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AContent Analysis

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**A report for written for the
College of Engineering and Computer Science,
The Australian National University.**

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Introduction

In the report[1] recently delivered to the College of Engineering and Computer Science (CECS) the content authoring tool AContent was identified as an excellent authoring tool for supplementing the Wattle learning management system.

As the next step in the process of developing an educational content repository capable of authoring, storing and delivering high quality, reusable learning objects it is important to better evaluate the use of AContent generally, but also specifically for use in the CECS context.

This analysis will deal with a number of the features and the usability of AContent and will discuss the processes necessary to utilise AContent alongside the existing Wattle (Moodle) Learning Management System (LMS) currently in use at ANU. This report will also deal with the regulatory and compliance issues associated with supporting a number of accessibility and learning standards that are provided by AContent and that are proving necessary as ANU, and tertiary institutions more generally, move to blended delivery of their courses.

AContent features and capabilities

AContent is a powerful system for the creation, storage and management of modular, reusable, standards based educational content. AContent provides the following capabilities for content authoring:

- Develop rich e-learning content using a WYSIWYG editor that supports the following content types:
    - Text
    - Equations / scientific notation (Latex)
    - Images
    - Videos / Animation
    - Audio
    - References
    - All HTML compliant mark-up including CSS for dynamically changing screen layout and content formatting (This capability could be used to create lecture slides, printable handouts, and reference material from a single content bundle).
- Develop and embed tests, quizzes and activities based on the following question and activity types:
    - Likert (rating)
    - Matching graphical and simple
    - multiple answer
    - multiple choice
    - open ended
    - ordering
    - true or false

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[1] Lachlan Blackhall, *Educational Content Authoring Tools*, 2011

- Develop and disseminate multiple content types using the IMS Access For All Adaptations to accommodate the learning needs of students with a disability and as well as the different learning modalities of many types of learners.
- Import and Export content using the following standard based forms
  - IMS Common Cartridge
  - IMS Content Package
  - Import and export tests or question banks in IMS QTI packages.
- Ensure that the following standards are supported
  - W3C XHTML 1.1 Compliance
  - WCAG 2.0 Compliance
- Disseminate content using
  - The internal web server
  - Content export (detailed above)
  - Web Service API – The web service API allows third party software to search, preview, import content from, and export content to the AContent repository.
  - OAuth API – The OAuth API allows creation of a single sign-on between a host system and an AContent repository connected to it. The road map (detailed below) indicates that this capability will allow content licensing in future implementations.

The AContent development roadmap

The AContent development team are continuously upgrading AContent to support new standards and offer new capabilities to content authors. The AContent roadmap[2] lists the following new features for implementation in the first half of 2011:
- AContent Upgrade Utility – A utility for upgrading AContent will be made available to ensure a simple upgrade path as newer versions of the AContent system become available.
- AContent Themes - A theme manager is being created for AContent that will allow content authors to have control over the look and feel of the content they create. The Fluid Skinning System[3] will be integrated into themes.
- Live Content - The AContent Web service API will be extended to allow live rendering of content from the repository into remote systems, making it possible to create one instance of a piece of content, that when updated, cascades over all systems accessing it.
- Content Licensing - As part of the Live Content implementation there is the potential to add content licensing, so authors who develop content that is not provided under an open content license, are able to maintain control over their content, and potentially provide access to it based on a licensing fee. OAuth, adopted by the Common Cartridge 1.0 specification to allow authenticated access to common cartridges, and currently available in AContent, will be extended to allow licensing of content.

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[2] http://atutor.ca/acontent/roadmap.php
[3] http://wiki.fluidproject.org/display/fluid/Fluid+Skinning+System+%28FSS%29

Authoring requirements within CECS

Having an understanding of the capabilities provided by AContent, it is important to understand the content authoring requirements of academics and content developers within CECS. To that end a survey[4] was conducted within CECS to ascertain the software, tools and methodologies they use to create and deliver course content. The results from the survey are summarised here and can be made available in full upon request.

