but shared).”⁸²

As a consequence, the open source software used even by internet giants is off limits to government developers, who must go ahead and reinvent the smallest of wheels while creating or paying for non-open-source solutions. Eaves suggests that this approach is motivated by a misplaced desire to protect future revenue streams – through the sale of government-developed proprietary software, for example – but that these sources of revenue rarely if ever materialize, and the much greater development costs exceed any potential benefits⁸³.

For government IT managers developing new software products, the use of open source software should quickly become the norm. By creating a tool that can be adapted and reused by other teams, departments, or levels of government, the benefit to citizens per cost is maximized. Teams that do so, and begin with existing open source components, can develop innovative technologies much more quickly than they would if beginning from scratch.

⁸⁰ Waring and Maddocks, 2005. pp. 416.

⁸¹ Ibid.

⁸² Eaves, David. 2010. “On Governments and Intellectual Property (or why we move slowly).” *eaves.ca*. <http://eaves.ca/2010/08/10/on-governments-and-intellectual-property-why-we-move-slowly/>

⁸³ Ibid.

In Canada, at the federal level, the most prominent government open source project is a user-interface library known as the “Web Experience Toolkit”. Initiated by the Treasury Board’s Web Standards Office, the project was created as an open source project, and – boldly – developed on a community coding platform that members of the general public could observe and contribute to⁸⁴. As a consequence, it was also much easier for web development counterparts throughout the federal government to participate in – an important asset as the toolkit streamlined much of the process of upgrading departmental websites to a new set of visual and accessibility standards. The project was particularly remarkable in that it was developed so quickly – owing to the thoughtful integration of other open source projects – and that it has already been reused by institutions and municipal governments throughout Canada for their own redesigned websites. In a matter of months, the toolkit has been widely adopted, and the open source approach has brought together a community of enthusiasts and web practitioners from a variety of government areas⁸⁵.

Rethinking IT project management

Technological changes related to government IT projects – not least the growing relevance of open data and open source software – are provoking changes in how such projects should be managed. Software is more complex than in the past, and is expected to do more. Handling vast amounts of electronic data reliably and securely has become a sought-after capability. Alongside these changes, the profound growth of open source software has changed the IT field tremendously. How do managers of IT projects in the public sector respond?

The general goal of IT project management can be framed as, maximizing the effectiveness of a software tool, while delivering it within time and cost constraints. There are a number of changes in IT management approach, relevant to public sector departments, that tend to increase

⁸⁴ “Web Experience Toolkit (WET) Project.” *GitHub*. <https://github.com/wet-boew/wet-boew>

⁸⁵ McMillan, Robert. 2013. “Canadian Coders Solve Mystery of Open Source Government.” *Wired Enterprise*. <http://www.wired.com/wiredenterprise/2013/01/wet/>

the effectiveness of a software development process while maintaining or lowering costs. The first is a philosophy of rapid iteration and agile design; the second, a move away from traditional large-scale ‘enterprise’ software and towards smaller providers. The third is a reassessment of the human capital required to successfully deliver software projects, in light of the first two changes. The following section explores these, and closes with a discussion of the ‘strategic intent’ of public sector IT development – the ‘what we are doing’ question, in the context of the rapid pace of modern technological change.

Rapid iteration, agility, and risk

Traditionally, IT procurement within government is treated much like other forms of products. Requirements are established, research is done to determine the anticipated costs, requests for bid are released or contractors are selected. For both commercially-purchased and internally-developed software, the software itself is framed as a completed good to be delivered. From a given set of requirements, a resulting product is expected – and the management of the project involves overseeing the development of (or purchase of) the product, responding to changes in requirements or technical considerations from the developer, until the product is received and the project is complete.

