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Annotum: launching a peer-reviewed journal online for free

Carl LEUBSDORF, Jr
Solvitor, LLC

Despite the growth of numerous open and free tools for creating, curating, and publishing content on the Internet, the process of authoring and publishing scholarly journals remains an expensive, time-consuming process that can require significant up-front investment and technical expertise. Annotum, an open source, open access, open process authoring and publishing system based on WordPress, provides a simple, free tool for creating peer-reviewed scholarly journals online.z

Introduction

In the second decade of the twenty-first century, creating a high-quality publication with rich content, beautiful design, and readership numbering in the millions has become easier than at any other time in history. Micro, mid-sized, and long-form content can be produced and distributed free using tools such as Twitter, Tumblr, and WordPress, among many others. At the same time, costs and competitive pressures are rising in the scholarly publishing world, from open access mandates that require free distribution of content to increasing competition among journals and growing staff and review costs.

And yet in the face of these two trends, the process of authoring and publishing scholarly journals remains an expensive, time-consuming process that can require significant up-front investment and technical expertise. Some electronic scholarly publishing systems exist, but they provide at best only rudimentary authoring tools, and tend to be very expensive and difficult to operate and maintain. It is as if the entire revolution in online, web-based content authoring and publishing tools has passed by the scientific publishing community.

Annotum, an open source, open access, open process authoring and publishing system based on WordPress, was created to provide a simple and free tool to allow anyone to create peer-reviewed scholarly journals online.

Project background

The inspiration for Annotum came from the Public Library of Science's (PLoS) *Currents* publication, a quick-turnaround, online journal launched as *PLoS: Currents Influenza* in 2009. *PLoS: Currents* was developed to speed up the process of disseminating new science – in stark contrast to the sometimes

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Figure 1. Published articles contain rich formatting including figures, equations, and tables, a complate citation, author information, and the ability to download each article in (NLM-compatibile) XML or PDF

one-year (or longer) peer-review cycle of traditional journals or even the 100-day cycle of PLoS One, *PLoS: Currents*' review cycle is as short as one day from submission to review and publication.

Currents is published using Google Knol (http://knol.google.com/), an article authoring, collaboration, and hosting service that provides a free, web-based authoring and hosting environment. Knol provides a feature-rich, browser-based editor, and its moderated collection feature allows for a simple, yet complete, online peer-review process. Once approved, articles appear immediately online, and via an arrangement with PubMed Central (PMC) are quickly imported and made available within that repository.

However, the Knol platform has a number of limitations.

Firstly, compatibility with PMC's XML format has been a challenge. Although Knol can be coaxed into emitting a reasonable form of XML output, a lack of authoring-side controls means that quite a bit of poorly structured content has to be removed, sometimes via hand-editing the exported XML. This is a real limitation when it comes to automatically importing the article into a central repository such as PMC.

For example, when using a web-based tool, or Microsoft Word for that matter, authors may select a heading style for headings, or they may simply make the heading text boldface with a larger font size. To the eye, or in print, headings marked in these disparate ways may appear exactly the same, but for tagging purposes the headings not explicitly tagged as such will not show up in a table of contents or other summary based on tags.

The lack of a robust structure in the output from Knol (or from Word and most other common or free tools) has spawned an entire industry of XML tagging and formatting tools and services, most of which either work poorly or cost a lot (up to several thousand dollars per license or more). Annotum creates structured XML for free, although it does put the 'burden' of imposing content structure squarely on the author of that content.

A second limitation of Knol is that it pro-

vides only limited presentation and customization options. Users cannot alter the basic design, which is spartan if not unattractive. And customizing the Knol workflow or adding new features is simply not possible on the Google-hosted platform.

Given the very real benefits of the Knol platform in enabling the publication of *PLoS: Currents*, but also the limitations outlined above, Google decided to fund the creation of a successor system that would continue the rapid review and publishing of web-based scientific publications while also addressing some of the Knol system's limitations.

That system, designed and built by the author, is called Annotum. NB: 'Annotum', aside from being a relatively short and easy-to-spell (for English speakers) word that was available as a .org and .com domain name, comes from the Latin for an individual annotation.

