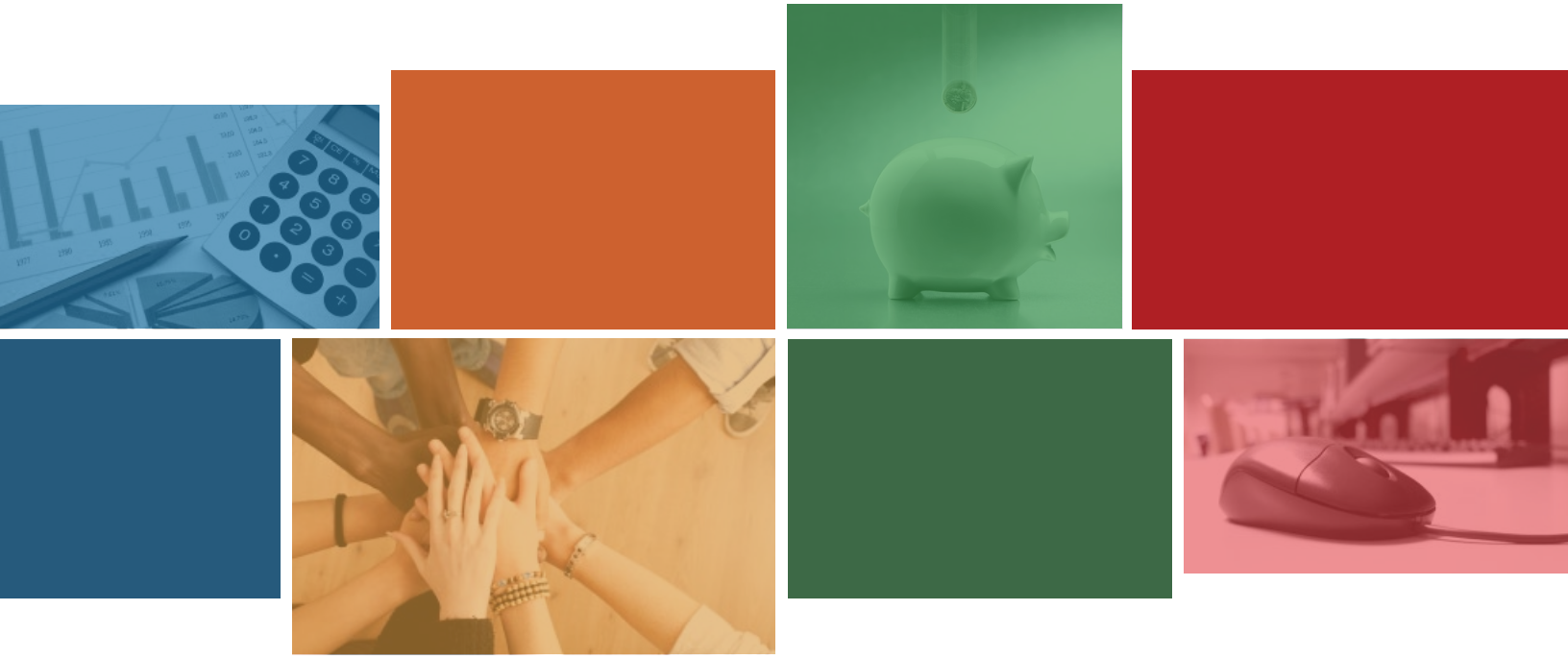


GOALS COST CASE STUDY

Costs of web accessibility in higher education

DECEMBER 2014

Authors:
Cyndi Rowland
Linda Goetze
Jonathan Whiting

Provided by:

GOALS

*G*aining *O*nline *A*ccessible *L*earning through *S*elf-Study

ACKNOWLEDGEMENTS

Project GOALS (Gaining Online Accessible Learning through Self-Study) began as a U.S. Department of Education, FIPSE funded, effort to assist postsecondary administrators and institutional leaders in understanding the importance of web accessibility for individuals with disabilities and to act on that awareness. Over time the GOALS work included blueprints useful for both institutions and regional accreditation entities. Begun in 2007, it is led by the National Center on Disability and Access to Education (NCDAE) at Utah State University's (USU) Center for Persons with Disabilities (CPD). Project GOALS works from multiple perspectives of a national consortium. With NCDAE as the lead, this consortium has included the Kentucky Council on Postsecondary Education (CPE), Michigan Community College Virtual Learning Collaborative (MCCVLA), Southern Association of Colleges and Schools-Commission on Colleges (SACSCOC), the Southern Region Education Board (SREB), Web Accessibility in Mind (WebAIM), and the Western Interstate Commission for Higher Education (WICHE).

NCDAE

michigan community college
VIRTUAL LEARNING COLLABORATIVE
A project of the Michigan Community College Association

SACSCOC

WebAIM
web accessibility in mind

WICHE
Western Interstate Commission for Higher Education

UtahStateUniversity
CENTER FOR PERSONS WITH DISABILITIES

SREB

FIPSE

The Project has been made possible by a grant from the Fund for the Improvement of Postsecondary Education (FIPSE), U.S. Department of Education. No official endorsement should be inferred.

Appreciation is given to all institutions who made these cost case studies possible. A special thanks is also given to Amy Wilson, the designer of this monograph.

TABLE OF CONTENTS

IMPORTANCE OF THE CASE STUDIES

The topic

There are many reasons why institutions are working to improve the accessibility of digital content for faculty, students and staff with disabilities. In the past two decades those in postsecondary settings have often heard, "it's the right thing to do", "it's the smart thing to do", and "it's the law". There is no doubt the internet has become central to the modern higher education experience. While it is true Federal law requires institutions that accept federal funds to provide equal opportunity for persons with disabilities, the motivations for digital accessibility often run deeper for those making the choice to engage in this work across the institution. Some indicate this work is mission driven and in line with institutional directions. Others express a keen understanding of the importance of accessibility if they are to focus on the academic outcomes of all students. Still others express its importance in keeping a diverse and vibrant campus community with faculty, staff and students who represent different personal experiences.

There is no doubt the internet is central to higher education.

Web accessibility advocates have helped top-level administrators understand and commit to web accessibility initiatives. However, the field has yet to reach a national saturation so that universal access is present for all who would benefit from it. Partners in Project GOALS[i] are working to provide information, resources, and tools to impact motivation and practices of leadership in higher education. One motive on the minds of many in administrative positions is how they can provide accessibility efficiently to their institution.

> *"The field is replete with logical statements about how web accessibility presents a cost savings and benefits, yet is devoid of cost or benefit data to support such claims."*

If we are going to make headway, we must address issues surrounding cost.

A significant barrier to increasing web accessibility in higher education is concern about what these efforts cost. The field is replete with logical statements about how web accessibility presents a cost savings and benefits (e.g., increases customer base and income, increases search engine optimization, decreases direct costs of future accommodations, reduces costs of future litigation), yet is devoid of cost or benefit data to support such claims. For those in top administrative positions in higher education, cost is a topic that has not been sufficiently addressed. Many express a fear that the cost of implementation will exceed available resources. They continue to ask questions about the higher education "business case", the "return on investment", and in general they want to understand how the cost of making content accessible from the beginning is in their best interest. If we are going to make headway with many postsecondary administrators, the field must address the issues surrounding cost.

Higher education administrators are not the only ones looking for cost information on web accessibility. When the Department of Justice (DOJ) published the Advanced Notice of Proposed Rulemaking (ANPRM)[ii] in the Americans with Disabilities Act they sought feedback on 19 questions, 4 of which were on costs and cost benefit alone.

Existing Information

In preparation to collect data on costs of web accessibility, the GOALS economist reviewed literature to identify existing data, economic methods and instruments used. The finding was there is a significant amount written about the rate of return on investment of web usability and very little on web accessibility across any single sector of society, let alone in education[iii]. The return on investment literature examines the costs and benefits from increased usability of web sites and content. The published work identifying the actual costs and benefits of web accessibility was very limited. While there are many sources that report financial benefits of web accessibility[iv], few provide data on actual costs or savings.

"While there are many sources that report financial benefits of web accessibility, few provide data on actual costs or savings."

GOALS staff reviewed over 300 responses sent to the DOJ and found no specific sources on cost data.

This lack of information extended beyond published literature to responses returned to the Department of Justice (DOJ) as they sought comment on an Advanced Notice of Proposed Rulemaking for the American's with Disabilities Act. The DOJ sought to clarify expectations in regards to the cost to provide accessible web content under the proposed rules. GOALS staff reviewed over 300 responses sent into the DOJ and posted on the Regulations.gov website. The comments mentioned a variety of costs incurred as a result of web accessibility requirements including such things as legal fees (interpreting standards), testing for compliance, licensing, user testing, transcript and captioning for video and audio. However, there were no specific sources of cost data relevant to web accessibility cited in the responses. This lack of evidence validated the findings of the literature review.

It is not surprising so many are looking for documentation on costs of web accessibility. When one looks to the available literature, there is a paucity of data on actual costs or cost-benefit data[v]. The most detailed work on costs of web accessibility was found in only three sources[vi]. In the first source, a book chapter, Bias and Mayhew (2005) described the costs and benefits associated with web accessibility. However what they described was a hypothetical method to estimate the cost of retrofitting web content to be accessible to various standards—such as the W3C's Web Content Accessibility Guidelines[vii], or to the U.S. Federal Government's Section 508 of the Rehabilitation Act[viii]. The proposed method estimated (1) the number of templates, (2) test and repair hours per template, (3) number of pages, (4) hours per page, and (5) hourly cost to estimate the overall cost to test and repair pages to a specific web accessibility standard. The standards used in

the proposed method included standard quality assurance, Section 508, and additional browser compatibility. No actual cost data to achieve those various standards was collected. The estimates in the text are based on simplified assumptions about what the author believed web accessibility changes would cost, based on time spent, salaries and standards achieved. There are some examples of common economic comparisons in web accessibility and web usability and they illustrate why understanding what is being compared is so important. "The rule of thumb in many usability-aware organizations is that the cost-benefit ratio for usability is $1:$10–$100. Once a system is in development, correcting a problem costs 10 times as much as fixing the same problem in design. If the system has been released, it costs 100 times as much relative to fixing [it] in design."[ix]

Keep in mind this refers to usability, not accessibility. The comparison that is being made is one of fixing a problem in the design phase versus waiting until it is deployed. Noted accessibility expert, Karl Groves pointed out, "I don't see any difference in terms of development time for something inaccessible vs. something accessible (provided the developer understands accessibility). I generally consider the level of effort to be identical for new development."[x] He argues there might even be reduced maintenance time and costs from developing accessibly. However, he goes on to point out there are a number of things that weaken this central argument; primarily that most development work is not completely new and doesn't fall into this simplified comparison. With that said, data were not provided to support his arguments.

"I don't see any difference in terms of development time for something inaccessible vs. something accessible (provided the developer understands accessibility). I generally consider the level of effort to be identical for new development."
—Karl Groves

The second source was a report commissioned by the California Community Colleges (Farr, Studier, Sipes, & Coombs, 2009)[xi]. This report was part of a broader needs assessment of distance education courses that existed within the CCC system at the time. It provided estimates of the costs to retrofit existing courses to a Section 508 standard, including training and support. Part 1 of the report presented the opinions of faculty and administration on accessibility issues in distance education and on cost. In Part II of the report, they estimated costs to create accessible distance education courses.

To estimate these costs, the authors asked reviewers familiar with accessibility to evaluate 5 distance education courses of varying complexity from different departments. They looked at each course to record "ingredients" of the course (e.g., like the presence of an image) that could then be mapped onto Section 508 standards. Then they looked more closely at each ingredient that would need to accessible (e.g., alternative text

added to an image), how often a particular ingredient appeared in the course, and then estimates of how long it would take for each ingredient to be made accessible. They also provided a list of who amongst personnel would be best suited to make each ingredient accessible (e.g., the faculty member, the distance education staff, the alternative media specialist, someone from disability services, or other personnel). The reviewers engaged in consensus building whenever there were variations in the person they identified as the best to create the ingredient or the time they estimated it would take. The authors then multiplied the hourly rate for the person identified by the time they believed it would take to determine an estimate of the cost of each ingredient.

The authors calculated the costs to make 2 specific courses accessible; this was in 2008 dollars. The English course was considered to be fairly simple (i.e., mostly text and images), and it was estimated that it would cost $477 to make accessible. The History course was considered to be more complex (i.e., containing multimedia elements). It was estimated to cost $2,016 to make accessible. The authors described several limitations to their methodology. For example, there is a range of cost for each ingredient (i.e., making "a table" accessible could take 10 minutes or 45). Also, it is not known if the times estimated by reviewers are representative of others, or even if the courses themselves are representative of the broader population of distance coursework. With all of this said, what is important is that they were able to get to an estimate of cost. This becomes a data point against which others can test. In the future, prospective data rather than estimates, could determine the extent to which their time and person estimates are accurate.

"The English course was considered to be fairly simple, and it was estimated it would cost $477 to make accessible. The History course was considered to be more complex. It was estimated to cost $2,016 to make accessible."

The third source that provided data also included detailed cost models and tools useful for those in the European Union (EU) to estimate the cost of accessibility[xii]. The European Commission contracted with the group Technosite to produce a detailed report. In their 2011 report, the Technosite authors noted little data had been available to inform the discussion of costs or benefit of web accessibility; a parallel finding for GOALS staff members. They set out to detail the costs and benefits from improved eAccessibilty efforts in the EU. The authors collected survey responses and retrospection on costs of accessibility across private companies, public administrations, and Non Governmental Organizations (NGO's). None of the information was gathered in education, but rather in banking, healthcare and government. They found great difficulty in securing participation in their research and had only a dozen or so participants that completed the web accessibility portion of the study. Moreover, they noted only 25% of the information given to them by participants could be quantified. It is no wonder a main finding was the need for greater systematic study of the issue of cost by using prospective—rather than retrospective—data sources.

Technosite reported the cost of accessibility, for the private organizations studied, was greater than the immediate business benefit of accessibility (e.g., an expanded audience, enhanced search engine optimization, or decreased maintenance cost). However they indicated an interesting observation: *"Although at aggregate level, projected organisational costs are higher than projected organisational benefits, they are fully offset when we bring into the picture potential benefits accruing to users, which represent the social return for economy and society as a whole."* (p 121) Further they noted there are differences in cost benefit when looking at private versus public sites. Although they did not collect data in any educational environment, when they considered the cost of public services they found the benefits exceed pure cost. *"The costs to the public sector cannot be considered as a private cost and could be seen as part of the [Improved Web Accessibility] policy. So, the real burden for introducing web accessibility is only that applying to the private sector. If we remove the public sector costs, then aggregate social net benefit are positive from the very start."* (p 121)

"Although at aggregate level, projected organisational costs are higher than projected organisational benefits, they are fully offset when we bring into the picture potential benefits accruing to users, which represent the social return for economy and society as a whole."

Decisions are being made in an information vacuum.

To summarize, while there is demand for information on cost, little is available to those who would benefit from it. This is especially true in education. It means institutional leaders are making decisions in an information vacuum. Key questions for institutions that wish to pursue web accessibility will necessarily include how to begin the work while minimizing costs. The need for accessible content is great across the enterprise and exists across classroom, department, college and institution-wide websites. How can we help leaders prioritize limited resources to have the most positive impact when there is no information for them on which to do so?

What GOALS wanted to examine

One of the reasons this information may be missing in the literature is that it is a complex issue where answers are not easily obtained. Ultimately we were looking for data on the cost of accessible designs compared to inaccessible designs so we could use the same vetted methods in higher education. We were unable to secure true cost information to use as we moved forward. Moreover, we were unable to secure methodology from which to pattern our work.

The reader may be interested in hearing what GOALS Project staff initially wanted to do. We wanted to conduct a project to show the total cost of creating a web site when done accessibly from the start versus the total cost of creating an inaccessible web site plus

the cost of retrofitting that site for accessibility later (since this is typically what is done in higher education). But because there were no existing research models to use, we had to shift to another plan. While we discussed creating such a design, there were a number of barriers to executing it in the short time frame we had for the work.

Principally, it is difficult to hold everything constant and only vary the one thing we wished to measure—costs for accessible and inaccessible design. Yet, that is what would have to be done to get to an honest comparison. In order to quantify a true comparison we would need comparable web site requests for development (e.g., in terms of complexity, number of pages and all other components). We would also have to have access to web developers who were "equivalent" in terms of their professional skill. The human capital of the developer(s) would need to be the same for the comparison to give us the true cost of the different methods, yet this is difficult. You cannot ask someone to build a website accessibly unless they are trained to do it accessibly. Nor can you ask someone who is trained to build content accessibly to build it as if they didn't know accessibility. The design would require both conditions of the comparisons to be made by those who have knowledge and skill in accessible design. In one condition you would ask them to create an accessible page or site. In another condition you would ask the same person to create an inaccessible one, matched for complexity and features. However, the question remains: could web developers trained in creating accessible content ignore the techniques they have used in the past and create an inaccessible website? It is possible it could take more time for developers trained in accessibility practices to create a web page that is not accessible, as it would require a conscious effort on their part to do so. Also, since much of the developers' work on accessibility is also good practice for usability, is it possible for the developer to create an inaccessible website with good usability but not accessibility?

"It is difficult to hold everything constant and only vary the one thing we wished to measure—costs for accessible and inaccessible design."

While it seems intuitive, we do not have data that points to whether or not it is more cost effective to build accessible web content from the beginning.

Because of such challenges, conducting a rigorous comparison of accessible and inaccessible web content is yet to be done. There are many important economic questions we realized we could not address. In our GOALS Cost Case Studies, we were unable to get the empirical evidence needed to state if it is more or less cost effective and efficient to build web content accessibly from the beginning than it is to retrofit it after it is built. While this question seems to have an easy answer (i.e., it is more cost effective to design accessibly from the start), it is irresponsible to say so in the absence of data to support it. The search for an answer to this question continues to be the Holy Grail in web accessibility today.

How GOALS is contributing

While staff members at GOALS were unable to accomplish cost comparisons of developing accessible and inaccessible web sites, what we did accomplish is important in the field. We identified existing practices in higher education, described them, and collected costs for them. These findings are detailed later in this report. It is hoped this will be the beginning of a serious exploration of the costs of web accessibility in higher education. Readers may acknowledge some trade-offs in regards to costs, benefits and outcomes as they read each case study. It should be noted this collection of institutional experiences is merely a description of their experience, and not an attempt to compare across institutions or practices. The web accessibility strategies that are described were the result of internal comparisons at each institution but not external ones. Given limited resources and competing priorities, an institution will need to make internal determinations about where those resources are best applied and how best to engage in accessibility activities. We hope this information is helpful to postsecondary leadership as they make choices about web accessibility practices in a way that will save them money and improve outcomes for students, faculties, staffs and community members with disabilities.

Purpose

The purpose of these cost case studies is to provide basic information about costs of web accessibility activities in postsecondary settings. While they are targeted to key decision-makers, others may find them useful. The intent of the information is to arm decision-makers with information they can use to act. Moreover, concentrating on fiscal issues provides a focus on one motivation for this group of leaders—to ensure their institution uses cost-effective practices in an environment of dwindling resources. As the field moves forward to achieve web accessibility in postsecondary education, one thing is clear; we must speak to the motivations of top administrators. Until Presidents, Chancellors and Provosts fully support web accessibility initiatives, the resources necessary for success will be used to support competing institutional priorities.

One thing is clear, we must speak to the motivations of top administrators.

