
Using XML for Web Site Management: Lessons Learned Report

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December 2007

Acknowledgments

This report is based on the lessons learned from CTG's XML Testbed. The success of the Testbed rested on the enthusiastic participation of five New York State (NYS) agencies who committed to extensive hours of workshops, training, and prototype development. CTG extends its thanks to the NYS Department of Civil Service, NYS Division of Housing and Community Renewal, NYS Higher Education Services Corporation, NYS Office for the Prevention of Domestic Violence, and the NYS Office of Cultural Education, State Education Department.

The Testbed was undertaken in partnership with the Governor's Office of Employee Relations (GOER), the Office of the Chief Information Officer (OCIO), and the Office for Technology (OFT).

Several members of the CTG staff made many important contributions to this report and the overall project: Sharon Dawes, Jane Krumm-Schwan, Alison Heaphy, and Paula Rickert.

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Introduction

Who should read this report

This report details the key benefits and barriers regarding the use of XML for Web site management within the framework of the lessons learned during the Center for Technology's (CTG) XML Testbed.

Project managers, Webmasters, public information officers, program managers, and anyone involved in getting information to the Web site will find value in the findings presented in this report. It is not a technical how-to on the intricacies of XML; it is an explanation of how the adoption of XML in the cases cited here affected business processes, workflow, content management, and public image.

This report is part of a suite of resources (see Appendix B) produced from the XML Testbed. Each of these resources has its own focus and target audience, but they should be considered as a whole to gain a full picture of how using XML for Web site management can impact an organization. The other resources are:

- *Using XML for Web Site Management: Getting Started Guide*
- *Using XML for Web Site Management: An Executive Briefing on streamlining workflow, reducing costs, and enhancing organizational value*
- The XML Toolkit

The challenge of Web site management

In the late 1990s, CTG faced critical issues as its Web site matured over a five-year span from a simple location for posting reports and project results to a highly complex site with over 1,300 Web pages, thousands of hyperlinks, multiple navigation and search routes, interactive applications, and ongoing updates. Because the Web site was playing a more prominent role

as the primary communication and outreach tool for the organization, its performance, appearance, and timeliness became greater concerns. The question confronting CTG was one faced by most government agencies:

How to efficiently manage a Web site that was continually growing in size, complexity, and importance without simply throwing more money and resources into it?

CTG's primary issue was managing the content—the dozens of publications and project descriptions—that comprised the majority of the material that appeared on its Web site. A typical publication contained 40 or more printed pages with tables and graphics. Each publication was produced as a printed document, as a downloadable PDF file, and as a series of hyperlinked HTML pages on the Web site.

In 2001, CTG had over 50 of these publications to manage. Every new publication or revision increased the difficulty of maintaining consistency among the various formats (print, PDF, HTML) and establishing an efficient workflow to keep the Web site up to date. CTG's practice of creating and managing individual HTML pages for its Web site—which was standard practice at the time—was creating unmanageable bottlenecks as more Web pages were added to the site. A database or content management system offered some relief in terms of workflow, but failed to address the root problem of maintaining the content in multiple formats and locations.

XML, however, offered a different solution. It addressed the root problem by providing a standard, non-proprietary structure for the original content coupled with tools to access and present that content in several different formats, including HTML and PDF. If the publications were taken out of their multiple formats as Word documents, PDF files, and HTML pages and converted to a single XML format, that would eliminate many of the consistency and workflow issues that were

hampering the Web site management process. From the XML source document, the different output formats could be automatically generated by XML stylesheets (XSL) that would eliminate the manual reformatting of content for different uses (see Figures 1 and 2).

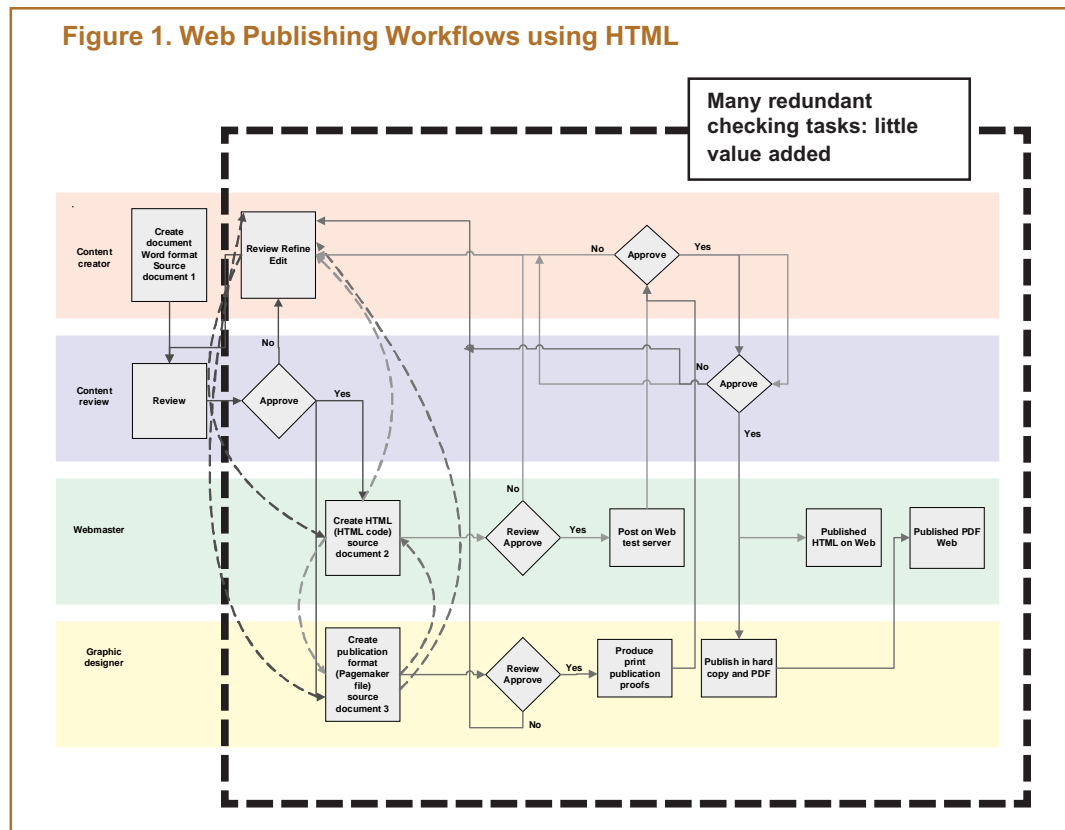
Over a nine-month period from September 2002 to May 2003, CTG converted its entire Web site to an XML basis, which resulted in an 80% reduction in the time and resources devoted to routine Web site updates and maintenance. Those savings, which have held true to the present day, have enabled Web resources to be reassigned to new development projects returning greater value to the organization.

The success of CTG's implementation of XML generated interest among other New York State

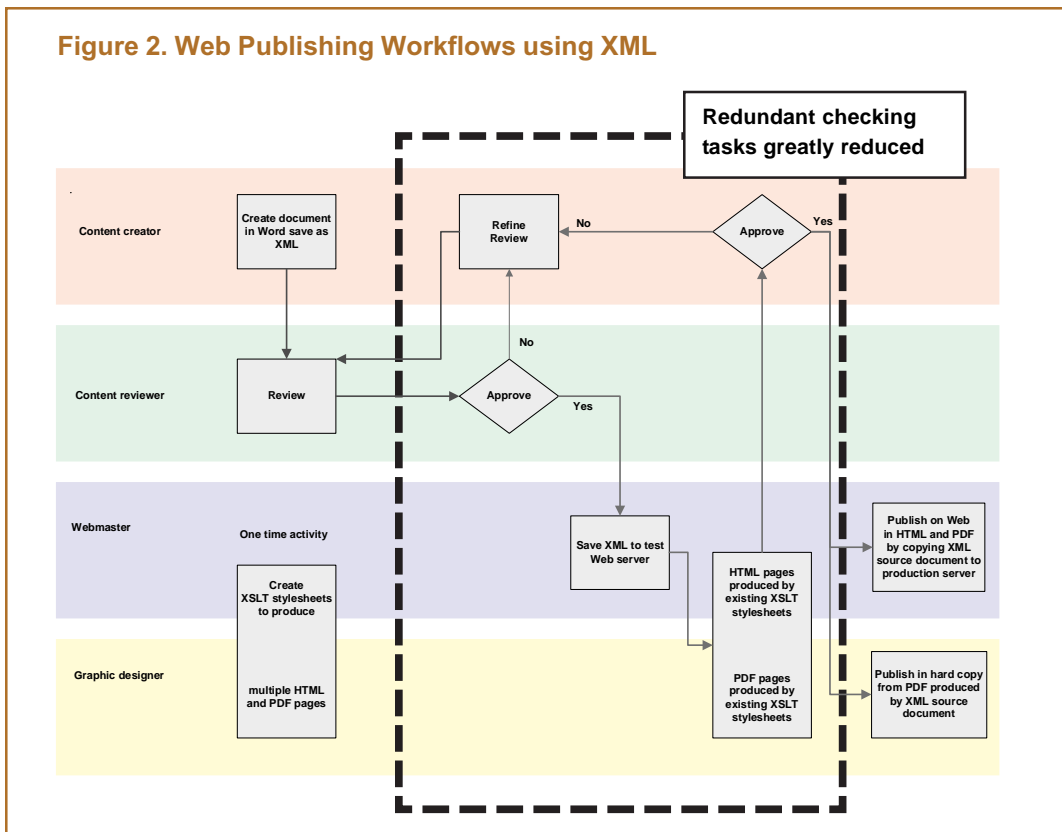
agencies in adopting XML-based approaches to their own Web site management challenges. Presentations and training sessions conducted by CTG for these agencies provided some help but were not enough to move the interest into the adoption and implementation phases. The "testbed" approach described in the next chapter became the logical next step in helping agencies move to the next phases.