For products outside the IT field – the construction of a building, or the selection of a fleet vehicle – this approach is well-established and sensible. Applying this model to IT procurement and development, as is done in most government agencies, reveals a number of flaws that are unique to the software development field. This approach to software acquisition (either purchasing or developing) is limited by both the complexity of software – potential conflicts between one software tool and another, or between various components of the same piece of software – and by the unpredictable nature of software users. Software implementation usually requires extremely comprehensive testing, to identify ‘bugs’ or flaws that cause errors, or to identify accidentally non-functional components of the software. For even the largest commercial software companies, software is almost never error-free, given the complexity of

interactions between its various components⁸⁶. A critical element, then, of effective software implementation, is *continual improvement* – constantly modifying and improving parts of a software tool in order to fix errors and to make it easier for users to use. This approach is fundamentally at odds with a procurement approach that sets requirements and then receives a fully completed product – a “one chance” approach⁸⁷. In practice, receiving a flawless and complete software product is unrealistic. Moreover, as users – either internal staff or the external public – engage with the software, it might become clear that small design changes would improve the effectiveness and ease-of-use of the product, something usually underestimated by institutional software developers. In many cases, however, the software development project is ‘complete’ and neither the technical resources nor the budget exist to make such improvements. As a result, internal and external clients may permanently use software that is only semi-functional, until a new version is created from scratch perhaps years later.

The solution, popular among small software developers and gaining traction in some public sector departments, is the development of software products through *rapid iteration* – that is, creating a basic version of the software, testing it with users, and continually improving it to create newer versions rapidly. Rather than anticipating the delivery of a completed product, this model expects that the received software will still need to be improved even once it is in use, and budgets time and resources accordingly. This approach requires that the initial software can be customized or modified after delivery, and so for it to succeed with commercially-purchased software, it requires the close participation of the software vendor. The rapid iteration model tends to be used more frequently with software that is being newly developed, rather than purchased, whether this development is done by in-house staff or by outside contractors. It can be achieved with both proprietary and open source software, although the latter usually benefits from being able to build on existing code, accelerating the pace of development and iteration

⁸⁶ Bessen, 2005. pp. 1.

⁸⁷ Ibid., 5.

considerably⁸⁸. The open source model also ensures that software can continue to be improved even if the original vendor is no longer available (as described in the previous section).

Applying a continual improvement approach to software does present some risks; the general tendency for public sector units to avoid change is a barrier to both the adoption of new software, and newer versions of the same. Without rigorous testing, changes designed to improve a product are liable to introduce errors or less-user-friendly processes than previously existed, potentially interfering with employees' work. However, software that is commercially purchased and not able to be improved has equal risk: that software bugs or poorly-designed user interfaces limit the effectiveness of a department's employees, but that these cannot be addressed – and so staff become accustomed to working around them. A rapid iteration approach to software can identify such issues, and address them through programming fixes – increasing the effectiveness of software users as a consequence.

Enterprise software is not the future

As a result of the established approach to IT procurement, software acquisition for public sector departments has become dependent on a set of large commercial software vendors. These vendors, specialized in software used by large companies and institutions – ‘enterprise software’ – create software that is purchased off-the-shelf by governments, or they are contracted to develop custom software. In both cases, they are usually involved in the implementation of the software by departments through service and support agreements – often a requirement given the complexity of the software in question. Database systems, content management systems, and business intelligence software are among the products created by enterprise software companies, and these companies compete on lucrative, years-long contracts put forward by government departments.

⁸⁸ Metheny, 2013. pp. 55.

There are a number of high-profile examples of contracting failures involving these large software firms, usually owing to highly complex projects as single deliverables⁸⁹. Although enterprise software firms do provide reliable and successful projects in many cases, these failures have led managers to consider smaller IT firms, working on smaller, connected projects, as a way to mitigate both the risk and high expense of relying on a single enterprise provider. In many cases, these small firms begin with open source software and customize it to a government department's specifications, allowing them to deliver large-scale projects more quickly and with lower costs. The rapid pace of innovation within the open source software sector means that these small providers can easily compete with enterprise vendors, who tend to use older, proprietary systems. The result is that, as Matthew Metheny describes,

“Through the use of smaller, agile procurements, federal agencies can achieve a higher yield and greater return on investment (ROI) compared to slower, inefficient long-term investments that use traditional procurement methods that tend to be outpaced by private sector innovations due to lengthy development cycles.”⁹⁰

This illustrates two challenges for government IT managers. The first is to embrace simplicity when designing and contracting out software systems. This relates in many ways to the concept of “government as a platform” – that the future direction of government software systems is to design simple foundations that other actors can reuse and extend⁹¹. This is a significant change in approach from the enterprise model of complex, all-in-one software systems. Government IT managers could take to heart, however, an early fundamental tenet of software engineering:

“A complex system that works is invariably found to have evolved from a simple system that worked. The inverse proposition also appears to be true. A complex system designed

⁸⁹ Bessen, 2005. pp. 8.