Many institutions of higher education have faced large cuts in state support during the recession. What tough choices have to be made to free resources for accessibility? While the case studies do not provide needed cost comparisons, they do begin to build a knowledge base about ways institutions are using resources for web accessibility as they move forward. Many case studies illustrate innovative practices and, we hope, describe them in ways that others can replicate. At a minimum, the case studies will lay a foundation for the next stage of economic study and analysis.

"Until Presidents, Chancellors, and Provosts fully support web accessibility initiatives, the resources necessary for success will be used to support competing institutional priorities."

METHODS

GOALS staff approached 12 institutions for participation in this project, 11 agreed to participate, and 7 completed data for the case studies. One of the "institutions" was in fact a state system of higher education, but will be called an institution for the purposes of the narrative. Of those 7, only 6 provided data that were complete enough to be used.

6 institutions provided data that could be used to create brief cost studies: 4 public universities, 1 public community college, and 1 state system of higher education.

While our sample includes only publically-funded enterprises and primarily 4-year institutions, we do have one case study from a community college, and as mentioned earlier, one from a system of higher education. The 6 sample institutions came from 6 states covering divergent locations across the nation. More specifically, they came from 3 of the 4 Census Bureau-designated regions: the West, the Midwest, and the South. There is no institution to represent the 4th region, the Northeast.

We also worked hard to select institutions that were at different stages of web accessibility on their campus. We used the *GOALS Indicators of Institutional Web Accessibility* to group each institution into one of the 4 Institutional Indicator categories. This means that the institution, in our opinion, was working on the following aspect of system-wide web accessibility at the time of the case study:

1. Indicator #1: work to secure leadership vision and commitment for the work of web accessibility;
2. Indicator #2: engage in web accessibility policy creation and a system-wide implementation planning;
3. Indicator #3: work to create and maintain resources and supports so the web accessibility policy and plan will succeed;
4. Indicator #4: engage in monitoring and assessment of both web accessibility outcomes and the process to achieve and sustain them.

In the 6 case studies we present here, information was gathered at one institution that represented Indicators #1, #2, and #3. There were 3 representing work that typically occurs at an institution working on indicator #4 issues.

"We used the GOALS Indicators of Institutional Web Accessibility to categorize each institution into one of the four Institutional Indicator categories."

To collect the information necessary to complete our case studies, we employed the use of both qualitative and quantitative methods. Specifically, qualitative methods included focus groups, surveys, and interviews. The quantitative methods resulted in data from time diaries, billing, purchasing information, and other artifacts submitted by each institution that would help us calculate cost.

Each institution began with a focus group where an issue of interest would be identified. Next, the GOALS economist developed individual protocols for each issue. In many cases, they included time diaries. These were gathered in a prospective manner. This means staff members completed time diaries to accurately collect activities and time involvement as these activities were occurring. This enabled us to have confidence the data received would not be subjected to forgetfulness or revisionism; this can occur when someone has been asked to recollect activities or time spent on any activity, particularly if they have a vested interest in the outcome.

"Staff members completed time diaries to accurately collect activities and time involvement as these activities were occurring."

Details on our methods can be found in ***Appendix A***.

CASE STUDIES

While it would have been interesting to collect similar practices across institutions and look at variability of cost of a single issue, we chose to highlight 6 different approaches used across institutions as they worked to implement web accessibility enterprise wide.

The following topics are addressed in the case studies:

1. Costs to litigate (or benefit to not litigate) a student complaint.
2. Costs to retrofit all online courses of a distance education unit.
3. Costs for captioning online audio and video on campus.
4. Cost benefit to provide retrofits to the accessibility of an open source Learning Management System (LMS).
5. Cost benefit of a group procurement as an effective way to lessen costs of accessibility.
6. Cost for instituting a procurement review process for accessibility on campus.

The following pages provide a summary for each of the 6 case studies. They contain a description of the institutional practice, followed by the costs encountered as the institution engaged in the practice. Detailed information for each case study can be found in the Appendices (i.e. B–G). It should be noted Institutions were quite varied in the detail and data they provided. To the extent we can share information, we have done so. At times, only brief descriptions are available, even in the Appendix.

"We chose to highlight 6 different approaches used across institutions as they worked to implement web accessibility enterprise wide."

While we have no way to determine if these practices were applied in the most efficient or effective manner at any given institution, these case studies should provide initial information useful to others who wish to study this area, or look to costs at their own institution.

COSTS TO LITIGATE (OR BENEFIT TO NOT LITIGATE) A STUDENT COMPLAINT

CASE STUDY 1

The complaint alleged that a student with a disability could not complete required coursework due to inaccessible web content.

A large public state university allowed us to gather costs of a student complaint that went to the Office of Civil Rights, and then to the pre-trial phase, before a settlement was reached. In this case, the complaint alleged that a postsecondary institution was in violation of federal law because the student couldn't complete coursework due to the inaccessibility of web content that was present in a required course. The student had made a complaint to the Office of Civil Rights two semesters before filing suit. Then, after less than a year of litigation, the Institution entered into a settlement agreement. While we do not have the full costs to the institution from defending themselves in this case (i.e., personnel costs at the institution for the time to engage in numerous and protracted meetings, or the State's Risk Management involvement), we do know that the institution was required to reimburse the advocacy group $801,000 for legal costs, expenses, and damages to the plaintiff. The institution paid out just over $530,000 and disputed an additional $271,000 as unreasonable fees. Although we were not able to measure the total cost, we do know that legal fees, remediation costs, and final settlement totaled over $800,000 (see ***Appendix B*** for details).

> *"The institution was required to reimburse the advocacy group $801,000 for legal costs, expenses, and damages to the plaintiff."*

We were told that legal and court costs would have been significantly higher if the case had continued on a track through the courts, so the settlement provided a cost savings to the institution assuming the same legal outcome. The costs reported here are the costs of taking a case through part of the pre-trial discovery process. Institutions often cannot avoid engaging in this work, and the associated costs, even if a case settles prior to trial.

In addition to paying damages and fees, the plaintiff agreed to make significant web accessibility improvements.

In addition to paying all damages and fees, the Institution agreed under the settlement to make significant improvements in the accessibility of their web and digital content, the cost of which is not included in these estimates. If the Institution had made these accommodations without legal action they could have saved considerable funds.

There were many non-dollar costs to all those involved as well. The student was unable to participate in the coursework or complete the degree program so there is a social loss due to decreased lifetime earnings and associated taxes paid, as well as overall quality of life. The staff of both groups involved in the legal action spent many hours that could have been spent in other productive activities on behalf of those they serve. These losses reflect additional opportunity costs of this case and illustrate a large potential benefit

for institutions. Of course proactive work to increase the accessibility of web content before it becomes a barrier to individuals with disabilities—in their work, education and knowledge acquisition—benefits a broader group of stakeholders (i.e., students, staff, faculty, and community members). It is usually preferable for an institution to take enterprise-wide web accessibility into their own hands and put it onto their own timeline rather than have it imposed on them by external forces.

As this case shows, there are fiscal consequences when digital content in higher education is not accessible to all. While advocates of web accessibility state that the work makes sense from a human perspective, here is an example that includes a financial one as well.

*"There are **fiscal consequences** when digital content in higher education is **not accessible to all.** While advocates of web accessibility state the work makes sense from a **human perspective,** here is an example that **includes a financial one** as well."*

Details on this case study can be found in ***Appendix B***.

COSTS TO RETROFIT ALL ONLINE COURSES OF A DISTANCE EDUCATION UNIT

CASE STUDY 2

To get a sample of costs, a large community college evaluated 6 representative courses (2 simple, 2 medium, 2 complex) from their 1,159 online courses.

A large community college with a sizable distance education program was interested in collecting an estimate of costs to retrofit the 1,159 inaccessible courses in their distance education program. When we began this case study, the institution was in the process of codifying a policy regarding web accessibility. According to our four-indicator classification, they would be considered to be an *Indicator 2* institution.

> ***"They evaluated accessibility errors from a sample of 6 courses that represented a range of online course complexity from their larger portfolio of online offerings."***

They patterned their methods after those found in the Farr, Studier, Sipes, & Coombs, (2009) report[xi] detailing an "ingredients" approach to estimate cost of web accessibility in distance education courses of the California Community Colleges. Here they evaluated accessibility errors from a sample of 6 courses that represented a range of online course complexity from their larger portfolio of online offerings (i.e., 1,159 courses). Two courses each were selected because they exemplified (1) the simple course, (2) the moderately complex course, and (3) the complex course. Four evaluators conducted accessibility evaluations of these 6 courses using the technical standard of Web Content Accessibility Guidelines (WCAG) 2.0 AA. Two of four evaluators were randomly selected to review each course, so each course was evaluated twice by a different evaluator. Differences between reviewers were conferenced for consensus. The evaluation included not only accessibility errors, but also an identification of who within the institution should make the fix (e.g., faculty, alternative media specialist, alternative media technician, outsourcing). Moreover they provided data on the time needed to make the fix "as if" the faculty or staff were already trained and knowledgeable in accessibility. For those items that would be fixed by faculty, the institution has 2 rates of pay; a full faculty pay rate and a curriculum development pay rate. The costs to retrofit each sample course were then determined according to known costs (e.g., staff pay rates, outsourcing rates, and the 2 rates of faculty pay). Next, all online offerings were categorized into one of the 3 course types (i.e., the 1,159 courses were categorized as the following: 811 simple courses; 336 moderately complex courses; and 12 complex courses). The time and costs from the sample courses were then used to extrapolate an estimate of what it might cost to retrofit all courses in their portfolio. ***Table 1*** provides a summary of what they found.

Table 1: Time and cost to retrofit simple, moderate, and complex online courses at a community college across 2 different faculty pay rates

	SIMPLE	MODERATE	COMPLEX	TOTAL
Total courses	811 (70%)	336 (29%)	12 (1%)	1,159 (100%)
Time in staff weeks to retrofit (a week is assumed to be 40 hrs)	152–188 staff weeks	509–1,026 staff weeks	4–17 staff weeks	665–1,231 staff weeks
Costs assuming special faculty rate ($29.04/hr)	$173,359–$198,217	$561,228–$1,265,188	$6,48–$18,882	$741,068–$1,482,287
Costs assuming full faculty rate ($64.04/hr)	$357,862–$389,596	$1,215,120–$2,650,502	$12,237–$40,162	$1,585,219–$3,080,260

Note: The 2 courses evaluated were not averaged for time or cost. Thus the range that is displayed represents each of two course evaluations.

If their sample is a good representation of the larger population of courses, and if pay rates can be selected, this community college would require somewhere between three-quarters of a million dollars to over three million dollars to retrofit all courses in their distance education department. This maps onto a workflow of between 665–1,231 staff weeks of work. These data display a large span, not suited to the budgeting or workflow process in higher education. Yet, it is likely that other algorithms could be used to narrow the estimates (e.g., What percentage of time are distance education faculty paid the lower "development" rate when they are creating their curriculum? Which sample course best represents time and needed fixes required?).

"If their sample is a good representation of the larger population of courses, and if pay rates can be selected, this community college would require somewhere between three-quarters of a million dollars to over three million dollars to retrofit all courses in their distance education department."

These estimates are conservative. They do not include the costs of faculty/staff benefits or accessibility training.

With that said, these estimates remain conservative. As one example, the salary does not include benefits paid along with salary. Also, while it is fine to create a model predicated on individuals who can make accessibility fixes "as if" they had the knowledge and skills, the fact remains that training and support represents a separate cost not factored into this case study.

It is important to remind the reader that waiting to make fixes after-the-fact is a less efficient process. So in some ways, this represents the worst-case scenario for an institution; fixing each course one at a time after they already exist. The analogy would

be to build your home, then decide you want a bathroom off the master bedroom. Had you planned this all along, the costs would have been greatly reduced, and efficiencies could have been brought to the situation.

Developing an accessible product from the beginning is likely more efficient than after-the-fact fixes.

It is common for institutions to believe that what they need to do to implement web accessibility is to make similar after-the-fact fixes of their courses. Certainly, anytime accessibility is needed, it must be delivered, and in some instances this model of the retrofit will be required. However, developing an accessible product from the beginning will likely save having to cycle back around to fix that which already exists. It is also common for institutions to implement web accessibility as courses are naturally undergoing updates or are in a new development cycle. It is not necessary to consider the costs of the retrofit as your only option in becoming an accessible institution. This case study is important, as it provides useful information for institutions, particularly those new to web accessibility. Every institution will have to identify the ways in which they will make their content accessible. Some may choose to phase in newly designed accessibility over time along with a rapid response team for retrofits as needed, and some may choose to wholly retrofit all existing courses.

"It is not necessary to consider the costs of the retrofit as your only option in becoming an accessible institution."

Details on this case study can be found in ***Appendix C***.

COSTS FOR CAPTIONING ONLINE AUDIO AND VIDEO ON CAMPUS

CASE STUDY 3

A large university wanted to identify which captioning option was the most cost-effective.

A large university, advanced in their campus-wide accessibility work (i.e., an Indicator 4 institution) wanted to collect and analyze the costs to caption media in courses. They understood that some viewed captioning as an untenable accessibility requirement. The campus had recently gone to a distributed billing system where each College on campus would receive invoices for the work to caption the audio or video courses they host, rather than it going centrally to be paid by the budget of the Disability Resource Center (DRC). They set out to identify if some practices are less costly than others, and also to identify the costs incurred by each College for captioning.

> *"Uncovering the fact that both an in-house and outsourced task is the same cost will provide them with real choices on where to house the work."*

They gathered invoices for 3 consecutive semesters (i.e. Spring and Fall of 2011; Spring of 2012) and analyzed the data. They found average costs per minute to caption to be the following:

- $1.50/min for the DRC to generate a transcript
- $1.90/min for the DRC to generate a transcript and sync it with the media
- $1.90/min for a private vendor to generate a transcript and sync it with the media
- $2.90/min for a private vendor to provide transcripts and syncing as a rush job

It is no surprise that planning ahead will save costs on the work of accessibility. Uncovering the fact that both an in-house and outsourced task is the same cost provided them with real choices on where to house the work.

The cost for (non-rush) captioning was the same for captions generated by the DRC and by a private vendor: $1.90/minute.

We evaluated the invoice data across the 3 semesters for each of the 5 Colleges with particular attention to how and when they used captions. There was great variability across College and semester. Some did not caption any media during a given semester, and one College captioned 1,956 minutes in a single semester. The total cost for any single College, across all 3 semesters, ranged from $190 to $3,369. The aggregate total for all Colleges was $6,199 for the 3-term period. These costs appear to be reasonable for both the Colleges and the institution.

Details on this case study can be found in ***Appendix D***.

COST BENEFIT TO PROVIDE RETROFITS TO ACCESSIBILITY OF AN OPEN SOURCE LMS

CASE STUDY 4

A large Land Grant University was interested in tracking accessibility improvements to their Moodle installation.

A large 4 year Land Grant University with an impressive history of web accessibility work was interested in tracking their costs devoted to improving the accessibility of their chosen learning platform; the open-source product, Moodle. They decided to improve the view and operation of the student gradebook, add Accessible Rich Internet Application (ARIA) landmarks to student views, and also improve the File Picker; this is how students upload their files. They also made minor changes to the Cascading Style Sheets (CSS), and other little improvements that were easy to make in the time given.

Three staff members (the institutional accessibility lead, an applications developer, and a web developer) engaged in this work over a 2-month period during the fall of 2012. Collectively they put 92 hours of work across a number of activities. Factoring in their salary and fringe, this work cost the institution $24,601.

The cost per registered student with a disability: $23.43

The impact of the work was large. After making the fixes, they were deployed throughout the entire university (4 distinct campuses and online learning, to nearly 35,000 students). The costs were modest in comparison to the impact. These fixes would have had an immediate impact on many of the 1,050 students registered with a disability. This would make the cost of these fixes for each registered student with a disability $23.43. It is important to note that not all registered students with a disability would benefit from these fixes, however, it is likely that others in the institution not registered with the DRC might benefit from these fixes too, especially if the fixes improved the overall usability of the LMS. Of course that charge is factored as a one-time charge, and it is more likely that students would interact with these improvements over multiple classes and semesters. Thus if a student who had a disability affecting computer and use of the internet used Moodle with these fixes in at least one class per Semester for 6 semesters, the fix has now dropped to $3.90 per student per semester.

The impact of this work would easily expand outside of the institution too if Moodle incorporated these fixes, because then every other Moodle campus would benefit as well. Our university contact told us they were unsure if their code ever made it into the Moodle Core. However, they did all they could to let others know how to secure a copy and implement the same fixes.

In short, this case study showed how a very modest investment in improvements to an open source LMS could positively impact students with (and perhaps even without) disabilities. Making changes in open source applications can have a significant economy of scale, even more so, if you can get them back into the application's core.

Details on this case study can be found in ***Appendix E***.

COST BENEFIT OF SYSTEM PROCUREMENTS AS AN EFFECTIVE WAY TO LESSEN COSTS OF ACCESSIBILITY

CASE STUDY 5

A large state system of higher education was interested in tracking potential savings of system-level procurement.

A large state system of higher education was interested in tracking what they would save with system-sized procurements. They choose to track both the system-level purchase of a tool that would assist in accessibility evaluation, along with campus sub-awards so that customization of that evaluation tool could occur for system purposes (i.e., they wanted to embed manual checks into their evaluation process; align it with WCAG 2.0; and provide different permissions and roles for users. They also included training for each campus in the sub-awards so that users would know how to use the new tool and its features). The state-level higher education system was quite sophisticated in their practice of web accessibility. However as each campus in the system is independent there were variations in web accessibility indicators across the institutions. The web accessibility stage of most campuses would have been classified between *Indicators 2* and *4*.

> ***"The state-level higher education system was quite sophisticated in their practice of web accessibility. However as each campus in the system is independent there were variations in web accessibility indicators across the institutions."***

A large procurement of an accessibility evaluation tool was made across the system. While only 87% of campuses in the system used the tool, each was billed for their "share" of the purchase. The savings from this group purchase over licensing it by individual campuses was $200,000 for the system. Moreover, there was an additional savings that is not monetized here; multiple campuses did not need to initiate requests for vendor proposals, review them, make the purchase, and execute the contract. The fact that this work was not necessary for almost two dozen campuses adds to the cost-efficiency of the system-level purchase.

Next, staff in the system offices provided sub-awards to two campuses. The work of these two sub-awards would assist with accessibility evaluation using the new tool as well as remediation of web content across the entire system. Both campuses completed the work over the course of a year. Campus A worked to support the design and implementation of additional processes and resources into the automated tool. This sub-award cost the system $23,997. Campus B worked to create new roles and permissions within the testing tool and also deliver training on a protocol of manual checking. This sub-award cost the system $10,203. It should be noted that Campus B used students in a computer science class to help with some aspects of the project. The

student contributed work provided an additional savings to the system (an estimated $13,750), and provided the students with an excellent real-world opportunity to engage in their discipline. The combined cost of the sub-awards was $34,200 to the system. If you were to assume that each institution would have made similar customizations to the tool, each campus would have incurred roughly $34,200 in costs. However, since this was done at the system level, each institution's share was only $1,487, providing a savings of $32,513 for each institution. The savings system-wide for this work would have been up to $747,799.

System-level purchases are a powerful instrument in keeping web accessibility costs low.

The economies of scale for system-level purchases are a powerful instrument in keeping web accessibility costs low. In this case study, the system was able to save up to $947,799 by approaching needs as a group, rather than as individual campuses.

Details on this case study can be found in ***Appendix F***.