How this report is written

This report details the findings of CTG's XML Testbed as reported by and observed in the five New York State participating agencies. The chapters and appendices are briefly outlined on the next page.



- **The Testbed Methodology** explains the systematic approach that was followed in the design and implementation of the project. This chapter is important for understanding the distinction between *prototypes*, *pilots*, and *testbeds* within CTG's rubric and why the testbed framework was the critical component of the project.
- **Benefits** itemizes the key benefits of using XML for Web site management that were identified as a result of the project.
- **Barriers and Challenges** details the forces and factors that project participants identified as impediments to realizing the benefits of XML.
- **Guidelines for Action** outlines steps that organizations interested in using XML for Web site management can take to overcome the barriers and reap the benefits.
- **Appendix A** provides additional background information on the partners and participants in the project.
- **Appendix B** provides a list and description of all of CTG's XML resources that are available for download from the CTG Web site.



Chapter One: The Testbed Methodology

Prototype, pilot, testbed

Prior to the 1980s, developers had few tools to test or simulate an application in a user's environment. In the early 1980s, *prototyping* was developed as a way to gain user acceptance or establish technical feasibility by constructing a partial system to demonstrate an intended system's behavior. During the same period, designers used *pilots* to provide a trial run of an application and correct any problems before implementation or large scale use.

However, prototypes and pilots did not look beyond the application to the social and organizational challenges raised by a new technology or workflow change. While technically feasible, systems still failed because social and organizational issues became barriers to implementation. In previous projects and research, CTG found that looking at all the issues—technical, organizational, and managerial—mitigated many of the barriers to system implementation. As a result, CTG developed a comprehensive prototyping approach that examines not just technical factors, but larger organizational issues as well.

For this project, comprehensive prototyping was employed within a larger testbed methodology that offered training, guidance, and a “safe environment” in which participants could examine the feasibility of using XML for Web site management within their specific situation. This testbed approach was taken because many agencies confront obstacles to the adoption and implementation of XML-based Web site management despite their recognition of its benefits. CTG wanted to determine if the problems were due to the technology or the social and organizational issues surrounding innovation. The XML Testbed provided not only technical training but also an exploration of the organizational impact and workflow changes that the implementation of XML would potentially cause. The project



was designed to help prospective agencies investigate their capability for such an implementation. As part of the Testbed model, agencies had to demonstrate leadership buy-in not only for participation in the Testbed, but also for the potential organizational changes their prototypes might produce.

Technology in context

The XML Testbed involved a series of presentations, training sessions, workshops, and discussions to support the development of agency-specific XML prototypes and business cases:

- Two training sessions were focused on XML programming and its advantages as well as the challenges when used for Web site management.
- Another two-day training session provided the basics of project management, including defining a problem, identifying stakeholders, analyzing workflows and business processes, and developing cost-benefit analysis. Each team developed a written business case for their prototype as a result of this training.

- A final training class was devoted to project management issues such as work breakdown structures, challenges of project management, competing priorities, and how to garner executive sponsorship.
- Six workshops were organized for participants to present their progress in both the development of their business cases and their XML prototypes. The teams were assigned specific tasks to complete between workshops. In addition, each workshop featured a presentation by an industry expert, a Webmaster with relevant expertise, or a university professor that highlighted some potential applications, capabilities, and limits of XML. Several workshops fostered discussions between and within the teams. Opportunities were also provided for people in similar roles (content providers, content reviewers, Web developers) to exchange ideas and concerns.
- Finally, communication among team members was encouraged for solving common questions and problems through the use of emails, office hours with the CTG project team members, and individual project team meetings.

To participate in the Testbed, an agency needed to meet specific requirements established by CTG. The team members had to represent all the roles involved in the Web publishing process from content creation to publishing on the Web. Through the development of their business cases, the agency teams needed to gain the necessary knowledge about their business problem in detail through investigating the workflow and business process currently followed, identifying relevant stakeholders, garnering executive support not only for the prototype but also for the potential future project, and identifying

where resistance to change could arise within the organizational units involved in the process. They also had to detail their ideal state—how the process would change by using XML as a Web management tool.

Agency teams were trained in the use of XML and were asked to develop a prototype based on their original agency proposals. Throughout this project, the project teams had the opportunity to further their knowledge about XML for content management and then apply it immediately to an aspect of their environment. Their learning occurred in the context of their organizations. They were able to identify the potential enablers and constraints facing an XML project. The comprehensive prototyping experience not only allowed participants to understand a technology, but also to understand a specific technology application (XML for Web site content management) immersed in a specific context (their state government agency).

The key factor in the Testbed was that participants were engaged and focused on a real project that directly impacted their organization and were asked to work on the project as if they were going to implement it at their site.

Training is not enough

The goal of the Testbed was to see if the benefits experienced by CTG in its transition to XML were replicable within state agencies. Because CTG's organizational environment was different from NYS agencies, its policies and practices in adopting XML could not be simply transferred to other organizations. Furthermore, each NYS agency has its own unique culture and capabilities, so CTG wanted to examine how XML implementation would play out across a spectrum of different agencies.

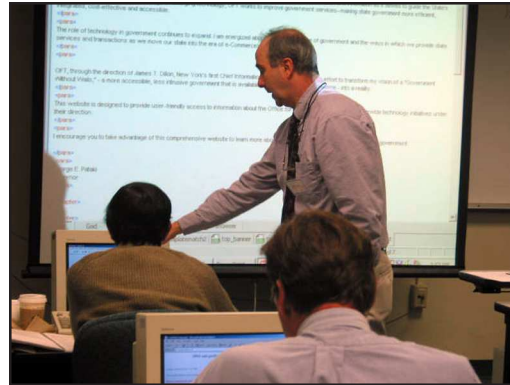
Initially, CTG developed a one-day *Introduction to XML for Web Site Content Management* training class that was delivered to over 65 different individuals (primarily Webmasters and IT managers) from over 30 different NYS agencies in 2004. However, follow-up with students indicated that they could not move past the training to implementation. They found it hard to apply what they learned in class into their work place. They were often unable to explore new skills due to competing priorities of their normal work load. And they felt isolated with no community of practice to help support their experimentation.

Training was effective in increasing knowledge of XML, but participants were still missing a supportive environment in which to experiment and apply what they learned. The adoption and implementation of XML involved much more than understanding a technology. It impacted workflows and business processes along with a new approach to managing Web site content. The class attendees realized they were only one piece of a much larger organizational puzzle.

The Testbed was designed to address these questions:

- What barriers prevented these students from applying what they learned in class back at their agencies?
- What additional items besides technical training were needed to successfully explore XML for Web content management?
- If training was not enough, what else was needed?

The Testbed provided the teams with a combination of training and practice within a safe environment. The teams themselves were chosen based on criteria that demonstrated commitment to the process. Each agency team had to provide a proposal for consideration for selection. Within their proposals they were required to discuss their current environment and their goals for participating in the Testbed.



Tables 1 and 2 provide a brief summary of each agency and the challenges they hoped to address by investigating XML for Web site management.

The Testbed also required the project team to represent the organizational spectrum from content creators to Webmasters. Since the Testbed design considers adoption and implementation of a technological innovation as more than a technical issue, expertise in XML was not as important as the fact that all roles within the process were represented. Some project team members had previously attended the one-day XML training; others were slightly familiar with the potential benefits that XML could provide. And still others were only familiar with XML from a data exchange perspective. Many had access to information technology expertise within their organization, while others had only minimal support.

The inherent design of the Testbed purposely addressed the shortcomings of traditional training alone. The Testbed allowed for experimentation and exploration. It provided the necessary community to share ideas and explore designs. It also required executive sponsorship for participation, a key aspect that students stated was missing when they returned to their offices after the single-day XML training.