Project objectives

The overall objective for Annotum version 1.0 is to develop a simple, robust, easy-to-use scholarly authoring and publishing system that:

- Allows publication owners to produce peer-reviewed journals online.
- Allows authors collaboratively to create content in structured XML.
- Supports rich designs and multiple output formats (e.g. PDF, XML).
- Provides extensive customization and flexible hosting options via open source code:
  - publications should be inexpensive (or free) to host/export;
  - system should require minimal technical skills to install, configure, operate, and maintain.

Of course, Annotum version 1.0 is not intended to replace all print/online journals, tools, and/or systems. Annotum 1.0 is an incremental step, but not the ultimate one, in the evolution of scientific publishing systems.

Project approach

When considering the goals for Annotum, an obvious question arises: why not use an existing publishing system? For example, the Public Knowledge Project's (PKP) OpenJournal System (OJS) and Phase2 Technology's OpenPublish provide complete online publishing systems including workflow; many existing scientific and other publications use these systems in production and have done so for years. Some standalone product offerings are also quite robust, such as Inera's eXtyles or the Microsoft Word Article Authoring add-in – these focus on the creation of standards-compliant XML from word-processing documents. And outside the scientific publishing sphere, the open source WordPress software provides a

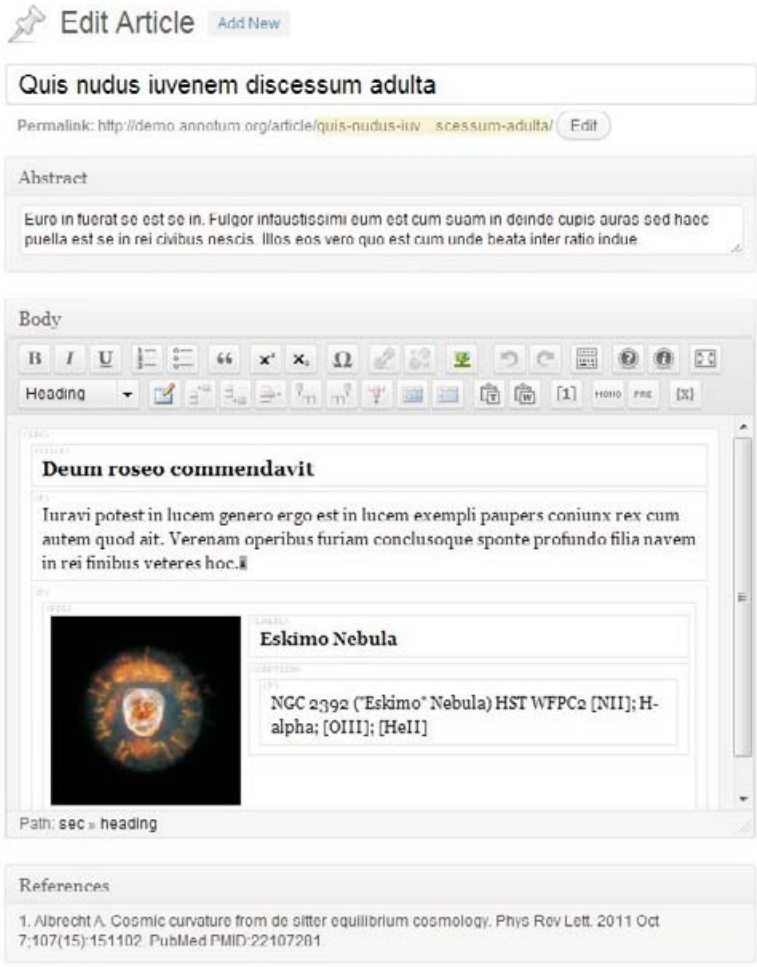

Figure 2. The Annotum article editor provides a WYMIWYG (What you *mean* is what you get) interface for authors, and includes text formatting (bold, italic, underline), lists, numbering, tables, and more.