*"The system was able to save up to **$947,799** by approaching needs as a group, rather than as individual campuses."*

COST FOR INSTITUTING A PROCUREMENT REVIEW PROCESS FOR ACCESSIBILITY ON CAMPUS

CASE STUDY 6

A large public 4-year institution wanted to capture costs to embed accessibility into procurement.

A large public 4-year institution with a strong history of institutional accessibility wanted to capture costs of creating and testing a procurement process that would integrate accessibility into product selection.

Once the work of this committee was complete, all faculty and staff purchasing an item above a $2,000 threshold would be required to go online to begin a 5-step process:

1. Submit an application online. The campus requestor would be required to detail the features and criteria for the desired product, as well as identify how this product could affect campus-wide issues of, security, networking and integration. The application process also embedded procedures for requesting and assessing the product's accessibility features.
2. The campus requestor would forward a Voluntary Product Accessibility Template (VPAT) to the vendor to complete.
3. The vendor would complete the VPAT and return it to the accessibility staff for review along with a demo of the product.
4. Campus accessibility staff would review the VPAT and run both manual and automated accessibility testing on the demo to determine if the product conformed to the institutional accessibility standard.
5. If selected for procurement, contract language would guarantee that the institution acquired what they needed.

> *"Substantial effort was spent in meetings and communicating with faculty, staff, and vendors, so that they could create a process that would become a mainstream part of the campus workflow."*

Three accessibility staff members participated in the development and beta testing of the process (detailed in ***Appendix G***). While their time reflected work developing a new campus-wide procurement process with the broader committee, their focus was on the accessibility requirements and subsequent product reviews. Their time was the only time tracked in diaries. In other words, some of their time was spent discussing issues other than accessibility, and the time of other committee members (which was not captured) was also spent discussing accessibility. Substantial effort was spent in meetings and communicating with faculty, staff, and vendors, so that they could create a process that would become a mainstream part of the campus workflow. Reviewing the vendor-submissions of the Voluntary Product Accessibility Template

(VPAT) and testing the products for accessibility with manual and automated tools took up a large amount of time as well. 23 products were fully evaluated during this beta testing period, which helped them refine a system. As an added benefit, accessibility was also included in the institutional IT life cycle.

In total, accessibility staff at this institution spent 464 hours to participate with the broader committee as they created and tested a fully operationalized version of the new purchasing process. They were able to test the new process across 23 product procurements. Information on their salaries and benefits reflected $13,792 of institutional resources; this does not include costs for both manual and automated testing. Additionally, the cost of licenses during this development year was $4,115.

"Information on their salaries and benefits reflected $13,792 of institutional resources."

Key IT staff on the procurement committee incidentally learned about accessibility.

As staff members reflected on this effort, they indicated that accessibility became integrated into the larger core institutional IT in ways it otherwise would not have been. Because of the committee's work, key IT staff members came to understand accessibility in new ways. Moreover, accessibility staff have been asked to participate on other committees. The review process was used over 200 times in the 16 months after development.

Changes have since been made to the purchasing threshold. It is now at $0 threshold (i.e., freeware is now required to go through the same procurement process). This modest investment has enabled the institution to close the gap between their stated aims of accessibility and the reality of the digital infrastructure delivered to students, employees, and community members at large.

Details on this case study can be found in ***Appendix G***.

SUMMARY

There are a many compelling claims about the cost-benefit of web accessibility, but little actual data.

The issues surrounding costs and cost-benefits of web accessibility are important. This was one reason we were surprised to find such little data on the topic as we began. While there are many logically crafted arguments about the cost-benefit, or even cost-efficiency of web accessibility there is a paucity of actual data to support, or negate, these claims. The field would benefit from more detailed economic studies including costs, cost-benefits, and cost-efficiencies.

To that end we are happy to add information on this topic. While the 6 case studies we presented here do not provide costs of inaccessible versus accessible materials—our prime interest as we began—we were able to detail a number of costs in higher education given specific contexts.

This report provides the experiences of 6 institutions of higher education and some of the costs they incurred as they worked to improve accessibility on their campus. So what did we learn by these case studies?

1. Cost to litigate: There can be fiscal consequences when an institution allows their web-based content to be inaccessible to those with disabilities. In this instance, a student who was blind alleged that the institution's online math course was not accessible. As part of the agreement, the institution was required to reimburse the advocacy group over $800,000 for legal costs, expenses, and damages to the plaintiff. These costs only represented the pre-trial discovery portion of the case. Non-dollar costs absorbed by the institution (e.g., multiple meetings across key leaders, loss of staff and faculty time and productivity, travel to depositions) were not included in these calculations. Nor was the cost of the social loss to the student who left without completing a degree. One feature of the settlement was the requirement that the institution make their entire web presence accessible, another cost to not detailed here. It is typically preferable for an institution to take enterprise-wide web accessibility into their own hands and timelines, rather than as a consequence of external forces. In this case, it was not an option.
2. Cost to retrofit: The institution in this case study estimated the costs to retrofit 1,159 inaccessible distance education courses. This cost study provided useful information on the resources that may be required for planning large scale retrofits in higher education today. While retrofitting is not ideal, it is the reality for many institutions new to web accessibility. Borrowing methodology from Farr, Studier, Sipes, and Coombs (2009)[xi] they reviewed 6 courses (i.e., 2 simple, 2 moderate, and 2 complex) to estimate what it would take for each course to become

"This cost study provided useful information on the resources that may be required for planning large scale retrofits in higher education today."

accessible. Multiplying the known personnel costs with the given time estimates, they produced a dollar amount range representing what it would take to fix courses by different types of faculties. It is interesting that their estimates are in line with those provided in the Farr,et al. study. Yet since they borrowed some estimates and methodology perhaps it should not be a surprise. They estimated it would cost between $214 to $480 to retrofit each simple course, and between $1,670 to $7,888 to retrofit each moderately complex course. Due to proprietary elements within the courses that could not be fixed natively, the institution was unable to estimate the true cost to fix complex courses, however they did provide a range of what they could fix. This was between $540 to $3,347 for each complex course. They did note that because they were unable to retrofit complex courses, most would have to be treated as a classic accommodation.

3. Costs of captioning: Captioning rich media is often viewed as the largest strain on an accessibility budget. In this case study we learned the costs of post-production captioning at an institution using using 3 different practices (i.e., campus produced, vendor, and vendor rush job). Institutional staff collected the costs of captioning by all colleges on their campus over 3 semesters. They found that it cost the same for their Disability Resource Center to generate a transcript and sync it with the media as it did for a vendor to do the job; the cost was $1.90 per minute. This provides them with a genuine choice to outsource or employ local individuals to complete the work, or possibly both if demand for captioning outstrips local capacity. Not surprisingly, they also found that the most expensive captioning option was using a vendor to create the transcript and sync the media when a rush job was needed; this was $2.90 per minute. Planning ahead for captioning will save resources. They also reported the total costs for 5 colleges within the institution to provide captioning of web-based media over a 3-semester timeframe. The two main findings were that (1) there was great variability of the need to caption across semesters and colleges, and (2) the aggregate costs appeared reasonable. The total cost for any single college across all 3 semesters ranged from $190 to $3,369. The aggregate total for all 5 colleges during the 3-term period was $6,199.

"Captioning rich media is often viewed as the largest strain on an accessibility budget."

The cost to retrofit the LMS was only $23 per student with a registered disability—when you spread that cost across semesters, the price drops even more.

4. Cost to retrofit an open source LMS: This case study showed how making accessibility changes within a core institutional technology (i.e., Moodle) has the potential for broad impact in ways that can be fairly immediate and flexible. The costs to the institution were under $25,000. When amortized across all registered students with disabilities the fix cost $23. It should be noted that this figure assumes the fix to be used during only one semester, yet the likelihood is greater that it would be used across successive semesters, reducing the per student cost. The case study also uncovered the dilemma of making changes that are not incorporated into the application's core. Each time an update was made to the LMS, institutional staff would have to implement their accessibility changes all over

again. This institution has since moved to a model where they are active in the formal LMS accessibility group so that all changes are made to the core application. Doing so has enabled them to spend less time and resources, yet have a voice in the direction of the working group so that their institutional pain points can be addressed. The trade off, however, has been slower turnaround in their accessibility fixes as they wait for formal updates with the needed changes.

5. Cost of making group accessibility procurements: In this case study, a state system of higher education displayed the power of group purchases, and they added in-system contracting of accessibility improvements to produce large cost savings. The state system purchased, and subsequently improved, accessibility evaluation software over the course of a year. Because they did this together as a system, rather than each institution engaging separately, they saved nearly a million dollars compared to each institution purchasing a separate license and making the same improvements. The fact that the system has central coordination for accessibility purposes made the coordinated procurements possible. In a climate where every dollar must be maximized, this is an important lesson. Also, students used during the campus subcontracts provided not only an added cost savings, but were provided with authentic experiences in which they could use real-life knowledge and skills, and learn more about accessibility.

> *"A state system of higher education displayed the power of group purchases, and they added in-system contracting of accessibility improvements to produce large cost savings."*

6. Cost to establish a procurement review process: Part of the challenge for an institution to acquire accessible goods and services is to ensure that accessibility is part of product review before purchase. In higher education, this means that it must be built into the procedures. This case study showed how a modest investment of resources (i.e., under $18,000) helped to create an accessibility product review that was integrated with other campus purchasing needs (i.e., to review security, networking, and integration needs along with accessibility needs). The costs to an institution for not purchasing accessible products can be very high. One interesting item reported in this case study was that while they began with a $2,000 purchasing threshold to initiate a formal purchasing process and product review, it has now gone to $0. This institution realized that freeware and very inexpensive software can be used so broadly, that failure to include accessibility determinations could have widespread negative consequences for the institution. One benefit to including accessibility reviews into the wider product review process was that accessibility personnel had opportunities to sit on a committee with key members of the central IT community. This experience helped forge important relationships and awareness of accessibility issues by IT personnel that may not have otherwise occurred.

The purchasing threshold changed from $2000 to $0 to include freeware and low-cost software.

Collecting prospective cost data is considerably more challenging than estimates or after the fact appraisals. Innovative methods to improve collection of this critical information are needed.

As we executed the cost case studies, several issues emerged worthy of sharing with others. Our experience gathering data was similar to that reported by the Technosite[xii] group, in that we ended up with only about half of the sample we thought would result. These losses occurred during the period of data collection. This may signal that there are difficulties in diary-based data collection that should be addressed in future methodology. We know that prospective data is much harder to secure than estimates or retrospection, yet it is more accurate and is exactly what is needed in the field now. Perhaps providing clear monetary incentives to complete time diaries would be necessary? Perhaps projects that included partnerships would be helpful as funding would flow to each partner to complete their role? We collected our information in a relatively short time frame, and our snapshots are a reflection of that. Future studies should consider if they want to collect costs over longer periods, thereby collecting a broader picture. In the final analysis, we echo the main finding of Technosite, that greater systematic study using prospective data is needed.

As others study and report on costs of web accessibility in higher education, we hope that detailed descriptions of both institutional context and institutional practices are reported. There are many other practices that can affect cost, and we would expect to see variability in the cost of accessibility as one considers institutional differences (e.g., size, degree to which centralization predominates, degree to which staff have skills to make designs and content accessible) as well as they ways in which accessibility is executed across campuses. The field will benefit if both contextual variability and accessibility practices are described in detail and included in cost descriptions of the future. Of course what is needed in the field now is a body of data to include not only details of costs, but also comparisons of costs, cost efficiencies, and cost effectiveness of accessibility overall.

"The field will benefit if both contextual variability and accessibility practices are described in detail and included in cost descriptions of the future."

We know that these case studies provide early information that others will use and build upon. We hope to see a time in the near future when prospective cost data informs decisions made in higher education.

APPENDIX A

PROJECT METHODOLOGY

It is important to start our section on methodology with some basic definitions and explanations of economic principals. This will help the reader understand the methods and findings reported.

The Principals Described

IDENTIFYING AND DETERMINING A MONETARY VALUE FOR PROGRAM COSTS

This is the method by which the value of an activity is estimated. Estimating the cost of various web accessibility activities can be useful, in and of itself, for setting goals and priorities within key departments and workgroups. It is a useful first step to understand the resources needed to accomplish key activities and steps toward web accessibility and it does not involve comparisons of similar alternatives.

Costs are defined as the dollar value of the resources used by a program.

Costs are defined as the dollar value of the resources used by a program. All component costs for a program must be identified to accurately calculate the entire costs for a particular program. This is one of the most difficult and tedious parts of any economic evaluation.

The first step in this type of cost analysis is to compile a complete description of individuals and services for each component of the study. It will include, for example, web programmers, disability student center staff, or staff in human resources (i.e., if they direct the ADA services for their campus). Also, we would want to include the time (i.e., cost) given by their supervisors as well as any related services that might be influenced by the activity that is under investigation.

> ***"Estimating the cost of various web accessibility activities can be useful for setting goals and priorities within key departments and workgroups."***

The dollar value of each resource must be estimated on "opportunity cost," the value of a resource in its best alternative use.

Typically, the major resources used in a program can be categorized as personnel, materials, equipment, and facilities. Some resources used by programs (e.g., the use of volunteers to create transcripts for media), do not entail actual dollar expenditures for the institution but nevertheless represent costs because they could be used in someone else's rendering of the model or process. Thus we wanted to capture all costs, so that others can fairly ascertain their value. The dollar value of each resource must be estimated on "opportunity cost," the value of a resource in its best alternative use. For example, volunteer time has a definite value, as it is time that could be spent by the person in paid work, in a productive activity at home, or volunteering elsewhere.

Similarly, a program for improving outcomes for students, faculty or staff with disabilities will require personnel, facilities, and materials that couldn't have been applied to other non-web accessibility endeavors. Thus the cost of a specific program or activity is defined as the value of all the resources that it uses had they been assigned to their most valuable alternative use. In this sense, all costs represent the sacrifice of any opportunity that has been forgone. It is this notion of opportunity lost that lies at the base of cost analysis in evaluation. By using resources in one way, we are giving up the ability to use them in another way, so a cost has been incurred.

This type of detailed accounting can be thought of as constructing an "ingredients" model wherein all ingredients that are required for any particular program or treatment are specified, and a value is placed on each of them. The dollar values of all ingredients are then summed to establish the total cost. This is a systematic and well-tested approach to determining the economic cost of any program[xiii].

Costs may be borne by individuals, units or departments, institutions, or various levels of government.

It is also important to analyze the distribution of the cost burden. Costs may be borne by individuals, units or departments, institutions, or various levels of government. In measuring costs, it is first necessary to determine all contributors to program costs, and then it is useful to report the distribution of those costs among the contributors to understand who is contributing which proportion of the resources as measured in dollars. For example, costs may be borne by taxpayers (because they subsidize public postsecondary institutions) or by individuals (such as students or faculty or staff) in their private capacities.

"It is also important to analyze the distribution of the cost burden."

ECONOMIC EFFICIENCY, EQUITY, COST-EFFECTIVE OR COST-BENEFIT ANALYSIS

Economic evaluation is always a comparison of alternatives with respect to two goals: equity and efficiency.

- Equity is a matter of the distribution within society of the gains and losses from a program. Information on the distribution of gains and losses provides a basis for assessing the fairness of programs, policies, or interventions.
- Efficiency is a matter of society's overall gains from a program. For example, Program "A" is more efficient than Program "B" if Program "A" can make at least one person better off and no one worse off.

Efficiency, equity, cost-effectiveness and cost-benefit comparisons take cost analysis a step further by comparing the cost **and** outcomes of different alternatives to make a choice that optimizes limited resource use at the institution. It is impossible to conclude that an activity to increase web accessibility is efficient or cost-effective in and of itself without comparing it to something else that is being considered as an option.

Economic efficiency is achieved when resources, such as time and money, are allocated to achieve the greatest or highest possible outcome. Alternatively, a strategy may be efficient if it achieves the same outcome as the alternative at lower cost.

Cost-effective strategies are those that achieve higher non-dollar outcomes for a given cost or achieve the same outcome for a lower cost.

Cost-effective strategies are those that achieve higher non-dollar outcomes (compared with some alternative) for a given cost or achieve the same outcome for a lower cost. An example of a non-dollar outcome is to reach a standard of accessibility such as 508 standards or WCAG 2.0 Level AA. There may be two ways to achieve the accessibility standard—one, by training web development staff employed at the institution in accessible web design strategies, or two, by hiring an outside consultant from a private firm to develop the website to the desired standard of accessibility. Reaching the accessibility standard (e.g., Section 508) is the effect, or "outcome", that is the goal of the accessibility activity. In the end, the initial costs to train in-house staff may be higher than the consultant but have additional positive outcomes. Having trained staff might increase the accessibility of other websites on campus, or serve as a mechanism to create an in-house training team that can provide others with their same expertise. These activities would then make the in-house training option worth the higher initial cost. All outcomes from the alternatives are weighed against the initial cost to determine the best economic choice given the budget and institutional priorities.

Benefit-cost analysis measures both what is gained (benefit) and what is given up (cost) in dollars and results in a benefit-cost ratio. For example if you spend $100,000 to implement web accessibility efforts on campus that prevents a lawsuit that would have cost $500,000 to defend, then the web accessibility effort has a benefit-cost ratio of 5:1 so that $5 in benefits accrues for every $1 invested. Cost-effectiveness analysis measures outcomes in non-dollar ways while cost-benefit analysis measures both costs and outcomes in dollars.

Methods

SAMPLE

Given the lack of useful information on costs of web accessibility in postsecondary education that was found in the literature review, staff from Project GOALS set out to fill a portion of the literature gap by capturing costs of different aspects of web accessibility across different postsecondary institutions. Although the project was not scaled to answer the question "what does implementing web accessibility at a system level cost?", or even "what are the relative costs of accessibility as compared to inaccessibility?", GOALS staff could compile the costs of different issues or practices across institutions and provide descriptions and cost data for each. In some cases alternative

"Project GOALS set out to fill a portion of the literature gap by capturing costs of different aspects of web accessibility across different postsecondary institutions."

product choices with different cost configurations that were considered within the institution are presented and explored along with the trade-offs in outcomes that were associated with the different choices. Outcomes and benefits are described for these issues and practices whenever they are available so that the reader can have a better understanding of what is given up and what is gained when using these strategies at a particular institution or system of campuses within an institutional system. This case study cost, outcome, and benefit data lays a foundation in the methods and findings from which to begin to build much needed work on the costs of web accessibility.

"This case study cost, outcome, and benefit data lays a foundation in the methods and findings from which to begin to build much needed work on the costs of web accessibility."

GOALS staff members approached 11 institutions and 1 state system of higher education to participate in the case studies; all 12 will be called institutions. Institutions that were approached were selected because GOALS staff knew of their work on web accessibility. Ten institutions and the state system agreed to participate. Each engaged in a focus group to identify an in-depth cost issue for their institution. Once the cost protocols were sent out, 3 of those institutions did not complete the work, and 1 additional institution had a catastrophic server crash where time logs were lost; they could not begin again. One additional institution provided time diaries that could not be used as they were incomplete (i.e., did not reflect all staff involved or the entire period of the project). Thus, the cost case studies will reflect issues across 6 institutions. ***Table A1*** shows some of the characteristics of the institutions that participated in the GOALS cost case study. All but two are large, public, 4-year institutions and all are Title IV eligible. One is a community college and one is a state system of higher education. The percent of students with disabilities, as measured by the number enrolled with the student disability center, varies from 3% to 6%.

The cost case studies will reflect issues across 6 institutions.