Table 1. Testbed Team Profiles				
Agency	# of FTEs	Environment	XML Web Content Prior Knowledge	IT Dept / Web Team
Department of Civil Service	570	ColdFusion Studio Dreamweaver	Yes	Both
Office of the Prevention of Domestic Violence	30	Dreamweaver DCJS Hosts Web site	No	No-1 person
Higher Education Service Corporation	700	Lotus Notes Domino	No	Both
Office of Cultural Education	Library	NYS ED Hosts Web site	No	Both
	Archives			Both
Division of Housing and Community Renewal	940	.NET	Yes	Both

Table 2. Challenges to be Addressed by XML

	Department of Civil Service	Office for the Prevention of Domestic Violence	Higher Education Services Corporation	Office of Cultural Education	Division of Housing and Community Renewal
<i>Duplication of Effort</i>	X	X	X		X
<i>Limited Document Formats</i>		X	X		X
<i>Resource Constraints (time, people)</i>	X	X			X
<i>Accessibility</i>			X	X	X
<i>Cross Platform Compatibility</i>			X		
<i>Separation of Content from Presentation</i>	X	X	X		
<i>Print</i>		X	X		X
<i>Ease of Update or Conversion</i>	X				X
<i>Lack of Standardization</i>	X		X		X

Chapter Two: Benefits

The eight benefits described in this chapter were identified by the Tested teams through the process of developing their prototypes and business cases. CTG administered surveys and conducted personal interviews with all the participants to refine these findings into those categories that exhibited the highest level of consensus and impact. The quotations used within the descriptions of the benefits are taken directly from the Testbed interviews.

Information consistency

Information consistency refers to text, images, and other content remaining the same regardless of how and where they are presented. In other words, though the presentation may vary with the media, the content remains the same. This holds true whether it's a printed publication, a Web page, mobile device, or a word processing format—to name just a few.

Ensuring this consistency frequently involves managing several different formats and multiple source documents. A change at any one point requires changes at all other points. As the number of presentation formats and source documents increase, so does the percentage of errors and inconsistencies, since the original author does not always perform the changes. Ownership of the content and responsibility for maintaining consistency can become muddled in this process. As one Webmaster explained, "They [content developers] rely on us [technical team] because we have always done this, if the text doesn't read right, we'll have to rewrite it ... so it falls on us."

Consistency is critical because inaccurate, incomplete, or conflicting information on a Web site can be embarrassing at best, and at worst, lead to litigation. A public information officer considers the accuracy of information throughout the Web as the main benefit of using XML for content management: "The overall benefit would be the accuracy of information. And that's very important for

anyone, but certainly when you're dealing with the customers that we have, that depend on the accuracy of information that we're providing."

XML enhances consistency in two ways:

- XML's ability to produce multiple HTML and PDF pages from single XML files. The management of thousands of individual Web pages is achieved via dozens of XML stylesheets (XSL) that produce those pages. This turns an overwhelming task into one that is highly manageable.
- XML's single-source of content (described further in the next section) ensures that the same information appears the same across a Web site because it all comes from the same source.

Reduced data duplication and content handling

Data duplication means that multiple source files exist for identical text, images, and other content that appear in multiple locations and formats across a Web site and other media. This requires that the "same" content be handled in several locations, probably by different people, and often at different times. The absence of a single source file:

- creates greater risk of "version differences" between the duplicates,
- requires manual tracking of all locations of the duplicated data, and
- demands different technical skills for handling the data in its various guises (e.g., Word, HTML, database, etc.).

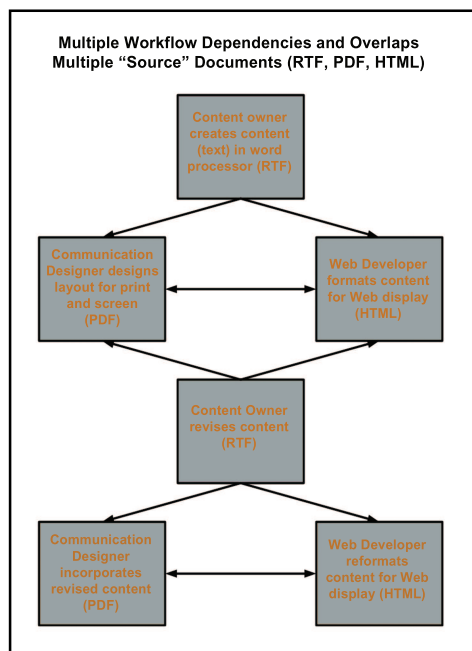
If content is modified in one instance, it needs to be modified in all its other occurrences, which can be an imposing task. One technical staff member characterized the process: "It's

sometimes difficult to get content up in a timely manner, again because of the multiple formats ... So there's a big emphasis in the formatted Web pages. Then of course you have to do the full HTML document for accessibility standards. Then you have to do the PDF to actually get the full document for that. And as everybody knows, you need to make one change in one document while the other two things might not necessarily need a change. So you get multiple versions floating around [out] there all the time." As Web sites grow, it becomes virtually impossible for any one person to remember where all of the entries are (see Figure 3).

XML can eliminate the duplication of data

because the XML file serves as the single source of the content. Its various manifestations throughout a Web site and beyond (HTML, Word, PDF, etc.) are produced via the XML stylesheets (XSL) that transform and present the XML content in the format and location desired, without modifying or duplicating the original XML source. XSL "handles" the content and produces the output, which not only eliminates the duplication of data, but also manages how that data is handled (see Figure 4 on next page). As one IT professional stated "Right now we have different Web pages for different types of documents like PDFs and different print-friendly forms and things along those lines. We have to change them in two or three places. So what we'll do now is we'll have the one document that will be accessed and we'll only need to change it in that one place. So that will make for a much better environment and less work."

Figure 3. Workflow in Non-XML Based Web Site

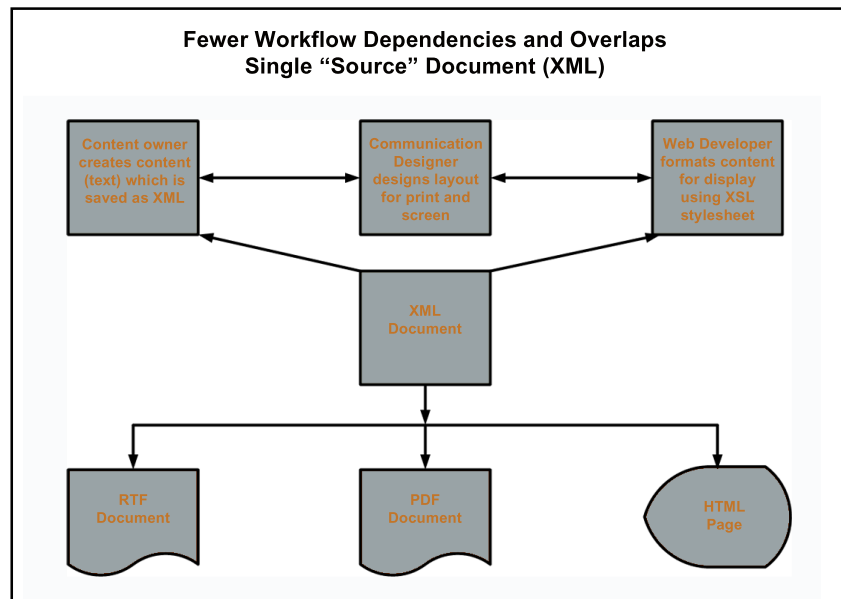


The diagram above shows how the single XML source document at the center of the process eliminates much of the redundancy and checking activity associated with the non-XML based workflow. Many of the manual tasks are automated.

Compatibility with multiple devices and formats

The Web is relatively young and the surrounding technology advances at incredible speeds. Devices barely imagined in the early days of the Web (PDA's, cellphones, iPods, etc.) are becoming commonplace; additional devices appear every year. As a technical lead on one of the XML Testbed teams said, "We're going to see more PDAs, more personal, smaller, wireless applications that everybody's going to want to deliver content to." As a result, Web designers now must plan for more than basic desktop delivery, and content owners must envision their information disseminated across a broad spectrum of devices. As these new technologies proliferate in the marketplace, they bring the compatibility, standards, and compliance issues that all new technologies bring. Web sites will need to adapt to support this new environment or, more accurately, *environments*. One Testbed participant emphasized the impacts that are already being seen: "Our legal staff and public information officer use BlackBerrys; other staff [members] use Palm Pilots and laptops, and a few others use cellphones ... making these

Figure 4. Workflow in XML Based Web Site



The diagram above shows how much activity is spent passing documents back and forth while trying to keep them all consistent and up-to-date. Many of the tasks consist of manual reformatting of the content for the Web, while checking that it's still accurate.

types of formats available seems like it would be much easier with XML.”

It's not that HTML-based approaches (including those that use dynamic scripting and database utilities) cannot handle multiple formats; they are just not designed for it. “Right now we have different Web pages for different types of documents like PDFs and different print-friendly forms and things along those lines,” remarked one Testbed participant on his agency's current Web site management process. When changes occur to the content, “we have to change pages in two or three places.” Another Testbed team member described an alternative approach using XML whereby “the generating of the PDF and the Web page could all be done behind the scenes and on the fly ... just click the button, fix it, save it and then the print version's updated and the Web version's updated.”