⁹⁰ Metheny, 2013. pp. 55.

⁹¹ O'Reilly, 2011. pp. 21.

from scratch never works and cannot be made to work. You have to start over beginning with a working simple system.”⁹²

The second challenge is that small-scale IT providers, who may be best suited to build new and innovative systems, often have difficulty navigating government procurement processes⁹³. Large enterprise firms may often have staff who specialize in interacting with government departments and bidding on contracts; this is much more challenging for small firms. Many large firms also have long-established relationships with government agencies, making it difficult for small firms and startups to compete⁹⁴. Government officials in the United States have suggested that small businesses, startups, and developers “get together and learn how to interface with government”⁹⁵ in order to address this barrier. Governments who facilitate this will see greater competition for software contracts – and over time, more innovation and lower costs as a consequence.

Human capital and government IT

Technology is changing quickly, and as it does so it is changing how societies and governments are connected. This raises questions about what kinds of staff and expertise are best suited to manage this relationship within government.

For some governments, an immediate challenge is the lack of internal IT capacity required to successfully manage software development and procurement. Government staff with an up-to-date knowledge of technological advances, particularly in the open source software field, are much more likely to successfully manage a software project than counterparts with less technical knowledge. Some authors point out that this internal IT capacity was lost over years of

⁹² John Gall, cited in O’Reilly, 2011. pp. 21.

⁹³ Metheny, 2013. pp. 54.

⁹⁴ Waring and Maddocks, 2005. pp. 423.

⁹⁵ Howard, Alex. 2011. “Government IT’s quiet open source evolution.” *O’Reilly Radar*. <http://radar.oreilly.com/2011/09/open-source-government-it-goscon.html>

outsourcing⁹⁶, although this varies from government to government. For government departments to successfully integrate new software with existing organizational processes and software, a level of internal IT competence is clearly required.

Equally, however, the nature of new technologies necessitates a different skill set for government workers than may have been required in the past. Today, IT competencies are required by government staff working well outside of traditional IT departments, from communications to policy fields, as information technology has become an essential part of everyday society. For government IT managers and staff, in turn, the trend towards collaborating and working with outside partners – small firms, open source volunteers, and community enthusiasts – requires a set of particularly non-technical skills. In a given IT project, staff may interact with a wide range of partners – necessitating skills in “business process reengineering, negotiation, mediation and network design.”⁹⁷ To fully reach the potential of modern online government, departments need to train and recruit employees with a complex new set of skills – and, some authors suggest, change the culture of the public sector in the process⁹⁸.

Strategic intent

Ultimately, for a software project to be successful, it should be very clear what the software is intended to do. This may sound like an intuitive principle, but projects are often compromised by changes in requirements, efforts to add unplanned functionality midway through a project, and uncertainty around target audiences and interface requirements. Successful software projects are notable for having a clear and specific vision: Twitter, for example, was famously designed on a single sheet of paper⁹⁹. Without a clear vision, the desire for yet greater functionality can lead to an unmanageable level of complexity.

⁹⁶ Waring and Maddocks, 2005. pp. 422-3.

⁹⁷ Eggers and Goldsmith, 2003. pp. 33.

⁹⁸ Ibid.

⁹⁹ O'Reilly, 2011. pp. 21.