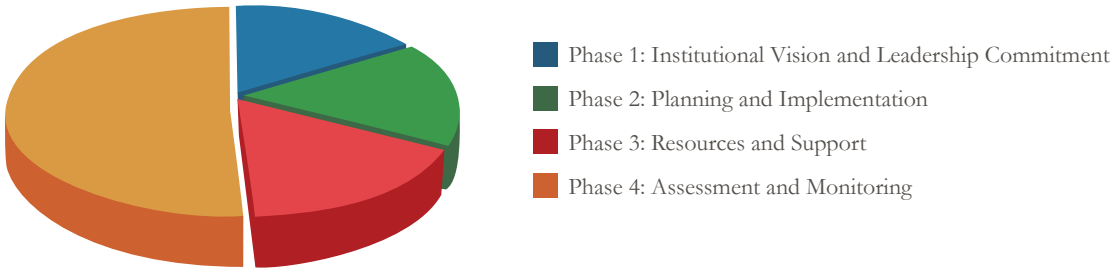
Table A1: Characteristics of GOALS cost case study institutions

INSTITUTION	TYPE (YEARS)	TYPE (CONTROL)	TYPE 4 ELIGIBLE	UNDERGRADS WITH DISABILITY	TOTAL ENROLLMENT FALL 2011	TOTAL FACULTY FALL 2011
1	2 year	Public	Yes	5%	34,632	2,110
2	4+ year	Public	Yes	3%	41,946	4,146
3	4+ year	Public	Yes	3%	34,767	2,075
4	4+ year state system	Public	Yes	3%	426,534	21,910
5	4+ year	Public	Yes	3%	33,320	2,493
6	4+ year	Public	Yes	6%	41,087	2,300

Half of the GOALS cost case study institutions were very sophisticated in their web accessibility work.

The GOALS cost case study institutions were each in different phases of web accessibility development and implementation. One was in the most basic stage that would be considered as developing a vision and leadership commitment for web accessibility. Another institution was in phase 2: planning and implementation. A third institution was in phase 3 which focuses on resources and support. While 3 others were at the most advanced stages of implementing web accessibility (i.e., assessing and monitoring their outcomes and making changes to continuing pain points). ***Figure A1*** shows the phases of web accessibility for the group of case study institutions. These include Phase 1=Vision; Phase 2=Policy & Planning; Phase 3=Resources and Supports; Phase 4=Assessment. These 4 phases are consistent with the phases identified in other GOALS work and described in detail in the GOALS tool (See *ncdae.org/GOALS*).

Figure A1: Phases of institutional web accessibility across case study institutions



GATHERING DATA ON INSTITUTIONAL ISSUES

We employed the use of both qualitative and quantitative methods across 11 institutions.

To collect the information necessary to complete our case studies, we employed the use of both qualitative and quantitative methods across 11 institutions. Specifically, qualitative methods included focus groups, surveys, and interviews. The quantitative methods resulted in data from time diaries, billing or purchasing information, and other artifacts submitted by each institution that would help us calculate cost.

Staff members completed time diaries to accurately collect activities and time involvement.

To begin the process, each institution participated in a focus group where a cost issue pertaining to web accessibility was identified. Next, the GOALS economist developed individual protocols for each institutional issue. In many cases, they included time diaries. These were gathered in a prospective manner. This means that staff members completed time diaries to accurately collect activities and time involvement as these activities were occurring. This enabled us to have confidence that the data received would not be subjected to forgetfulness or revisionism; this can occur when someone has been asked to recollect activities or time spent on any activity.

Focus group methods to identify in-depth issue

Focus groups were held with key staff at each participating institution. This helped us identify issues that were of interest for more in-depth analysis related to cost and web accessibility. The goal of these focus groups was to gather together key stakeholders for an in-depth discussion about the past and current direction of web accessibility efforts, vital as we identified the in-depth issue on which we would focus. We discovered

during the first few focus groups that we were spending most of the time talking about the history and context of web accessibility at the institution and that left little time to talk about current activities and challenges, especially in regard to cost. Therefore we changed the focus group protocol after the first 2 institutions. Beginning with the third focus group, we scheduled a separate small group discussion with 2 or 3 key staff at each institution. We met prior to the larger focus group, to discuss institutional history, background and context of web accessibility. Our understanding of institutional context was then presented briefly in each of the large focus groups for group member confirmation. This allowed a longer, more in-depth discussion during the focus group about current activities and strategies being implemented to solve accessibility challenges. We worked to focus on current institutional web accessibility activities that were undertaken with cost considerations in mind. After the first couple of focus groups we also added a small group debriefing, scheduled just after the main focus group discussion, with 2 or 3 key staff.

"The goal of these focus groups was to gather together key stakeholders for an in-depth discussion about the past and current direction of web accessibility efforts."

Eventually we uncovered that the best method contained 3 separate sections. This tripartite process began with an initial brief meeting, of approximately 30-90 minutes. It was composed of a small core of personnel (i.e., 2-4) with the most knowledge on the institutional accessibility efforts. The focus of this group was on institutional context and history with respect to web accessibility. Next came the broader focus group with participants representing entities across the institution (i.e., 7-20). It always included those with whom we had our initial briefing. The broader group would help define a focus for the in-depth study. The final meeting came with the smaller group again, where we provided a summary of the institutional focus for study as well as recommended processes and protocols for the cost collection.

Staff sample for focus groups and surveys:

Participation in the cost case study required some time commitment by staff at those institutions and was voluntary. Most of the sample was recruited through prior connections between GOALS staff members and key web or disability office staff. There were time constraints and institutions were told that all data had to be completed between fall 2011 and fall 2012. An honorarium of $50 was offered to focus group participants to thank them for their time. Some staff members were unable to accept the honorarium because it conflicted with their institution's policy on extra-compensation during staff hours. In those cases, only focus group participants, such as students, were paid for their efforts.

An honorarium of $50 was offered to focus group participants to thank them for their time.

Examples of participants invited to participate in the focus groups included:

- An individual from central administration (e.g., Vice President for Student services or Chief Information Officer)
- Faculty member: online, remedial education, etc.
- Library representative
- Staff member from finance
- Information Technology staff (preferably someone who assisted in campus wide technology)
- A person involved in Section 504 compliance
- A person involved in ADA compliance (may be the same individual as above)
- An individual who works in training faculty or staff
- At least one individual with a disability (e.g., faculty, staff, or student) who used web content and needed that content to be accessible to them
- Individual(s) from the Disability Resource Center (or equivalent group at that institution), including the director and one person who worked with digital accommodations
- Web Developer(s), including at least one individual who worked with accessibility (e.g., designed content accessibly or retrofitted content for accessibility accommodations)

All of the focus groups included the director for the disability student center. If we heard that compliance for Section 504 and ADA were held in separate offices, we did our best to make sure those responsible for each were present. Most often they also included a representative from administration, the library, and at least one web developer; usually we had more than one. Almost all of the focus groups included at least one individual with a disability and sometimes more than one such as one faculty member and one or two students who had different disabilities.

Structure

GOALS staff developed a focus group protocol that described the process for holding the focus group.

Each focus group was planned for 2 hours. GOALS staff developed a focus group protocol that described the process for holding the focus group. The protocol listed questions to explore with the group. Approval for the protocol and focus group participant consent was obtained from Utah State University's Institutional Review Board office. The complete protocol is presented at the end of this section. The broad questions and issues that guided the focus group discussion were the following:

1. Introductions, purpose, focus group "rules," warm up activity.
2. Explore the institutional context—centralize/decentralized, size, history of web accessibility, current policies.
3. Explain what happens on your campus for web accessibility? Describe web accessibility practices.
4. What do you think of your institution's web accessibility strategy overall? Are there activities or processes that we could document from a cost perspective that are coming up in the near future?

5. Given your experience and what you know about web accessibility what would you tell a new institution that was just getting started? Can you recommend a best practice process—what it would look like and what would it cost? What resources would be involved to implement that practice efficiently?
6. What are you not doing that you would be doing if you had greater web accessibility? Are there processes that have recently occurred that were particularly inefficient?
7. What are you doing for web accessibility for online courses?
8. How do you think web accessibility could be improved? Timing (quick response team or a queue?), cost-effectiveness, training, funding, comprehensiveness of the response? Are there activities that you have undertaken that could have been done different and saved institution or user money or time?
9. Thank the participants and explain next steps.

The focus group process was designed so participants would determine the focus of the discussion.

There were many follow-up questions within the broad areas noted above. This led to discussions that varied greatly by topic as well as by amount of time spent on a particular topic. The focus group process was designed so participants would determine the focus of the discussion. As a consequence, there was a lot of variability across institutions. Interestingly, there was a great deal of similarity in the issues discussed. Some of the focus groups resulted in several different interesting possibilities for web accessibility cost follow-up while others clearly rested on one issue.

Many institutions had common areas of activity interest such as procuring accessible products and captioning. Yet they shared wide variations in how they were addressing these issues as well as variations in the activities themselves.

"Many institutions had common areas of activity interest such as procuring accessible products and captioning. Yet they shared wide variations in how they were addressing these issues as well as variations in the activities themselves."

COLLECTING COST INFORMATION

Key staff members from each institution were identified to complete additional time and cost protocols or, in some cases, guided interviews; this was dependent on the particular topic identified for in-depth study. These staff usually participated in the focus group, but occasionally participants who did not attend the focus group were asked to help provide information on the in-depth issue. When that occurred, each participant was briefed on what they were to do, and why it was important.

Time and cost protocols to quantify in-depth issue

Once the in-depth issue at the institution was identified, the GOALS economist associated additional methods to describe the costs and outcomes. In most cases she applied the ingredients method of cost analysis. Specific staffs were asked to complete time diaries. This tracked time spent on the in-depth issue that had become the focus

of the institutional case study. A cost form to capture the salary of individuals whose time was spent in the in-depth issue was also administered at all institutions where time tracking occurred. The cost form included salary and benefit questions as well as other resources the institution used to implement the activity under study. These could include professional development costs, software, hardware, overhead and other resources. The time diary and cost forms were designed to do several things. First, they were designed with diverse institutional issues and resource use in mind. The sections were set up so that respondents could skip cost sections that were not relevant to their particular issue. Second, the time diary and cost forms included a comprehensive list of resources so that they were designed to capture a comprehensive list of ingredients, resources, and their costs or prices, so that the full cost of the activity would be measured. In some instances a time diary and cost form could not be used to describe costs of a particular activity and an alternative method was identified to collect quantifiable data about the issue. In some cases, these alternatives included the use of extant data such as invoices that were billed and paid by the institution. In other cases, a guided interview was provided to collect data about the issue being explored.

"The cost form included salary and benefit questions as well as other resources the institution used to implement the activity under study."

It should be noted that the GOALS economist unexpectedly left the project for retirement prior to completing data analysis or the case study write-ups. Thus, in some instances a simple cost was calculated by GOALS staff members to represent the institutional issue.

The ***focus group protocol, cost, time diary,*** and ***sample interview protocols*** are included for your reference.

GOALS Focus Group Protocol

Purpose: To gather qualitative baseline information about the process of web accessibility in higher education. We will explore diverse stakeholder attitudes about the activities, time and other resources involved and the challenges past and present for each participant and institution involved in these discussions. Specifically, the questions are designed to identify additional issues that can be quantitatively measured through in-depth surveys with participants following these group discussions.

Participants: Separate focus groups will be conducted with constituencies from 12 institutions of postsecondary education. One person may serve more than one role. It is anticipated that each focus group will involve 8–12 participants that may represent the sample roles that follow:

- An individual from central administration (e.g., VP for Student services or CIO)
- Faculty member: on-line, remedial education, etc.
- Library representative
- Staff member from finance.
- Information Technology staff (preferably someone who assists with campus wide IT)
- A person involved in Section 504 compliance
- A person involved in ADA compliance (may be the same individual as above)
- An individual who works in faculty/staff IT training.
- An individual with a disability (e.g., faculty, staff, or student) who uses web content and needs that content to be accessible to them.
- Individual(s) from the Disability Resource Center (or equivalent group at your institution), including the director and one person who works with digital accommodations.
- Web Developer(s), including at least one individual who works with accessibility (e.g., designs content accessibly or retrofits content for accessibility accommodations).

RECRUITMENT OF PARTICIPANTS:

Focus Group Participants will need to be identified by one or two key staff at the institution that knows which staff would be most involved in web accessibility. We will contact each person and describe what is involved and that we will provide a modest $50 stipend for their participation. The final number of participants in the focus group should not exceed 12 people. Institutions have the right to anonymity for the institution and this will be decided after the case studies are completed by the institution administrator that is responsible for research activities on campus. This is explained in the participant consent and participants will be made aware that anonymity is decided at the institutional level not by each participant. Individual comments of participants will not be included in the focus group summaries or final case studies although there is a risk that participant identity may not be fully protected if the institution decides to allow the institution's name to be used in the final report of their case study results.

Follow-up Surveys will be developed based on the focus group findings within 1–2 months after the focus groups have been completed. These surveys will be sent to participants along with a deadline for returning it—respondents would be given about 2 weeks. A second survey may be developed at the end all of the focus groups to gather surveys that are designed for specific staff roles. Staff across all 12 institutions representing a specific role may have similar surveys administered. It is recommended that the lead staff member for this effort will personally invite representatives to attend the focus groups and then give the names of those who are interested to Goals staff for follow-up, and confirmation of their participation and full consent explanation and finalization. Both will mention the protection of confidentiality and the right to withdraw from the study at any time.

Time frame for holding focus groups: The targeted institutions for focus group participation will be selected in consultation with the institution's administrative staff. The focus groups should be **completed by the end of February, 2012 (for the first six participating institutions) and for all by June, 2012.**

A **two-hour** block of time is needed for each focus group. The lead institution contact will recommend a time of day that is feasible for participants.

Location: Ideally, focus groups are held in a location that is viewed as "neutral," e.g., conference center, a library, or a conference room on campus. The venue should be conveniently located, have parking available, hold 14 people comfortably, and allow food & beverages to be served. A large table with chairs, a flip chart, and a smaller table for the recorder are needed in the room.

Incentives: **Participants** will receive $50 for their participation in the cost study (includes the focus group and the survey) and this will all be paid after the focus group and the survey are both completed.

FOCUS GROUP DISCUSSION GUIDE:

List key issues and responses on a flip chart

Focus Group Questions: Explore institutional context, current status and activities of WA implementation, successes and challenges in implementing web accessible content.

1. Introductions, purpose, focus group "rules," warm up activity
   a. Facilitator and recorder introduce themselves
   b. Purpose of focus group: To gather qualitative baseline information about the who, what, when and where of web accessibility at the participating institution.
   c. Explain focus group process: Want to hear different opinions, don't need to agree; make sure everyone has an opportunity to be heard; may need to interrupt to change questions or give others opportunity to talk.
   d. Review participant consent form, plans to audiotape.

e. Ask Participants to introduce themselves: Please tell us Your name, position, how long in position, formal and informal background and training

2. Explore the institutional context—
   a. Centralized or decentralized IT?
   b. What is the overall size of the institutional web (sites, or pages, servers)?
   c. How is the web developed on campus?
   d. Is this on a regular repeating schedule (e.g., every 2 years) or at-will?
   e. Does web development go through any vetting by others? Describe the process.
   f. Do you use product development life cycle process (e.g., analysis, spec building, design and development, content writing, coding, testing, promotion, maintenance, and updates) or other systems when developing web sites?
   g. Is accessibility a part of what is considered?
   h. Describe the level of institutional commitment at your institution for web accessibility?
   i. Probe re: phase of web accessibility work (e.g., along our indicators: vision, policy plan, resources and support, or assessment).
   j. Does the campus use any web-based IT procurements? (examples include learning management systems or campus wide HR or financial systems)
   k. Are you aware if there are issues of web accessibility with those systems?
   l. If so how have you handled it?
   m. If you have a state web accessibility policy and state procurement system how did the system(s) pass the state requirement?
   n. What open source software are you using?
   o. Are there web accessibility issues with that?
   p. If so, how are you handling those?
   q. Do you have a procurement office that functions to purchase institutional software?
   r. Does it help with web accessibility?
   s. Do you have human resource efforts to help with web accessibility?
   t. Is web accessibility knowledge and skills included in job descriptions for relevant jobs?
   u. Is there Staff and personnel training in web accessibility?

3. Explain what happens on your campus for web accessibility?
   a. What is the process?
   b. What happens if a student or other user files a request or complaint about web content?
      i. Re: first steps? Who? What? When? Where?
      ii. Re: funding for your response to the student?
      iii. Tell us about your response? Is it effective? Could it be done at lower cost? When do most of the web accessibility activities occur? In response to individual needs? Proactively?

iv. What do you think of your institution's response to the complaint or request?
Examples: 1) Captioning: Suppose you have a new student who is deaf and enrolls in a course with a heavy online video component. How would you respond to their needs? 2) If you are moving to a new platform…a student information system that pulled all IT staff for several months. What will you do to accommodate for students that need it right now?

4. What do you think of your institution's web accessibility strategy overall?
5. Given your experience and what you know about web accessibility what would you tell a new institution that was just getting started?
6. What are you not doing that you would be doing if you had greater web accessibility?
7. What are you doing for web accessibility for on-line courses?
8. How do you think the web accessibility could be improved? ***Timing (quick response team or a queue?), cost-effectiveness, training, funding, comprehensiveness of the response?***
   a. Are there specific strengths or problems such as retrofitting content in response to complaints?
   b. How do you think web accessibility content could be improved, i.e. training, awareness of staff, resources up front, administration, etc.?
   c. What would make your web accessibility better?
9. Thank the participants. We will follow-up with surveys to you and the responses from the focus groups and surveys will be reported in a case study describing your institution and the other 11 institutions as well.

GOALS Cost Web Accessibility Protocols

Instructions:
Attached are time diary and cost surveys for the GOALS Cost Case Study at your institution.

The **Expertise Rating and Activity Time Diary Log** is to be completed by anyone at your institution who is spending time on the in-depth cost issue that is the focus of the GOALS cost study. Staff is to use this form to track all time that is spent on your institution's in-depth issue as it pertains to web accessibility only. For example, if you were looking at the cost of creating reasonable accommodations, you would only look at that portion specific to creating accommodations for web content, not for all digital content (e.g., text books and instructor notes).

The **Cost Form** is to be filled out by the lead staff member for the GOALS Cost Case Study. This form is designed to capture all staff salaries, benefits and other resources that may be used as part of the in-depth cost issue at your institution. The most important resource is personnel cost and therefore most of the questions are designed to capture those items (e.g., relevant personnel training, experience, salary or wages and benefits). Personnel may be your only cost incurred. The personnel descriptions of all staff that complete time diaries should be included in the cost time diary questions on personnel professional development, experience, training, time, benefits, salaries and wages. There may also be personnel included in the cost forms that did not complete a time diary. If so leave the other categories blank or write zero in any category that is not used as part of your in-depth issue and web accessibility. Questions about other resources that your institution may incur as part of the in-depth issue being evaluated such as software, materials and supplies and overhead are included to determine whether these are used and if so the amount and cost of each. Please include descriptions of any of these that are relevant. The Lead Economist for the project, Linda Goetze, will phone you to help you complete these forms. She can be reached at *(number given)* or by email at *(email given)*. **These forms should be completed and returned to Linda by November 1st, 2012.**

Expertise and Activity Time Diary Log

Please include only expertise ratings and time spent on activities that are related to both web accessibility and your institution's in-depth cost issue. **This form should be completed and returned by November 1st, 2012 via fax to *(fax given)* or email to *(email given)*.**

Your in-depth cost issue is: _____

Each person who spends time on your institution's in-depth cost case study should complete an activity time diary log.