From the survey it was determined that content authors use the following software and tools for creating learning content:

- Learning Management Systems (predominantly wattle because it is mandated at ANU)
- Word processing software (Microsoft Office (Word, Excel), OpenOffice, PDF Software)
- Presentation Software (Microsoft Powerpoint, Apple Keynote, PDF Software)
- Graphics and Diagramming Programs (Inkscape, Gimp, OmniGraffle, Adobe Illustrator)
- Typesetting Software (Latex, Adobe Indesign)
- Bibliography Software (Bibtex, CrossRef Pro
- Specialist software (Programming languages, research specific software, simulation software)
- Audio and Video Creation tools (including software to add audio to Microsoft Powerpoint)
- Web authoring tools

Having created this course material the content is usually provided to students in the following formats:

- In PDF/DOC/PPT/OpenOffice/etc… format (either as a link within Wattle or on another website).
- On a standalone website (Not in Wattle).
- As a webpage or lesson within Wattle.
- Printed directly and given (or sold) to students.
- Links to external contents on the internet.
- Written notes, sketches, photocopied and scanned materials (i.e. non-digital content).

Almost without exception those developing courses use online content to supplement their teaching material. This online content includes:

- Quizzes, tutorial problems and solutions, and assignments.
- Forums seeking peer feedback and grading.
- Video (e.g. YouTube), slide shows (e.g. slideshare.com), and visual demonstrations.
- Audio and podcasts (both ANU DLD recordings and others available through the internet).

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[4]https://spreadsheets.google.com/viewform?
hl=en&formkey=dHllQ3V0SVZGQWl5cFIyUnlCNzN6QXc6MQ#gid=0

- Links to additional existing online content.

From the plethora of tools and software currently being used there were also a small number of capabilities that content authors did not feel were provided. The additional capabilities desired by content authors include:

- A repository of courses both for maintenance of courses that an individual is teaching but also to view (without editing) the content being prepared by other lecturers.

  "An accessible repository of lecture material from other courses in the curriculum would help tremendously. Wattle effectively places all courses on islands and barred faculty members from looking around in other courses which their students are listening to. Thus I currently need to ask every colleague individually whether I can have access to current lecture material. I perceive this as unhelpful. My courses have always been in the open and everybody can have a look anytime what's on offer there."

- There was also mention of a more collegiate atmosphere around the preparation of course material so that lecturers can better work with, learn from, and have opportunities for peer review from each other.

  "I have all the tools I need. Interaction/review with other academics is the key need."

- A number of highly discipline specific tools for delivering content in lectures (i.e. UNIX terminals) were requested and a number of the requests were for features that are currently provided through wattle or would be trivially satisfied by the use of AContent.

Almost without exception the content authoring requirements of the staff within CECS would be satisfied by the use of the AContent authoring tool. As technical disciplines (of which engineering and computer science are two core disciplines in this domain) require the most content authoring capabilities the survey results indicate that AContent would also satisfy the content authoring needs of the majority, if not all, of the academic disciplines being taught within ANU.

This is not true of the current Wattle implementation where many of the authoring capabilities sought are not currently supported. This finding gives considerable weight to the idea of supplementing the current Wattle system with the AContent authoring system.

Academic willingness to adopt a new authoring tool

That a system satisfies the content authoring needs of users is one important facet of this analysis but determining how many would be wiling to adopt such a system is

also critically important. Using the survey of academics within CECS[5] it was determined that fifty percent of respondents would be interested in adopting a new tool that supported the necessary content types as input and could produce a variety of document types necessary for course delivery. In the context of this discussion this tool would be AContent and from the analysis of the AContent features the overwhelming majority of existing content could be supported by the AContent system.

Advantageously, one hundred percent of respondents who would be willing to adopt such a system would be willing to import their content into this system, offering an excellent opportunity for capturing existing content into the new standards based form offered by AContent.

From those respondents not willing to adopt such a system their reasons for not adopting a system included the following comments:

> *"Do not want my course content being stored in another location, I am sceptical that such a tool could be any more user-friendly than the fruits of the best efforts to date."*

> *"too application specific - if we move to another platform, or if I want to use the material in another forum, I would have to make changes that may be more time consuming that if I was using a more widely available software package."*

These concerns would not be well founded in the context of adopting AContent as the system is both easy to use, standards based (hence content is not locked in a proprietary form) and very flexible. The current development focus of AContent appears logical and well structured and the roadmap offers good support for necessary features. It is my belief that a well planned deployment and education program around the use of AContent with existing tools and methodologies would be likely to garner broad support amongst academics and over time would become the de-facto authoring tool both within CECS and across the ANU more broadly.