Maintaining a clear vision for a software project is particularly challenging in the public sector, where accountability for a project is distributed among a number of actors. Beyond individual software projects, maintaining a clear vision for online government -related agencies as a whole can also be an issue. This applies to both in-house development and contracted work. As Eggers and Goldsmith explain,

“All too often, precious little thought is given to what policy goals an agency is trying to accomplish and how they relate to what is contracted out. Instead, agency officials pick up their organizational chart, look for something they’re not doing very well, and then get the private sector to do it for them.

But before federal executives think about how they should do something, they need to figure out what they’re trying to do in the first place. “The biggest challenge in contracting out in government is determining what it is we want to accomplish,” says Deidre Lee, the Defense Department’s acquisition chief. “What is our mission? What do we need to accomplish the mission? Oftentimes, government is not clear about all this when we go out to bid.”¹⁰⁰

For online government projects throughout departments, maintaining a clear vision is an essential and challenging element. A compelling response to this, framed by the Helsinki Design Lab (HDL), is maintaining a clear sense of strategic intent within a department. As the authors explain, strategic intent is what translates a grand vision “into principles that can be used to make choices on a more discrete level”¹⁰¹ – by maintaining a clear view of the intended ends of a project, while being flexible about the means used to get there. The HDL authors cleverly cite Savielly Tartakower, a chess grandmaster, who explains:

“Tactics is knowing what to do when there is something to do, strategy is knowing what to do when there is nothing to do.”¹⁰²

¹⁰⁰ Eggers and Goldsmith, 2003. pp. 30.

¹⁰¹ Boyer, Bryan, Justin W. Cook, and Marco Steinberg. 2011. *In Studio: Recipes for Systemic Change*. Helsinki: SITRA. pp. 23.

¹⁰² *Ibid.*, pp. 22.

Employees who are self-directed and have a clear sense of direction, even when there is “nothing to do”, are well-suited to develop innovative public service approaches. The online government field provides a tremendous level of opportunity for government agencies, but it presents changes to traditional operating procedures that are difficult to navigate. Doing so will require a dedicated effort by public servants with a strong understanding of both technology and methods of government. Maintaining a clear sense of strategic intent will be tremendously important for government departments, as they develop and use innovative new technologies.

Case-study: GOV.UK

New online technologies have tremendous potential to improve and streamline government services. For many government institutions, however, it can be very difficult to know where to begin. Legacy software systems, dependent relationships on large enterprise vendors, and uncertainty around the benefits and risks of innovative tools: all of these slow down efforts to improve online government systems.

Fortunately, there is a contemporary case that exemplifies a revolutionary approach to reforming online government systems. GOV.UK, a project run by the Government Digital Services (GDS) team within the United Kingdom’s Cabinet Office, has illustrated a dramatic new approach for government IT efforts. Within the span of two years, the GDS team has consolidated every ministerial department website, alongside a wide range of others, onto a highly-innovative single point of service website, GOV.UK. The resulting project has won a number of awards, through a dedicated focus to the needs of its everyday users. Equally, the team has carried out the project in full public view, with public access to the project source code and a candid, thoughtful blog that explained the team’s approach. The team’s public engagement emphasized sharing lessons learned and collecting feedback: from initial planning conversations, to alpha and beta versions, to the launch of the live site, and continued improvements throughout. All told, it represents a

compelling – and encouraging – example for governments throughout the world that are seeking to redefine their approach to online government.

Background

The genesis for the GOV.UK project was a 2010 report by the UK's Digital Champion, Martha Lane Fox. Her report was titled, "Directgov 2010 and Beyond: Revolution Not Evolution", and beyond simply listing the advantages of migrating government services to the online world, it called for dramatic rather than incremental changes to existing online systems. A particular emphasis of the report was the potential and importance of designing government services around the needs of the citizens using them. As she explained, a new online approach:

"...could be the link to easing up the bureaucracy of many services and focusing on what creates the absolutely best citizen experience. ... It seems to me that the time is now to use the Internet to shift the lead in the design of services from the policy and legal teams to the end users."¹⁰³

The UK government responded with an objective of making services 'digital by default', a transformation towards online services in order to better meet citizens' needs and to reduce costs¹⁰⁴.

