

A Web-based Platform for Collaborative Document Management in Radiotherapy

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Summary

We describe *DepDocs*, a web-based platform that we have developed to manage the committee meetings, policies, procedures and other documents within our otherwise paperless radiotherapy clinic. DepDocs is essentially a document management system based on the popular Drupal content management software. For security and confidentiality, it is hosted on a linux server internal to our hospital network such that documents are never sent to the *cloud* or outside of the hospital firewall.

We used Drupal's in-built role-based user rights management system to assign a role, and associated document editing rights, to each user. Documents are accessed for viewing using either a simple Google-like search or by generating a list of related documents from a taxonomy of categorization terms. Our system provides document revision tracking and a document review and approval mechanism for all official policies and procedures. Committee meeting schedules, agendas and minutes are maintained by committee chairs and are restricted to committee members.

DepDocs has been operational within our department for over six months and has already 45 unique users and an archive of over 1000 documents, mostly policies and procedures. Documents are easily retrievable from the system using any web browser within our hospital's network.

1. Introduction/Background

Document management in the healthcare environment is a vexing task. On one hand it is important for decision-makers to publish policies and procedures and to share them with the clinical team. On the other hand, document writing can be very time-consuming and a policy and procedure handbook requires continuous maintenance in order to be kept current.

Many radiotherapy centres, such as our own, have organically evolved from using paper memos and paper handbooks to using email memos and shared hard drives. For small departments this solution works quite well. However, for larger departments the shared hard drive and email solution ultimately falls apart under the load and complexity of the documents that must be managed. After an attempt to address the document management problem at our centre using a Wiki, we decided to develop our own custom-built Drupal-based platform for document management.

1.1 Drupal

Drupal (www.drupal.org) is a popular free and open-source content management framework written in PHP and distributed under the GNU General Public License. It consists of a backbone website management toolkit, known as *Drupal Core*, and a plethora of add-on modules developed by Drupal users around the world that expand the functionality of the backbone software.

Drupal is inherently role based. Each user of the system has a unique username and password and is assigned a role with associated user rights. User rights include administrative management of the backbone software and/or role-specific permissions for document creation, viewing and editing.

2 DepDocs

To address the need for comprehensive and user-friendly document management software at our centre we investigated possible web-based tools. With its user rights management and wealth of add-on modules, Drupal offered an almost out-of-the box solution to our document management problem. However, Drupal is designed primarily as a content management tool for websites and so does not necessarily lend itself easily to document management tasks.

To render Drupal more suitable for document management, we assembled and configured approximately 30 add-on modules that provided us with a system for creation, uploading and editing of documents online. We called our initial tool *DepDocs* and released it to the physicists within our clinic on a trial basis. Based on feedback from its initial users, we have refined DepDocs to include a user-specific dashboard, a document review and approval system, and a facility for simple Google-like document retrieval.

We are currently increasing the use of DepDocs within our department and investigating possible expansion within our hospital and beyond. Figure 1 presents a screenshot of DepDocs.

The screenshot displays the DepDocs web interface. At the top, there are navigation tabs for 'About', 'Dashboard', 'Documents' (highlighted in red), and 'Committee'. Below the navigation is the 'DepDocs' header with the subtitle 'Departmental Documents and Online Resources'. A search bar and a 'Log out' link are visible on the right. The main content area features three large icons for document creation: 'Note' (with a red notepad icon), 'File' (with a red folder icon), and 'Spreadsheet' (with a red spreadsheet icon). Below these icons are buttons for 'Create in Browser' and 'Add/Upload'. A 'Filtering Documents' section follows, with instructions to use filters below. It includes input fields for 'Author (optional)', 'Search Title (optional)', 'From date (optional)', and 'To date (optional)'. Below these are dropdown menus for 'Published' (set to '- Any -'), 'Document Type' (set to '- Any -'), and 'Category' (with options for 'Physicists', 'QA', and 'Patient DQA'). 'Apply Filter' and 'Reset Filter' buttons are also present. The main part of the interface is a table listing documents with columns for 'Title (hover title for brief summary)', 'Content Type', 'Updated', '- Author - (Permissions)', and 'Download File'. The table contains several entries, including 'Tomo DQA Schedule', 'Mapcheck 2 Manual', 'Film DQA Results', 'Tomo DQA with Ion Chamber', 'Tomo DQA Coverage', and 'MAPCHECK 2 Instructions for Use and QA'. At the bottom, there is a footer with the text 'New To DepDocs? Optimized for Chrome, Firefox & Safari Changes to DepDocs'.