- Institution Name:
- Name of person completing this form:
- Phone Number:
- Email address:
- Date and time diary was begun:
- Date and time diary ended:

A: EXPERTISE AND PROFESSIONAL DEVELOPMENT RELATED TO WEB ACCESSIBILITY AND YOUR IN-DEPTH COST ISSUE:

1. On a scale of 1 to 5 with 1 being the lowest rating and 5 being the highest please rate your expertise on web accessibility _____
2. Have you had professional development that helped you get to this level for web accessibility? If yes please describe it:
3. On a scale of 1 to 5 with 1 being the lowest rating and 5 being the highest please rate your expertise on this in-depth issue _____
4. Have you had professional development that helped you get to this level for your institution's in-depth issue? If yes please describe it:

B: TIME DIARY LOG

Please include only time spent on activities specifically involved with your institution's in-depth issue and web accessibility. For example, you attend a 60-minute procurement meeting where 15 minutes was spent on procurement of accessible web products, report 15 minutes not 60 if your in-depth issue is procurement. Please report an activity code each day. If you don't spend time on the in-depth issue for a day or more please give the date and use code 14 or write zero next to the date. This will tell us that it is not missing data and that no time is spent on that day(s).

DATE	*ACTIVITY CODE AND DESCRIPTION*	*TOTAL MINUTES SPENT ON YOUR IN-DEPTH ISSUE AND WEB ACCESSIBILITY*	*NUMBER OF ADDITIONAL STAFF INVOLVED IN THIS ACTIVITY (FOR GROUP ACTIVITIES)*

DATE	ACTIVITY CODE AND DESCRIPTION	TOTAL MINUTES SPENT ON YOUR IN-DEPTH ISSUE AND WEB ACCESSIBILITY	NUMBER OF ADDITIONAL STAFF INVOLVED IN THIS ACTIVITY (FOR GROUP ACTIVITIES)

WEB ACCESSIBILITY AND PROCUREMENT ISSUE ACTIVITY CODES:

1. Meetings
2. Communications (e.g. email, phone, face-to-face incidental) where focus is on web accessibility and your institution's topic
3. Institutional wide assessment
4. Retrofitting existing materials for accessibility
5. Manual web accessibility testing
6. Automated web accessibility testing
7. User web accessibility testing
8. Create materials, documents or training
9. Comment or rate
10. Report writing or creation
11. Travel
12. Provide Tech support
13. Troubleshoot system
14. Training or other professional development received
15. Training or other professional development provided
16. No time spent on this date doing web accessibility and the in-depth issue
17. Other Activity _____
18. Other Activity _____
19. Other Activity _____
20. Other Activity _____

2012 GOALS Cost Case Study Survey

Institution Name:

Lead Contact Name:

Survey Completed by:

Date Completed:

In-Depth Cost Issue:

What is the beginning and end date during which your time and costs for your in-depth issue were incurred?

Beginning Date: End Date:

Each institution focuses on a different in-depth cost issue. Only some of the cost categories in this survey may pertain to your in-depth issue. Choose yes or no (below) then proceed to fill out the sections that you check yes there was a cost in that category for your institution's work on your in-depth issue.

Section I: Personnel (pages 2–5)	*Yes*	*No*
Section II: Subcontractors and or Consultants (page 5–6)	*Yes*	*No*
Section III: Annual Overhead Costs (page 6)	*Yes*	*No*
Section IV: Other Operating Costs (e.g. software Materials & supplies, staff travel, assistive technology, or other costs) (page 6–7)	*Yes*	*No*

Please return this completed survey to Linda.Goetze@usu.edu by November 1st, 2012 by email or fax 435 797 9724.

COST CATEGORY

I. Personnel

1. Personnel Benefits

a. Please provide your benefit rate that is in addition to salary for the following employees:

Contract employees_____ Hourly employees_____ Students_____

Use ***Table A*** to describe all benefits that your institution provides to employees in addition to salary. Check all that apply for each employee type.

Table A: Benefits for Contract, hourly and student employees:

BENEFITS PROVIDED	*CONTRACT*	*HOURLY*	*STUDENTS*
Health Insurance			
Dental Insurance			
Life Insurance			
Short Term Disability			
Long Term Disability			
Other _____			
Other _____			

2. Personnel Professional Development, Staff Education/Training Costs

Fill out ***Tables B*** and ***C*** completely for all employees participating in your in-depth cost issue. You may need to copy it as we only had space to reflect 8 individuals per page.

Table B: Definitions and descriptions:

a. **Name:** Please list the first and last name of each individual
b. **Job Titles/Positions:** Please list the title of the personnel position. If there are more than one please list the one that best relates to the in-depth issue (e.g., an IT professional may have 2 positions at your institution and the one that relates best to your issue may be "web developer").
c. **Years Experience at this position:** Please list the number of years the individual has had at the position you listed in "b" above (e.g., while they may have been at your institution for several years, they may have only held the position that relates to your in-depth issue for 2 years).
d. **Educational level / Discipline:** Please list the highest level of educational attainment and the discipline (e.g., Master's in Instructional Technology).
e. **Professional development:** Did any of these staff have professional development in web accessibility? Or did they receive professional development related to the in-depth issue? It's not bound by the time frame of the cost study. If so, please describe it.

Table B: Personnel Position, Training, Education and professional development

NAME	*POSITION*	*YEARS EXPERIENCE*	*EDUCATIONAL LEVEL/ DISCIPLINE*	*PROFESSIONAL DEVELOPMENT*

What was the total expenditure for professional development, education or training for staff to learn what they needed to learn for your in-depth issue? This would include the following:

a. Fees for workshops or courses: $
b. Conferences: $
c. Travel allowances (for trainings only): $
d. Other types of staff training/professional development: $
e. Total year's staff education/training costs: $

3. Personnel Time and Salary or Wages

a. How many hours are in a typical full-time work week? _____
b. How many hours are in a typical workday? _____
c. How many total hours per year do your employees work (after deducting paid sick and annual leave)? _____

In table 3 please list the name (identical to the list in Table 2) time worked, and wages or salary for each individual using the definitions in a through d below.

Table C: Personnel time and salary or wages

a. **Name:** Please list the first and last name of each individual
b. **Total months worked:** Please let us know how many months a year this individual works (e.g., 9 months, 12 months)
c. **Total hours per week:** Please list the total hour this individual works (on average) each week
d. **Total hours on the in-depth issue:** Please let us know the amount of time (on average) this individual works on your institution's in-depth issue

e. **Total salary or wage:** Please list the total monthly salary (or annual if monthly varies) for each individual as a gross salary amount (before taxes are removed and before benefits)
f. **Total benefits:** Please list the dollar amount that is reflected in the benefits for each individual on a monthly basis (or annual if monthly varies)

Table C: Personnel Time and Salary or Wage Rate

NAME	*TOTAL MONTHS WORKED*	*TOTAL HOURS PER WEEK*	*TOTAL HOURS INDEPTH ISSUE*	*TOTAL SALARY OR WAGE*	*TOTAL BENEFITS*

II. Subcontractors and/or Consultants:

We would like to know about subcontractors or consultants who work on the in-depth issue at your institution. These are the people for whom you do not pay benefits and who are not employed directly by your institution but through a contractual agreement. You may not have any people who fit in this category.

Table D describes consultant compensation

a. **Type of service:** describe the type of service the consultant or organization performed for your institution.
b. **Dates of service:** indicate when service started and ended. If service has not been completed, estimate the date of completion.
c. **Total Days or Service Hours:** Provide the actual or estimated number of days or hours for which the consultant will be paid. If service included training with staff, indicate how many staff received training.
d. **Compensation Rate:** List the hourly or daily rate paid to the consultant for services (may not apply to organizational contracts).
e. **Total Compensation:** List the total amount paid to the consultant for services based on columns C & D over the period of time reflected in this survey. Please provide the percent or dollar amount of total compensation for activities related to your in-depth issue. Feel free to make comments to clarify this Sheet at the end of the survey.

Table D: Consulting Compensation

TYPE OF SERVICE	*DATES OF SERVICES*	*TOTAL DAYS OR SERVICE HOURS*	*COMPENSATION RATE*	*TOTAL COMPENSATION*

III. Total Annual Overhead Costs

Thinking about the department and staff involved in your in-depth cost case study what overhead rate or cost would you apply to this cost study keeping in mind the department's use of space, administrative supervision, and other overhead expenses?

_____% of Direct Costs

IV. OPERATING Costs

If applicable please report costs incurred at your institution that have not been reported elsewhere on this form.

For our purposes we will use the following definition for equipment:

Equipment: something that **lasts more than 1 year** and costs over $500 such as a copy machine

Software: Something that was specifically purchased or licensed and used for the issue identified on page one (this does not include assistive technologies used by students or staff with disabilities)

This information may be available on a financial report, budget, tax statement, audit or other type of document. You may attach a copy of any such documents to this survey

Table E: Other Operating Costs for Web Accessibility Issue for Your Institution

COST TYPE	*COST OF ITEM USED FOR THE ISSUE IDENTIFIED ON PAGE ONE*
Software (See definition)	
Rental Equipment and maintenance on rental equipment	
Staff travel	
Photocopying, copy paper, printing, publications	
Assistive Technology	
Licensing and fees	
Other, please specify:	
TOTAL ANNUAL "OTHER" OPERATING COSTS	

V: Comments/Clarification

Describe other expenditures/revenues that are important to understanding the resources used for the issue we are tracking from page one of this survey:

Is there any other relevant information or comments you would like to provide?

APPENDIX B

COSTS TO LITIGATE (OR BENEFIT TO NOT LITIGATE) A STUDENT COMPLAINT

CASE STUDY 1

Context

Total enrollment at this state university exceeded 40,000.

The information for this case study comes from a state university. At the time of cost collection, this large 4-year public institution resembled many across the nation. They had roughly 2,300 faculty members, with 650 of these as part time or adjunct faculty. Their total student enrollment was over 40,000 with most (i.e., 32,000) seeking undergraduate degrees. About 6% of the student body was registered with the Disability Resource Office.

Institutional Indicator for web accessibility

The institution was at the beginning of getting administrative buy-in for the need to implement web accessibility campus-wide. For this reason, we would categorize the institution as an *Indicator 1* institution. With that said, there were individual units that had begun to work on web accessibility and experts on campus who were available to provide assistance to the campus community.

In-depth issue

This case study outlines the cost of litigating a complaint of web accessibility through to settlement.

The case study presented here is the cost of litigating a complaint of web accessibility through to settlement within this one institution. The case study is interesting from a cost perspective because all costs presented here represent a fiscal benefit for making content accessible. In other words, if content were accessible, the campus would not need to spend resources on a complaint. Whether the complaint was justified or not, the costs were real.

The issue of a legal complaint is one that weighs on the minds of many in higher education administration. There are many reasons why institutions are working to improve the accessibility of digital content for faculty, students and staff who have disabilities. Federal law requires institutions that accept federal funds, to provide equal opportunity for persons with disabilities. Today that equal opportunity includes equal access to content in web and other digital media. There have been a number of lawsuits brought against institutions of higher education for violation of equal opportunity under Section 504 of the Rehabilitation Act as well as the American with Disabilities Act (ADA). The costs to mitigate student complaints that

> *"The case study is interesting from a cost perspective because all costs presented here represent a fiscal benefit for making content accessible."*

stem from inaccessible content can be high, both in terms of dollars and reputation. The cost that may result from legal action is a strong incentive for institutions of higher education to improve their efforts to make web content accessible for those who benefit from it.

A student with a disability alleged that inaccessible web content prevented the completion of required coursework.

In this case, a student with a disability alleged that inaccessible web content prevented coursework completion. What made the situation even more challenging was that this coursework was required to secure the degree sought by the student. An advocacy organization assisted the student throughout the process after requests made by the student did not accomplish the accessibility they desired. Next, a formal complaint was filed with the Office of Civil Rights. Two semesters later, when no resolution was allegedly in sight, they began the litigation process. After nearly a year, the institution entered into a settlement agreement. They were required to pay the fees and expenses incurred by the advocacy organization, damages to the plaintiff, fees for outside counsel, and to make their web content accessible.

Results

The cost was sizable for this institution. First, they attempted to make an after-the-fact accommodation for the course. This was ultimately not acceptable to the student or to the Office of Civil Rights. At the time of the complaint they had already spent over $30,000 in hardware and software (at $20,000) and salaries (at $10,356) trying to address the issue, without success. Once it went into litigation, the institution had access to State counsel. While that was a real cost to the State, who pays the salary for State counsel? It is not included here as it was not a specific cost paid out by the particular institution. ***Table B1*** provides a summary of what the institution paid.

The institution did, however have to pay for outside counsel and legal fees of roughly $115,000. Moreover, they paid damages to the plaintiff of $150,000. The settlement agreement also included a requirement to pay the costs incurred by the advocacy organization. They submitted total attorney and paralegal fees of $389,000. They also submitted expenses for co-counsel, a mediator, an expert, and travel of $117,000. Thus they submitted costs for the institution to reimburse $506,000. The institution reimbursed the advocacy group $235,000 and they are disputing the remaining balance of $271,000 as unreasonable.

"The settlement agreement also included a requirement to pay the costs incurred by the advocacy organization. They submitted total attorney and paralegal fees of $389,000."

Table B1: Known costs incurred by the Institution during the pre-trial process leading to a settlement

ITEM	KNOWN COSTS BILLED TO THE INSTITUTION	ADVOCACY ORGANIZATION COSTS (TO BE PAID BY THE INSTITUTION)	NOTES
Hardware, software, and personnel time to create an after-the-fact fix	$30,356		
Total attorney and paralegal fees		$389,000	The institution disputed payment of $271,000 as unreasonable fees.
Co-counsel, mediator, expert, and travel		$117,000	
Damages to Plaintiff	$150,000		
Outside counsel and fees	$115,000		
TOTAL	$295,356	$506,000	$801,356

What is unknown are the real costs incurred by the institution as their staff met numerous times, as they traveled and were deposed, and as they worked together to address the complaint. The records were not available as to which groups met for how long, and how many times they met, or the hours needed to pull together documentation required during this complaint and pre-trial process. While our institutional contact agreed that this would be in the hundreds of hours, a comprehensive recollection was not possible. It is noteworthy that those involved in meetings such as these would most likely be in the top tier of the institutional salary schedule.

We do not know the cost of the numerous meetings held on this topic. Most attendees were likely in the top salary tier.

Thus, the total known out-of-pocket costs for this complaint by both the institution and advocacy group are $801,356. The current monies paid by the institution is $530,356. If the remaining advocacy charges are upheld, the total cost paid out by the institution will be in excess of $800,000; remember, this does not include institutional meetings or work on the complaint or settlement by institutional staff and faculty members. We were told that legal and court costs would have been significantly higher if the case had continued on a track through the courts. The costs reported here are the costs of taking a case through part of the pre-trial discovery process. Institutions often cannot avoid engaging in this work, and the associated costs, even if a case settles prior to trial. The Office of Risk Management paid out most all of these costs.

Sadly, even this figure would not begin to represent the actual cost paid by the institution. For example, the settlement required that web content be made accessible. This is a cost that is not reflected here; yet it is a cost attributed to the litigation because it was required in the settlement. Moreover, there are real costs to the institution's reputation, and perceptions by those in the local and postsecondary education community. It is not known if these events affected campus wide development efforts, the acquisition of competitive grants and contracts, or State legislative appropriations at the time it was unfolding. If any of these occurred, the cost to the institution was appreciably higher.

Such a simplified analysis omits many dollar and non-dollar costs attributed to the litigation. For example, the student who raised the complaint did not attain a degree from this institution, and at the time of this writing has not obtained a degree from any institution. What are differences for this student in lifetime earnings, or the taxes they would have paid? No one would argue that failure to obtain a 4-year degree will reduce this student's future opportunities and overall quality of life. However, other costs are not quantified in this analysis. For example, one has to consider the opportunity costs to staff at both the advocacy organization and the institution. What endeavors would these individuals have accomplished, if they did not place their energy into fighting this legal issue? Certainly when we only include what was billed, we are underestimating the real cost of this action.

"Moreover, there are real costs to the institution's reputation, and perceptions by those in the local and postsecondary education community."

There are fiscal consequences when digital content in higher education is not accessible to all.

Of course proactive work to increase the accessibility of web content before it becomes a barrier to individuals with disabilities benefits a broader group of stakeholders (i.e., students, staff, faculty and community members). As this case shows, there are fiscal consequences when digital content in higher education is not accessible to all. While advocates of web accessibility state the work makes sense from a human perspective, here is an example that includes a financial one as well.

APPENDIX C

COSTS TO RETROFIT ALL ONLINE COURSES OF A DISTANCE EDUCATION UNIT

CASE STUDY 2

CONTEXT

This large community college had over 30,000 active students, and just over 2,000 faculty members.

The information for this case study comes from a large community college. The college has 4 physical locations to deliver programs as well as a well-established distance and online learning program. When the case study was collected, it had over 30,000 active students, and just over 2,000 faculty members, making it a large 2-year program. Over three-quarters of its faculty are part-time or adjunct. College staff reported high numbers of both turnover and new hires (e.g., as they continue to grow they hire additional part time faculty from other campuses who teach online learning as an overload). They reported a centralized IT infrastructure for the main campus pages, but a decentralized structure for online coursework. Their student body included about 5% registered to receive supports from the Disability Service Office.

INSTITUTIONAL INDICATOR FOR WEB ACCESSIBILITY

At the time of the GOALS case study, this institution had made the case to their administration regarding the importance of web accessibility. The result was a support for accessibility and campus-wide change. They had just completed a draft of their web accessibility standards, and were working to get administrative approval prior to implementation. Because of this, we would consider this college to be an *Indicator 2* campus, where they were focusing energies on creating policy and engaging in planning for large-scale implementation.

> ***"[The institution] had just completed a draft of their web accessibility standards, and were working to get administrative approval prior to implementation."***

IN-DEPTH ISSUE

The topic of interest for this institution was to identify costs necessary to retrofit 1,159 existing inaccessible online courses offered through their distance education unit. Since this would not represent the cost to make content accessible from the beginning, but rather represent the worst case scenario—accessibility as an after-the-fact-accommodation—it would provide them with a useful baseline against which future accessibility initiatives could be judged. Moreover, it sadly represents what many campuses believe they should do—add on accessibility after a course or site is already built. Many view this approach to be the most inefficient way to tackle accessibility.

With that said, for institutions new to web accessibility they must make tough decisions about what to do with their large portfolio of existing, inaccessible coursework.

RESULTS

In order to identify costs, the institution engaged in 8 distinct steps. Each is described below. It should be noted they used the key methods outlined in the Farr, Studier, Sipes, & Coombs, (2009) report[xi] that detailed an ingredients approach to estimate the cost of web accessibility in distance education courses of the California Community Colleges.

1. First, the institution needed to determine the standard to which accessibility would be evaluated. They decided courses would be evaluated to the Level AA success criteria found in the *Web Content Accessibility Guidelines (WCAG) 2.0*
2. Next, they chose to identify a sample set of courses that would serve to represent the broader population of their existing online courses. They identified 6 courses that represented the 3 most common course types. This provided them with courses of varying length and complexity useful as they built a model for estimating cost for retrofitting the entire distance education portfolio.
   a. Two courses were simple and contained mostly text and links. None of these contained any multimedia elements;
   b. Two courses were moderately complex and contained video and or audio elements. They did not include any interactive elements;
   c. The final two courses were considered complex courses with dynamic elements and interactivity.
3. Once a sample set of courses was identified, 4 reviewers were randomly assigned to evaluate the accessibility of 3 of the 6 sample courses. This ensured that two different individuals evaluated each course. These reviewers were:
   a. The Disability Student Director
   b. Online Development Facilitator
   c. Instructional Technology Specialist / Accessibility Advocate
   d. Accessibility Assistant
4. Along with an evaluation against WCAG 2.0 AA success criteria, reviewers included determinations as to whom they believed should make changes to accessibility errors uncovered during the review. For example, it was their opinion that faculty members should be able to fix headers or list styles in Word documents or place alternative text on images on their own. However, someone with technical expertise should be the one to handle the accessibility of a complex PDF form or dynamic content. ***Table C1*** displays each item for review and the individual who the review team deemed to be the responsible party to make the accessibility fix.