XML holds a big advantage over HTML in this regard because XML is a content specification standard (a meta-language of rules for how data can and should be described). Unlike HTML, it is not tied to an output format such as producing pages on a Web browser. Because XML is an open standard, it can easily adapt and integrate with new devices and formats. In the simplest sense, it only requires an XSL file to format the output to a particular device. And when content changes in the XML files, the XSL file immediately and automatically brings those changes to all the desired formats and devices. As summed up by one end user on a Testbed team: “Reusability—in terms of taking one XML document and being able to put it out in different formats and devices—that would be a big improvement.”

Better information for Web site users

Using XML results in better Web site information from a variety of perspectives. The Webmaster benefits from the reduced effort required; users benefit from the more responsive service; and content providers benefit from the accuracy and timeliness of the information provided to the Web. As the Testbed participants discovered, XML offers a strategic advantage in this regard. One participant said, "It's really the case that this is a forward-looking strategy."

Since the Web has become the primary vehicle for organizations to get information to their users, the challenge is to provide as much information as possible, in ways that are most useful to those users. From a business and public service sense, it is important that the information be timely, accurate, and effective. It not only demonstrates professionalism and competence, but mitigates potential bad will or lawsuits. XML can aid in this strategy because it dramatically reduces the time required for maintenance of Web pages (due to enhanced consistency and reduced duplication), while eliminating error-prone and redundant tasks in the workflow.

The highly automated framework that XML brings to Web site management increases confidence in the accuracy of the site while freeing up staff to produce higher value products for the Web. Testbed members found this cascading benefit in their own projects: "I think the biggest advantage you're going to have is freeing up a really talented person to do more complicated work than is being done right now." Or as one participant remarked, "Our Web site is getting exactly what it was getting before, except a little more and a little better, and it's cost us nothing and it's requiring no time, really, and it's saving hours every day."

As Web sites continue to grow in importance, the public continues to become more savvy and demanding and increasingly expects high levels of service from them. When service does not

live up to those expectations, the threat of alienating or losing these users increases. Because an XML-based Web site offers the opportunity to shift many of the time-consuming maintenance tasks to activities that improve the quality and responsiveness of the Web site, it can produce more consumer-oriented benefits. As one technical staff member said in regard to his project, "I don't really think there's a lot of resistance because everybody sees that it just opens a new avenue, because there are so many people out there that we really aren't reaching, or we're not reaching to the full extent. So by doing this project, it's going to allow us to get those people in here."

Stronger foundation for data sharing and archiving

Data sharing, collaboration, and integration are dominant topics in today's IT world. Organizations need to share data within their own organization and across organizations throughout the world. In addition, the *shelf life* of data is an increasing concern, especially as technology advances and formats once thought to be *universal* are now *obsolete*. As Tim Bray, co-inventor of XML and director of Web technologies at Sun Microsystems, stated at the XML Testbed Symposium, "XML is the best tool for creating a file format to ensure that things written today will have an excellent chance of being available for centuries to come."

The costs of developing and maintaining interfaces and middleware to communicate data across different formats can be prohibitive and shortsighted. It is far more advisable to use data formats that are open, standard, easily communicable and persist over time. XML is first and foremost an open, standards-based, data formatting specification. By its very nature, it is designed to enable the sharing of information because it is not tied to any device, technology, or proprietary software. By using XML—especially by adopting industry-wide standards within XML such as DocBook, EAD, and other data definition schemas used by the

Testbed teams—organizations are building the elements of a shared information structure.

And the issue extends beyond data sharing to data ownership and accessibility. As Tim Bray also stressed at the symposium, XML provides organizations with the greatest assurance of content “longevity, reusability, internationalization, and vendor-independence.” In regard to ongoing access and archiving of that content, which is not captive to specific software or hardware requirements, XML offers the best solution.

Cost-efficiency in Web site and content management

HTML-based Web sites often require menial, repetitive maintenance tasks (checking pages for consistency, making the same changes in several different places, etc.), while XML eliminates most of them through its single-source, multiple output design. An agency staff member stated, “Its pretty straightforward to make conversions in XML documents quicker (than traditional methods) and more standardized so that there’s less wasted resources.”

With HTML, cost efficiencies are inversely tied to the size of the Web site. It can be very cost-efficient to maintain a small site in HTML; but as the site grows, those efficiencies decrease with more pages and duplications of content to manage. With XML, the opposite occurs. Since the multiple pages of a Web site are generated by a very small number of XSL files, the number of files to manage stays constant as the occurrence of individual Web pages increases. For instance, an XML-based site with 20 XSL files may produce 100, 1,000, or 10,000 HTML Web pages. Regardless of the number of Web pages, the content still comes from single-source XML files, and those 20 XSL files produce all the pages. It’s a much easier management structure. (See Figure 5 on next page.)

As an IT manager from a large state agency clearly stated, “In terms of us actually doing the

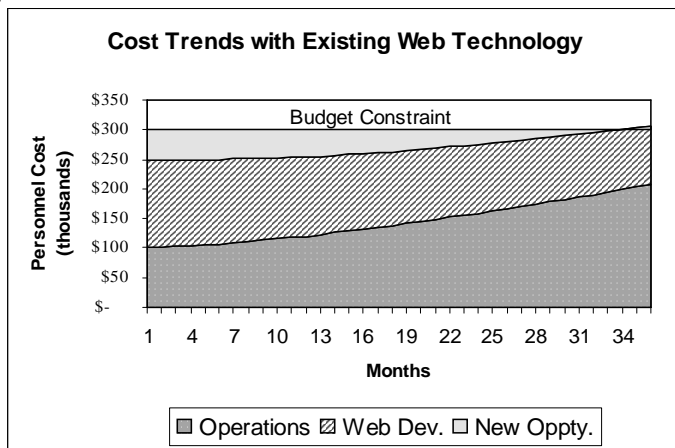
management of it [the Web site], I don’t see any problems. I can’t see where it’s going to do anything but save us time and resources, which mean money.” Likewise an individual serving as a technical liaison agreed on this benefit and linked it to XML’s single source capability: “I think just the notion that you’re creating that single source, which is incredibly important, you’re saving so much—you’re saving time, you’re saving money.”

It is also important that with XML, staff time is not consumed by menial, repetitious tasks, but rather in work that will make the Web site more timely, accurate, and cost-efficient. A program staff member who works closely with the IT unit summarized it this way: “Well, the most important benefits I think would actually be sort of secondary benefits ... freeing up the Web unit from spending all their time creating HTML pages and altering HTML and tweaking stuff for people ... Having them freed up to do the more involved projects that we’d rather have them working on, would be a benefit for everybody.”

Better coordination of publications and information

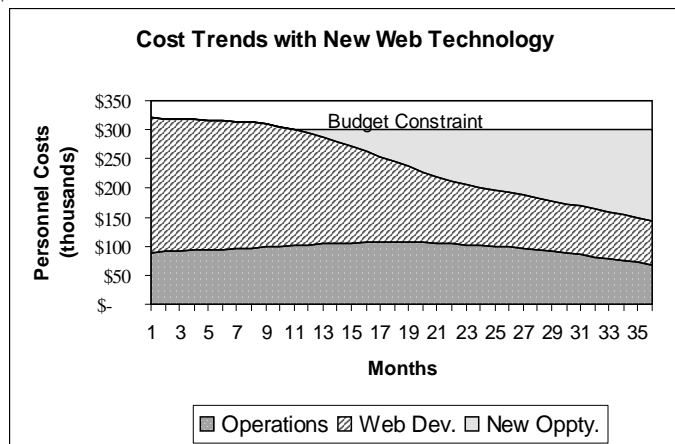
Publications present particular difficulties to Web sites due to their number of pages, unique formatting and layout, and navigation/paging requirements. In addition, most publications are created and maintained in a format that is “foreign” to HTML, such as word processing or desktop publishing software. Things that are taken for granted in many publications such as a table of contents, tables, graphics, and footnotes can be very difficult to recreate in HTML pages. Likewise, a single publication may have many incarnations on its way to the Web—from a word processing document (the “original”) to a desktop published document (the “printer’s original”) to a series of individual HTML pages (the “Web original”) to a PDF file (on the Web and in print). As a technology manager explained, “I actually happen to have somewhat of an example of that going on right

Figure 5. Return on Investment for CTG in Converting to an XML-based Web site



Non-XML Based Web Site

CTG found that continuing to maintain its Web site with existing HTML-based technology would squeeze out opportunities for new technical projects as Web staff would be forced to devote increasing amounts of time to operational maintenance. This was not a viable strategy for future success.



XML Based Web Site

By converting to an XML-based technology for its Web site, CTG saw the prospects for new development opportunities enhanced dramatically. As routine maintenance tasks were streamlined and automated, operational activity leveled off as a small percentage of overall time. Productivity increased while budgets remained steady.

