E-PARCC
COLLABORATIVE GOVERNANCE INITIATIVE
Syracuse University
Maxwell School of Citizenship and Public Affairs
Program for the Advancement of Research on Conflict and Collaboration

The Adoption of Technology Open Standards Policy by the Commonwealth of Massachusetts

Case Study

Summary

This case discusses the adoption of an Information Technology (IT) Open Standards Policy by the Commonwealth of MA during the administration of Governor Mitt Romney. It details the political and administrative process of adopting and implementing an IT architecture to carry the Commonwealth forward into the 21st century and achieve operational, economic and political objectives. The political repercussions prompted an investigation by the State Auditor and the ensuing report provides important lessons in public management. Additionally, technological concepts and issues are explored in detail with consideration for their bearing on administrative and political functions.

Readers interested in public management will find that the case explores and explains the key IT procurement policy considerations of open standards, total cost of ownership, and key (and often misunderstood) distinctions between free/libre and open source commercial and proprietary software and the challenges of vendor lock-in. This case more specifically also exposes the student to more technical issues that they may encounter in public management settings such as the concept of open data, open data standards (XML),

This case was an honorable mention place winner in E-PARCC's 2012-13 "Collaborative Public Management, Collaborative Governance, and Collaborative Problem Solving" teaching case and simulation competition. It was double-blind peer reviewed by a committee of academics and practitioners. It was written by Charles Schweik and Lucia N. Miller the University of Massachusetts, Amherst. This case is intended for classroom discussion and is not intended to suggest either effective or ineffective handling of the situation depicted. It is brought to you by E-PARCC, part of the Maxwell School of Syracuse University's Collaborative Governance Initiative, a subset of the Program for the Advancement of Research on Conflict and Collaboration (PARCC).

the idea of systems interoperability, and perhaps most importantly, the concern and some of the issues surrounding digital data archival – one of the key challenges the public sector[1] (and every sector) faces in this emerging era of paperless operations.

In concluding we stress that these IT concepts are more broadly applicable and in fact form the foundation of the new era of open government in the digital age. This is reflected in the Obama Administration Open Government Initiative and the corresponding federal mandate to establish a system of transparency, public participation, and collaboration. It is also borne in the so-called "Gov 2.0" ideas that recognize the power of government and technology combined as a platform for participatory democracy, problem solving, and innovation.

[1] I (co-author Schweik) once had a discussion with a former National Science Foundation Program Officer who ran the Digital Government program for many years. Over dinner, I told him that I thought he should write a book; that by reading all the grants being submitted to his program, he had a better idea than almost anyone in the country what the key research needs were around information technology and government. I then asked him what he thought was the most pressing issue in the digital government area. Without hesitation, he responded that he thought digital archival of data was a really key issue that we, as a country, needed to work on.

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Attachments (separate files)

[Note: We attach these appendices to be co-located with this case because we are concerned that over time, their URLs may change or they may be taken off the Web (a digital archive issue! This occurred in the time lapsed between the first draft and this final version.]

Attachment 1. From the Executive Office for Administration and Finance (www.mass.gov). **The Enterprise Open Standards Policy** 1/13/2004. ***Note that this policy is still in effect as of February, 2013***.

Attachment 2. The Office of the State Auditor's Report on the Examination of the Information Technology Division's Policy for Implementing the Open Document Standard, No. 2006-0884-4T. While this entire report is relevant, four appendices are of particular interest for this case:

Appendix 1. Chronology of Events (p. 59)
Appendix 2. Memorandum re Information Technology Policy 9/25/2003 (p. 61)
Appendix 4. Cost Analysis 9/19/2005 (p. 63)
Appendix 5. CIO Letter 8/23/2006 re adaptive technologies (p. 66)

Key Players in the Administration of Governor Mitt Romney, Massachusetts

Secretary of Administration and Finance
Eric Kriss *worked with Romney at Bain Capital, served as campaign policy advisor, led transition team, then took A&F post and led IT Policy adoption*
Bethann Pepoli *succeeded Eric Kriss on an interim basis*
Thomas Trimarco *served during the State Audit*

Chief Information Officer
Peter Quinn *joined Eric Kriss as technology delivery systems expert and led IT Policy adoption*
Louis Gutierrez *succeeded Peter Quinn and served during State Audit*

Chairman of the Senate Committee on Post Audit and Oversight
Senator Marc Pacheco *requested State Audit of IT Policy*

State Auditor
Joseph DeNucci *was responsible for the IT Policy audit*

Introduction

The sun reflected brightly off the Statehouse dome on historic Beacon Hill in Boston. Massachusetts Governor Mitt Romney was still riding the post-election high after handily defeating his rival in the November 2002 election. As a Republican governor in this Democratic stronghold, Romney took his victory as a green light from the electorate to pursue his free market economic policies, at least as far as the predominantly Democratic legislature would allow, and unleash the power of the marketplace. With a highly educated and technologically savvy workforce, Massachusetts had long been a hotbed of technological innovation. Recently, however, both the brainpower and companies were finding the West Coast more appealing, and the state was losing its competitive edge. Wishing to return the Commonwealth to its position of national and international technological prowess, Romney saw great opportunity in unlocking the creativity and innovation found in the multitude of institutions of higher education, established and start-up information technology (IT) enterprises for which the Commonwealth was known. Along with higher education, the IT sector was one of the state's greatest assets, and competition among its innovators was sure to be a boon to the economy. Technological innovation was the ticket to economic development in a state with a legacy of Yankee ingenuity.

Expertise in the Romney Administration

Governor Romney had found kindred spirits in his administration with Eric Kriss and Peter Quinn. Kriss cut his teeth in the financial world in 1983 as one of the founders of Bain Capital, now one of the largest private equity firms, and also well known to be one of the sources of Governor Romney's wealth. Kriss honed his entrepreneurial and tech skills in the private sector where he gained experience with and an appreciation for the importance of Information Technology (IT) systems. He went into public service in the administration of Governor Weld, who preceded Romney, serving as both Chief Financial Officer and Assistant Secretary of Administration and Finance from 1991 to 1993, then returned to the private sector. In 2002, when Governor Romney's first ran for office, Kriss served as a policy advisor, then led the transition team, and later took the post of Secretary of Administration and Finance, a key position in the Romney administration.

Peter Quinn, on the other hand, came to his position from Boston Financial Data Services where he had risen from Systems Officer to Chief Information Officer (CIO). His leadership in the analysis of technology delivery services and the resulting processes modifications were key to a 300% growth in five years. Quinn joined the Commonwealth IT Division in 2002 under Governor Romney as Commissioner and was responsible for overseeing 173 agencies in the Executive Branch as well as managing the Technology Bond Fund that served the three branches of government, two university systems, constitutional offices,

and 20 independent authorities. With the arrival of Eric Kriss, Peter Quinn's position was renamed CIO.

IT Challenges

Key concepts: System integration, interoperability, data archiving, access, sharing, data archival and retrieval over time

Together, Eric Kriss and Peter Quinn were responsible for the technology needed for running the approximately 50,000 computers and information systems that served state offices, departments, and agencies across the Commonwealth. Both understood that an overhaul of the IT infrastructure was over due as use of technology had grown exponentially without an overarching plan. Challenges could be found at every level as agency budgets were managed autonomously, including technology purchases, with a resulting vast, out-of-date system of computers, software and other technologies spread across the Commonwealth bureaucracy of administrative offices, agencies, and schools. Kriss and Quinn saw an opportunity to design and implement a new IT architecture that would carry the Commonwealth forward into the 21st century and achieve operational, economic, and also political objectives.