Title (hover title for brief summary)	Content Type	Updated	- Author - (Permissions)	Download File
• Tomo DQA Schedule	Spreadsheet	Wed, 2013-10-09 11:51		No File
• Mapcheck 2 Manual	Miscellaneous File	Wed, 2013-10-09 15:02		mapcheck2referenceguidecopy.pdf
• Film DQA Results	Miscellaneous File	Thu, 2013-12-05 16:52		results.pdf
• Tomo DQA with Ion Chamber	Procedure	Tue, 2013-12-10 16:32		No File
• Tomo DQA Coverage	Spreadsheet	Tue, 2013-12-17 12:39		No File
• MAPCHECK 2 Instructions for Use and QA	Procedure	Wed, 2014-01-15 12:37		No File

Figure 1: A screenshot of DepDocs, the Drupal-based document management software that we have developed for our otherwise paperless radiotherapy clinic.

2.1 Security, Confidentiality and Reliability

Security and confidentiality of the documents archived on DepDocs is of utmost priority. Although the system was not initially intended for patient documents, it has been used from early-on to manage documents related to protocol research and clinical trials for our patients. As such, we have been conscious of the need for a secure and reliable system from the outset.

To obviate the need for encryption and the overhead of system security beyond our expertise, access to DepDocs is restricted to registered users within our hospital firewall. Outside access is only possible via the hospital's virtual private network. Furthermore, once logged in, a user may only edit documents that he/she has created or has been granted editing permission.

Data integrity is maintained by daily backups of the Drupal software and database. Two versions of the system are maintained; one for clinical use and the other for development. Software upgrades and security patches are applied as soon as available.

2.2 Document Creation, Publishing and Tracking

Documents may be added to DepDocs by direct upload or in-browser creation. We strongly encourage all users to choose the latter as it allows for revision tracking, shared editing and promotes a common look and feel. On creating a document, the user specifies the content type (policy, procedure, vendor manual, etc) and assigns one or more categories from a taxonomy of keywords. He/she may choose to grant editing rights to other users and send an email notification to other users or groups of users. In-browser editing is achieved using the free and open source CKEditor WYSIWYG module for Drupal (ckeditor.com).

All documents on DepDocs, except those related to research and clinical trials, are intentionally visible to all users. However, documents may be tagged with the user group for which the document is of primary interest (eg physicist, dosimetrist, physician, therapist, etc). All types of document may be published on DepDocs. However, official departmental policies and procedures are labelled as *draft* until approved by the appropriate decision maker with "publishing" rights. For example, physics policies and procedures must be approved by the chief physicist and therapist policies and procedures by the chief therapist.

Document retrieval is achieved by generating a list of related documents using the keyword taxonomy or by using the in-built *Solr* search engine (lucene.apache.org/solr). Solr is a fast and efficient Google-like search engine that may be used to index all content on a Drupal website.

2.3 Committees and Meetings

After its initial trial-run and following feedback from users, we realized that DepDocs could be used to manage documents related to committees and meetings within our department. A committee feature was added to the system and released. Presently, nine departmental committees make use of DepDocs to manage their schedules, agendas and minutes. Any user can create a committee within DepDocs and assign membership to other users. The list of committees is visible to all users but only committee members are privy to committee documents. Email notifications for upcoming meetings may be sent by the committee administrator to all committee members.

The committee feature of Drupal has proven very successful as a way to manage meeting agendas and minutes. We are currently improving the meeting scheduling aspect and working on a solution to integrate the Drupal calendar with personal user calendars such as Outlook and Google.

4. Conclusion

To address the need for a low-cost, efficient and user-friendly system for policy and procedure management within our otherwise paperless radiotherapy clinic we developed a web-based platform that we have called DepDocs. DepDocs uses the open source Drupal content management software as its backbone. After six months of use, our system already has 45 users and over 1000 documents. Recent additions have included a system to manage committee meetings and associated agendas and minutes. We believe that DepDocs is an example of the type of collaborative web-based document management system that is needed in healthcare and we are keen to expand its use within and beyond our hospital.