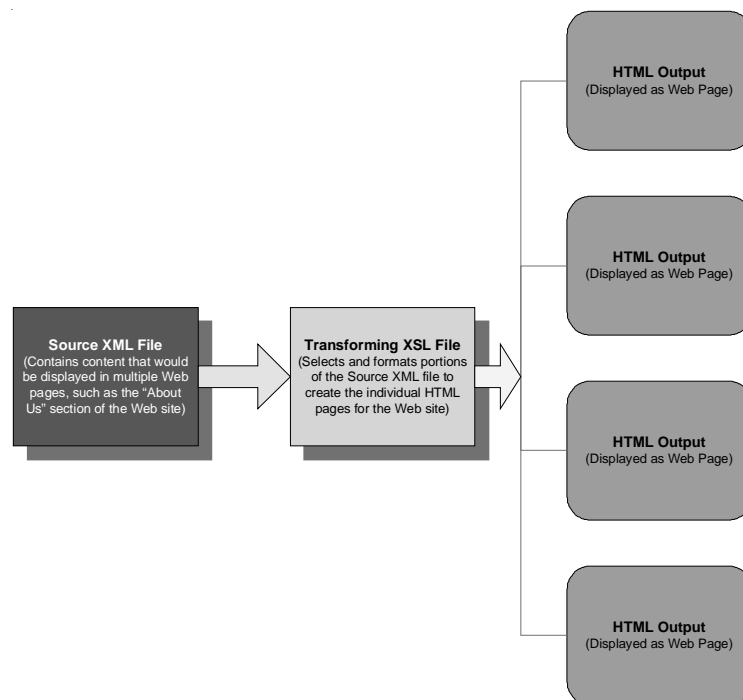
now, this consolidated plan, this three-hundred page plan. They want to put it out—they had the version out there in PDF that was for public comment. Now they've gotten the approved plan ... And the question from the deputy for policy [was] ... what do I do [and] what do you want it in, what format? ... and I said, well, you need to get a PDF of it and we can put it out in PDF. If you wanted an HTML, you need to send us the Word document. The PDF can go out almost immediately once you've signed that this is ready to be posted. I said the HTML could take a week."

XML/XSL provides perhaps its biggest benefits in its ability to better coordinate publications. Since all the content for a publication can be contained in one single-source XML document, the problem with various versions and formats of the "originals" can be alleviated (see Figure 6 on previous page). Likewise, the peculiar

challenges posed by publications for a Web page, such as the table of contents and footnotes mentioned above, can be "programmed" into a single XSL file and then applied to all the publications encountered on the Web site.

In addition, one of the biggest challenges in the publication process occurs within the workflow. In most publication processes, once the document leaves the content developer and is handed off for review and edit, control of the source document can be compromised. In addition, different actors within the process can perform various jobs, so consistency and integrity can be compromised. A program staff member from a large agency explained it this way: "There are bottlenecks [in the] process, whether it is a piece of paper or electronic, ... it's got to go through all those hands. The nice thing [about using XML] would be that ... we

Figure 6. Creating and Maintaining HTML Web Pages via XML/XSL Files



would just give them their piece ... to review and they could say, fine, and move on. So in that way hopefully it would make things move a little quicker.”

Accessibility

A key principle of Web accessibility is designing Web sites and software that meet different user needs, preferences, and situations. Section 508 of the Rehabilitation Act of 1973 and NYS Policy P04-002 require Web sites to be accessible to persons with disabilities. “The process can be very labor-intensive bringing thousands of non-compliant HTML pages into compliance, but making it accessible might be a little easier for the Web unit, using XML,” said a technical Testbed participant. Properly structuring the data and style with XML can ease that burden since Web pages are generated automatically and uniformly. A change in one file can bring dozens or hundreds or even thousands of Web pages into compliance.

Furthermore, because XML separates content from style, it enables easier adaptation to new formats and requirements that occur in the future. One Testbed Webmaster expects XML to help them “better meet the accessibility standard with properly-structured code and more flexibility ... rather than it was coded to do this certain thing a couple of years ago and now you have to recode it to do this new thing this year.”

Chapter Three: Barriers and Challenges

As with the benefits outlined in the previous chapter, the barriers and challenges described in this chapter were also identified by the Tested project teams through the process of developing their prototypes and business cases. CTG administered surveys and conducted personal interviews with all the participants to refine these findings into those categories which exhibited the highest level of consensus and impact. Some of the items that were perceived to be barriers at the start of the project actually turned out not to be barriers at all. The quotations used within the descriptions of the barriers and challenges are taken directly from the Testbed interviews.

Resistance to change

Resistance to change is a common barrier to any initiative or innovation. Recognizing and addressing the issue through planning and communication can help to overcome it. Regarding the use of XML, all of the project teams saw individual and organizational resistance to change as a concern. One program staff member summarized individual resistance to change as a “common problem in any organization. People don’t want change if what they’re currently doing is working, especially because what they’ve currently been doing has been no problem for them.” It’s important to recognize that certain individuals will resist change no matter what, so workarounds or accommodations may be necessary.

On the other hand, some individuals may find an incentive to change due to more efficient processes, better service and products, and less redundant work down the line. Since the changes will be felt throughout the entire organization, change has to be addressed across the organization, not just in the IT or Web unit. As a program staff member explained, you need to understand “how it will affect them [content developers] directly; if they can’t understand this, they are less likely to help implement it.”

Along with the resistance to change, the reluctance to abandon accepted technologies or procedures was also a common barrier. A technical staff member stated, “We’re changing the way we are doing business, so that’s a potential issue. We’re adding software that’s not part of the standard culture so in the infrastructure group, that’s going to be an issue.” If staff have grown accustomed to technologies and procedures that work for them (regardless of how inefficient they may appear to an impartial observer), it is difficult to convince them to change on a promise. Fortunately, because it’s a non-proprietary, open standard, XML does not present an either/or situation. It integrates well with existing technologies and procedures. At the same time, because of the efficiencies it brings to content management and Web workflow processes, XML can offer a strong alternative to accepted practices.

Overly ambitious goals

Redesigning a Web site can be a huge undertaking for an organization and involve far more people, areas, and resources than anticipated. One of the respondents explained, “One of the reasons I said before that we’re going to focus on three or four [documents] is the fact that’s manageable. If we tried to do every [document], we’d be in serious trouble. But I think we’re smart enough to know that. But we’d sure like this to work right out of the box and ... have something we can use. But that’s just not a realistic expectation. So managing the ambition, managing the resource, is going to be very important.”

Evaluating the appropriateness of goals is important for two reasons. First, goals that are too ambitious can negatively affect willingness to participate and support the project. A public information officer emphasizes this situation: “When I said that setting goals that are too ambitious, I think that’s kind of a no-brainer, at least for me, because once you do that, you set the bar too high. Then if you don’t meet it,

everybody gets annoyed at you. There has to be a willingness; there has to be a buy-in by the people at the top.” By recognizing overly ambitious goals, public managers can scale back plans accordingly to mitigate unrealistic expectations. “I know we struggled,” said one Testbed member regarding this balance, “and I know a lot of the other agencies did too with just having bit off more than we could chew.”

Second, the ambitiousness of the goals should not be confused with the feasibility of the project. XML for Web site management offers good flexibility for scaling back projects to fit an organization’s capabilities, while still delivering benefits. For example, an organization may start a project planning to convert all 10,000 pages of its Web site to XML because of potential benefits. Then, management may see that it is too much to tackle based on available resources and expertise. So they can scale back to just convert the most popular publications and still derive the benefits of single-source and content consistency, while creating a model for future applications of XML. An IT manager of a medium agency explains how they set their goals to work on a more doable project at the beginning: “Instead of taking our Internet site, our public Web site, and making changes to that, we’re going to take our intranet site and convert that first into our content management package, and then convert it to XML, to use XML.” In the end, it can be a positive experience, as summarized by another agency participant: “We went off in the wrong direction a couple of times, but I think [it] was just part of the learning process.”

Competing priorities

Many different departments are involved in Web content (e.g., individual business or program units, public information offices, IT, Web unit, etc.) and all these departments have their own priorities. As one liaison between the technical and program units stated, “There mainly is the sort of lack of one defining focus of where we want it to go and what we want it to look like. Everybody from different parts of the agency thinks that whatever they’re doing, it’s the most important thing and needs to be at the top of

the page and flashing red letters instead of in an appropriate and logical spot. So they [Web team] deal a lot with the personalities and the priorities.”

In addition, different departments have different understandings of what’s important and the workflow processes involved. The Web unit, for example, may have a goal of getting out of the business of converting 20-page MS Word documents into 20 linked HTML files, while a program unit may have a goal of seeing their documents in different formats and on different devices. Therefore, it’s important to clarify overall goals to balance them among one another and with the overall organizational mission. It may even turn out that two departmental priorities that at first were seen to be in conflict are, on a closer look, supportive. To continue the previous example, XML may get the Web unit out of converting MS Word documents into HTML files by hand while also making these documents accessible in different formats and different devices.

An XML-based Web site may not eliminate departmental conflicts but it can help to align priorities by stressing the single-source content and demonstrating how everyone benefits from keeping the content consistent, timely, and accurate.