Knowing Governor Romney's entrepreneurial spirit and his wish to return the State of Massachusetts to national prominence in the technology sector, Kriss and Quinn wanted to position the state to lead the way and bring along the private sector in the process (Updegrove, 2006). With the rapid evolution of technology, operational challenges were presenting themselves in an ever-quickening fashion. Government budgets for technology had not kept pace with changes in the private sector, leaving agency equipment and software outmoded with little functional integration among agencies and branches. System integration was necessary to increase efficiency and to allow for interoperability and data sharing among various agencies and government sectors.

Without an overarching plan, there were different software packages, programs, databases, and computers with limited ability to communicate shared data.[2] Duplication of data and functions was often needed to accomplish comparable tasks in different departments and agencies. Furthermore, older computers and proprietary software were no longer compatible with newer versions, making data transfer between systems difficult or impossible without duplication. Public records were stored in a variety of formats ranging from digital to paper, some no longer accessible because of technological changes. With each upgrade in proprietary software and operating systems, the Commonwealth risked losing access to more information. Furthermore, older operating systems were less secure than new ones and posed security issues. And, for a public entity, perhaps the most

[2] For example, a state or local agency dealing with child abuse reports might want access to criminal records or domestic violence reports that might be maintained by a different agency.

troubling issue was that many digital records and data of historical importance were no longer accessible to constituents because of incompatibility issues between the older and newer hardware and software. Kriss and Quinn saw the idea of "open standards" as a ke concept for resolving some of these issues.

See Box 1 for an example of why agreed upon standards for data formatting ("open standards") are important in digital archiving and ensuring access.

QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION

- What is perhaps the most important concern driving Kriss and Quinn's efforts?
- Where in your experience have you encountered challenges with digital archiving?
- What were some of the challenges given the existing IT infrastructure?
- What does "functional integration" and "interoperability" mean in the context of information technology?
- Why are functional integration and interoperability important not only to administrators but also to the public?
- Where have you seen duplication of data and functions?
- When, in your experience with technology, have you run into challenges of interoperability? Have you encountered a situation where you could not read a digital file because you or an organization shifted to a new software?
- In what kinds of situations might public access to data – or lack of access – be an issue in public sector settings?

Announcing a New Information Technology Procurement Policy

Key concepts: open standards, open data, open source, vendor lock in, proprietary software, interoperability

On September 25, 2003, the Commonwealth made an unprecedented move. In a memo from Eric Kriss, Secretary of Administration & Finance to his CIO Peter Quinn, the Commonwealth issued its Information Technology Policy outlining the adoption of open standards and open source software. Making it the first state in the nation, this move from proprietary to open standards and open source was both visionary and controversial and would frame the ensuing debate for years to come. Given Kriss's responsibility for the state's budget, the move was presented primarily as financial, with long-term savings and improved efficiency, however the political ramifications were widespread.

The Open Standards Policy

The Massachusetts Information Technology Policy was in effect an "open standards policy" (Attachment 1). In a memo to CIO Quinn, Kriss directed,

> "Effective immediately, we will adopt, under the guidance of the Commonwealth's Chief Information Officer Peter Quinn, a comprehensive Open Standards, Open Source policy for all future IT investments and operating expenditures."

He further directed that new applications comply with this policy and existing applications undergo review for either "encapsulation" or migration to the new standards. Statewide implementation of the IT Policy promised to create a new architecture for all IT based on the idea of "open standards." Standards were an innovation of the Industrial Revolution – consider, for example, the standardization of railroad track widths or light bulbs and sockets. They were (and are still) critical to the emergence of some very important innovations in information technology (see Box 2), but had not yet become predominant in some portions of the IT sector.[3]

The Idea of Vendor Lock-in

Proprietary or closed source software (see Box 3), for example, typically requires contracts and licenses that must be upgraded through the vendor to stay current with software improvements or new features. If and when a vendor decides it will no longer support a given platform or program version, often referred to as planned obsolescence, the customer is forced to decide whether to purchase new software that is supported by the firm or run compromised systems. This kind of path-dependency, is known as the "vendor lock-in" problem (Linux Information Project, 2006).

Kriss and Quinn knew that a state policy would also facilitate a move in the direction of open standards adoption in the private sector and would help to reduce Massachusetts' problem of vendor lock-in. In instances where the Commonwealth adopted proprietary software solutions, it risked being locked in to that particular software vendor for support and subjected to upgrading when the software vendor decided to no longer support a particular earlier version of the software. By adopting an open standards policy, the Commonwealth would have the option to make a choice, in some IT circumstances, to stay with the same software package but change the vendor who supported the package.

They also believed that embracing an IT procurement policy grounded on open standards would spur further development and adoption of open source software (see Box 4),

[3] A current example is the lack of a consistent standard in education for electronic transmission of transcripts. Although discussed for many years at all levels, K-16 and beyond, there is no consensus and remains a low priority.

potentially leading to a boon for Massachusetts economic development by generating competition for new and innovative commercial IT solutions[4] and ultimately the creation of a seamless public IT architecture. (See Box 5 for a discussion of how proprietary, commercial, open source, and open standards relate to one another). This competition would also yield more products at (potentially) lower costs and to make it even more attractive, the products could be maintained and upgraded by other tech vendors without having to purchase and transition to a new product, thereby gaining a measure of "vendor independence" (Updegrove, 2008). Non-proprietary software would prove itself cost effective not only in the short-term implementation but also in the longer term operation and maintenance. (See Box 6 to learn more about Total Cost of Ownership). Kriss and Quinn had run cost-benefit comparisons to show that switching costs for transitioning to open standards and open source were lower than upgrading the current system with proprietary products (Attachment 2, Appendix 4).

Interoperability and Data Archival

Another compelling reason for the Commonwealth to push toward an IT procurement policy that embraced the idea of open standards is the long-term management of digital data. A concern was that some digital data being archived by the Commonwealth, over the long term, would be rendered unreadable if stored in a proprietary format that does not comply with an agreed upon open standard. A move toward a software procurement policy that encouraged open standards could help avoid this problem because of its underlying principle of "interoperability" – the ability of one software to read the data generated b other (sometimes earlier) software.

In short, to Kriss and Quinn, pushing forth the open source and open standards policy was not only a prudent fiscal choice addressing the vendor lock-in problem, but also a strategic move to a fundamentally democratic system facilitating economic developing in the IT sector, and, at the same time, building toward a more workable digital archive system. Massachusetts would be leading the way nationally.

QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION

- Define, in your own words, the idea of "vendor lock-in" as it relates to information technology procurement.
- Define, in your own words, the concepts of "open standards," "proprietary software," "commercial software," "closed source software," and "open source software."

[4] For example, some universities have made a shift from a proprietary learning management system (e.g., Blackboard) to an open source one (e.g., Moodle). While Moodle is open source, there are a whole new set of firms that have emerged that are in business supporting Moodle. See http://moodle.com/partners/. This is an example of the kind of economic development Kriss and Quinn may have been envisioning. .

- Open source and open standards are often discussed together. Are they related? Why or why not?
- Why was the IT Policy visionary? Why was it also controversial?
- Identify the stakeholders who might object to the policy and propose reasons for their position. Who would likely be in favor and why?
- Why is open source an important consideration for IT procurement policy? What are advantages of a seamless proprietary system? Alternatively, in what circumstances might vendor lock-in be a problem?
- What are the economic, political, and social benefits of interoperability? Costs?