The Government Digital Service ("GDS team") was formed as a result. It was established in April 2011, as a team within the Cabinet Office. Alongside a number of experimental projects, it embarked on an 'alpha' pilot project of a single-domain website for all UK government services. The results were promising, and work on a beta version of GOV.UK was given the go-ahead in August 2011¹⁰⁵. The beta was launched on January 30, 2012, as a planned replacement for the two

¹⁰³ Fox, Martha Lane. 2010. "Directgov 2010 and Beyond: Revolution Not Evolution." <https://www.gov.uk/government/publications/directgov-2010-and-beyond-revolution-not-evolution-a-report-by-martha-lane-fox>

¹⁰⁴ Bracken, Mike. 2011a. "Francis Maude, Minister for the Cabinet Office, opens the new home of the Government Digital Service." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2011/12/08/new-home-for-gds/>

¹⁰⁵ Loosemore, Tom. 2012. "Introducing the beta of GOV.UK." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/01/31/beta/>

major cross-departmental websites operated by the UK government, Directgov and Businesslink. On October 17, 2012, GOV.UK was officially declared the primary point of contact for services and information across the whole of the UK government – less than two years after the project was initiated.

The underlying philosophy of the GOV.UK project is that it should be “relentlessly”¹⁰⁶ focused on the needs of its users – that is, members of the public looking for information on government services. The GDS team’s first design principle is to “Start with needs – user needs not government needs”. As they explain:

“The design process must start with identifying and thinking about real user needs. We should design around those — not around the way the ‘official process’ is at the moment. We must understand those needs thoroughly — interrogating data, not just making assumptions — and we should remember that what users ask for is not always what they need.”¹⁰⁷

Government institutions and the services they provide are often complicated; the GOV.UK project attempts to minimize complexity with a goal that users should not have to understand government in order to interact with it¹⁰⁸. This was a primary design goal, alongside the assumption that users would be on the “journey” of finding information using a search engine, and that they would want to minimize the amount of time they spent on a government website¹⁰⁹. The website’s structure and design was developed with this in mind.

¹⁰⁶ Bracken, Mike. 2012. “Why GOV.UK matters: A platform for a digital Government.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/17/why-gov-uk-matters/>

¹⁰⁷ Government Digital Service. 2012b. “GDS design principles.” <https://www.gov.uk/designprinciples>

¹⁰⁸ Pope, Richard. 2011. “A few design rules for Alpha.gov.uk.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2011/04/28/alpha-gov-uk-design-rules/>

¹⁰⁹ Ibid.

Effective digital teams

As the GDS team was established, it recruited a wide range of staff from outside of the government. The GDS team had a stated goal of transforming how digital services were delivered, and there was an acknowledged lack of cutting-edge IT talent within the UK government¹¹⁰. Hiring a new set of “fresh eyes”¹¹¹ from outside government – developers, designers, project managers and content experts – helped spark more innovative ways of solving problems¹¹².

The GDS team also placed a high degree of trust in its members, with self-managing product teams. Meri Williams describes this as follows:

“With the users’ needs in mind, the product manager defines what needs to be done and the team itself decides how to achieve it. This is instantly a more motivating approach. You’re trusting people to design the best solution to meet the need, rather than handing down a ‘solved problem’ to be implemented. You’re also making the most of the smart, talented people you’ve worked so hard to find.

The approach we’ve taken at GDS is to create high-performing multi-disciplinary teams. These teams consist of designers, developers, user researchers, content designers, technical architects, delivery managers, product managers and experts in customer insight, web operations and product analytics. These people all work together to build digital products and services. Managers are no longer expected to tell people what to do and how to do it.”¹¹³

¹¹⁰ Bracken, Mike. 2011b. “The second lever.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2011/10/25/the-second-lever/>

¹¹¹ Leach, Jimmy. 2011. “The power of the disinterested.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2011/05/09/the-power-of-the-disinterested/>

¹¹² Ibid.

¹¹³ Williams, Meri. 2012. “People management in an agile setting.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/11/27/people-management-in-an-agile-setting/>

The GDS team also invested in an effective working environment for their staff, enabling them to work flexibly, discuss frequently, and sit close together with team members – the latter emphasized as particularly important for the success of a project¹¹⁴.