Necessary AContent improvements

While offering a powerful content authoring tool and repository the AContent system could benefit from additional capabilities. While the following list is not exhaustive the addition of these capabilities would render AContent suitable for widespread deployment in a production environment like CECS, or more broadly across ANU.

- o Ability to browse for files (instead of having to know the file name exactly) when including multimedia files in WYSWIG content authoring tool.
- o Version control (discussed in detail below)
- o Multiple user access to a single lesson (discussed in more detail below)
- o Support for IMS MetaData standard
- o Support for HTML5

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[5]https://spreadsheets.google.com/viewform?
hl=en&formkey=dHllQ3V0SVZGQWl5cFIyUnlCNzN6QXc6MQ#gid=0

    o   Inline conversion to a variety of other formats (i.e. PDF, PPT) for export.

    o   Inline conversion for importing other content.

Additional development that would prove useful for the many existing Moodle implementations would include adding the following capabilities to allow tight integration between the AContent authoring tool and the LMS being used:

    o   Incorporate the AContent system directly into the Moodle workflow.

    o   User management and administration via third party database (i.e. LDAP)

Incorporating AContent into the Moodle workflow would increase the ease with which existing Moodle users can adopt the new authoring tools and take advantage of the AContent advantages. This implementation would not directly replace the existing tools within Moodle as direct implementation of AContent into Moodle may result in many of the deficits already faced by integrated systems, as was discussed in a previous report[6].

The documentation for AContent is not sufficient, thus for an enterprise deployment (such as in CECS) it would be necessary to ensure the following documentation were available and useful:

    o   Author documentation

    o   Administrator documentation

    o   Installation, support and development documentation

AContent Development Plan

A proposal for the development of AContent to overcome its current deficits is currently being prepared and would constitute the next step forward in creating a future-proof repository for the creation and storage of highly modular, reusable and standards based content. The quote will be provided as soon as can be arranged and will likely be available for the final version of this report.

Configuration of the AContent repository

At its current version, and at the time of writing, the AContent repository requires a server with the following capabilities[7].

- HTTP Web Server. (The Apache[8] web server is highly recommended)
- MySQL[9] - 4.1.10+
- PHP[10] 5.0.2+ with the following libraries installed:

    o   --with-apxs2=/usr/local/apache2/bin/apxs

    o   --with-mysql

    o   --with-zlib

    o   --with-curl

    o   --enable-mbstring

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[6] Lachlan Blackhall, *Educational Content Authoring Tools*, 2011

[7] http://atutor.ca/atutor/docs/requirements.php

[8] http://apache.org/

[9] http://www.mysql.com/

[10] http://www.php.net/

o   --with-gd
  o   --with-jpeg-dir=/usr/lib

Installation is automated and very simple and the base configuration is suitable for immediate deployment to content authors.

Using AContent in conjunction with Wattle

In the ANU context the Wattle LMS offers a vast array of capabilities, only one of which is content authoring. In order to utilise AContent it is important to understand how AContent can be used in conjunction with Wattle to deliver content created within AContent.

Providing content to Wattle from AContent

Using AContent alongside Wattle can be accomplished in three ways, depending on the development pathway that Moodle (and hence Wattle) adopts in future. In the current versions of both systems there are two ways to use Wattle to distribute content created in AContent. Details of these possibilities can be seen in Figure 1 and Figure 2. If Moodle were able to support live content then content could be provided to Moodle using the approach detailed in Figure 3.

In Figure 1 content created within AContent is exported using the IMS content packages or IMS common cartridges and can then be uploaded into Wattle for dissemination to students. This has the disadvantage that changes within AContent require content to be exported and imported again into Wattle.
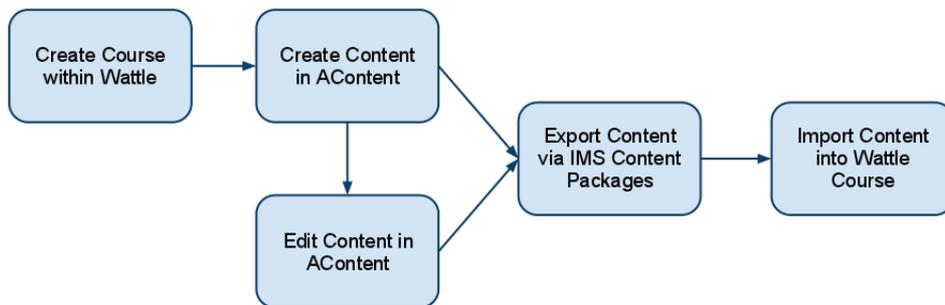