Adoption

Key concepts: open standards and open source per Mass ITD, Open Document Format

The IT Division (ITD) formally adopted its new IT Policy on January 13, 2004 (Attachment 1). This became official with the online publication of the Enterprise Open Standards Policy, the IT Acquisition Policy, and the first version of the Enterprise Technical Reference Model. In that document, open standards were defined as

> Specifications for systems that are publicly available and are developed by an open community and affirmed by a standards body. Hypertext Markup Language (HTML) is an example of an open standard. Open standards imply that multiple vendors can compete directly based on the features and performance of their products. It also implies that the existing information technology solution is portable and that it can be removed and replaced with that of another vendor with minimal effort and without major interruption (Mass ITD, 2004).

The Enterprise Technical Reference Model (ETRM) provided a framework for standards, specifications, and technologies required to support the computing environment and implementation of the IT Policy. The ETRM substantiated the vision of a consistent architectural framework that would facilitate planning, development, and implementation of IT systems. Eric Kriss understood Open Source as follows

> Open Source refers to software that can be redistributed free without use restrictions, including all source code. In other words, the software is not proprietary (Attachment 2, Appendix 2).

Key to his understanding of open source software was that they often were built upon an "underlying open standard, developed by an open community, and affirmed by a standards body; or de facto format standards controlled by other entities that are fully documented

and made available for public use under perpetual, royalty-free, and non-discriminatory terms" (Kriss, 2005).

This policy would, of course, cover lots of different types of software used in the Commonwealth's agencies for many different business purposes. One prominent example is office productivity software. Prior to the announcement of this policy, one software package, widely deployed in the Commonwealth's agencies was the Microsoft Office suite that many readers of this case probably use themselves. MS Office's word processing software "Word," stored data in a proprietary storage format ".doc." Data stored in Word documents not only have letters, numbers and special symbols in them, but also underlying codes that tell Word where, for example, to bold or italicize text. These codes are not visible to the user of Word, but are hidden in the underlying and un-viewable proprietary data format (.doc). The adoption of the policy meant a transition of office processing from the MS Office platform to an open source platform called Open Office that stored word processing data in an open data standard called "Open Document Format" or ODF in which codes are visible to the user, if wanted.[5]

Moreover, cost analysis presented by Quinn and Kriss estimated an $8 million transition to Open Office as compared to $34 million required to upgrade to the next version of Microsoft Office. A deadline of January 1st, 2007 was proposed to do the conversion from MS Office to Open Office for the entire executive branch of MA state government.

Repercussions

Key concepts: total cost of ownership, proprietary v. open data formats, vendors and procurement policy

Peter Quinn's experience at Boston Financial Data Services modifying technical delivery services did not prepare him for the challenges that the new IT Policy elicited. Quinn was criticized, among other things, for their cost estimates for conversion from proprietary to open software. Some felt that the "Total Cost of Ownership" (Box 6) was not properly accounted for as there were also substantial expenses for staff training, continuing programming upgrades, and conversion of old records. Internal resistance from within the complex system of autonomous agencies was not entirely unexpected as each had its own array of software and established systems. And, there was a question of the quality of the new software since it was generally not well known or as well marketed as the more established, proprietary options. Its open and evolving nature, although participatory and

[5] "Open Office" stored data (word processing files, spreadsheets, etc.) in an "eXtensible Markup Language" (see Box 7) or XML-based file structure called "Open Document Format" or ODF (see Box 8). This was an open standard data format that was developed by the Organization for the Advancement of Structured Information Standards (OASIS) consortium.

accessible, necessitated a higher degree of technical expertise than a simple proprietary upgrade (Updegrove, 2008).

Also upset with this new policy were the proprietary vendors, some holding current licenses, who were concerned that they would be summarily disqualified from competing for business. The largest vendor was the software giant Microsoft, not only a US company but also the preferred vendor for many proprietary IT products used by the Commonwealth. Microsoft did not want to lose such a significant account, especially since several other states were looking at similar moves to open source, and this would potentially set a national precedent that Microsoft did not want to have to overcome. In response, Microsoft went so far as to question the International Standards Organization (ISO) definition of open standards (note in Box 2 we discuss that open meetings and consensus are important components for the establishment of an open standard). In a bid to maintain their competitive position, Microsoft worked to develop a new XML format called "Office Open Extensible Markup Language (OOXML, see Box 9) that would qualify as open according to ISO and meet the parameters of the new Massachusetts policy. OOXML users would have the option to save their documents in this format instead of the default ".doc" proprietary format.

The battle turned political when Senator Marc Pacheco, Chairman of the Senate Committee on Post Audit and Oversight, requested on September 22, 2005 that the State Auditor review the IT Division's cost analysis for implementation. He subsequently expanded the audit request to include both the IT Policy development and its implementation target date of January 1, 2007. Senator Pacheco specifically wished to determine whether:

1. The Commonwealth's Information Technology Division (ITD) undertook an appropriate process to research and adopt the Open Document standard.
2. The Information Technology Division (ITD) undertook an appropriate process to develop, review, and issue the ODF implementation policy for the Executive Branch Agencies.
3. ITD's cost analysis submitted to the Senate Committee on Post Audit and Oversight on September 20, 2005 was sufficiently comprehensive and verifiable to support management decision-making regarding the adoption and implementation of ODF.

By the end of 2005, both Eric Kriss, Secretary of Administration and Finance, and Peter Quinn, CIO of the IT Division, had resigned their respective positions. Kriss was succeeded on an interim basis by Bethann Pepoli and Quinn by Louis Gutierrez. It was Gutierrez who would handle the question of OOXML as Microsoft had announced in November that it would be submitting its new standard to the International Standards Organization (ISO) and Ecma International, a European standards body comprised of technology developers and vendors, for approval. Their OOXML format passed muster with Ecma, but not so quickly with the ISO as many questioned whether the nearly 6,000 pages of technical

specifications and close resemblance to a proprietary format negated it from being truly open (Kesan, 2007).

QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION

- What was the State Audit intended to accomplish? What were the likely outcomes?
- What factors should be considered in an IT procurement policy?
- How does total cost of ownership affect procurement?
- Was Microsoft's response justified? Was their new OOXML standard "open"? Do you think it is different of the same as ODF?
- What other stakeholders might the MA ITD have forgotten to consider?

An Unexpected Turn

Key concepts: data access, open document format

The debate heated u and took an unexpected direction, however, when the Disability Policy Consortium publicly voiced their opposition to the adoption of open standards in March 2006. The Massachusetts IT policy-makers had failed to recognize that the special needs of the disabled were well met by an array of technologies that had been developed to be compatible with proprietary Microsoft systems. Unfortunately, these essential adaptive technologies were incompatible with the existing software that stored data in Open Document Format, such as Open Office Writer's .odt format that follows that standard (See Box 8). Without these compatibilities, this community would not be able to access public records and those employed by the state would not be able to perform their jobs, ironically contradicting the principles underlying open source and open formats.

CIO Louis Gutierrez, to some degree, stayed the course and announced that new plug-in software for Microsoft Office would allow the storage of documents in the Open Document Format (ODF) rather than in the proprietary .doc format. This plug-in would be available by the January 1, 2007 implementation deadline. By running on Microsoft Word, it would mean it was compatible with disability reader software that are compatible with MS Word software. In an open letter to the disabled community on August 23, 2006, Gutierrez announced that the IT Division had signed a Memorandum of Understanding (MOU) with the Massachusetts Office on Disability and the Executive Office of Health and Human Services. The MOU:

> …memorializes our understanding that the goals of the Commonwealth's efforts in this area should be the accessibility and usability of technology and the transition to new or upgraded systems that are as seamless for people with disabilities as they are for people without disabilities.