The software development philosophy used by the GDS team – “agile development” – involves breaking projects into small parts that can be completed in week-long “sprints”. Progress and goals become much easier to track as a consequence. GDS programmers also work in pairs, in order to collectively identify and troubleshoot problems, and rotate through programming partners from project to project in order to continually learn from other staff members¹¹⁵. The key first step, in this approach, is creating a ‘minimum viable product’: the simplest, initial version of a software that fulfills (usually very simple) initial goals, but that works properly and can be tested with actual users¹¹⁶. Then, additional sets of functionality are added and tested one at a time – a much more reliable approach than attempting to create one all-encompassing software project at once. The GDS team embraced the idea of rapid iteration – continually creating newly improved versions, testing them internally and externally, releasing them for public use, identifying improvements, and continuing in a cycle¹¹⁷.

Open source and APIs

In order to create GOV.UK as cost-effectively and rapidly as possible, the GDS team embraced open source “unapologetically”¹¹⁸. GOV.UK uses open source software throughout: for a wide range of front-end and interactive components, for server infrastructure and operating systems, for redirection systems, databases, and the programming frameworks used to build the site’s

¹¹⁴ Government Digital Service. 2013b. “Your working environment — Government Service Design Manual.” <https://www.gov.uk/service-manual/the-team/working-environment.html>

¹¹⁵ Sharpe, Sam et al. 2013. “Benefits of diversity.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/06/03/benefits-of-diversity/>

¹¹⁶ O’Reilly, 2011. pp. 36.

¹¹⁷ Mosley, Mazz. 2012. “One size does not fit all.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/11/one-size-does-not-fit-all/>

¹¹⁸ Bracken, 2012.

custom applications¹¹⁹. Aside from the lack of licensing costs, using open source allowed the team to quickly test and iterate systems – keeping the focus on user needs rather than software requirements¹²⁰. With open source, the team could download a software tool – a search engine, in their example – test it, then decide to start using it right away. The team could immediately try out a piece of software “without a lengthy pre-sales process or costly and complex licensing arrangements”¹²¹ – and could easily switch to an alternative version if it was more effective. Beyond cost considerations, using open source was a key element in creating GOV.UK so quickly.

The GDS team also publishes their own software under an open source license, so that others can analyze it and use it for their own projects as desired¹²². One of the most interesting consequences is that members of the public can suggest changes to the actual GOV.UK software code. In the first example of this taking place, a member of the public (and former civil servant) noticed an error with GOV.UK’s bank holidays calculator, located the page in question in the GDS team’s open source code, and submitted a modified version of the code that fixed the error. After checking it carefully, the GDS team integrated his code back into GOV.UK and the error was resolved¹²³. The example illustrates the unique potential of government-created open source software interacting with the public.

GOV.UK also uses Application Programming Interfaces – APIs – in essential ways. APIs, described above, allow software systems to automatically exchange information with each other, in standardized and inter-compatible formats. GOV.UK uses APIs to exchange information with

¹¹⁹ Government Digital Service. 2012a. “Colophon for GOV.UK at launch.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/govuk-launch-colophon/>

¹²⁰ Stewart, James. 2012c. “Coding in the open.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/12/coding-in-the-open/>

¹²¹ Ibid.

¹²² Ibid.

¹²³ Mann, David. 2012. “GOV.UK – a truly open and collaborative platform.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/02/02/gov-uk-truly-open-platform/>

publishing tools and other government databases¹²⁴, an important element in a project to consolidate government information in a single place. Just as importantly, the various pieces of the GOV.UK software use APIs to interact with each other. As a consequence, different parts of the software can be replaced or changed rapidly without affecting the functionality of other parts¹²⁵. And, the GOV.UK website also provides these APIs to the public¹²⁶, so that outside developers – working, for example, for municipal governments or non-profit organizations – can easily access and integrate the information on GOV.UK pages with other software tools.