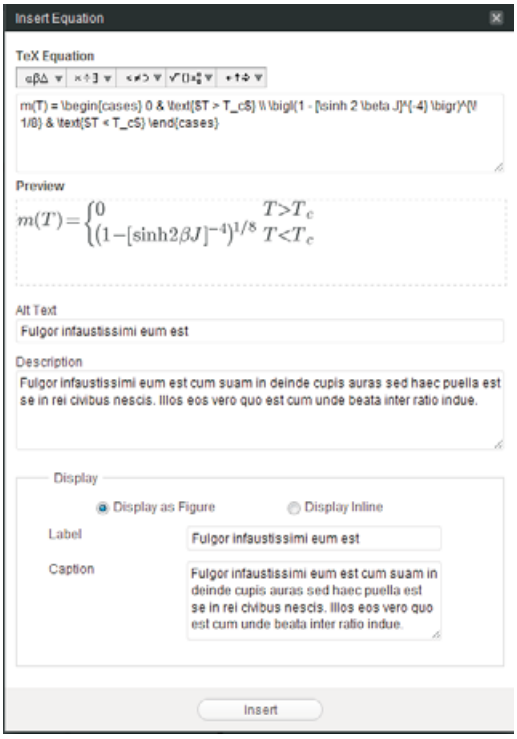

Figure 3. Inserting an equation

maintenance and operation of OJS usually requires at least one full-time technician

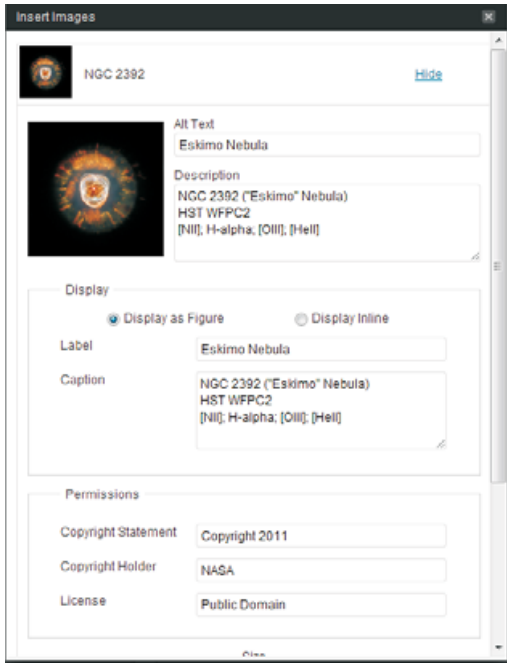

Figure 4. Inserting a figure

comprehensive content management system (CMS) with extremely simple set-up and

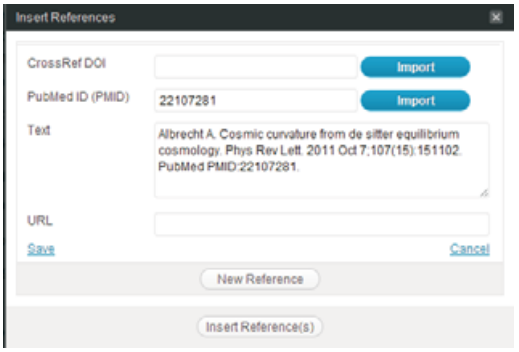

Figure 5. Inserting a reference; PMID lookup

free (on WordPress.com) or very inexpensive hosting options.

The main options considered as a starting point for Annotum were OJS, OpenPublish, and WordPress. All of these platforms have limitations; OpenPublish and OJS both provide options for publications out of the box – subscription models and highly configurable workflow options for example. But they also tend to be rather complicated systems to set up and maintain. Upgrades for Drupal (the platform on which OpenPublish is based) are time-consuming and complex; maintenance and operation of OJS usually requires at least one full-time technician, making it beyond the reach of a small research group. Other limitations surfaced: WordPress has no workflow built-in; conversely OJS and OpenPublish do have a very robust – but perhaps overly complex – workflow functionality, well beyond what is required for the *Currents*-style peer-review process. Finally, OJS is more of a document handling system with no provision for web-based editing of articles, a key Annotum requirement.

After the initial review, OJS and WordPress made the short list. Both are open source, both are extensible via a plugin architecture, and both support customized templates (themes) for presentation. In the final analysis OJS's complex maintenance needs, complex workflow system, and lack of the core web-based editing capability led us to select WordPress as the basis for Annotum version 1.0.