There was also an accessibility group formed within the IT Division to track these efforts and make sure the Enterprise Technical Reference Model (ETRM) was updated every six months.

QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION

- Should the IT Division have anticipated the complaint by the Disability Policy Consortium? Why or why not?

IT Policy Implementation

Meeting the initial deadline of January 2007 for full policy implementation, however, proved impossible. Microsoft needed more time to gain approvals from both ISO and Ecma for its newly developed OOXML platform. Allowing Microsoft more time allayed political tensions not only between the Commonwealth and the corporation but also gave state agencies more time to prepare for the transition. The deadline for implementation was pushed back six months to June 30, 2007. A plan for stepped implementation was laid out that included some of the Commonwealth Executive Agencies, with the Massachusetts Office on Disability leading the way, and others to follow by June 30.

The Office on Disability was an early adopter of newly developed plug-in technology to be used with Microsoft Office software. As an early adopter, they received delivery in November 2006 of newly developed adaptive features for testing and validation with the expectation that this would enable the Office on Disability to meet the phased January 2007 deadline. Adaptive technologies would be used with Microsoft products (e.g., Word, Excel, etc.) but would allow files to be opened and saved in the Open Document Format, making them readable to the wider community utilizing open sources and open standards. For example, the "Service Pack" for MS Word 2007 provided new functionality to both open and save in the Open Document Text (.odt) format, however it also provided, by default, the saving of Word documents following Microsoft's "Open Office XML" standard, Word's new ".docx" format.

By the time State Auditor Joseph DeNucci issued his report, both Eric Kriss and Peter Quinn had left the Romney administration and moved into the private sector. The groundwork they laid, however, was being carried forward by Secretary of Administration and Finance Thomas Trimarco and CIO Louis Gutierrez. With the Office on Disability deeply involved, transition to the open document format was phased in and completed by the revised June 30, 2007 deadline.

MA State Auditor's Report

Key concepts: policy adoption versus implementation, building consensus, transparency, collaboration, participation, and security

On September 20, 2007, State Auditor Joseph DeNucci issued his report on the Examination of the Information Technology Division's Policy for Implementing the Open Document Standard (Attachment 2). The audit found that the research done by the IT Division on open standards and open documentation was adequate, however they did not sufficiently address the implementation plan and interface with existing systems. As expected, accessibility issues and the failure to test products for interoperability were raised, although by the time the report was issued, these had been addressed.

The development of the implementation policy was criticized for not gaining input from and consensus of all branches of the government, for not including the operational management of agencies, and for the policy being issued unilaterally. There were also questions raised about procedural issues including the timeframe for public comment and corresponding responsiveness, risk analysis, economic and technical feasibility, implementation, monitoring, evaluation, and funding. Furthermore, issues raised by the disabled community and addressed in collaboration with the Office on Disability through plug-ins and a modified implementation plan were detailed.

Finally, the report scrutinized the cost analysis originally provided and criticized it for lacking sufficient detail to support the policy. A calculation error was found reducing the difference between the open and Microsoft systems to $17.5 million rather than $26 million, in part due to some computers being too old to upgrade to Windows 12. What was characterized as a "build once, use many times" philosophy did not incorporate the scope of expenses that could be encountered over the lifetime of the IT solution (see Box 6 for more on the Total Cost o Ownership in Software). The IT Division was also criticized for not following its own acquisitions policy to perform a best value evaluation considering total cost of ownership as well as "business requirements, reliability, performance, scalability, security, maintenance requirements, legal risks, ease of customization, and ease of migration."

The report concluded with the recommendation that the Commonwealth's record and retention policy be reviewed and updated to reflect changes in technology and requirements for accessibility. Furthermore it stated that key stakeholders should agree on an appropriate level of transparency. It recommended that oversight be provided by the Office of the Secretary of the Commonwealth to maintain record integrity, security, and accessibility, as well as establish a centralized electronic archive. The IT Division was charged with ensuring interoperability, a detailed review of the Enterprise Technical

Reference Model, and developing a strategic plan for services and initiatives across state government using commonly accepted business case analysis methodology. It also stated that open source options should be considered alongside proprietary products. The IT Division was charged with providing a comprehensive cost analysis, setting contract and web accessibility standards by August 17, 2007, and training all Executive Branch IT designers and developers by August 17, 2008, including in the newly established Assistive Technology Computing Lab. The report recommended that ITD lengthen the public review process, track comments and responses. Both management oversight and control practices were strengthened, as was the role of the IT Advisory Board.

As of this writing (March 2013), the Commonwealth of Massachusetts maintains its Open Standards policy (Attachment 1) and continues to move toward its full implementation. According to the Document History in Attachment 1, it was scheduled for review in January 2013. As of this writing (February 2013), this review has not been completed as far as we can tell.

QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION

- If you use Microsoft Word, did you ever wonder what the difference between ".doc" and ".docx" was? Can you explain it now?
- Given the implementation of the IT Policy prior to the auditor's report, was the report's criticism warranted? How was it constructive?
- What are the primary lessons learned for future IT policy writing, adopting, and implementing?

The Latest Trend – The Evolution Toward More "Open Government"

Key concepts: transparency, collaboration, participation, governance, crowd sourcing application programming interface

Up until now, this case has focused on information technology technical procurement issues as they relate to (1) the question of dependency on proprietary software vendors (vendor lock-in); (2) the concern over the long term archival and readability of government digital records (open standards), and (3) issues related to access for all to this information. Underlying much of this is the idea in open source software and open standards that an user be allowed the freedom to either read the software code (open source) or get access to the data that is stored by the software (open standards). Not long after the MA ITD efforts, the open movement in software inspired the Obama Administration to try to embed or extend these ideals in the deeper operations of government – what is sometimes referred to as "Open Government."

President Obama, on his first day in office in January 2009, signed the Memorandum on Transparency and Open Government that then was followed up with an unprecedented Open Government Directive on December 8, 2009 (http://www.whitehouse.gov/open) The initiative embraces the principles of transparency, collaboration, and participation as the foundation of an open government with the goals of reducing the influence of special interests, increasing access to and understanding of government spending, and empowering the public to increase participation. The directive not only requires executive offices and agencies to improve the quality of government information and publish it online, but also attempts to create and institutionalize a culture of "open government."

This national Open Government Initiative grew out, in part, of the work of Beth Noveck who brought her expertise on technology and institutional innovation to the Obama Administration Office of Science and Technology Policy. (For those interested in hearing Beth Noveck's TED talk, please visit http://www.youtube.com/watch?v=bLGTrz1Zolk) Noveck recognized the limitations of centralized bureaucracies, the outmoded flow of values through voting given today's highly responsive technologies, and the need for a new evolved model predicated on the power of technology and networks. Transparency alone, however, does not change government. It must be coupled with the additional steps of increased opportunities for citizen participation and collaboration to improve governance, creating an ebb and flow.

The Obama Administration was navigating uncharted waters as it reached out to public sector employees and citizens for their ideas for co-creating this new model of governance. Crowd-sourcing also presented new opportunities for using accessible government data to develop innovations and better policy. At the heart of this initiative is the belief that open institutions make for better democracy.