Outside partners

Lastly, the GDS project has enlisted the services of a number of external providers, with a particular focus on small IT enterprises in the UK. Government departments outside of GDS have also hired small-scale developers to redesign online systems – intranets, for example – using GDS-developed tools to great success¹²⁷. This is an intentional element of a broader strategy to move UK government IT systems away from long-term contracts with large single vendors¹²⁸. In order to achieve this, the GDS team used a number of techniques – particularly, breaking large contracts into smaller parts to encourage competition, using commodity online services across government, and commissioning services instead of entering into long-term procurement contracts, in order to reduce the potential costs of switching service providers in the future¹²⁹.

¹²⁴ Stewart, James. 2012b. “Building with APIs.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/08/building-with-apis/>

¹²⁵ Stewart, James. 2011. “Building APIs, building on APIs.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2011/09/22/building-apis-building-on-apis/>

¹²⁶ Stewart, James. 2012a. “APIs for all.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/15/apis-for-all/>

¹²⁷ Loosemore, Tom. 2013. “Intranets: DCMS doing it right.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/03/18/intranets-dcms/>

¹²⁸ Forrester, James. 2011. “The Unacceptable.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2011/11/02/the-unacceptable/>

¹²⁹ Bracken, Mike, and Liam Maxwell. 2013. “2012/13 Savings: Better for Less.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/06/10/better-for-less/>

The GDS team's Service Manual – written to guide other UK government departments through IT transformation – suggests the following:

“Wherever appropriate, the government should use existing external platforms, such as payments services (ranging from third party merchant acquirer services to the UK’s national payments infrastructure). Deciding to develop platforms in-house will happen only where that is the best way to meet users’ needs in the most flexible and cost-effective way.”¹³⁰

Although different government contexts have a variety of legal restrictions on the use of external service providers, this approach allows departments to maintain a focus on serving user needs, rather than reinventing technical systems.

Results

GOV.UK came out of ‘beta’ – and replaced its predecessor websites, Directgov and Businesslink – on October 17, 2012. On its first day, the website had more than 1.1 million visits, a healthy indicator that visitors were being successfully redirected from old links to the new site¹³¹. Within the first two weeks, the GDS team released updated versions of the website’s software *more than a hundred times* – part of the team’s iterative, continual improvement approach¹³².

With the site officially launched, work began to transition government departments to GOV.UK. This involved a close level of collaboration between the GDS team and staff throughout government, as departments assessed the information contained on their old websites, and determined what should be transitioned to GOV.UK. A particular focus was placed on rewriting

¹³⁰ Government Digital Service. 2013a. “Government as a platform — Government Service Design Manual.” <https://www.gov.uk/service-manual/technology/government-as-a-platform.html>

¹³¹ Prag, Sarah. 2012. “GOV.UK – One day in.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/18/gov-uk-one-day-in/>

¹³² Rushgrove, Gareth. 2012. “Regular Releases Reduce Risk.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/11/02/regular-releases-reduce-risk/>

government policies in clearer language¹³³. As more and more government departments were transitioned, the GOV.UK software was continually improved, and aspects of the design were modified based on feedback from users¹³⁴.

Six months after GOV.UK went live, at the end of April, 2013, all twenty-four of the UK's ministerial departments had been successfully transitioned to the new website. More than two dozen other government agencies, as well as UK embassy websites, had also been transitioned at the same time. For some of these departments and agencies, the transition involved thousands of publications, and hundreds of news articles, speeches, and policy documents¹³⁵. Throughout the process, the GDS team and partner departments published more than 50,000 pages of web content, removed or consolidated 116,000 old pages and files, and created 275,000 redirects from old links to their new counterparts. Within these first six months, 5.8 million people had visited GOV.UK, making 29 million page views¹³⁶. More broadly, GOV.UK has allowed the UK government to consolidate online resources significantly. Of the more than 2,000 separate government websites that previously existed, 1,720 websites have been closed, while almost three hundred websites are being consolidated on GOV.UK¹³⁷. In June 2013, the Cabinet Office announced that the work of the GDS team had saved UK government departments more than £500 million over the previous financial year¹³⁸.