WordPress is extremely simple to set up and run, with numerous free or inexpensive hosting options available, and it comes with

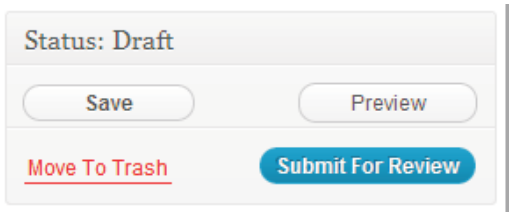

Figure 6. Workflow, step 1: Click to submit your article for review

Figure 7. Workflow, step 2: Reviewers enter comments and choose Approve, Reject, or Request Revision.

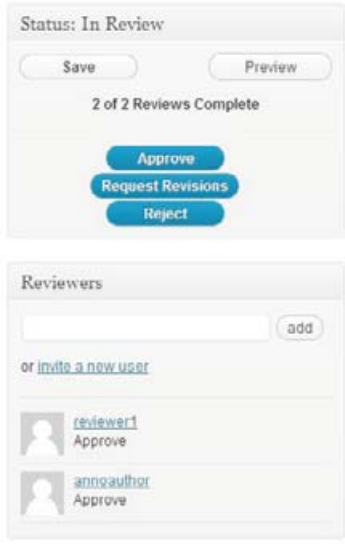

Figure 8. Workflow, step 3: The lead reviewer (editor) makes the final decision.

Figure 9. Workflow, step 4: After approval, articles may be published with a single click immediately, or according to a schedule for

a rich set of user-friendly, web-based editing controls. Moreover, WordPress functionality is easily extended using plugins and themes. One could argue that OJS is also extensible, but the WordPress platform has spawned a far more diverse and productive 'ecosystem' of developers for themes, plugins, and extensions, offering a much larger set of options for adding functionality to Annotum in the future. And finally, the set-up and operation of a WordPress site is among the simplest of any web-based application. On WordPress.com, for example, users with an account need only provide a name for their site to have a fully functioning site available in a single click.

WordPress, whether as a hosted service (WordPress.com) or the open-source and freely downloadable software package (WordPress.org), has seen extremely wide adoption for a very broad range of web sites:

- 14.7% of the top million websites worldwide, and 22% of new, active domains in the US are running WordPress (http://wordpress.org/news/2011/08/state-of-the-word/).
- 71.2 million sites run WordPress software, about one-half of which are hosted on WordPress.com (http://en.wordpress.com/stats/).
- Over 354 million people view more than 2.5 billion pages per month on WordPress.com (http://en.wordpress.com/stats/).

Of course, setting up a journal authoring, review, and publishing system is not a popularity contest – but it is important to recognize the real benefits of using a platform with a very large user and developer/designer base. Because so many people use WordPress, journal publishers using a WordPress-based CMS have literally thousands of existing development and design shops, and themes and plugins, from which to choose.

Despite these many advantages, for the Annotum project WordPress is missing some key requirements:

Figure 10. A group of collaborators use a local Annotum installation to author and collaborate on a series of articles, which are then published on the web or printed (PDF) for distribution to their friends and colleagues.

Annotum version 1.0 has officially launched on WordPress.com as a free hosted theme

- Support for multiple author and version control/comparison.
- Peer-review workflow with appropriate roles and permissions.
- Scholarly features:
  - reference handling including import via CrossRef DOIs and PubMed IDs;
  - equations, headings, figures, and tables (all properly structured with labels, captions, etc.).
- Export to and import from appropriate XML formats such as the NLM/PubMed Journal Article DTD.

Annotum is provided as open-source software – all software code and other materials will be made available to the open-source community for use and future enhancement or development. More information about Annotum can be found at the Annotum_site (http://annotum.wordpress.com), and the theme is available on WordPress.org (http://wordpress.org/extend/themes/annotum).

The Annotum WordPress theme

As of this writing (November 2011), Annotum version 1.0 has officially launched on WordPress.com as a free hosted theme, allowing anyone to create a scholarly, peer-reviewed journal with all of the features listed in this article at zero cost with very little, if any, technical expertise required.

Annotum 1.0 is also available on WordPress.org (http://wordpress.org/ extend/themes/annotum) for installation on self-hosted (.org) WordPress sites.

The following section describes some technical details about how Annotum is implemented, and is followed by a brief walk-through of key Annotum features and set-up.