A further evolution of the Open Government concept is the idea of "government as a platform" that forms the foundation for innovation in the private sector to occur (O'Reilly, 2009). A good historical example of the innovation that can occur driven by Government initiatives as a "platform" is the Global Positioning System (GPS) that allows for the easy geo-location of anything using a GPS device. In the early days of GPS (e.g., mid-1990s), the GPS satellite system signal was intentionally degraded by the US Dept of Defense, so that US enemies in the military theater could not utilize GPS locations against us. The error in the signal was called "Selective Availability." Only US military GPS devices had the ability to remove that error in the signal and get high quality latitude/longitude locations. However, nearing the end of the Clinton Administration, there were technological fixes that anyone could deploy that could figure out the Selective Availability error. President Clinton, in response, decided to remove the error and make the correct signal available for the world to use. The result? Not long thereafter, companies like Garmin, Magellan, Trimble and others competed with each other to develop end user devices such as car GPS navigation

equipment. Not long after that, cell phones had embedded GPS. Whole new GPS-supported industries emerged for consumer markets, and for the public good.[6]

The Obama Administration's Open Data Initiative, trying to make government agency data more accessible and available over the Web, was built on the same "Government as Platform" idea – that wide access to data would lead to new innovations and analytic capabilities grounded on the idea that with large numbers of people with access, innovations and insights will follow.

It may still be too soon to fully grasp whether "open source", "open standards", and simply open, transparent access to information will truly be transformative in the way the public sector operates. However, it is vitally important that public managers understand these ideas and their implications.

QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION

- What are the core ideas behind the Open Government Initiative?
- What connections can be made between the MA Open Source IT Policy and the Open Government Initiative?
- What are the key ideas and concepts discussed earlier in this case are essential to the Open Government Initiative and why are they essential?

[6] The government support for the construction of the Internet is another example of the idea of "government as platform" based on open standards. Think of the innovation that has occurred in the private sector based on this government supported open platform.

IT Explanations

Box 1:
Why an Agreed Upon Data Storage Format (an "Open Standard")
is Important for Digital Archiving

During the earlier days of desktop computing, the 1980s and 1990s, two proprietary and commercial word processing software were popular: first WordStar, followed a little later by a software called WordPerfect. In one of the authors' parents' attic, is a box filled with 5 ¼ inch floppy "disks", an old storage format analogous to today's "USB flash sticks", used on early personal computers but with a more limited capacity. Today, it is very difficult to read the content on these diskettes, not only because it is hard to find a 5 ¼" diskette reader, but also because, even if we could find one, the word processor software used its own proprietary storage format. Comparable to Microsoft Office's Word software storing its data in a popular (proprietary) ".doc" format (that includes underlying codes for things like bold and italics), the earlier WordStar, WordPerfect and MS Word all had their own proprietary (secret) storage formats for storing their word processing data that precluded opening it in one of their rival storage formats. This was in part, to create so-called "network effects" and establish larger numbers of users (customers). Eventually, MS Word's .doc format won out, becoming a proprietary, but de facto standard for the storage of word processing data.

Because Microsoft Word became the dominant software used for word processing, it became increasingly difficult to read files stored in one of these older digital word processing formats (Wordstar or Word Perfect files). This problem – the difficulty in being able to read an old proprietary data storage format years later because of changes in the software industry – is an extremely important issue as we move increasingly toward a paperless workplace. The idea of an agreed upon open data storage format, theoretically, helps alleviate this problem because an agreed upon standard should be followed or complied with over time. And even if it isn't, the standard should be open and well documented and, as a result, should be easier for technicians to recover the data.

For many readers of this case, this old example of word processing software – WordStar, WordPerfect and MS Word – may not really resonate because these software lost their market share before your time. But there are other areas of digital data that, if archived at all, may result in readability problems in the future. Consider this: thirty years from now, will you still be able to display digital photos that you stored or backed up on an external USB hard disk? Will you still be able to read and listen to an old digital music collection on your iPod or MP3 player that captures the essence of your high school or college experience? These problems of archival, and the importance of open data storage standards, is not only an issue of the archival of old word processing formats but also digital photos, sound, video and other types of data. Many of the data files you use in you daily life today fall under proprietary storage formats.

Box 2:
The Concept of Open Standards

Somewhat strangely, there isn't an agreed upon definition of "Open Standard." Here, we will follow some of the logic described by Ken Krechmer (2005) who points out that the term "open standard" can be viewed from three perspectives:

1. Standard setting organizations, who create an agreed upon *structure* or *set of guidelines* through open meetings, consensus and due process;
2. An "implementer" of an existing standard (such as a software developer);
3. The user of the standard (such as a software user).

Krechmer (2005) goes on to describe ten requirements that "enable" an open standard. Here, we will describe the seven most relevant ones for our purposes:

1. Open meetings - where anyone can participate in the standards development process;
2. Consensus - where all interests are discussed and some agreement is achieved without domination by any participant;
3. Due process - with systems of voting and mechanisms to handle appeals;
4. Open Intellectual Property Rights (IPR) – issues around how organizations or individuals with IPR related to the standard make their IPR available to others;
5. One world – the standard is the same across the world;
6. Open change – that changes to the standard occur following the first five principles above;
7. Open documents – that the standard-making committee makes all documents describing the standard easily available to all interested parties.

In software, openly established or agreed upon standards can describe, for example, how software should communicate with one another, or how data will be stored or transferred between computers or between software. For example, the "Transmission Control Protocol (TCP) and Internet Protocol (IP) are sets of communication standards from the 1970s specifying how data should be formatted, addressed, and transmitted between computers and are still used today (Postel 1981a, b). Similarly, the American Standard Code for Information Interchange (ASCII) was designed to promote the "general interchange of information among information processing systems, communication systems, and associated equipment" (Cerf, 1969). The ASCII format still allows us to read data that was stored in it more than 30 years later. Readers of this case may be familiar with "comma delimited text files" that are based on ASCII, and even today are often used to transfer data, for example, from a spreadsheet to a statistical software package.

Box 3:
The Concept of Proprietary (or "Closed Source") Software

Proprietary software, sometimes referred to also as "closed source" software, is software sold with an associated contract or user license. Most readers of this case will be familiar with proprietary software as an end-user as much of what they use on their personal computers is likely proprietary.

At the heart of the idea of proprietary software are intellectual property rights. Proprietary software is often confused with "commercial software" (see Box 5). Proprietary implies that the underlying software logic or source code that makes the software do what it does is not readable by others, whereas commercial implies whether it is sold or not.

In proprietary software situations, the end-user receives the "binary executable code" – meaning the software in a form readable only by computers. Users are not able to "open the hood" and see the underlying computer programs in a human-readable form. The programming logic is treated as protected intellectual property by the organization that built it.

Some readers may find it interesting that in the early days of computing – the 1950s through the 1970s (the "mainframe" era) – most software development organizations were not concerned about computer software logic as intellectual property. Software was shared and programmers collaborated on the software even between companies. As computers became more common in the late 1970s and 1980s, particularly with the emergence of desktop computing, software companies realized they could make profits by treating their software as a private good that could be sold, and therefore that software code needed intellectual property protection. Hence, software firms sold compiled "binary" unreadable (by humans) software and developed legal contracts (software licenses) that placed rules on where the software could be installed (Northwest Regional Educational Laboratory, 2012).

Box 4:
The Concept of Open Source Software

Open Source software differs from proprietary software in that the computer source code – the internal logic of the program – is made available for anyone to access and read.