"Along with an evaluation against WCAG 2.0 AA success criteria, reviewers included determinations as to whom they believed should make changes to accessibility errors uncovered during the review."

Table C1: Course items and persons deemed responsible to make accessibility fixes

ITEM	DESCRIPTION OF HOW IT SHOULD BE ACCESSIBLE	RESPONSIBLE PARTY TO FIX ERRORS
Course review	Review entire course for accessibility.	Accessibility Advocate for online classes
Images and non-text elements	Information for images and non-text elements.	Faculty member
Web pages and Word Documents	Give structure to documents with headings and lists.	Faculty member
PDFs	Made from electronic document.	Faculty member
	A complex form or scanned article.	Alt. Media Specialist
Link text	Real words that describe the destination should be used for link text.	Faculty
Presentations (such as PowerPoints)	Should be constructed and shared in a way that allows users to access content and speaker notes in a logical, meaningful way.	Faculty
Forms, Surveys, Quizzes/ Tests outside of LMS and editable	Should be constructed and deployed in a way that allows users to complete and submit regardless of input method. (If constructed within LMS, no need to retrofit quiz structure.)	Faculty
Simple Data Tables	Tables should have headers, a logical reading order and one or more of: summary, alt text or caption.	Faculty for simple table in Word or HTML
Complex Data Tables	Tables with two or more logical levels of row or column headers need to be marked up to associate data cells with header cells.	Alt Media Tech
Use of Color	There needs to be adequate color contrast in web pages and documents.	Faculty
Flashing/Blinking Content	Should only be used when necessary and not for longer than 3 flashes per second.	Alt. Media Tech
Audio recordings	Audio recordings should be transcribed.	Faculty
Videos – produced by the institution (including instructor-made)	Should be captioned.	Faculty
Videos not produced by the institution	Should be captioned.	Outsourced

5. The reviewers estimated the amount of time it would take for the person identified to make the accessibility fix.. In some instances the reviewers used existing data on time to make changes (e.g., Farr, Studier, Sipes, & Coombs, 2009[xii]). In other instances they performed the changes themselves or used experts to help identify the time needed to fix errors. Reviewers discussed and came to consensus when there were any disagreements on the personnel or time to fix the error. Time estimates that were provided assumed knowledge and skills of faculty and staff "as if" they had received training and were fluent in making the change. Thus, these estimates do not represent time for a novice to fix errors.
6. They then took information from each reviewed sample course (e.g., number and types of errors, the appropriate person to fix those errors, and the estimated time to make the fix) and estimated the cost to retrofit the accessibility of each course type (i.e., for simple, moderately complex, and complex courses). Because of the small sample it would not make sense to average estimates across the 2 courses. So both estimates are displayed (i.e., as courses A&B; C&D; and E&F). Time and money to make fixes are displayed as a range with both courses establishing the variability. They used faculty and staff salary averages to build out the cost of fixing each course type. They did not include any fringe benefits in their estimates. The average salaries were the following:
   - Accessibility Advocate for Online Courses: $25/hr
   - Alt. Media Specialist: $25/hr
   - Alt. Media Tech: $15.76/hr
   - Faculty member: $64.04/hr | $1.07/min
     i. They also provided an estimate of cost if the faculty member was paid based on a flat course revision fee, or special project and curriculum development rate of $29.04/hr | $.48/min rather than the full salary base

Tables C2 through C4 display the results of the course reviews by course type and item.

Table C2: Costs by item to fix two sample courses identified as "Simple"

ITEM	TIME AND COST PER ITEM FOR SIMPLE COURSES	TOTAL ITEM & COST FOR SIMPLE COURSE "A"	TOTAL ITEM & COST FOR SIMPLE COURSE "B"
Course review	1 hr at $25/hr (Access Advocate)	1 hr review = $25	1 hr review = $25
Images and non-text elements	1 min/image; $1.07/image (Faculty)	0*	0*
Web pages and Word Documents	10 min/page; $10.67/page (Faculty)	36 pages = 6 hrs = $384.24	37 pages = 6 hrs & 10 min = $394.88
PDFs	30 sec/page; $0.54/page (Faculty)	0*	7 pages = 3 mins and 30 secs = $3.78
	10 min/pg; $4.16/page (Alt media specialist)	0*	0*
Link text	30 sec/link; $0.54/link (Faculty)	0*	2 links = 1 min =$1.07
Presentations (such as PowerPoints)	4 min–6.5 min/page; $4.28 to $6.96/page (Faculty)	0*	0*
Forms, Surveys, Quizzes/ Tests outside of LMS and editable	2.5 hrs/form, survey, quiz or test; $160.10 (Faculty)	0 outside of LMS	0*
Simple Data Tables	1 min/simple table in a Word document; $1.07 (Faculty)	0*	0*
	15 min for a simple html table; $16.01 (Faculty)	2 tables = 30 min = $32.02	2 tables = 30 min = $32.02
Complex Data Tables	45 min/table; at $11.82/complex table (Alt Media Tech)	0*	2 tables = 90 min = $23.64
Use of Color	1 min/color instance; $1.07/instance of color (Faculty)	0*	0*
Flashing/Blinking Content	45 min/instance; $11.82 /instance (Alt Media Tech)	0*	0*
Audio recordings	5 min at $5.35/min of audio (Faculty) =$26.75	0*	0*
Videos – produced by the institution (including instructor made)	8 min at $8.56/min of video (Faculty) =$68.48	0*	0*
Videos not produced by the institution	$132/hr or $2.20/min (Outsourced)	0*	0*
Total time and cost to retrofit a simple course when faculty are paid regular rate of $64.04/hr and staff rates as noted		Sample course A **$441.26** (7hrs 30 min)	Sample course B **$480.39** (9hrs 14min)
Total time and cost to retrofit a simple course when faculty are paid a curriculum development or course review rate of $29.04/hr and staff rates as noted		**$213.76** (7hrs 30 min)	**$244.41** (9hrs 14 min)

** Indicates there was no item in the sample course, thus no fix necessary; the time and cost would be 0.*

Table C3: Costs to fix two sample courses identified as "Moderately Complex"

ITEM	TIME AND COST PER ITEM FOR MODERATELY COMPLEX COURSES	TOTAL ITEM & COST FOR MODERATELY COMPLEX COURSE "C"	TOTAL ITEM & COST FOR MODERATELY COMPLEX COURSE "D"
Course review	2–3 hrs; $50–$75/review (Access Advocate)	$50–$75	$50–$75
Images and non-text elements	1 min/image; $1.07/image (Faculty)	0*	18 images = 18 mins =$19.26
Web pages and Word Documents	10 min/page; $10.67/page (Faculty)	39 pages = 6 hrs & 30 min = $416.26	52 pages = 8 hrs & 40 min = $554.84
PDFs	30 sec/page; $0.54/page (Faculty)	46 pages= 23 mins = $24.84	0*
	10 min/page; $4.16/page (Alt media specialist)	0*	0*
Link text	30 sec/link; $0.54/link (Faculty)	0*	5 links = 2.5 min = $2.70
Presentations (such as PowerPoints)	4–6.5 min/page; $4.28–$6.96/page (Faculty)	0*	0*
Forms, Surveys, Quizzes/ Tests outside of LMS and editable	2.5 hrs/form, survey, quiz or test; $160.10 (Faculty)	0*	0*
Simple Data Tables	1 min/simple table in a Word document; $1.07 (Faculty)	0*	0*
	15 min for a simple html table; $16.01 (Faculty)	0*	2 tables = 30 min = $32.02
Complex Data Tables	45 min/table =$11.82/complex table (Alt Media Tech)	1 table = 45 min =$11.82	1 table = 45 min =$11.82
Use of Color	1 min/color instance; $1.07/instance of color (Faculty)	0*	1 instance =1 min =$1.07
Flashing/Blinking Content	45 min/instance; $11.82 /instance (Alt Media Tech)	0*	0*
Audio recordings	5 min at $5.35/min of audio (Faculty) =$26.75	0*	0*
Videos – produced by the institution (including instructor made)	8 min at $8.56/min of video (Faculty) =$68.48	828 mins of video x 8 faculty min per each video min =110 hrs 24 min of captioning work = $7,087.68	344 mins of video x 8 faculty min per each video min = 45 hrs 52 min of captioning work = $2,944.64
Videos not produced by the institution	$132/hr or $2.20/min (Outsourced)	2 hrs and 4 min of video = $272.80	0*
Total time and cost to retrofit a moderately complex course when faculty are paid regular rate of $64.04/hr + staff rates and captioning rates as noted (121 hrs 6 min–122 hrs 6 min, depending on the review)		Sample Course C **$7,863.40–$7,888.40** Depending on initial review time	Sample Course D **$3,616.43–$3,641.43** Depending on initial review time
Total time and cost to retrofit a moderately complex course when faculty are paid a curriculum development or course review rate of $29.04/hr + staff and captioning rates as noted		**$3,740.44–$3765.44**	**$1,670.32–$1,695.32**

** Indicates there was no item in the sample course, thus no fix necessary; the time and cost would be 0.*

Table C4: Costs by item to fix two sample courses identified as "Complex"

ITEM	TIME AND COST PER ITEM FOR COMPLEX COURSES	TOTAL ITEM & COST FOR COMPLEX COURSE "E"	TOTAL ITEM & COST FOR COMPLEX COURSE "F"
Course review	4 hrs at $25/hr (Access Advocate)	$100	$100
Images and non-text elements	1 min/image; $1.07/image (Faculty)	226 images = 226 min (3 hrs 46 min) = $241.82	40 images = 40 min =$42.80
Web pages and Word Documents	10 min/page; $10.67/page (Faculty)	49 pages = 490 min (8 hrs 10 min) = $524.30	48 pages = 480 min (8 hrs) = $513.60
PDFs	30 sec/page; $0.54/page (Faculty)	0*	4 pages; 2 min; $2.16
	10 min/pg; $4.16/page (Alt media specialist)	0*	3 pages; 30 min; $12.48
Link text	30 sec/link; $0.54/link (Faculty)	0*	Too many links to count
Presentations (such as PowerPoints)	4 min–6:30 min/page; $4.28–$6.96/page (Faculty)	0*	0*
Forms, Surveys, Quizzes/ Tests outside of LMS and editable	2.5 hrs/form, survey, quiz or test (Faculty)	7 Word doc forms not formatted as forms =17.5 hrs (1,050 min) = $1,120.70	40% of the forms and quizzes were from outside websites and not editable. No estimates to fix them, these would require an accommodation.
Simple Data Tables	1 min/simple table in a Word doc; $1.07 (Faculty)	0*	0*
	15 min for a simple html table; $16.05 (Faculty)	68 HTML tables =1,020 min (17 hrs) =$1,091.40	13 tables =195 min (3 hrs and 15 min) =$208.65
Complex Data Tables	45 min/table =$11.82/complex table (Alt Media Tech)	1 table = 45 min =$11.82	0*
Use of Color	1 min/color instance; $1.07/instance of color (Faculty)	0*	0*
Flashing/Blinking Content	45 min/instance; $48.15/instance (Alt Media Tech)	0*	0*
Audio recordings	5 min at $5.35/min of audio (Faculty) =$26.75	68 of musical recordings. No way to transcribe them (they are instrumental) but musical scores should be used when possible.	0*
Videos – produced by the institution (including instructor made)	8 min at $8.56/min of video (Faculty) =$68.48	30 min of video x 8 faculty min/each video min =240 min (4 hours) of captioning =$256.80	12 min 16 sec of video x 8 faculty min per each video min = 98 min (1 hr 38 min) =$104.86
Videos not produced by the institution	$132/hr or $2.20/min (Outsourced)	0*	1 video 16 min long =$35.20
Total time and cost to retrofit a complex course when faculty are paid regular rate of $64.04/hr		Sample Course E **$3,346.84** (55 hrs and 11 min)	Sample Course F **$1,019.75** (18 hrs and 53 min)
Total time and cost to retrofit a complex course when faculty are paid a curriculum development or course review rate of $29.04/hr		**$1,573.54**	**$540.05**

** Indicates there was no item in the sample course, thus no fix necessary; the time and cost would be 0.*

7. Next, they classified their existing 1,159 courses into one of the 3 levels of complexity (i.e., simple, moderately complex, and complex). They estimated that 70% of the online courses at the time of case study data collection would be categorized to be "simple" (n=811). 29% of online course would be categorized to be moderately complex (n=336), and only 1% of their existing online courses would be considered complex (n=12).
8. Finally, to arrive at a total estimated time, and cost of making all existing online courses accessible, they multiplied the number of courses in each complexity level by the estimated time and costs to retrofit courses from their sample. ***Table C5*** displays this information. Please note that the range contained in these figures is due to the use of data from both reviewed courses.

Table C5: Cost and time estimates to retrofit online courses of varying complexity for accessibility

	SIMPLE	*MODERATE*	*COMPLEX*	*TOTAL*
Total courses	811 (70%)	336 (29%)	12 (1%)	1,159 (100%)
Time in staff weeks to retrofit (a week is assumed to be 40 hrs)	152–188 staff weeks	509–1,026 staff weeks	4–17 staff weeks	665–1,231 staff weeks
Costs assuming special faculty rate ($29.04/hr)	$173,359–$198,217	$561,228–$1,265,188	$6,481–$18,882	$741,068–$1,482,287
Costs assuming full faculty rate ($64.04/hr)	$357,862–$389,596	$1,215,120–$2,650,502	$12,237–$40,162	$1,585,219–$3,080,260

Estimated costs to retrofit all 1,159 courses are 3/4 to 3 million dollars. This is conservative as training is not included in these figures.

Thus, it is likely this institution would expend between three-quarters of a million dollars to over three million dollars if they chose to retrofit all existing online courses. This is viewed as a conservative figure. In part because some costs were not included in the model (e.g., fringe benefits added to the salary line), and in part because it contained assumptions that would result in a cost for the institution (i.e., that all faculty and staff are already trained and can make the changes "as if" they know what to do). So the likely cost scenario is much higher than these data display.

It is important to note that some costs are unknown when trying to retrofit the more complex courses. While on the face of it, it appears that retrofitting a complex course would cost approximately 2.3 times the simple course (i.e., an average cost to fix the least expensive simple course assuming a full faculty rates is $441 whereas the comparable complex course is estimated at $1,020). However, what is not accounted for is the fact that many of the interactive widgets and elements could not be retrofitted by anyone at the college whatsoever. Thus estimates were not included in these cases. This results in unknown costs hiding in the complex course estimates provided.

It is interesting to compare the results from this case study with that reported by Farr, Studier, Sipes, and Coombs (2009)[xi]. The cost of a simple course within the current case study ranged from $214 to $480. The cost of the California Community College (CCC) simple course was $477. The complex course in this case study ranged from $540 to $3,347, while the complex course from the CCC was $2,016. In each instance, the costs presented in the Farr et al report fits within the range of the current case study. It is also interesting to note that the current case study used the technical guideline WCAG 2.0 as their point of reference, whereas the CCC used the technical standard from Section 508.

"It is also common for institutions to implement web accessibility as courses are naturally undergoing updates or are in a new development cycle."

It is common for institutions to believe that what they need to do to implement web accessibility is to make similar after-the-fact fixes of their courses. Certainly, anytime accessibility is needed, it must be delivered, and in some instances this model of the retrofit will be required. However, developing an accessible product from the beginning will likely save having to cycle back around to fix that which already exists. It is also common for institutions to implement web accessibility as courses are naturally undergoing updates or are in a new development cycle. It is not necessary to consider the costs of the retrofit as your only option in becoming an accessible institution.

This case study is important as it sheds light on a common dilemma. Retrofitting is a reality for most institutions and every institution will have to identify the ways in which they will make their content accessible. Some may choose to phase in newly designed accessibility over time along with a rapid response team for retrofits as needed, and some may choose to wholly retrofit all existing courses.

APPENDIX D

COSTS FOR CAPTIONING ONLINE AUDIO AND VIDEO ON CAMPUS

CASE STUDY 3

CONTEXT

This large public university had a student enrollment of nearly 42,000.

The information for this case study comes from a large public 4+ year university. At the time of the cost case study data collection, they had a student enrollment of nearly 42,000. Of that almost 30,000 were enrolled in an undergraduate program. The faculty are large as well, with over 3,100 full time faculty and over 1,000 part time faculty. Just over 3% of the student body was registered with the Disability Resource Office for supports and services. The institution reported a decentralized IT with the exception of the most public-facing pages, organized by a branding and communications unit. There had been a push to use template-driven web pages, in part so that both branding and accessibility could be maximized.

INSTITUTIONAL INDICATOR FOR WEB ACCESSIBILITY

This institution was quite mature in its web accessibility approach. They had long had an institutional policy and have implemented campus-wide efforts for over a decade. They had a central accessibility committee of 9 individuals who represented divergent needs of the campus. Faculty and staff were provided with training and supports. Accessibility requirements are included in contract language and for the purposes of procurement. They also had included language in their hiring documents so they could establish that technical jobs have preferential hiring of those with accessibility knowledge and skills. This campus had been through numerous self-evaluations and cycles of monitoring and assessment so that continuous improvements were made. For these reasons, this institution would be classified as operating as an *Indicator 4* campus.

> ***"They also had included language in their hiring documents so they would establish that technical jobs have preferential hiring of those with accessibility knowledge and skills."***

IN-DEPTH ISSUE

The campus was most interested in collecting the costs of different methods they use for captioning across campus. Captioning is one of those elements in accessibility that benefits individuals without disabilities almost as much as it benefits those with disabilities (i.e., those who are hard of hearing or deaf, have English as a second language, and some who have learning or cognitive disabilities). Having captions allows the user to engage in multi-modal learning, and because text is searchable, is useful

for both discovery of concepts and studying. Of course it is also helpful to the typical user when sound is an issue too (e.g., a noisy location, or a location where sound is not allowed). The flexibility and benefits of captioning make it an excellent target to deploy for the entire campus merely based on sound learning principals, and not necessarily the accessibility needs of students with disabilities alone.

Those in higher education often report captioning is a pain point, and a source of great cost.

With that said, widespread captioning has long been difficult for institutions to achieve easily. In part due to the expense. Since this institution uses different methods, they were interested in making some comparisons across the ways they caption. But they wanted to track these costs for a broader institutional purpose; to uncover costs by College.

Historically, captioning had been paid for through 2 units: the Disability Resource Center (DRC) and the Library. These costs had been increasing dramatically each year. So a decision was made to spread the costs to the colleges that host courses requiring captions. The DRC would ensure that arrangements were made and that the captions occurred, but the costs would flow back to each college via invoices and a billing process. As with most policies, there were a few exceptions. For example, grant work would pay for their own captioning. Also, some faculties choose to do their own captioning work, and that would remain an allowable practice. Finally, the Library would continue to support captioning of their resources.

RESULTS

To gather the costs of captioning, all caption invoices were gathered for a 3-semester period (i.e., Spring and Fall of 2011, and Spring of 2012). These data were then combined and analyzed.