Lack of knowledge

A lack of knowledge creates barriers on many levels especially when changes in technology have direct impacts throughout an organization. When looking to adopt and implement XML for Web site management, the following types of knowledge-related barriers are typically encountered.

- **Program and service staff generally do not possess in-depth technical knowledge**, nor should they be expected to possess this knowledge. However, this lack may hamper a clear understanding of how an unfamiliar technology such as XML can provide benefits, thus making an evaluation or

acceptance of it difficult to achieve. They may not even be aware that a problem exists since workflows are isolated in organizational silos. As one Testbed participant from a program area remarked, “I frankly wasn’t sure what XML was ... I didn’t have a complete understanding of the difficulties that our technical people face in terms of putting changes out on the Web.”

- **The pace of technology advances often exceeds our ability to keep up**, which presents a two-fold problem. First, there can be a reluctance to adopt anything new or different for fear that it’s just a passing trend with no long-term benefit. Second, it feels safer to stick with what the technical staff already know. “Does everyone fear that XML is the latest flavor of the month—absolutely,” is how one technical staff member put it. Fortunately, XML has two advantages in this regard. One, since it’s not really a technology, but rather a text-based specification for formatting content, it can be learned relatively easily. Two, since XML is a non-proprietary, open standard, it is not expected to pass away or be superseded by future software versions. As that same technical staff member concluded regarding the flavor-of-the-month, “From everything that I know, it’s the contrary. XML is how everyone should be moving forward.”

Turf conflicts

This is a general organizational problem whereby different units or individuals have certain “turf” (programs, people, priorities) that they want to protect and that they may perceive as being threatened by other initiatives. A technical staff member recalled, “When I got here, I said, oh my god, why are you fighting over this? It’d be better to work together, but it

just never was the culture to do that, and that’s changing a little bit now.” An IT manager from a medium agency explains, “Getting these people to come to any kind of mutual agreement is extremely difficult ... The different program areas perform extremely different functions with extremely different goals ... It had its fair share of political influences and so everyone is a chief and no one is really willing to compromise. “

Turf conflicts can threaten any innovation because they are not based on any reasonable ground that can be evaluated and argued. Stressing potential benefits may have no impact upon these turf loyalties. On the other hand, some negotiation may be necessary and useful to lessen the impact of the conflicts. At best, XML for Web site management can help to show commonalities throughout a work process and perhaps blur some of the hard and fast lines that lead to turf loyalty and conflicts. But these are still human relations and organizational issues that need to be addressed on their own to achieve the benefits from XML.

Lack of common publishing and communication standards

A Web site is one component in a publishing process. It may be the final step in the process, or it may direct activity throughout the process. It may provide an alternative form of publication or be the primary communication vehicle. It may be all of these and more. In any case, a lack of standards in the process creates barriers to successful implementation of XML. These barriers are seen in three key areas:

- workflow issues;
- technology that works against common standards; and
- technology that struggles against non-standards-based, proprietary software.

All three of these problem areas trace back to one root cause: the absence of a single source document at the center of the process that can be transformed into multiple publication formats as needed.

In regard to workflow, this lack of a single source document leads to “version control” issues and consistency problems as content is reformatted and manipulated in various steps along the way. Workflow procedures are instituted merely to monitor and check the changes that occur as content moves from one person to another and from one format to another along the chain. No value is added, but time and resources are spent. As one Testbed participant characterized it, “You have a lot of inefficiencies. You have a lot of time issues; you have a lot of checking that has to happen and the checking is just meant to ensure that we don’t have one version on the Web and another version in paper.”

Sometimes, technology is part of the problem, not the solution. Independent, proprietary formats for word processing, spreadsheets, print publishing, and Web pages do not necessarily work well together. What results is a proliferation of standards for the different formats, none of which co-exist easily. From another perspective, content management software attempts to consolidate these divergent formats and impose a uniform standard, but in doing so adds another layer in the process.

Because XML is a specification for defining content structure, it addresses these common publishing and communication standards at the root. The innate structure of XML-based documents lends them to procedures and standards that capitalize on this structure and streamline the publishing flow. Rather than multiple source documents in various formats, XML encourages and demands single-source documents in a standard format.

Lack of specific funding for Web site management

Initially, funding for Web site management was perceived to be a barrier by virtually all of the team members. However, after the initial workshops, the teams found this to be non-existent. As one program person stated, “I don’t think money really even becomes an issue with us for this thing, because it’s not going to require anything new. We’re not spending any money really of any significant amount on software or hardware or anything else. It’s really just a matter of people doing their job slightly differently and being more efficient at it.”

As another program person said, “I think that the benefits definitely should outweigh any kind of costs if you look at it in the long term. I think that it’s going to decrease the amount of staff time that’s needed to be putting these publications out to the Web site.” By the end of the Testbed project, funding was revealed as more of a *perceived* barrier than an actual one.

Lack of top executive support for XML

As with any organizational initiative, top executive support is needed to explore new areas and overcome organizational inertia. Despite perceived benefits, departmental enthusiasm, and convincing prototypes, if top management does not want a project to proceed, it will not proceed. In general terms, many of the reasons for lack of top executive support can be traced to the barriers previously itemized. Executive support will not be forthcoming if the concept has not been thoroughly examined before proceeding. Many projects can not even be explored without first demonstrating to executive management the anticipated return or benefit.

Recognizing the importance of executive support, CTG made it a threshold criterion for participation in the Testbed. Agency teams needed executive sign-off in their proposals

just to be considered for inclusion in the project. Many of the participants stated that “participation in the Testbed provided them credibility to explore new concepts.” One of the findings from the initial training experience was that the trainees were unable to explore using XML within their agencies due to competing priorities. Participation in the Testbed gave them the mandate to experiment.

However, this barrier goes beyond experimentation. As many of the participants recognized throughout the Testbed, organizational change was the major barrier they faced. They needed executive support to require their organizations to change. A Webmaster remarked, “The big cost, so to speak, not that it would necessarily be financial or anything, would be getting those people on board and getting all the management at various levels to actually demand it, allowing us to say, no you need do it this way from now on.” As one technical staff member stated, “An XML for Web site and content management project, if properly executed, can obviate many of these concerns [resistance to change] by addressing them directly to the executive level.”

Lengthy project life cycle

Many of the team members initially thought the process of converting to XML would be a long, arduous process. Many saw this as an “all or nothing” endeavor. The CTG XML team shared their experience with the team members in the first workshop explaining how they approached XML “one document at a time.” As the CTG Webmaster said, “We took one report and did our own prototype. We created the XML structure, which met all Section 508 accessibility standards, and found it to be a very easy conversion. Once we saw that much of our Web site was just a series of documents, the structure we employed in our test conversion could easily be applied to all of our publications and to the Web site as a whole.” He continues, “What we thought was going to be a major undertaking turned into a very easy conversion, allowing us to apply what we learned in our prototype to the whole Web site. Now we were not only compliant with

accessibility standards, we knew we would never have to double check this again since it was controlled by one style sheet.”

Once the teams saw that they could approach their own Web sites one document at a time they began to see how it could be an incremental process. They did not need to tackle their whole Web site at once. They started to think of their Web sites not in Web pages, but in documents. As they classified what their Web site contained, they were able to look at the work differently. It was not as daunting as they first imagined. Again, a *perceived* barrier became less imposing as it was better understood.

Lack of guidelines, tools, and training to support XML

Although XML is very popular in data exchange applications, it is not in prevalent use for Web site and content management. Many of the tools, training, and other infrastructure for this use are not in place. CTG’s XML Toolkit Web site at <http://www.thexmltoolkit.org> was created as a result of the Testbed to address the need for XML tools, training, and guidelines. The problem, even for individuals and organizations convinced that XML is appropriate for their organization’s Web site management, is that they may have no idea how to implement it on a practical level in their environment. “It would be nice to know of other state agencies that have used XML in a similar way,” said one Testbed member.

This continues to be a problem, even though as XML usage grows, more resources are slowly appearing. Successful organizational experiences can, to a certain extent, mitigate this barrier. One of the respondents explained, “We’re pretty convinced that XML isn’t just the flavor of the month so I don’t think that’s an issue. And the fact that [another] system [in our organization] is built in XML and has been tremendously successful really mitigates that as an issue.”

Likewise, there is at this point a relatively small set of training offerings (online or classroom) that specifically address the use of XML for Web site and content management. Adequate training is always a major issue when implementing any organizational change, especially technical and cross-departmental changes. This absence continues to be a problem, although more training offerings are slowly appearing (both online and in classrooms) as XML usage grows. One program staff member explained, “As it stands right now, we have too many different areas doing different things. So it’s hard to train everybody on everything.”

Control-oriented versus collaborative project management

This barrier identifies a top-down, authoritative approach to project management as opposed to an approach that involves a wider spectrum of affected participants using shared understanding and decision making.