Figure 1 - As a standalone tool, changes in content within AContent must be exported and uploaded into Wattle for the changes to take effect.

In Figure 2 Wattle links to the live public facing web site of the course of interest created in AContent. This eliminates the need for exporting and re-importing to Wattle when the content changes but means that students will be accessing content outside of Wattle, something that may not be desirable given the emphasis on the use of Wattle within ANU. Such an implementation may also lead to student confusion over which system does what, something that would surely impact learning outcomes.
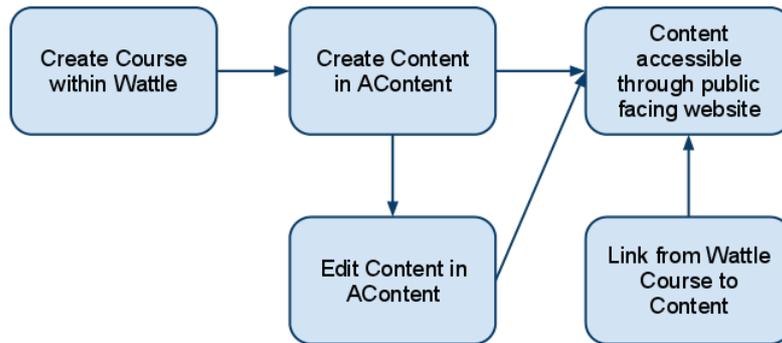
Figure 2 – Courses within Wattle could access material developed in AContent by linking directly to it, instead of importing it into Wattle.

In Figure 3 we see how live content can be accessed using the OAuth and Web service capabilities of AContent. While Wattle does currently support live access it could no doubt be upgraded to support this capability and this would likely be the optimal solution for the long term integration of Wattle and AContent.
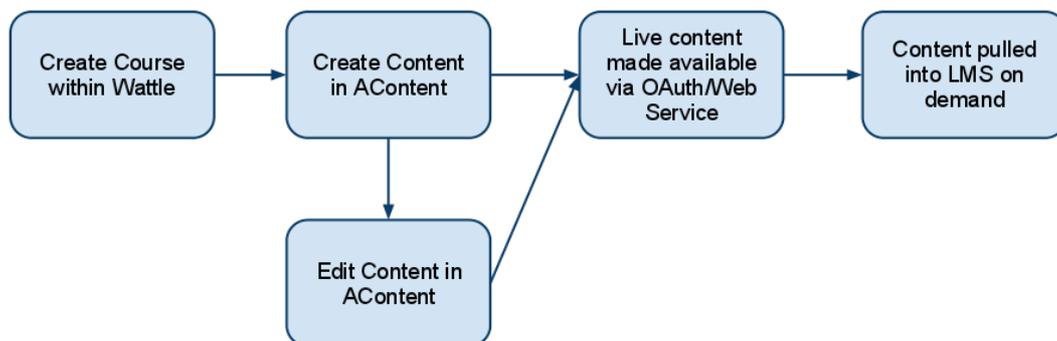

Figure 3 – With a compliant LMS (which unfortunately Moodle is currently not) it is possible to access live content from AContent thus ensuring that the most up to date content is available to students.

It should be noted that quizzes and tests created within AContent cannot be directly exported to Moodle / Wattle as the IMS QTI standard supported by AContent is yet to be supported by Moodle. This may change with the advent of Moodle 2.0[11] suggesting that Wattle may support the IMS QTI, and hence AContent quizzes and tests within the next six to twelve months. Alternatively it would be possible to develop an IMS QTI to Moodle XML conversion filter but this would require additional development time and costs and is a poor solution given the availability of an excellent interoperability standard like IMS QTI.