The GOV.UK project has also won two notable awards since its inception. On April 16, 2013, it was awarded the Design of the Year award, a competition which it won over competing new

¹³³ Kean, Sharon Anne. 2012. "The right words for the job." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/10/25/right-words/>

¹³⁴ Williams, Neil. 2013b. "Marking one year since the Inside Government beta." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/02/28/marking-one-year-since-the-inside-government-beta/>

¹³⁵ Ferguson, Ross. 2013. "Welcoming DfE and HM Treasury to GOV.UK." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/04/25/welcome-dfe-and-hmt-to-govuk/>

¹³⁶ Williams, Neil. 2013a. "24 departments later." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/04/30/24-departments-later/>

¹³⁷ Ferris, Pauline. 2012. "Exemptions." *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2012/12/11/exemptions/>

¹³⁸ Bracken and Maxwell, 2013.

designs in fashion, furniture, and architecture. Judges praised its “well thought out, yet understated” design and its capacity to improve life for millions of citizens accomplishing everyday chores¹³⁹. In the GDS team’s own words, the award reflected that the public service can indeed deliver “ambitious, world-class digital projects at scale”¹⁴⁰ – and that recognition from the award would help them continue to recruit talented staff for digital efforts across government¹⁴¹. In June 2013, the team was also awarded the D&AD “Black Pencil” award, in the writing for design category, an award which they also credited to their colleagues throughout government¹⁴².

For the GDS team, the awards validate their approach of constantly focusing on user needs. For IT managers in governments around the world, GOV.UK is a striking illustration of what is possible with modern open source tools, talented staff, and a clear vision.

Conclusions

GOV.UK sets a new bar for the quality of online services provided by governments. Government departments in other countries – particularly Canada – can learn a lot from their efforts and reflections.

For government IT managers, the GOV.UK project illustrates a number of key tenets: invest in highly talented staff. Recruit employees with strong IT competencies, but from a diverse set of disciplines, into the public service¹⁴³. Decide, boldly, that in-house software projects will be released as open source, in real-time if possible. Require that externally-developed custom software is released as open source as well, and establish this as a consistent feature of IT

¹³⁹ “Gov.uk website wins design award.” 2013. *BBC News*. <http://www.bbc.co.uk/news/entertainment-arts-22164715>

¹⁴⁰ Terrett, Ben. 2013. “GOV.UK wins Design of the Year 2013.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/04/17/gov-uk-wins-design-of-the-year-2013/>

¹⁴¹ Ibid.

¹⁴² Richards, Sarah. 2013. “Pencils.” *Government Digital Service*. <http://digital.cabinetoffice.gov.uk/2013/07/02/pencils/>

¹⁴³ McDermott, Patrice. 2010. pp. 403.

contracts. Embrace the open source movement, and be prepared to interact with a community of developers and citizens who want to understand your approach to online government, to contribute to it, and to critique it. And with every new project, begin with a clear set of data requirements, and design APIs first.

Beyond new technical approaches, many authors suggest that effective modern online government requires a culture change in the public service. The GOV.UK team operated with a high degree of trust, and very little hierarchy. Team members moved from project to project with a considerable amount of flexibility. Moreover, they were given the space to experiment, take risks, fail, and iterate again. High trust and risk-taking allows creativity to flourish and projects to take shape more quickly¹⁴⁴, and being able to learn quickly from failed experiments is an essential mindset for effective software development¹⁴⁵.

This approach, rare though it may seem in the UK and Canadian public services, meshes well with the Clerk's *Blueprint 2020* vision. Agile and high-performing public servants, given high expectations and a high degree of trust, may well become the future norm of the federal public service. Although developing a culture of creativity and risk-taking will take time, the potential for bright new ideas is tremendously important.

When teams within the Canadian public service are given the space to develop and champion innovative new approaches to online government, they too might become examples for governments around the world to follow.

¹⁴⁴ Oh, Susan. 2010. "B.C. government turns static intranet into a community." <http://www.ragan.com/Main/Articles/42471.aspx>

¹⁴⁵ O'Reilly, 2011. pp. 36.

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