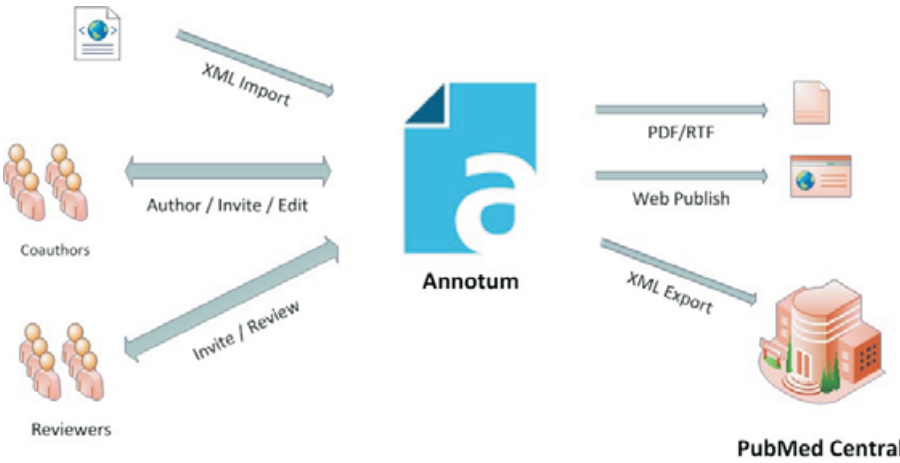

Figure 11. An online journal or university site accepts submissions via XML import or content authored on its in-house Annotum system. The Journal can use Annotum editorial workflow features, or those of any existing system they prefer. Approved, reviewed articles are published to the web and/or exported in XML format to a public repository such as NLM’s PubMed Central.

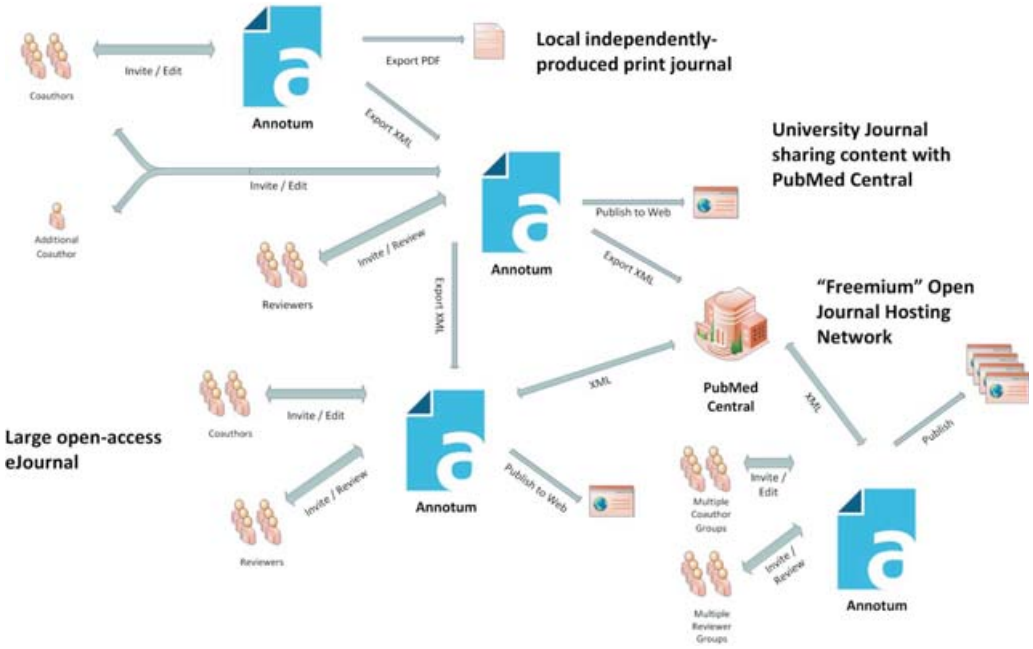

Figure 12. A somewhat more expansive system vision with multiple publicly- and privately-hosted Annotum systems, collection of articles into journals and textbooks, and other scenarios.