The open source idea evolved from the "free software movement" of the early 1980s, a response to the emerging trend to protect intellectual property (see Box 3). This movement, led by MIT computer scientist Richard Stallman, championed the idea that collaboration and sharing have always been at the heart of computer programming. Because of the digital nature of software and its nearly no-cost distribution, Stallman asserted that certain user rights should be automatically attached to software, including the freedom (1) to run the software; (2) to review the software logic; (3) to make changes to it; and (4) to redistribute copies of the software. Stallman ingeniously utilized copyright law to create a software license, called the General Public License or GPL, to attach to his own software product, the Gnu operating system, that carried these four freedoms. This kind of license that uses copyright law to permit the distribution of copies or new derivatives of software is sometimes referred to as a "Copyleft" license – a clever play b Stallman on the term "copyright" (Deek and McHugh 2007). Stallman referred to software licensed under his GPL as "free" software (as in freedom, not cost). Today, software under GPL licenses and those that follow similar principles are sometimes referred to as "free/libre" software.

The phrase "open source" emerged a little later when philosophical debates emerged between computer programmers. Free/libre advocates were championing the above four freedoms (Stallman, 2010). Those in favor of calling it "open source" in part did this to emphasize that the software logic was available, and to avoid confusion between Stallman's "free software" label about freedoms and "free software" meaning closed source software made available at no cost. Alternative open source licenses appeared with subtle differences from the underlying GPL license philosophy, including those nuanced to be more sympathetic to business interests not willing to accept all the freedoms established in the GPL. More on the specifics of open source licenses can be found at http://www.opensource.org.

For this case, we use the phrase "open source" as a term that encompasses both software that is licensed as "free/libre" (e.g., GPL and GPL-like licenses) and also open source licenses. The Massachusetts officials in the case also used the open source term more generally.

Box 5:
How the Terms "Proprietary," "Commercial,"
"Open Source," and "Open Standards" Relate to Each Other

In discussions about open source, there is sometimes confusion between the concepts of *proprietary software* and *commercial software*. People sometimes treat these phrases as meaning the same thing – they are not. Public sector managers need to understand the differences.

As Box 3 described, proprietary software is closed source; it means that the software logic is treated as intellectual property that must be protected. In these cases the source code is tightly controlled and not shared. Commercial software refers to the ability to sell the software or services around the software.

The table below describes the four categories of software that emerge when one considers open and closed source, and commercial or non-commercial.

	Commercial Software	**Non-Commercial Software**
Proprietary (Closed source)	(1) Lots of the software we use today. E.g., MS Office; Stata (statistical software); Oracle (database); etc.	(2) Freeware. E.g., Free Antivirus software; Google Chrome web browser; See http://download.cnet.com for more.
Open Source	(3) Software for which you can purchase support packages from a vendor. E.g., the RedHat Linux operating system; Moodle Learning Management System; etc.	(4) Software that you download from the web that does not have commercial support vendors. Many of the software projects found on Sourceforge.net.

Much of the software we use in our daily lives falls under the Commercial, Proprietary (or Closed source) category (1) and includes many of the standard software packages organizations use. Readers can probably come up with examples of this category that they use in their own daily work. There is also, however, proprietary software that is not commercial (2): "freeware", proprietary (one cannot get to the code) but it is offered and available at no cost (free) over the Internet. This is not to be confused with Stallman's

"free software" and its corresponding freedoms.

Open source software may also be provided commercially such as when a business emerges around the support of open source software (3). Red Hat, probably the most widely known company that falls in this category, creates and maintains "software distributions" – shrink-wrapped versions and documentation of the open source operating system "Linux," and sells this distribution. In this instance, the software itself is open source, but the consumer purchases Red Hat's service of putting all the software components together in a neat package and providing related documentation.

Finally, the last cell in the table represents open source software that is not commercial, where much of the open source software falls (4). For example, the office productivity suite Open Office, and now a related offshoot called "LibreOffice", falls under this category.

The above table is augmented with a third dimension, depicted in a simplified version below, that addresses whether or not the software complies with an established open standard. There can be circumstances where commercial, proprietary software complies with an established open standard (3) such as the idea of Microsoft Excel providing a mechanism to output in comma delimited text format. There also can be open source software that does not comply with some established open data standard (4).

	Commercial Software	**Not Commercial Software**
Complies with Open Standards	(1) Some of the software used today, such as software underlying the Internet that follow the TCP/IP communication protocols	(2) Open Office or Libre Office are examples
Does not comply with Open Standards	(3) Many of the commercial software we buy today from proprietary companies	(4) Many packages do not comply with an open standard; e.g. the hosting site Sourceforge.net has over 170,000 software packages in its database. In some cases, there may be no established open standard to comply with!

The discussion in this box, we hope, helps the reader understand these key concepts and the complexities circling around the MA open source and open standards policy.

Box 6:
The Total Cost of Ownership in Software

Often people who purchase computer software think that the cost of the software is simply its purchase price. The idea of getting software at no cost, as is often the case in open source software, means that there are real savings for the organization. This has some merit if an organization, like the Commonwealth of Massachusetts, purchases a significantly large quantity of software for deployment on many desktop computers.

In reality, however, the purchase price of the software is only one of the costs involved in IT deployment. Other costs include:

- The purchase price of the hardware on which the software runs;
- The training of staff on how to utilize the software (or manage it);
- Hardware and software maintenance costs; and,
- The costs of updating or replacing the software as new versions come along, or transitioning the organization to new replacement software.

Source: Podolsky, 2003.

Box 7:
The Importance of Structured Data, XML, and Open Standards

XML stands for eXtensible Markup Language, a way to use "tags" to help transport and store data in a structured format. Tags are text-based codes that help label the data and allow computer programs to read and find data stored in digital files.

To clarify, let's return to our word processing example described in Box 1. Suppose yo create a new document using a word processor, like MS Word. At the top of the file you create a heading, and you set the heading text to **bold** and *italics*. While you don't see it on the screen, MS Word stores codes before and after your heading to document that you want the heading bolded and in italics.[1] Tags, in XML, are in a way, similar to these codes that help format your data.

One of the reasons XML was invented was to allow people to separate the structure of data (text or other information) from the way that data is displayed. HyperText Markup Language (HTML) – also a formatting language that uses the idea of "tags" on World Wide

Web pages – is used to *display* the data. XML and HTML work together: XML "structures" the data; HTML formats the look or display of the data (w3schools.com, 2012). XML complements HTML; they work together. If readers have heard of the concept of the "Semantic Web" – the idea of creating web pages that are structured so that computers and software can more easily find data embedded in web pages – underlying this concept is the idea of structuring data stored in HTML using markup languages like XML to achieve this goal (Berners-Lee, 2001).

Note that XML doesn't have its own predefined tags to structure data. Data creators desig their own markup tags to describe their data. This is the reason that it is referred to as an "extensible" markup language, or a markup language that takes into account future growth. For example, if you wanted to create an XML structure to format data in a memo to your boss summarizing yesterday's meeting, it might look like this:

<memo>
<to>boss</to>
<from>me</from>
<heading>Meeting, Friday March 16, 2012</heading>
<body>We really didn't cover much that was useful</body>
</memo>

Of course, the above is a silly example, but there are many examples of openly shared XML structures that are quite useful and important. For example, scientists in the field of Ecology have created an agreed upon XML structure called the Ecological Metadata Language or EML to establish a standard markup language to describe ecological data (KNB, 2012). This brings us back to the idea of an "open standard." EML is an ope standard for describing ecological data. Another example is XBRL, the eXtensible Business Reporting Language.