Administrative control of AContent

AContent is a standalone tool which comes with many benefits, most important of which is that it has a dedicated task and is not tied to the effectiveness and usability of other tools, within which it is embedded.

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[11] http://moodle.org/mod/forum/discuss.php?d=162022 and http://moodle.org/mod/forum/discuss.php?d=154888

Being standalone however has the disadvantage that it is not embedded within the user management capabilities of existing LMS, including Wattle. This creates an additional administrative overhead for the successful implementation and management of the AContent system.

In its current form AContent requires an administrator account on the AContent system to manage the AContent repository. However, users are able to register and start creating content themselves without requiring administrative permissions. As the user management uses an SQL database it would be possible to populate the users database using an existing user database. With minor modifications to AContent it should also be possible to use existing third party authentication services like LDAP, a service already supported within ANU[12].

In terms of administrative control over the content being created it would be possible to allow 'admin' access to certain content if and when multi-user editing was allowed within AContent.

It would also be ideal if AContent could be embedded within Moodle, and other LMS, so that users could use a native content editor and repository without having to leave the LMS they are used to working with.

Version control for AContent

Version control is the ability to manage various versions of an object, be that a single file, directory, or data structure, for the purpose of keeping track of updates or changes to the object over time. In this instance version control will refer to the ability to manage individual lessons as they are created, changed and updated by the content authors.

In this instance version control would be used to allow multiple users to edit a single lesson whilst maintaining a history of all the changes made to the lesson. Unlike traditional version control methods where new branches of the object allow independent editing channels there is no reason for this in the creation of educational content. This is so primarily because the granularity of teaching content implies that each lesson is likely to be authored by a single author, and branches would most likely correspond to new versions of a course thus content would likely be copied into the new course, rather than maintained as a branch of the initial course repository.

Allowing multiple authors to work on a single lesson while maintaining accurate version control requires a versioning system that ensures each new version is given a unique identity, each version is appropriately stored, and there is a concurrency methodology in place to ensure that changes to the object are appropriately committed.

There are two primary concurrency methodologies: locking and merging. Locking prevent the object being edited when another user is in the process of editing it, whilst merging allows simultaneous editing and then requires multiple copies to be merged into a single version within the repository.

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[12] http://information.anu.edu.au/daisy/infoservices/2225/25/1400.html

Due to the long time frames for creating educational content and the minimal number of authors likely to be involved it is unlikely that being able to merge multiple copies is a necessity. For this reason it would be reasonable to consider that a simple versioning system that supports multi-user access and a locking concurrency system would be the appropriate way to proceed. Such an implementation is currently in the process of being costed for implementation into future versions of AContent.

Porting and importing existing content into AContent

Being able to effectively and easily convert existing educational content into the native AContent format would greatly increase the effectiveness of the AContent system. Fortunately, AContent uses standard HTML encoding, with customised mark-up for special content types. For this reason it will be possible to import existing content provided that content can be converted to HTML and there is a great deal of information available regarding converting to and from the HTML format[13].

The major challenge with any format conversion will be addressing the needs of mathematical and scientific notation in existing documents. Mathematical and scientific notation typically uses a proprietary format in existing document types and thus the conversion is non-standard and document specific. Within the HTML standard the representation of mathematical and scientific notation is governed by the MathML standard and thus this is the export standard that would need to be supported when converting documents containing mathematical and scientific formulae.

We will be investigating the following document formats for conversion into AContent:
- PDF
- PPT/PPTX
- DOC/DOCX
- ODT/ODF
- TXT/RTF
- TEX

PDF

Converting from PDF to HTML is possible in a number of ways but due to the manner in which PDF is formatted it is likely that a small amount of clean-up will always be required.

There is a significant list of available software[14] that can convert PDF directly to HTML and a number of online services that will do this for free[15]. While the majority of the content and formatting will be preserved this cannot be guaranteed. Mathematics formulae rendered in PDF will be exported as images in the final HTML file.

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[13] http://www.w3.org/Tools/Filters.html
[14] http://en.wikipedia.org/wiki/List_of_PDF_software
[15] http://www.convertpdftohtml.net/

If such mathematics were rendered from an original TEX (or other file) file then working directly with the TEX file is the best point at which to attempt conversion to HTML, and thus to AContent. If the original file is unavailable then the PDF file should be converted to HTML and then the MathML content can be added manually. This could be quite time consuming depending on the length of the PDF file in question.