The premise behind XML-based Web site management requires a process or workflow orientation that calls for a more collaborative, inclusive approach in project management style. Every unit that is involved in the process of moving content to the Web needs to be involved in the discussion. This approach results in a management style that cuts across departments; a strictly control-oriented approach to project management would alienate many of the primary stakeholders and threaten the success of the project.

While an XML-based approach to Web site management cannot in itself change or dictate a project management style, it does, by its cross-organizational look at workflow processes, provide an opportunity for participants and team members to look outside of their organization and understand how their work impacts others. In a more traditional project management approach, the focus will be on PERT charts and task lists rather than on understanding the impact a change may have

on another organization upstream or downstream from the project. This all inclusive, more collaborative approach, which is in fact a requirement, will result in a more successful XML implementation.

Compliance with policies and mandates

Policy barriers, while initially perceived as being a potential barrier, proved to be one of the least imposing issues the team members faced. The New York State accessibility policy was the only major state policy that the Testbed agencies were required to comply with. They expected that changing to an XML format would actually assist with this compliance. As one program manager states, “Having the state policy has made it much easier for us, because we can say, look, it is not us—it’s NYS. So having the policy in writing has been very helpful.” Since XML can manage multiple output formats with far fewer files, it can also make it easier to “generate more accessible Web documents,” as one Testbed member remarked.

Chapter Four: Guidelines for Action

The guidelines for action itemized in this chapter were developed by CTG in collaboration with the XML Testbed teams based on findings from the project. Throughout this Testbed, it was found that in addition to the training and workshop framework, each of the teams needed to be supported differently based on four specific dimensions.

- **Readiness**, which is a team's ability to act. Did the team have a shared vision? Did the team have a project lead who took responsibility for managing the work and expectations of the team? Did the team have the right members participating? Did they have representation from the appropriate areas? Did they have time to learn and experiment? Was the team knowledgeable about the work processes they were investigating?
- **Confidence**, which is the team's collective expectation that they would be successful in achieving their goals. Did they have the executive support they needed to devote time and resources to the project? Did they have a champion to assist them in gaining the necessary support? Did they have an evangelist who would assist them in garnering the organizational support? Did they feel they had the skills required or a plan to acquire the skills necessary to complete their task?
- **Communication**, which is the team's ability have open communication among its members as well as with its executive sponsor and champion. Did they have a communication plan? How were they going to keep their executive sponsor advised of their progress? How were they going to gauge or evaluate their progress?



- **Knowledge**, which includes the team's technical, organizational, and political skills. Did the team have the specific knowledge set within the team? If not, did they have a plan for acquiring those skills or supplementing their knowledge with outside resources? Did they have the organizational knowledge or programmatic knowledge to understand the bigger picture of how this project fit into the larger organizational strategy or scheme?

These capability dimensions provide a framework for an organization when taking the recommended actions described in this chapter to help mitigate the barriers. Many of the recommendations apply to any innovation; some are specific to XML for Web site management. All of them are intended to help other organizations apply the lessons learned from the XML Testbed to their own environment in a practical manner. The final guideline in this chapter, "Use Comprehensive Prototyping within a Testbed Approach," encompasses most of the findings of the XML Testbed project and serves as the major recommendation.

Obtain and nurture executive support

Unfortunately, XML for Web content management does not always provide the tangible results needed to easily demonstrate progress. Having a more effective and efficient workflow is not as flashy as a new widget or application. Each team needed to determine for themselves what they would need to provide their management to show progress. A technical staff member from a large agency explained how they used frequent meetings to maintain support: “We’ve always had our management’s backing for this ... We have meetings with our management and the different project areas [to continue this support].”

The teams also found the business case they developed as a part of the Testbed to be very helpful in this process. Each team also developed a communication plan that the project manager followed to keep executives informed of progress. In each of the agency teams that were part of this project, executive support shifted due to the nature of the world in which government operates. It was through this communication plan that they were able to maintain executive sponsorship and support, even when executive sponsorship changed. The business case and communication plan provided them with a consistent and effective way to provide new leadership with the information necessary to garner their support.

Focus on the business, not on the technology

As stated earlier, reviewing the workflow processes that content follows from creation to Web will help identify bottlenecks, inefficiencies, and potential areas for improvement. As a Webmaster of a large agency mentioned, “We needed to fix what was broken first, and then make it a lot easier to succeed. Instead of just using the XML and putting all these fixes, just look for the problem



in the first place. And not only will that help with [one] process; it’s going to help with many, many other projects along the way.”

Analyzing the workflow process identifies inter-organizational hand-offs and helps individual units see beyond their own boundaries. As one member of the Testbed stated, “I never knew exactly what happened once it left our office. I am amazed at the work they [the other unit] have to do with it once we think it is final.” This acknowledgment helps organizational units see all the parts in a larger picture. It also removes the emotional connection or ownership many have to the final product. Through this analysis, the individuals involved saw how their roles fit within the larger organization. This factor alone can help eliminate or reduce the number of turf conflicts and ownership issues that can and do occur.

In addition, it is an opportunity to reflect on the current processes and think about ways to improve them. A public information officer from a medium-sized agency clearly highlighted this opportunity: “Whenever you have an initiative like this and you’re starting a process, a new one, it forces you to reexamine where the old processes have developed faults or developed problems ... So it would be beneficial, because the agency as a whole would have to kind of undergo a self-examination ... So this would give us an excuse to take a closer look and see where improvements might be made.”

Involve all relevant stakeholders

There are many different types of stakeholders to any process. However, not all stakeholders are created equal—they vary in power, legitimacy, and urgency. They each pull different weights. Regardless of this fact, each of them needs to be considered in your analysis. If your focus is too narrow, or you only focus on the most powerful stakeholders, other important stakeholders can and will be overlooked. One way to mitigate this is by considering the workflow process as a way to identify potential stakeholders.

Involvement of those stakeholders can then take many forms—from active engagement to keeping them informed of your progress. This not only helps to ensure a well-informed design, but also mitigates many of the barriers identified by Testbed team members, such as lack of understanding and cooperation among participating departments. A technical staff member working for a medium agency said, “So if you can get everyone, if you can get the right people in ... if you can sell them on what the concept is, we’re going to get support all the way through. And I think by doing that, obviously by identifying your stakeholders, having your stakeholders involved to the point where they’re very receptive to this move, it benefits everybody.”

Act incrementally, but think globally

Redesigning a Web site is a daunting task, not only for the technical team but for the program and executive staff as well. However, in its research, CTG has found that by breaking tasks down into actionable components and focusing a project on “doable” subsets, the overall objective becomes obtainable. Each of the five Testbed teams found that by narrowing the focus of their initial project to one publication or one static content page, they were afforded the time and energy needed to learn and explore the possibilities of XML.

Once they achieved this incremental step, they start thinking more globally. The smaller project provided them with valuable information to help guide a larger project. They were able to consider the changes necessary to the workflow process in order to accomplish this task.

- How does this information become transferable or scaleable for the larger endeavor?
- What are the training and support issues learned in the smaller project?
- What are the organizational changes that need to be addressed before moving forward with the larger more complicated project?

This approach also afforded them the opportunity to gain knowledge that can and will be applied to other projects. XML becomes a new “club in the bag or tool in the toolbox,” as one team member stated.

Secure training for technical and program staff

As stressed throughout this report, adopting and implementing XML for Web site management is not just a concern for the technical staff. All the individuals involved in the process need to understand how XML works and how it may change their individual processes and job functions. That is why training was more broad-based in the Testbed and not restricted to one topic, format, or group. Without this broad-based training, key players may be left out of the process or not actively engaged in the activities surrounding workflow improvements. A shared understanding by all affected parties also helps to diminish the tendency for turf conflicts and communication problems. That is why the Testbed provided some level of technical XML training to *all* staff, not just the programmers, and required everyone to attend and participate in project management and business process analysis sessions. Everyone benefits when knowledge is shared.

As one program person stated, “I had not ever really been formally through a process like that. So for me, it helped me a lot. A business case was something I had heard of, but I really didn’t know the pieces that all went together to make a business case. So that to me, all the pieces, once they kind of jived in my head, they were all really useful. I did go to the one training for XML, only stayed like two-thirds of the day because, again, while I’m not a programmer I got enough to understand what they were trying to do but it certainly wasn’t my job to have to do that, so I didn’t have to be an expert in it, I just needed enough of an understanding to be able to contribute to the discussion that did impact me, which was the content development portion.”

Balance readiness with support

Organizational readiness is a dimension that is often overlooked by analysts when they consider moving forward with an initiative, whether it is an IT initiative or an organizational change initiative. CTG has found through past projects and research that organizations must first assess and address their capability for change before attempting to enact a change, if they wish to succeed.

In the Testbed, CTG found that agencies with a strong IT technical staff needed to focus more on support for organizational change, since they already had the technical capability. On the other hand, agencies with limited technical staff needed to focus on obtaining IT support, since that was a critical first need.

During the Testbed, CTG was able to supplement the organizational readiness of the agencies with CTG staff—whether that was in IT knowledge and training, project management knowledge or support, or business analysis and organizational change support. In other situations, project sponsors need to consider their level of organizational readiness and make arrangements to obtain the necessary support—whether it was internal or external to the organization.