Annotum implementation

Annotum is provided as a single WordPress theme, including its own plugins, templates, and custom code. Although some features are already available as stand-alone plugins for WordPress, a key design philosophy of Annotum was to keep the installation as simple as possible. WordPress plugins and themes can at times conflict; the Annotum team sought to reduce the chance of such conflicts by having a single theme contain all of the features to be delivered.

The Annotum theme is based on the Carrington theme engine (http://carringtontheme.com/), a CMS framework provided by Crowd Favorite Ltd, who also provided software engineering resources for Annotum. Carrington provides an elegant framework for creating sophisticated WordPress themes, and supports multiple child themes for sites with multiple publications (e.g. a professional society with multiple journals or sections, as with *PLoS: Currents*). In Annotum the Carrington engine is enhanced with a workflow and permissions engine, along with a custom post type ('article') that supports the additional requirements. An enhanced editor rounds out the package.

One specific feature of Annotum deserves some mention: support for (enforcement of) structured XML content in the editor. In order to ensure clean, well-formed XML output, Annotum provides only a very basic and simple set of text formatting options, and rigorously strips from the content any tags or other elements that are not compliant. This entails some overhead for the author, particularly if he or she has spent time laboriously crafting a document in Microsoft Word and, for example, formatted all of the headings using sized fonts rather than a heading style. Once pasted into Annotum the font sizes are stripped out. This somewhat Draconian approach is essential to ensuring structure conformance at authoring time.

Annotum feature walkthrough and demo

Features for journal readers

- Articles
  - citation and author information
  - author page/listing – Outputs: print, XML, PDF
- Widgets, menus, RSS

Authoring features

- Login and article creation
- The main editor
  - entering and formatting text, adding headings, adding new sections
  - full-screen mode
  - adding and inserting figures
  - adding and inserting equations
  - adding and inserting tables
  - adding and inserting quotations (block quotes)
  - adding and inserting references
- Collaboration
  - adding coauthors
  - revisions
  - internal comments
  - submitting an article for review
- Advanced editing controls
  - Import XML
  - cloning and article
  - featured images, carousel
  - editing permalinks
  - audit log

it is possible to envision several compelling use cases from individual groups of interested parties self-publishing journals to an entire ecosystem of content reuse and republication

Peer review: submission and workflow

- About permissions
- Workflow diagram
- Adding reviewers
- Reviewing an article
- Accept/reject/revise

Setting up a working Journal

- Annotum installation/set-up
- Setting configuration options
  - adding users: editors, reviewers, authors
  - design and layout options
- Customizing (for self-hosted journals)

If the publication has made arrangements with PMC for inclusion of published work in the repository, PMC will monitor that publication's Annotum RSS feed for newly published articles. When a new article is available, PMC will download the XML version and import it directly into PMC for publication there.

Conclusions

Annotum significantly reduces the barriers to entry for new, scientific journals built on the type of rapid-review process pioneered by *PLoS: Currents*. It is hoped that Annotum's free software and free hosting options will spur the development of a vibrant open-source community, whereby scholars and others can contribute new features and foster the spread and improvement of this publishing tool.

Where can this growth lead? Given the ability of Annotum both to import and export structured, scholarly content, it is possible to envision several compelling use cases from individual groups of interested parties self-publishing journals to an entire ecosystem of content reuse and republication across professional societies, individuals, universities, and public knowledge repositories such as PMC.

For more information about Annotum, please visit the Annotum homepage (http://annotum.org/), download the code from WordPress.org (http://wordpress.org/extend/themes/annotum), or set up your own Annotum site for free at WordPress.com (http://wordpress.com/), or follow @annotum on twitter.

The author may be reached via solvitor.com or directly at annotum@solvitor.com.

Postscript

At press time, nearly 5,000 sites on WordPress.com were using the Annotum theme, and the theme software had been downloaded from WordPress.org over 35,000 times.

Acknowledgments

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Annotum is free (speech and beer).

Portions adapted from Annotum: an open-source authoring and publishing platform based on WordPress, Proceedings of the Journal Article Tag Suite Conference 2011 (http://www.ncbi.nlm.nih.gov/books/NBK63828/). Bethesda, MD, National Center for Biotechnology Information, 2011.

Carl LEUBSDORF, Jr
Solvitor, LLC
Email: annotum@solvitor.com