The average cost per minute to caption video is displayed in ***Table D1***. You can see that different sources account for varied costs per minute.

Table D1: Average cost per minute of captioning video from various sources

SOURCE	*COST PER MINUTE*
In-house: Disability Resource Center transcript	$1.50
In-house: Disability Resource Center transcript and syncing	$1.90
Outsourced with private vendor (transcript and syncing)	$1.90
Outsourced with private vendor—rush job	$2.90

Most captioning cost an average of $1.90/minute. Rush jobs averaged $2.90/minute.

As predicted, the caption work with the least cost was the one with the least amount of effort (i.e., transcript only). Likewise it does not come as a surprise that outsourcing a rush job was the most expensive captioning method at an average $2.90 per minute. So the obvious lesson is to plan ahead as much as is possible. It is interesting that both the in-house and outsourced work to secure a transcript and sync the media was the same cost at an average $1.90 per minute. In hindsight it would have been interesting to identify how long each of these options took. There may be some additional advantages to one over the other that are unknown from the data we collected. Assuming other elements are equal, some might think it not worth the hassle to continue to complete the work on campus. However, others might think that the local quality control and opportunity to keep students or local individuals employed is a good reason to continue to offer the in-house option. Equivalent cost does provide the choice either way.

Next, the institution was interested in looking across Colleges to see how often the captioning was being used, and determine the costs sent to each College over time. ***Table D2*** displays the courses billed to each College by semester. These are costs for captions to be added in post production, not to engage a real-time transcriptionist and captioner.

Table D2: Captioning time and costs by College and semester

	SPRING 2011 SEMESTER	*FALL 2011 SEMESTER*	*SPRING 2012 SEMESTER*	*TOTALS FOR EACH COLLEGE*
College A	1 course (53 min)	1 course (58 min)	0	2 courses (111 min) **$190**
College B	0	3 courses (305 min)	7 courses (304 min)	10 courses (609 min) **$1,057**
College C	0	0	1 course (176 min)	1 course (176 min) **$366**
College D	1 course (65 min)	2 courses (164 min)	1 course (510 min)	4 courses (738 min) **$1,217**
College E	Unknown (1,956 min)	1 course (15 min)	2 courses (59 min)	At least 4 courses (2,030 min) **$3,369**

Considering how often captioning is highlighted as an unattainable practice at scale, and how often people say that requiring it in higher education will be the demise of accessibility efforts, we are struck by how little it cost this progressive institution. Granted the variability is high (i.e., from 111 minutes to 2,030 minutes across 3 semesters), yet there may be differences across the Colleges such that one would naturally use media more than another. The total cost for captioning across all 3 semesters and all 5 Colleges is only $6,199.

In hindsight it would have been interesting to find out if campus staff believe that requests to caption have declined since the billing is going to their respective College. If faculties were using multimedia less because of the perceived costs of captioning, that would be unfortunate.

Caption costs appear reasonable.

Post Production Captioning appears to be a reasonable cost, not only for the institution, but for each College to incur. As shown in Table 9, the amount of captioning billed to colleges in any one semester is relatively small. The largest was in the spring semester, 2011 for courses in College E totaling $3,369. In fact, courses in this College accounted for over half the total cost of captioning during the 3 semesters that were the focus of this case study. Yet the director of the DRC that oversaw captioning reported that no one at the college level has complained about these charges. A quick review of some of the college budgets on the institution website reveals that the total college budgets are indeed large. For example College B has a total budget of over $105 million and College C's was nearly $32 million in 2011–2012.

One of the more innovative funding policies identified at a Cost Study institution was the one described here which distributed the fiscal responsibility more broadly to ensure accessibility of web content across campus. While this policy pertained to funding to make all web content accessible, the biggest impact seen thus far is with captioned media.

"While delivering captioned media is a challenge, determining who pays for it is equally challenging."

While delivering captioned media is a challenge, determining who pays for it is equally challenging. Many campuses centralize funding for classroom accommodations in the DRC budget. Captioned media presents an unusual twist in this conventional model. Unlike the conversion of print to audio or note-taking services used exclusively by students with disabilities, the captioned media product remains the property of the faculty or department, not the student. Additionally, captioned media is "searchable" and can enhance learning outcomes for everyone, especially people with limited English proficiency, extending the value of media beyond accessibility.

The funding policy implemented at this institution accomplished a number of objectives. It redistributed the cost from the department to the college where the department resides. Because the college budgets were larger than those available to individual departments or faculty, the relative cost of web accessibility was more easily absorbed in the total college budget. There were no reports of resistance at the college level to this cost shifting.

It also communicates the shared responsibility of making the campus accessible rather than loading all of the fiscal costs into one center (e.g., the DRC). The end result was that each college had a relatively small bill to pay for accessible content for courses within that college. Also, faculty retained possession of the media to be used in subsequent semesters and/or for research purposes.

A system that includes a path to funding decreases the likelihood that a student in need of captioning will go without.

There is also an important attitudinal benefit that might accompany such a funding policy shift. Since this policy allows faculty to make full use of media in their teaching practices without being limited to using just what their individual budgets can afford, it is possible that faculty might not perceive a student who is Deaf or Hard of Hearing as an "expensive" or "burdensome" student. Most importantly with a system in place that includes a path to funding, it decreases the likelihood that a student who needs captions will go without.

COST BENEFIT TO PROVIDE RETROFITS TO ACCESSIBILITY OF AN OPEN SOURCE LMS

CASE STUDY 4

CONTEXT

The information for this case study came from a publically funded, 4+ year, land-grant university with distributed campuses (i.e., a main campus and 3 other physical locations). The number of degree programs was sizable (i.e. over 100 undergraduate programs, over 100 master's programs, and 60 doctoral programs). At the time of data collection the campus had a total student enrollment of approximately 35,000, with just over 25,000 seeking undergraduate degrees. They reported that 3% of the student population had registered with the Disability Student Service Office to receive supports. This state university had just over 2,000 faculty members with 83% categorized to be full time. Their IT infrastructure, like many, was reported to be decentralized, with centralized supports for each campus.

INSTITUTIONAL INDICATOR FOR WEB ACCESSIBILITY

Many years earlier, this institution received an OCR complaint. Since then, it has made enormous progress.

Many years earlier this institution received a complaint made to the Office of Civil Rights alleging issues with the accessibility of digital content. Since that incident, they made enormous advancements towards accessibility. They developed and passed institution-wide web accessibility policy through the faculty senate, created central structures to address accessibility, and hired personnel to lead the enterprise-wide effort. Many supports for developing accessible content are currently available for faculty and staff alike. Campus staff engage in regular monitoring of their success and they engage in cycles of continuous improvement on web accessibility. For these reasons, they are considered an *Indicator 4* institution.

IN-DEPTH ISSUE

The institution has been using the open-source learning platform Moodle.

The backbone of course delivery at most institutions is a Learning Management System (LMS). Whether used to support face-to-face courses across the 4 campus locations, or for distance delivery, this university viewed their LMS as a critical piece of IT infrastructure, that needed improved accessibility. The institution has been using the open-source learning platform Moodle for some time now. The accessibility of Moodle has come a long way in a few years, but improvements still needed to be made. One advantage of using an open source LMS is the ability to make changes where they are needed and quickly address issues as they arise. This is not always the case with proprietary LMS's. While Moodle has accessibility work groups, if you need a quicker remedy to a problem you identify, you often need to complete the work on your own.

Staff members at this institution were interested in identifying the costs they devoted to improving the accessibility of aspects of Moodle. The institutional accessibility staff looked at issues that were present at the time, and determined what could be accomplished with their efforts. The decision was made to improve elements of Moodle accessibility, specifically of student facing content. They worked on the following:

- Improving how the student gradebook looks and operates
- Adding ARIA landmarks to student views
- Improving the file picker; which is a way for students to upload files
- Making several small changes to the Cascading Style Sheets (CSS), and other little things that would improve overall accessibility.

Other issues important to Moodle accessibility were deemed too enormous to attempt during the period of the cost case study. One example would have been improving the accessibility of the discussion forums.

RESULTS

The personnel involved in these fixes worked over a 2-month period during the fall of 2012. These staff members included the institutional lead for accessibility, an applications developer and a web developer. Activities and total time from staff time diary summaries are displayed in ***Table E1***.

The process in which they engaged to improve the accessibility of Moodle components was fairly straightforward. First, Moodle released version 2. Next, staff members assessed its accessibility. Then fixes were delivered by the small team of 3, and finally, these accessibility improvements were deployed to the campus community.

Table E1: Activities and total time to implement Moodle accessibility fixes

ACTIVITY CODES USED IN TIME DIARIES	TIME REPORTED BY STAFF 1	TIME REPORTED BY STAFF 2	TIME REPORTED BY STAFF 3	TOTAL MINUTES
Meetings	120	210	245	575
Communications (e.g., email, phone, face-to-face)	141	60	30	231
Retrofitting existing materials	2,373	495	–	2,868
Manual web accessibility testing	600	615	–	1,215
Report writing / documentation	578	–	–	578
Training or other professional development provided	–	60	–	60
Total minutes	**3,812**	**1,440**	**275**	**5,527**
Total hours	**63.53**	**24**	**4.58**	**92.12**

The total costs of personnel time and fringe for this work is presented in ***Table E2***. While these fees cover close to 100 hours of skilled personnel time, the total cost to the institution was quite modest, at only $24,601.

Table E2: Cost of personnel time to engage in improvements to Moodle accessibility

	STAFF 1	STAFF 1	STAFF 3	TOTAL
Total effort in hours	63.53	24	4.58	92.12
Total salary and fringe for the time	$7,070.57	$8,138.71	$9,391.72	$24,601

Note: staff members are not listed in the order of the narrative to improve protection of personal information.

While it is not known how many separate classes would have had access to these improvements as they were made, we looked for ways to think about the cost in relation to the scope of impact. Isolating the impact to the approximately 1,050 students registered with a disability, the cost for each student to receive an improvement in their LMS accessibility was $23.43. Of course not every student registered with the DRC would have a disability that affects computer and internet use. Yet, it is also likely that individuals not registered with the DRC would benefit from some of these fixes. These accessibility changes to Moodle are factored as a one-time charge. It is more likely that students would interact with these improvements over multiple courses and semesters. Thus if a student registered with a disability used Moodle in at least 1 course per Semester for 6 semesters, the fix has now dropped to $3.90 per student.

"If a student registered with a disability used Moodle in at least 1 course per Semester for 6 semesters, the fix has now dropped to $3.90 per student."

Please remember that these changes were an immediate benefit for students on campus, and they did not have to wait for the vendor to provide an upgrade. Moreover, if the Moodle improvements also affected the usability of the product, one could argue that it benefitted the broader group of students as well. If that were the case, the cost per student to the institution would be even less. For example, if each student benefitted in at least one course, the cost ($26,601) divided by the enrollment (35,000) would make the changes $.75 per student. But we know that students take more than a single course per term. During this same semester (i.e., Fall 2012), the university had over 420,000 student credit hours. If the fixes improved the experience of all students and if all courses included a Moodle component, these same fixes, viewed on a per credit hour basis, would have equated to $.06, a credit hour during that semester. Even if only some students with disabilities benefitted from the accessibility fixes, their impact and unit cost would need to be averaged over the life of the fix. If baked into Moodle's application,

this would be a long time. If not, it would continue, but would require some work to ensure it applies to every update.

The impact of this work could expand outside of the institution too. If Moodle were to incorporate these fixes into the core, every other Moodle campus would benefit as well. Our university contact told us that they were unsure if their code ever made it into the Moodle Core. However, the university staff members mounted their own campaign to let others in higher education know what they had accomplished and the accessibility fixes that were available to anyone who asked.

> ***"This case study showed how a very modest investment in improvements to an open source LMS could positively impact students with and without disabilities."***

In short, this case study showed how a very modest investment in improvements to an open source LMS could positively impact students with and without disabilities. Making these changes in open source applications can have an enormous economy of scale, especially, if you can get them back into the application's core.

UPDATE

As an update to this case study: This institution no longer puts institutional programming resources into Moodle accessibility. In fact, they now formally belong to a Moodle accessibility interest group where others are doing the programming and Moodle embeds all approved code directly into their core. One staff member participates about 30 hours a year (i.e., monthly hour long meeting along with institutional coordination and some testing and training for the institution). While this has extended the time it takes to receive improvements in accessibility, more is actually accomplished than one institution could mount alone; this is because there is a larger group working on the fixes in a distributed way. The drawback is that customized fixes to accessibility are often not available to the local institution until much later; when Moodle pushes it to everyone.

This state university now belongs to the Moodle accessibility interest group.

COST BENEFIT OF SYSTEM PROCUREMENTS AS AN EFFECTIVE WAY TO LESSEN COSTS OF ACCESSIBILITY

CASE STUDY 5

CONTEXT

This case study was completed by a state system of higher education.

This case study was completed by a state system of higher education. The campuses in the system are each four-year institutions. Looking at them together, they had over 350,000 undergraduate students and over 425,000 total students enrolled at the time of the cost case study collection. Roughly 3% of the student body had registered with their respective Disability Services Offices for assistance. The number of faculty within this system was also large, with over 11,000 full time faculty and over 10,000 part-time faculty. It is important to note that each campus implements IT practices locally—with coordination at the level of the state-system offices—and each IT system is reported to be highly decentralized.

> *"They had over 350,000 undergraduate students and over 425,000 total students enrolled at the time of the cost case study collection."*

INSTITUTIONAL INDICATOR FOR WEB ACCESSIBILITY

This system of higher education has been working on web accessibility initiatives for nearly a decade. With that said, since each campus operates separately, it is not possible to designate a single performance level for the system. Considering the fact that there are policies and implementation plans in place, all campuses are working at least at a level of *Indicator 2*. The system office is at an advanced phase of providing support to each campus; this includes assessment processes for web accessibility across their institutions. Since many campuses perform annual evaluations and reporting, these would be considered institutions working on issues of *Indicator 4* institutions.

IN-DEPTH ISSUE

The web accessibility efforts of the state system offices are designed to utilize the strengths of staff at the various campuses, and to oversee a progression towards accessibility in a cost effective manner. Leveraging the size of the system and its purchasing power helps achieve this. So does the access to experts across multiple campuses, each with a stake in similar outcomes. The staff members from the state system were interested in quantifying cost-savings from their work. Their topic became an initiative to evaluate the web accessibility of campus pages more effectively. They

wanted a way to embed both automated and manual checks into their existing web accessibility evaluation systems.

The cost study followed the impact of two practices: 1. System-level procurement. 2. Providing sub-awards to campuses in the system.

They selected two practices to follow for the purposes of the case study. The first was the impact that a system-level procurement can have on campus finance. Simply purchasing software or other services (e.g., captioning services for the entire system), and managing large procurements from the system-level office is one way the economy of scale helps them to operate in a cost effective manner. The second is the impact of providing sub-awards to individual campuses. These sub-awards were to be used for a variety of things from development to training, and even software adaptations that are then offered to all of the other campuses; it was reported that this practice helped achieve lower costs and better outcomes across the system. The benefit is the sub-awards were typically performed in ways that kept the product highly tied to the unique needs of the entire system that a vendor could not accomplish. Having a personal and professional stake in the outcome, and having deep input from staff at other campuses, helps to keep the features in line with the true need.

PROCUREMENT RESULTS

The system had previously purchased and used an automated tool to assess and improve the accessibility of web content throughout their campuses. Most used the tool to run reports to help them improve and monitor accessibility with administrative websites, course schedules, registration, and student services as well as pages at the college and department levels. However they wanted a way to embed manual checking at critical junctures throughout the process. When the existing contract was up, they began a new search with a Request For Proposal from the purchasing unit of the system offices.

The vendor bid request included new requirements in the software that were critical for their success. For example, the system would now require that the assessments were mapped onto the Web Content Accessibility Guidelines 2.0 (WCAG 2.0). The successful vendor would be required to develop, test, add resources, and maintain WCAG 2.0 content in their assessment tool. Staff from the system office also requested that the vendor provide a way to enhance the automated tool by providing a mechanism for manual checking of accessibility items using the freely available WAVE tool; one example of the need for a manual check would be the appropriateness of alternative text within the context of the page— something that cannot be determined by an automated process.

Each institution received a substantial discount for opting into the system-wide purchase rather than purchasing the license alone. While any given institution could choose to participate in using the tool or not, each campus was

"Each institution received a substantial discount for opting into the system-wide purchase rather than purchasing the license alone."

billed for their portion of the group procurement even if they did not use it. In the final analysis 87% of campuses in the system used the newly procured tool.

Using a central purchase saved each campus $10,000 off the price of a campus license, plus additional procurement costs.

Not surprisingly, the system-level procurement saved resources for each participating campus. The large-scale procurement saved each of the campuses that used it $10,000 from what it would have cost them had they licensed the product at their campus alone. This represented over a $200,000 savings by using the system-level purchase. Moreover, using a central purchase saved each campus additional resources. For example, separate procurements would have engaged the purchasing staff at each campus, along with accessibility review teams at each campus. Had this not been done centrally, each campuses would have engaged in the very same work (i.e., each to create vendor specifications, post the Request for Proposal, review the submissions, and make—and then monitor—the award). This cost was reduced considerably as it was done once, and not over 20 times. It also provided a consistency of expectations and product across all institutions.

SUB-AWARD RESULTS

System office staff awarded subcontracts to 2 campuses in the system:

The work of Campus "A" was to support the design and implementation of additional processes and resources into the automated tool. This work would assist in the accessibility evaluation and remediation of web content across the entire system. The sub-award mainly covered expert staff time.

> ***"They combined the current Section 508 guidelines, the WCAG 2.0 guidelines and the manual evaluation guidelines used by their institution into the compliance tool."***

The staff of Campus A engaged in numerous activities. They combined the current Section 508 guidelines, the WCAG 2.0 guidelines and the manual evaluation guidelines used by their institution into the compliance tool. The sub-award included funding to review and revise the tool based on feedback from institutions that were using it to "help identify and organize resource materials and update the guidelines as new federal guidelines are approved." They were to create website content contributor requirements, test those requirements or additions for correctness and maintain a spreadsheet detailing those requirements to share with all campuses. In addition they were to provide new links to remediation resources including WCAG 2.0 techniques, manual testing tools links, and augment and maintain other educational resources that are linked to the requirements. They were also required to publicize and share the new resources and tools with all other campuses so they would know what was available. The sub-award also included a requirement for the campus experts to conduct training related to updated accessibility requirements.

Campus A completed this workscope in a year (i.e., from July, 2011 to June, 2012). ***Table F1*** shows the staffing for these changes and the cost in terms of salary for professionals and assistants that worked on the project. Assistants spent the most time on this project at 941 hours, compared to 311.5 hours for the experts. This resulted in a fairly even distribution of the total cost across the two types of staff of about $12,000 each or $24,000 for all activities for this project.

Table F1: Cost for Campus A subaward to embed manual checks and provide system level training

TIME PERIOD	NUMBER OF EXPERT PERSONNEL	NUMBER OF ASSISTANTS	TOTAL EXPERT HOURS	TOTAL ASSISTANT HOURS	SALARIED EXPERTS	SALARIED ASSISTANTS	TOTAL SALARIES
July 2011–Dec 2011	2	5	161	431	$6,795	$5,212	$12,007
Jan 2012–June 2012	2	4	150.5	510	$6,114	$5,876	$11,990
Total			311.5	941	$12,909	$11,088	**$23,997**

The award made to Campus B was established so they would create and test a new set of permissions and roles within the accessibility tool. This sub-award was the same period of time as the sub-award from Campus A (i.e., 1 year). After testing, Campus B worked with the software company who then implemented the permissions directly into the tool. These new permissions and clearances were established to customize the experience of those in different roles so they could access what was needed without becoming overwhelmed by all the features. Also, it enabled some groups to access reporting features. The roles and permissions were created for:

- Administrator,
- Group Administrator,
- Developer,
- Content Contributor and
- Report Viewer.