While there are critics, the value of XML to the structure of data and the potential for computers to locate data embedded in files stored on the Internet, have led some to consider it the "ASCII of the 21st Century" (Delgado-Kloos and Sanchex-Fernandez, 2002; See Box 2 for more on ASCII).

[1] The code would be something like Bold On and Bold Off but we don't know for sure what the codes are because Word, being proprietary and not open, doesn't let you see them by default. If you've ever deleted a passage of text in MS Word and that deletion caused the text that followed the deletion to change formatting (such as a new font or something) that is because your deletion caused some formatting codes to be removed unbeknownst to you as you were deleting the text.

Box 8:
A Short Summary of the Open Document Format (ODF) Standard

"The OpenDocument Format (ODF) is an open XML-based document file format (see Box 7) for office applications to be used for documents containing text, spreadsheets, charts, and graphical elements" (OASIS, 2012). Organizations and individuals who have contributed to defining this standard can be found at http://www.oasis-open.org/committees/office/obligation.php. Common filename extensions following open document specifications include:

- .odt for text or word processing documents;
- .ods for spreadsheets; and,
- .odp for presentation files.

To view the actual agreed upon ODF XML structure (version 1.2, September 29, 2011) visit http://docs.oasis-open.org/office/v1.2/os/OpenDocument-v1.2-os.html.

Box 9:
A Short Summary of the Office Open XML (OOXML) Standard

"Office Open XML (OpenXML) is a proposed open standard for word-processing documents, presentations, and spreadsheets that can be freely implemented by multiple applications on multiple platforms. Its publication benefits organizations that intend to implement applications capable of using the format, commercial and governmental entities that procure such software, and educators or authors who teach the format. Ultimately, all users enjoy the benefits of an XML standard for their documents, including stability, preservation, interoperability, and ongoing evolution" (Ngo, 2012).

An overview is provided by Ngo (2012). For details on its specifications, see http://www.ecma-international.org/publications/standards/Ecma-376.htm.

Common filename extensions following OOXML standards include:

- .docx for text or word processing files;
- .xlsx for spreadsheets; and,
- .pptx for presentations.

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TEACHING NOTES

Introduction

Undoubtedly, Information Technology has permeated into almost everything public managers do. Moreover, in the context of public policy and management as it relates to collaboration, multi-organizational networking, collaborative governance and collaborative problem solving, *information and data sharing* are critical.

In our view and experience, underlying issues surrounding Information Technology management and procurement policy are often not a subject addressed in public policy and administration programs, and yet these systems drive the way information is shared within and across organizations. With the ever-expanding scope of technology in the workplace (including mobile technologies) the issues described in this case, while somewhat technical, are crucial for students in public management to understand. They relate not only to managerial issues around information technology design and procurement, but also expand into information policy issues and so-called "Open Government."

Advice for Instructors

After assigning the case for students to read, we suggest the instructor sequentially walk through the sections and specifically discuss the "QUESTIONS FOR READER CONTEMPLATION OR DISCUSSION" that we presented in the narrative. Below, we repeat these questions for your convenience, along with the answers we would be looking for if we were teaching the case. The questions listed in **bold** are the ones we think are especially important for the students to contemplate and understand.

After working with this case, students will:

- Be aware of arguably one of the most important issues in information management facing the public sector: digital data archival for the long-term.
- Have familiarity with the concepts of open source and open standards, as well as the concept of proprietary data formats and some of their histories.
- Learn that while open source and open standards are often used or mentioned together, they are different concepts. Some open source software follow open standards, others may not. Similarly, some proprietary software might store data following an open standard, others may not. In this case we discussed the MS Office word processing format .doc as an example of a proprietary format, and Open Office's ".odt" (open document text) as an example of a format that follows an open document format.
- Understand key information management issues in the 21st century: "open source," "open standards," "proprietary," "commercial," "interoperability," "data accessibility," and "vendor lock-in."

- Understand that there are important managerial and policy dimensions in this case that are sometimes related but are different: (1) Open versus proprietary (closed) data formats; (2) open versus proprietary software and the difference between binary executable software and the actual human readable source code; (3) you can have open source commercial software or open source non-commercial software, just as you can have proprietary commercial software or have proprietary non-commercial software (e.g., "freeware"). Moreover, not all open source software comply with established open data standards.
- Understand what XML is generally and why these kinds of extensible markup languages are important for data sharing on the Internet.
- Grapple with the complexities of potentially conflicting interests of direct and indirect stakeholders and also the idea that sometimes in policy, there may be ramifications that are not anticipated – unintended consequences.
- Be able to articulate reasons why adopting open standards in government technology policy might be desirable and that the cost of ownership includes factors beyond software purchase.

All of these concepts are important for people to understand in the era of 21st century public sector information management.

"IT CHALLENGES" SECTION:
QUESTIONS (AND ANSWERS) FOR READER CONTEMPLATION/DISCUSSION.

Key concepts: System integration, interoperability, data archiving, access, sharing, data archival and retrieval over time

- **What is perhaps *the most important concern* driving Kriss and Quinn's efforts?** *Data archival and preservation of digital data with the ability, years later, to read these data.*
- **Where in your experience have you encountered challenges with digital archiving?** *Most readers will have had first hand experience here, perhaps in their personal lives, if not their professional lives. Archiving digital family photos, or music, for example. Look also for public or nonprofit workplace examples. For example, the author has run into problems in the past related to the archival of landcover datasets (e.g., NASA's Landsat satellite imagery) that used to be stored on large tape drives. Remind them the students to look back at Box 1's examples.*
- What were some of the challenges given the existing IT infrastructure? *This is a chance to talk about system integration, interoperability, sharing, and duplication of functions.*
- What does "functional integration" and "interoperability" mean in the context of information technology? *Allowing "seamless" transfer of data between systems.*

- Why are functional integration and interoperability important not only to administrators but also to the public? *Access to information is key. Both current and past data.*
- Where have you seen duplication of data and functions? *You may consider leading this discussion with an example of your own if readers' have limited professional experience. One simple example would be an experience where an organization manages programs using separate (not shared) spreadsheets on two different employee's personal computers but there is some duplication in those spreadsheets (such as client's addresses, for example). The era of distributed computing – the PC* era – *led to significant problems related to duplication of data and databases that were not shared.*
- When, in your experience with technology, have you run into challenges of data interoperability? Have you encountered a situation where you could not read a digital file because you or an organization shifted to a new software? *The example we used, that will be understood by older students, is a reflection on the days when other word processors were dominant, such as Wordperfect or, even older, Wordstar. The author still has 5 ¼" floppy diskettes that has files stored on it in data formats that these older software used. Assuming we could even read these old diskettes, we might be hard-pressed to read the data stored in these old formats. This is a good example of the longevity problem we face as we rely less and less on paper archival systems.*
- **In what kinds of situations might public access to data – or lack of access – be an issue in public sector settings?** *Look for answers such as any public records, historical or current: financial or budgetary data, legislative, records of meetings. This is the underpinning to a well functioning democracy.*

"ANNOUNCING A NEW IT POLICY" SECTION:
QUESTIONS (AND ANSWERS) FOR READER CONTEMPLATION/DISCUSSION

Key concepts: open standards, open data, open source, vendor lock in, proprietary software, interoperability

- **Define, in your own words, the idea of "vendor lock-in" as it relates to information systems procurement**. *Here, look for an answer that suggests path-dependency. Purchasing a computer system and making a commitment to use it in the workplace leads then to a kind of dependency on that software and, ultimately, the vendor who produced it to maintain it. An example of a vendor lock-in challenge that might be a useful example for a class in a university is what our own university has been struggling with in recent years – our learning management system (LMS). We have historically have spent millions of dollars on a vendor's LMS, only to have the vendor announce that it would no longer support it. This forced us into deciding between migrating to the system they would support or to a completely different*

system supported by a different vendor. Typically, the latter involves more transaction costs.