PPT/PPTX and DOC/DOCX

The DOC and PPT format used a proprietary equation editor so converting to HTML, using either word directly or a command line tool[16] will result in the text being exported directly but the equations being transformed into images and the MathML content will need to be added manually.

The DOCX and PPTX formats store the equations in a more compliant fashion and thus it is possible to convert DOCX files to XHTML with MathML support, although this process is not necessarily trivial[17]

ODF

Converting from the OpenOffice suite of programs can be accomplished in a number of ways. Using the software directly it is possible to export to HTML format. In this case any content is converted well and equations created within OpenOffice are exported as images. It is possible to obtain a plug-in[18] for OpenOffice that will export documents to XHTML whilst converting any equations into well formed MathML.

TXT/RTF

TXT and RTF formats are quite basic formats and thus conversion to HTML is trivial. This can be achieved through dedicated conversion programs or simply through the use of Microsoft Word or OpenOffice programs, both of which are able to work directly with these file formats.

TEX

There are a number of TEX to HTML conversion programs[19] supporting MathML and equations. The TEX format is particularly suited to HTML conversion due simply to the fact that TEX is a format for typesetting.

Existing Wattle / Moodle Content

Exporting content from Wattle into AContent cannot be accomplished readily unless the content within Wattle is created using the Moodle Book module. This is primarily due to the proprietary standards used to store Moodle based content. The Moodle book however can be exported as an IMS Content Package making it simple to import into AContent, where it can be further edited, stored and then exported back to Wattle as required using one of the methodologies discussed previously in this report.

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[16] http://www.artofsolving.com/opensource/jodconverter
[17] http://en.wikipedia.org/wiki/Microsoft_Equation_Editor,
http://dpcarlisle.blogspot.com/2007/04/xhtml-and-mathml-from-office-20007.html
[18] http://writer2latex.sourceforge.net/
[19] http://www.w3.org/Tools/Word_proc_filters.html

Exporting content from the AContent repository

Having the ability to create and disseminate content in an HTML compliant manner is highly important but there are still occasions when it would be appropriate to provide the content in other formats. Converting from HTML to a variety of other formats can be achieved with a variety of proprietary and open source tools[20]. Many of these tools can be automated to produce the requisite formats on demand. While this service is not currently provided within AContent development of this capability is an import next step in the advancement of the AContent system.

Using AContent on mobile devices

Portable devices, including smart phones (iPhone, Android, etc…), tablets (iPad, Android, etc..) and networked and embedded devices are rapidly emerging as a key method for consuming content of all types, especially rich multimedia like audio and video. This push has come at a similar time to the emergence of web standards (in the form of HTML5) that natively support this content. HTML5 represents the first truly, multi-platform, standards based content format and as such is rapidly becoming the de-facto standard for disseminating online content.

In ensuring that content stored in AContent can be disseminated to mobile devices it is thus sufficient that the content can be made available in HTML5 format. AContent already has support for HTML and XHTML and will hopefully soon have support for HTML5 thus trivially facilitating this capability.

Compliance Analysis

Using a tool such as AContent that requires additional work, beyond creating the content, to ensure that content is accessible, has appropriate metadata, and providing additional content types for access by people with a disability will create additional compliance costs in both time for content authors, and therefore money for their employers. This increase in compliance costs for the initial creation of the content however is offset by the simplicity with which content can be reused in both the same and other courses and appropriate storage, labelling (through metadata), and access will mean that the ongoing costs of maintaining the content will be significantly reduced. This implies that over a short term period the additional compliance costs will be greater but that they will suffer a marked decline over multiple teaching periods.

Costs of compliance for Accessibility and Other Standards with AContent

The following standards would require additional work to ensure compliance when creating content with AContent:
- o WCAG
- o W3C HTML
- o Metadata
- o Course Descriptions
- o Access for All

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[20] http://www.w3.org/Tools/html2things.html, http://www.htmldoc.org/

Assessing the WCAG and HTML compliance of course material created within AContent is based on the result of online, real-time tests made available by the W3C[21]. These tests are typically conducted once; at the end of course development and necessary changes can be implemented to ensure compliance is achieved. This should be a small additional cost in terms of time

Whilst WCAG and W3C HTML compliance are normally assessed at the completion of content development the course descriptions and metadata are typically created when the course is created. Again, the compliance costs of these details are minimal while greatly adding to the effectiveness of the content repository.