Students, enrolled in a computer science course, and their advisor, completed some of the work of this subcontract as it was included in assignments of their course. They estimated that their cost to develop the new roles and permission system was $12,112.50. This estimate was based on 484.5 hours of student work time, billed at $25 per hour, (the hourly rate that a new computer scientist might earn). This was not paid by the institution but is the value estimated by the class if the project had been purchased through a separate contract. The student advisor's time was another contribution. Her salary with benefits was $54.60 an hour. She spent 30 hours on this project. Thus an additional $1,638 would represent the advisor supervising the students' work if it had not been a course project. Taken together, this represented a total savings to the system of $13,750.50 in work, since the work was technically provided for free. Even if you were to base the savings of this work on what students on campus are actually paid, versus a professional rate, there is still a savings. The alternative, lower estimate can be easily made based on the actual hourly rate, which is typically paid for student time; this was $13 per hour. This lower rate results in a $6298.50 total

contribution from the student's hours which when added to the $1,638 for the advisor, totals $7936.50. Either way it was a great way to get what everyone described as a wonderful product for little out-of-pocket cost to the institution. Additionally, students received real-life experience and the campus gained a working product for minimal cost. In other words, Campus B provided a great hands-on learning experience for the students that were involved, while saving money for the entire system.

Table F2: Costs for Campus B Subaward to create new permissions and access in the tool

TIME PERIOD	NUMBER OF EXPERT PERSONNEL	TOTAL EXPERT HOURS	TOTAL SALARIES
Jan 2012–June 2012	2	120	$5,141.80
June 2012–Dec 2012	2	118.8	$5,061.27
Total		238.8	**$10,203.07**

Note: This does not include the benefit of students and supervisor efforts, that if monetized would have been either $7,936.50 or $13,750.50 depending on the model chosen from the paragraph above.

Table F2 shows details of how the sub-award to Campus B was spent. These staff also worked with other campuses using the tool to develop the new tool roles and permissions. The use of students saved the institution having to hire and pay for assistants for this project. The experts were able to take the student report and work with the system level office staff and the vendor for a significantly lower cost than if Campus B staff had done all of the work themselves.

These internal subcontracts can be a powerful mechanism to keep costs low. Remember that the tasks here were noteworthy; to work with the vendor to create and deploy an automated accessibility-testing tool, customized for the needs of the system, with training and support in place. The benefits from both campus projects were spread across all campuses in the system. The total combined cost was is a little over $34,000. Had each campus in the system replicated these projects you would anticipate that it would have cost a similar amount for each campus. Instead, as this single cost is spread across the system, each campus pays $1,487, saving each $32,513. If these two campuses had been the only ones to work on the products and use them, there would still have been a benefit. Together they served almost 35,000 students in 2011, with approximately 3% identified with specific disabilities (just over 1000 students). They also employed over 1,800 faculty members in the same year. The costs would have increased significantly if undertaken by any single campus. But what made it even greater is that the work of these two campuses effected on the entire system. By engaging in a system-level procurement and by using internal subcontracting—that did include some

contributed labor—the system saved nearly a million dollars (i.e., a total of $947,776—the $200,000 procurement savings along with the savings of $32,512 for each institution in the system).

Bundling the power of a group purchase along with new vendor requirements and customizing features after purchase is an efficient strategy for a postsecondary system.

In this case study, the changes the State System of Higher Education made to the tool will have broad, and long lasting, benefits. Campus staffs now have a tool that is more effective due to appropriate permissions, processes for manual checks, and training and support in using the tool. Staff at the campuses using the same tool can share their experiences to learn how to better use the tool and to make improvements to it.

"Students and others with disabilities benefit because the process of creating accessible content on the web at over 20 campuses is improved for a relatively low cost."

Students and others with disabilities benefit because the process of creating accessible content on the web at over 20 campuses is improved for a relatively low cost. Moreover, the software company has a tool with new features that they can now offer to other clients and perhaps expand their client base. Additional postsecondary institutions and their students, faculty and staff may reap benefits from these additions to the tool. These changes, which took time and expertise, can now be replicated for others at different postsecondary institutions that will also benefit from them and that can occur at a relatively low cost.

This case study illustrates the economies of scale that can occur when projects are coordinated at a system level.

This case study illustrates the economies of scale that can occur in a postsecondary system when projects are developed with collaboration and input from multiple campuses within the system. In this case it required leadership from central administration to spark the changes and flow funding to support system-wide improvements to the tool. Also, staff developed a positive business relationship with the software vendor and have proven themselves to be a valuable customer; not only because of their sizable procurement power, but also as a source of input and product development for the company. The IT staff in the central system office also recognized and utilized the great IT expertise on other campuses to make product improvements through sub-awards and through regular meetings to share ideas about how best to improve web accessibility outcomes. When so many institutions are struggling to meet the challenges of web accessibility, it is truly remarkable to describe the process through which they do so in a cost-effective way for the system as a whole.

COST FOR INSTITUTING A PROCUREMENT REVIEW PROCESS FOR ACCESSIBILITY ON CAMPUS

CASE STUDY 6

CONTEXT

The information for this case study came from a large, 4+ year, publically-controlled university. It served students across 4 campuses distributed within their region. During Fall term 2011, their enrollment was just over 33,000, and about 20,000 of those were undergraduates. The institution offered over 200 degree programs for students ranging from undergraduate through doctoral studies. Approximately 3% of the student body was registered with the Office of Disability Supports. Their faculty was equally large, with over 1,300 full time faculty and another 1,100 part time faculty. Their IT system was reported to be decentralized, however they offer central supports for units on campus as well as for faculty and staff.

WEB ACCESSIBILITY

One issue that can plague an institution's accessibility efforts is failing to purchase goods and services that live up to policy and practice.

At the time of this cost case study, the institution had a decade-long history of web accessibility. They had an institutional policy in place covering web accessibility for the entire institution. They also had an office of Web Accessibility providing central coordination, supports, and resources to campus units and individuals. Their assessment of the institution's web accessibility, and continuous improvements of what they do was an ongoing feature at the time of our cost case data collection. For these reasons, this institution was categorized to be at an *Indicator 4* level.

IN-DEPTH ISSUE

There are many issues that can plague an institution on their path to accessibility. Certainly, one of those is the ability to deliver on commitments of accessibility if you have not addressed procurement of accessible goods and services. Failure to purchase accessible products can result in shifts of both responsibilities and costs that are counterproductive to institutional efforts. The responsibility to develop and deliver accessible products shifts from the vendor to the institution, since it is the institution, not the vendor, that has the legal liability to provide access. The cost also shifts from the vendor to the institution, as the institution places resources through accommodation or retrofitting processes. When this happens, rather than the vendor or developer owning responsibility to deliver and maintain

"It is the institution, not the vendor, that has the legal liability to provide access."

accessible products or services, the institution must now do so for the life of the product. This does not make sense over the long haul, yet, it can be difficult to avoid this burden.

> *"Not only do you need to add appropriate language to Requests for Proposals or Acquisitions from vendors, but you must evaluate the vendor's claims, make recommendations, and make selections based in part on accessibility components."*

Many institutions that are mature in their web accessibility work include accessibility requirements as part of their overall procurement process. However, the work involves many different elements, and can be complex. For example, not only do you need to add appropriate language to Requests for Proposals or Acquisitions from vendors, but you must evaluate the vendor's claims, make recommendations, and make selections based in part on accessibility components. You must execute contracts that include this feature as part of what is expected from each vendor, and monitor that what is delivered is what was promised. Most importantly, you must communicate to the entire campus that procurement now includes this as a criterion. You must help others understand what this means for them and help them learn how to spot issues before they recommend a purchase of the next "shiny" postsecondary object.

As accessible procurement guidelines develop, an institution must define what is included in the "purchasing" process. For example, at many institutions, the central purchasing office handles any item procured for use by the institution that is over a certain dollar threshold (e.g., $5,000). But what are the results of purchases that do not go through a standard procurement process? Think of an inaccessible $200 widget implemented campus-wide, or the use of inaccessible freeware identified and used by individual faculty members? Accessibility concerns are not the only ones changing procurement in higher education today. Security of the digital infrastructure and its content shares a similar concern. Thus, sometimes the $200 widget can cost the institution $10,000 in after-the-fact accommodations for staff or students with disabilities—or make them vulnerable to litigation. Additionally, freeware selected by faculty can insert vulnerabilities and compromise security campus wide.

Accessibility would be one of several features, and they wanted to track this cost.

This institution was changing the ways in which it would procure goods and services. Accessibility would be one of several features, and they wanted to track this cost. Thus the case study issue presented below is the cost to develop, test, and refine a procurement system to include accessibility.

RESULTS

A central standards committee established an internal process that would require a review of all purchasing requests of $2,000 or above to include 3 new important institutional elements. Those items were (1) accessibility, (2) security, and (3) networking

and integration. The work in this case study reflects the time it took for the institution to establish draft processes and testing procedures as well as a beta test to operationalize the accessibility aspect of the process. Thus, once the work of this committee was complete, all faculty and staff purchasing an item above a $2,000 threshold would be required to go online and submit an application for product review.

Table G1 displays the work of only those individuals who helped develop the accessibility policy within the institutional procurement process. The staff members included in the accessibility segment of the work were: the Coordinator of Accessible IT, an Accessible Media Specialist, and a Program Specialist. There were others addressing changes to purchasing as well; their work to address security or networking and integration is not included here. It should be noted that since the institution included all 3 components simultaneously we chose to include the total involvement of the accessibility personnel even when not engaged in accessibility work. For example, in a 3-hour meeting accessibility concerns might only be present during 45 total minutes. In this case, all 3 hours are included. While we did not exclude the time accessibility personnel provided input or feedback on the other 2 elements, we also did not include the time others might have done the same on accessibility. Thus the time and cost estimates given to developing the accessibility feature in the procurement process may be a bit bloated for what actually happened. We did ask the principal staff to estimate the amount of time accessibility was the focal point (i.e., during meetings, communications, and documentation reviews). They indicated about a quarter of the time. However, since their invitation was to sit on the full committee and participate in the full process, we included all time involvement.

Table G1: Activities and total time to develop and test new standards of accessibility in the institutional procurement process

ACTIVITY CODES USED IN TIME DIARIES	MINUTES REPORTED BY STAFF 1	MINUTES REPORTED BY STAFF 2	MINUTES REPORTED BY STAFF 3	TOTAL MINUTES
Meetings	180	0	565	745
Communications (e.g., email, phone, face-to-face)	120	0	2,830	2,950
Manual web accessibility testing	4,800	0	4,800	9,600
Automated web accessibility testing	–	–	330	330
Create materials, documents, or training	–	1,020	1,020	2,040
Report writing	300	–	300	600
Training or other professional development provided	360	–	360	720
Other–VPAT reviews, Life cycle integration	180	–	10,700	10,880
Total minutes	**5,940**	**1,020**	**20,905**	**27,865**
Total hours	**99**	**77**	**348**	**464**

A great deal of time was spent in meetings with the committee to provide input on the process, on testing, and on recommendations. Another large segment of time was spent talking with faculty and staff, and also vendors. This was to establish a process that made sense to all, and was considerate of typical workflow, as they wanted to ensure that this would become part of mainstream campus expectations. Reviews of the Voluntary Product Accessibility Template (VPAT), took considerable time, as did document creation that would be useful for both groups (i.e., campus members and vendors). This new process was also put into the institutional IT life cycle; this covers the life of a campus IT service, from planning to delivering, operating and supporting, and then managing and governing campus technology. Having this as part of the IT life cycle ensured that accessibility would be a required aspect of any Request for Proposal or Acquisition and that vendors would understand expectations as well as testing requirements during selection.

"This was to establish a process that made sense to all, and was considerate of typical workflow, as they wanted to ensure that this would become part of mainstream campus expectations."

In short, the procurement process now included the following steps:

1. Campus employees completed a request that went into the central purchasing offices. They detailed the business rationale for the product or service and identified why the acquisition was in the best interest of the campus. They also detailed why this specific product was selected, any costs or resources needed to host, deploy or maintain it over time, and the impact on other administrative or centrally-networked systems. The request identified any protected data that would be collected or stored, and documented how data would be secured.
2. If the procurement went to the next stage, the campus employee forwarded a VPAT to the vendor for completion. They also had the option to complete documentation to exempt the vendor's product from accessibility requirements of the institution; exceptions were used for only 4 specific instances and required substantive documentation.
3. The vendor completed both a Section 508 and a WCAG 2.0 VPAT. In most cases they were asked to provide a demo of the product so it could be reviewed.
4. Once returned, the accessibility staff engaged in a review of the VPAT. They tested the product or service with both manual and automated tools. They then completed their review and communicated the result to the staff member requesting the purchase and the vendor.
5. If selected based on all criteria required for institutional procurement, contract language was drawn up and delivered to the vendor.

During the beta test of the review process, accessibility staff included both manual and automated tests. The institution conducted testing using products they were already licensed to use. Specifically, they used the JAWS screen reader for all manual tests (3 licenses at a total of $3,150), and the SSB-Bart product AMP for all automated tests (a 3 year license for $7,620). Based on a JAWS version lifecycle of 2 years, and the cost of the 3-year AMP license, the yearly costs to have testing software at this institution for the purposes of the reviews was $4,115. During a beta test operationalizing the new process, accessibility staff performed 23 reviews of products. ***Table G2*** displays the costs of personnel (i.e., their time X salary and fringe benefits) to engage in the product testing.

Table G2: Cost of personnel time to engage in development and initial testing of accessibility into central procurement processes

	STAFF 1	STAFF 2	STAFF 3	TOTAL
Total salary and fringe for the time	$12,001	$306	$1,485	$13,792

Note: staff members are not listed in the order of the narrative or prior tables to improve protection of personal information.

Over 200 products have been reviewed using this process.

Accessibility staff at the institution had a few comments on their process. In the nearly 2 years since the process was created and tested, over 200 products have been reviewed using this process. They indicated that since the beta test, they now take more time for each product review, and that manual testing has taken on a larger role. They noted one important lesson—that the review process is predicated on what is provided by the vendor for testing purposes. While some vendors provided solid products from which they could conduct a review, others did not. Clearly if the review is to be effective, the vendor must provide a fully-functioning product. To the extent that they were not fully featured, issues might not be identified until implementation occurs and a student or employee encounters problems. They are working now to make sure reviews provide a more complete picture of product accessibility.

> ***"One ongoing issue is ensuring all staff are aware of the requirement and of the supports that are available to assist them."***

One ongoing issue is ensuring all staff are aware of the requirement and of the supports that are available to assist them. Since the time of this beta test, the purchasing floor has gone from $2,000 to $0. Meaning that even freeware is included in the requirement. Faculty and staff going through purchasing training, or those who use Purchasing Cards get the message, but what do you do to ensure that others do as well? Getting this out to the campus community will take some time.

The staff expressed that the modest (i.e. under $14,000) one time investment of resources had a powerful positive affect of accessibility on campus, in part because it allowed accessibility to become baked into the very core of the institutional IT framework. Typically accessibility is discussed as a standalone component of the central IT infrastructure. Combining it into procurement aided the realization that accessibility is part of core architecture.

One added benefit to the participation of accessibility personnel in this process was that others could learn about accessibility; having an opportunity to sit in a central IT committee enabled other campus thought leaders to understand the issues of accessibility. This was reported to have a great impact. Key IT staff members now understand critical issues like never before. They now ask questions that before only accessibility personnel would have asked. Moreover, the accessibility coordinator was subsequently put on other central committees as a result of exposure during this work. This has been helpful to accessibility integration across the enterprise (e.g., ability to review an RFP to procure a new institutional email). The integration of accessibility into other institutional documents has aided a deeper commitment of the institution to the aims of access for all.

"The accessibility coordinator was subsequently put on other committees as a result of exposure during this work."

Accessibility has been integrated into other institutional documents, showing a deeper commitment to accessibility.

REFERENCES

[i] Partners in Gaining Online Accessibility through Self-Study (GOALS) include
- *National Center on Disability and Access to Education*
- *WebAIM*
- *Western Interstate Commission on Higher Education*
- *Southern Regional Education Board*
- *Southern Association of Colleges and Schools – Commission on Colleges*

[ii] Department of Justice. (2010). Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations Retrieved from *http://www.ada.gov/anprm2010/web anprm_2010.htm*

[iii] G3ict Global Initiative for Inclusive Information and Communication Technologies (2012). Benefits and Costs of e-Accessibility. Atlanta, GA: Burger, D., Tabeling, B., Manant, M., & Seiffert, M.D. (Eds).

Technosite (2011) Study SMART 0072 - Economic Assessment for Improving eAccessibility Services and Products. Retrieved from *http://www.eaccessibility-impacts.eu/researchResults.aspx.*

[iv] See the following examples:
http://www.w3.org/WAI/bcase/fin.html
http://www.karlgroves.com/2011/04/13/chasing-the-accessibility-business-case-part-1/
http://www.karlgroves.com/2011/09/22/chasing-the-accessibility-business-case-part-2/

[v] Rowland, C., Whiting, J., Mariger, H., & Goetze, L. (2010). Year One Report to the U.S. Department of Education (FIPSE P116B100152). National Consortium to Broaden Access of Electronically-Mediated Education through Institutional Self-Study: Project GOALS. Washington: DC

[vi] Bias, R.G., & Mayhew, D.J. [2005], Cost-Justifying Usability: An Update for the Internet Age; Second Ed., Morgan Kaufmann Publishers

Technosite (2011) Study SMART 0072 - Economic Assessment for Improving eAccessibility Services and Products. Retrieved from *http://www.eaccessibility-impacts.eu/researchResults.aspx*

Farr, B., Studier, C., Sipes, L., & Coombs, N. (2009). A Needs Assessment of the Accessibility of Distance Education in the California Community College System. *Part II: Costs and promising practices associated with making distance education courses accessible;* Berkeley CA: MPR Associates (ERIC Document Reproduction Service No. ED537862.)

[vii] See *http://www.w3.org/TR/WCAG20/*

[viii] See *http://www.access-board.gov/sec508/guide/1194.22.htm*

[ix] Gilb, T. (1988). Principles of software engineering management. In Usability is good business. Cited in Return on Investment for Usable User-Interface Design: Examples and Statistics, Version 28, February 2002; Aaron Marcus.

[x] Karl Groves Blog post Oct 7, 2011
http://www.karlgroves.com/2011/10/07/accessibility-and-reduced-design-development-production-maintenance-costs/; Website Accessibility and Reduced Design, Development, Production, Maintenance Costs, October 7, 2011, Karl Groves.

[xi] Farr, B., Studier, C., Sipes, L., & Coombs, N. (2009). A Needs Assessment of the Accessibility of Distance Education in the California Community College System. *Part II: Costs and promising practices associated with making distance education courses accessible;* Berkeley CA: MPR Associates (ERIC Document Reproduction Service No. ED537862.)

[xii] Technosite (2011) Study SMART 0072 - Economic Assessment for Improving eAccessibility Services and Products. Retrieved from *http://www.eaccessibility-impacts.eu/researchResults.aspx*

[xiii] Levin, H.H. (1983). *Cost effectiveness: A primer.* Beverly Hills, CA: Sage