- **Define, in your own words, the concepts of "open standards," "proprietary software," "commercial software," "closed source software," and "open source software**." *This question gives you an opportunity to revisit the concepts described in Box 1-5.*
- Open source and open standards are often discussed together. Are they related? Why or why not? *Open source software often, but not always, follow an open standard*.
- **Why was the IT Policy visionary? Why was it also controversial?** *The visionary part could contain discussion about leading on a national basis, spurring economic growth, and the potential for a new IT architecture. Massachusetts was one of the first states in the country to contemplate such a policy. Controversy centered around how it was approached, lack of inclusion in the process, stakeholders such as Microsoft and the disabled who were adversely impacted.*
- Identify the stakeholders who might object to the policy and propose reasons for their position. Who would likely be in favor and why? *Opponents clearly included Microsoft and any existing proprietary vendors. Software developers in the tech sector would be in favor, for example, firms who might support alternative technologies that comply with the open standards. Plenty more points to be made on both sides here.*
- **Why is open source an important consideration for IT procurement policy? What are advantages of a seamless proprietary system? Alternatively, in what circumstances might vendor lock-in be a problem?** *This question also provides an opportunity to revisit the concepts described in Box 4 and 5.*
- What are the economic, political, and social benefits of interoperability? Costs? *This would be a place to introduce intended and unintended consequences and explore them in the three spheres.*

"REPERCUSSIONS" SECTION:
QUESTIONS (AND ANSWERS) FOR READER CONTEMPLATION/DISCUSSION

Key concepts: total cost of ownership, proprietary v. open data formats, vendors, and procurement policy

- What was the State Audit intended to accomplish? What were the likely outcomes? *This discussion should focus on intended and unintended consequences, policy adoption and implementation, and the audit as a means to establish transparency that was not previously part of the process.*
- **What factors should be considered in an IT procurement policy?** *Students can offer their ideas that might include factors such as key IT concepts listed above as well as political considerations. Consider bringing this back to the issues of vendor lock-in, software usability and integration, and the data archival and longevity issue.*

- **How does total cost of ownership affect procurement**? *This is an opportunity to address hidden costs and management issues. Revisit the concepts in Box 6.*
- Was Microsoft's response justified? Was their new OOXML standard "open"? Do you think it is different or the same as ODF? *This is a case study unto itself involving two international standards boards. During this time, Microsoft was waging a state by state campaign to defeat implementation of eight similar policies. The question of whether the OOXML standard was truly open is open to debate. Remind the students that the idea behind open standards is some agreement across interested parties. OOXML follows a different standard than ODF. Students interested in more clarity should be encouraged to visit the websites listed in Boxes 8 and 9. Students interested in more of the technical aspects of this – such as XML and how it relates to open standards – should revisit Box 7.*

"AN UNEXPECTED TURN" SECTION:
QUESTIONS (AND ANSWERS) FOR READER CONTEMPLATION/DISCUSSION

Key concepts: data access, open document format, and stakeholders

- **Should the IT Division have anticipated the complaint by the Disability Policy Consortium? Why or why not?** *This question is included for the student's contemplation about considering all relevant stakeholders involved.*

"MA STATE AUDITOR'S REPORT" SECTION:
QUESTIONS (AND ANSWERS) FOR READER CONTEMPLATION/DISCUSSION

Key concepts: policy adoption versus implementation, building consensus, transparency, collaboration, participation, and security

- If you use MS Word, did you ever wonder what the difference between the extension names ".doc" and ".docx"? Can you explain it now? *The .docx is utilizing Microsoft's Open Office Extensible Markup Language (OOXML). The .doc format is the old format that does not comply with the OOXML standard.*
- Given the implementation of the IT Policy prior to the auditor's report, was criticism warranted? How was it constructive? *This is an opportunity to think specifically about the timing and content of the auditors report. It served to establish a written and therefore transparent record of the policy adoption and implementation and may therefore have been undertaken primarily for this purpose. Students can be challenged to debate this.*
- **What are the primary lessons learned for future policy writing, adopting, and implementing?** *This question provides an opportunity to summarize the*

recommendations in the report and review principles of transparency, collaboration, and participation.

"THE LATEST TREND – THE EVOLUTION TOWARD MORE OPEN GOVERNMENT" SECTION:
QUESTIONS (AND ANSWERS) FOR READER CONTEMPLATION/DISCUSSION

Key concepts: transparency, collaboration, participation, governance, crowd sourcing, application programming interface

- What are the core ideas behind the Obama Administration's Open Government Initiative? *This question allows the class to revisit the three main ideas behind this: transparency, collaboration and participation.*
- What connections can be made between the MA Open Source IT Policy and the Obama Administration's Open Government Initiative? *The idea here is to look at the technological underpinnings found in MA that are also present at and necessary to the federal level.*
- **What are the key ideas and concepts discussed earlier in this case that are essential to the Open Government Initiative and why are they essential?** *This is an opportunity for students to think back over the IT concepts we've addressed earlier and likely discover that all are applicable.*

CONCLUDING/WRAP-UP QUESTIONS

- **So in conclusion, what were the goals of the Commonwealth in adopting open standards?** *The focus should be on innovation, vendor lock in, interoperability and the need for a new IT architecture.*

- **Is government support for open standards adoption necessary?** *This would be an appropriate place to discuss de facto versus de jure standards*. Why might a de facto standard be advantageous over a de jure one? What are some of the arguments in support of such a policy or some of the reasons against such a policy? *This is an opportunity to also invite discussion about the scope of government and legislation.*

A CLOSING EXERCISE TO CONSIDER

If you are teaching this case in a computer lab, you can have all of your students try this, assuming you have some kind of "unzipping" software available, as well as Open Office or Libre Office available. Or, if you have a laptop and a data projector, you can demonstrate this to the class yourself. Try this experiment. This exercise "opens the hood" on these open document formats so you can see XML and the open standard in action. It is this opennes that means that these digital data can be more easily read over the long term.

1. Download and install Open Office (http://www.openoffice.org/) or its "relative," Libre Office (http://www.libreoffice.org). Or us a versio of MS Word that has a "save as" option to save as the Open Document Format. Use this word processor in these office suites to create a small document. Type the word "test."

2. Save it as Open Document Format (.odt).

3. On your computer, find the file that you saved but DO NOT open it using Open Office. Instead, open it using an "unzip" uncompression package such as the software "7-zip" (http://www.7-zip.org/) or MacZip (http://download.cnet.com/MacZip/3000-2250_4-10025248.html) or any of the other unzip-type packages. (Note: zip files are compressed files and software like pkzip can read and "unpack" them. By opening the .odt file using an unzip software, you will be "opening the hood" and will see the various components of this open document standard. There will be several files produced or extracted. One is named "content" and is an XML file. You can open it using "Wordpad" on Windows machines, or "textedit" on Macs. You should be able to see all the XML codes or "tags." Look for the following "body" tag:

   ><office:body><office:text text:use-soft-page-breaks="true"><text:p text:style-name="P1">test</text:p></office:text></

4. This provides an example of how the .odt file format complies with an open standard and allows us to open its contents using software outside of Open Office Writer.