Communicate

The need for open and constant communication forms an essential component of all the recommendations outlined here. However, communication is such a critical factor, it merits additional mention on its own.

Perhaps the most important and most often overlooked component of communication is *listening*. The XML Testbed project devoted a great deal of time and energy towards creating opportunities for individuals from different departments and organizations to *listen* to one another and to outside sources for help on improving processes and creating better products and services.

The message must be communicated in terms that the audience will understand and in ways that emphasize its benefits to them. Staff then need the confidence and tools to communicate their message through the rest of the organization so that the project succeeds. It cannot just be assumed that everyone will know what’s going on, why it’s important, and support it.

As one Testbed member summarized, “You really have to make those issues clear as to what it will do for the users on the other end, and then they’ll go along with you. I mean, as long as they know that it is a problem, they talk

to the people and it's confirmed, they'll go along with this stuff. But you really need to explain to them what you're doing for the users out there, and it makes it easier to get your point across and to get the projects raised in priority and get the manpower to do them."

Understand and address multiple organizational priorities

There will always be competing priorities in any organization or unit. The best way to accommodate this situation is to understand those priorities and communicate among each other to ensure effective decisions can be made for the entire organization. Competing interests often became shared goals when a broader understanding (beyond individual silo perspectives) is achieved. Ignoring the competing priorities or focusing only on one perspective more often leads to the turf conflicts and other barriers identified by the Testbed teams.

A Testbed member from a program area expressed the real advantages of addressing all the organizational priorities: "It opened up a good rapport [with the IT unit]. And I think that they see things from a different perspective on their end too, that it isn't just about the



technical end; it is about the content." And a technical team member echoed that sentiment as well: "The willingness of people to examine those ideas and change their policies on that, is probably the number one hurdle for getting things done the cleanest, easiest way."

Use comprehensive prototyping within a testbed approach

Traditional prototypes provide programmers and program staff the ability to explore concepts and test assumptions. What prototypes and pilots do not provide is a way to look beyond the technical application to the social and organizational challenges. Expanding the traditional concept of prototyping to the comprehensive prototyping model within a Testbed approach allows for the exploration of technical, organizational, and policy implications.

In this project, comprehensive prototyping within the Testbed model enabled the teams to grow into the project by balancing capability with support. If a team had lower capability at the start (based on the four dimensions of readiness, confidence, communication, and knowledge outlined at the start of this chapter), they may have needed more outside support from CTG staff in the beginning. As they progressed through the Testbed and their capabilities increased, the need for support dropped off. The Testbed framework provided each team with additional support:

- through knowledge gained in training and the workshops;
- by alleviating project management responsibilities through the external framework of the Testbed model and the CTG teams; and
- by providing an environment where the teams could meet and work on their individual projects.

As seen throughout this report, a project such as implementing XML for Web site

management impacts organizations, workflow processes, technical resources, and willingness to innovate. What at first may appear to be a purely technical task (XML) is seen on closer examination to involve much more. Due to this complexity, traditional training and system development approaches may not be sufficient to carry the project through to successful implementation.

The Testbed model, which can be implemented within a single agency, is specifically designed to fill the gaps left by the traditional methods and provide the additional levels of needed support. Training, for example, is delivered in the context of a specific product development or process improvement. More importantly, the training is delivered across organizational units and encompasses technical and business process areas (so-called “hard skills” and “soft skills”). Project teams are given time and support to apply what was learned in the training directly to the prototypes and business cases they develop. Executive support is procured at the start and nurtured throughout the process.

The Testbed teams provided the most convincing validation of the value of the approach, primarily in their prototypes and business cases, but also in their reflections on the process. Some saw value in the cross-organizational team makeup of the Testbed: “A real benefit in just going through this entire exercise was the team. In a lot of ways, it was a real eye opener for [the other units] in terms of what we’ve got to go through ... what it takes for us to do this.”

Others stressed how the Testbed created the work environment that they needed to make their case: “[The Tested] certainly convinced me that technically it’s doable and technically it’s a great thing. We had suspected, but I wanted to actually prove that; I wanted proof of that theory.” That proof of concept enabled the teams to take the next step forward: “Without this project, I don’t think that we would’ve had the confidence to put a business case forward

... I think it gave us the confidence; it gave us the tools.”

The Testbed environment also allowed the teams to investigate all aspects of the innovation more thoroughly, “to look at the whole thing, to take it and break it down step by step” as one participant put it. The outcome, according to this person, was that “we changed a lot, we really did. We thought our problem was one thing and in reality it was something different.” Another participant saw benefits beyond this one project: “I think the business case development was a good exercise, not just for this particular focused area but for anything that’s coming down the road; those were good skills to learn.”

And even though the Testbed focused on a prototype development, not a full-fledged system implementation, that did not diminish the impact of the work. As one team member remarked, “I think we actually went above and beyond what we thought we were going to do ... And so just by looking at [the prototype] and just like seeing what we could do with it, I think it was just such a positive; it was just such a great feeling. And I think everybody on our team was really happy with it.” Or, as another said: “I’m always amazed in looking back at how much we did accomplish in such a short time.”

APPENDIX A: Project Participants

Partners

Lead partners

- New York State Governor's Office of Employee Relations (GOER)
- New York State Office of the Chief Information Officer (OCIO)
- New York State Office for Technology (OFT)

Agency partners

- NYS Department of Civil Service
Project Lead: Michael Short
- NYS Division of Housing and Community Renewal
Project Lead: Audrey Dean
- NYS Higher Education Services Corporation
Project Lead: William Beaudin
- NYS Office of Cultural Education
Project Leads: Kathleen De Mers, Diane Madrigal, and Michelle Arprey
- NYS Office for the Prevention of Domestic Violence
Project Lead: Lizette Rivera

Corporate partners

- Hewlett Packard
- MicroKnowledge
- Sun Microsystems
- Icen Technology Ltd.
- SyncROSoft Ltd. (<oxygen/> XML Editor)
- Logitrans

Expert presenters

- Jennifer Kang – *Webmaster*
NYS Office of Children and Family Services
- Steve Gold – *Webmaster*
Unified Court Systems, Office of the Deputy Chief Administrative Judge for Courts Outside of New York City
- Brenda Breslin, PMP – *Director*
Project Management Office, NYS Office for Technology
- F. Michael Donovan
NYS Office of the CIO
- Nancy Mulholland, PMP – *Deputy Commissioner Information Technologies*
NYS Workers' Compensation Board
- Dianna Pinto, PMP
Project Management Office, NYS Thruway Authority
- Thomas Mackey
Assistant Professor
Department of Information Studies, College of Computing and Information University at Albany
- William R. Nimz – *Senior Performance Consultant*
Hewlett-Packard
- Debi Orton – *Manager Technology Services/Web Manager*
Governor's Office of Employee Relations
- Michael Short
Department of Civil Service
- Eleonora Morell
MicroKnowledge
- Jon Bozak
Sun Microsystems
- Tim Bray – *Director of Web Technologies*
Sun Microsystems

APPENDIX B: XML Resources

Using XML for Web Site Management: An Executive Briefing on streamlining workflow, reducing costs, and enhancing organizational value

This executive briefing emphasizes the features that make XML an ideal strategy for preparing for the future, while achieving efficiencies today—open standard, reusability, and technologically neutral.

http://www.ctg.albany.edu/publications/reports/xml_exec_brief

Using XML for Web Site Management: Getting Started Guide

This guide is based on CTG's own experience converting its Web site to XML, along with the experiences of five New York State agencies who participated in CTG's XML Testbed.

By using this guide, government agencies can gain new insights into how they can benefit from XML and develop strategies to address the technical and organizational issues to get started.

http://www.ctg.albany.edu/publications/guides/xml_getting_started

The XML Toolkit

The XML Toolkit provides resources, examples, and code for use in developing XML-based Web sites. It is based on lessons learned from CTG's XML Testbed and the design and components of The XML Toolkit were developed in consultation with the Testbed team members.

The site, in addition to the code samples developed by CTG, includes numerous annotated links to other resources in the XML and Web design community. It is designed to be a user-friendly browsing arena for those

interested in XML and is in compliance with NYS accessibility requirements for Web sites. CTG drew on its relationships and experience with XML over the past several years—from vendors to users to industry experts—in building this site. It is intended to be a “living” Web site with regular updates and additions, and is to grow over time and benefit from the contributions of the online community.

<http://www.thexmltoolkit.org/>

Return on Investment In Information Technology: A Guide for Managers

New information technology (IT) systems are serious, and potentially risky, investments for government agencies and nonprofit organizations. This guide is designed to help public sector managers better understand how a return on investment (ROI) analysis can take some of that risk out of their next IT investment.

The guide contains a detailed case study illustrating the benefits achieved by CTG in its own experience converting its Web site to XML.

<http://www.ctg.albany.edu/publications/guides/roi>