The remaining compliance cost is that of supporting the IMS Access-For-All standard. This standard provides support for multiple content types for a single content object within the course content. For example an image may also have a written explanation and a video or audio explanation to ensure that students with a disability have the greatest chance for accessing the content. Supporting this standard could require significant additional course creation costs due to the extra work required to create the additional content. The trade-off is of course complete support for students with a disability and increased capabilities of addressing the needs of students with different learning modalities. In fact it should be realised that supporting students with a disability also directly increases the overall effectiveness of course content.

While the compliance costs for supporting Access For All, and the other standards listed above, could be significant there are other factors in the compliance argument, detailed below, that may necessarily require, or even statutorily mandate, that such standards are supported.

Other Factors on the Costs of Compliance

To directly measure the costs of compliance for meeting disability standards, of which Access for All and WCAG are two important standards, is a difficult challenge. A measure of the time taken for such compliance is an obvious example but such a direct measure must also be balanced against the risks inherent in not addressing such standards. Such risks include intangible risks to the brand value of ANU if there is a perception that institutions do not value such standards, leading to a reduction in attendance from those who perceive, or need, such standards to be supported. The further risk is to the possible civil redress available to students who feel they have been disadvantaged by a failure to meet their disability and other access needs. Such redress could result in significant financial impact to the institution through being sued.

Other risks include a mandated policy from the government that the institution must meet such standards which could imply a greater financial burden if the work is required to be completed on short notice.

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[21] http://www.w3.org/

In addressing the possible implications we can look initially to the ANU Equal Opportunity Policy[22] where it is stated that

> ANU will **promote inclusive work and study environments** that value the diversity of backgrounds and perspectives of the University community.

And that ANU intends

> to eliminate discrimination on the grounds of ...; **disability**...

and that equal opportunity in education

> includes the principle of selection and assessment of students on merit, which **precludes irrelevant personal attributes**. Fair and transparent processes are applied in assessing the capacity of a student against specified requirements **to access and participate in** educational programs.

In the context of creating educational content the failure to provide accessible and disability standards based content would be in direct violation of the ANU Equal Opportunity Policy and could leave the university liable to recourse by students. It would obviously also impact the view of ANU being the best university in Australia.

The Australian Government also recently announced that all government websites need to conform to the WCAG 2.0 standard moving from level 'A' compliance in 2012 to double 'A' compliance by 2015[23]. That the government is mandating such conformance implies that government institutions can surely not be far behind, thus implying that ANU may be required to meet such standards in the not too distant future.

More broadly there is a move to ensure that all web based and digital content is standards based and disability friendly and recent moves in this direction against Google[24] are notable in that even large companies are currently struggling to meet these standards. Given that universities are important cultural and social institutions it is appropriate and proper that universities, through their education and actions, look to set the benchmark for uptake of these standards.

Inter-Institutional Content Reuse with AContent

Truly modular, reusable, compelling digital content has great potential to be reused between institutions. Facilitating the sharing of such content, through either paid or unpaid licenses could be facilitated quite simply within AContent.

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[22] http://policies.anu.edu.au/policies/equal_opportunity_policy/policy
[23] http://webguide.gov.au/accessibility-usability/
[24] http://www.techworld.com.au/article/379869/google_apps_slammed_by_advocacy_group_blind/

As AContent supports the IMS content packages standard any content created within AContent can be exported directly to other IMS compliant systems. In the first instance this would mean that universities could share content simply by exporting the necessary courses as IMS packages and sending them to other institutions.

In the longer term it is possible that a marketplace for such course material may develop. In this instance additional strategies will be needed to manage the licensing of such course content but the native format of AContent will still ensure that course material can be easily transferred between institutions. Managing the licensing of AContent courses could be achieved through the use of the OAuth and Web Service provisions currently supported within AContent. Although both OAuth and the Web Service are only in the infancy of being supported the complete development of these services within AContent will offer a powerful capability for inter-institutional sharing, licensing and reuse of content.