Drupal-Based Project Website Construction: A Case Study of the "Open Resources Construction" Website (Postprint)

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Abstract

【Objective】 To rapidly construct an outcome management and publishing website for the "Open Resource Construction" project using Drupal. 【Application Background】 The "Open Resource Construction" project required establishing an outcome publishing platform under constrained time and technical conditions; Drupal' s flexibility, simplicity, and robust module support can satisfy this requirement. 【Methods】Drupal core modules and contributed modules were employed to accomplish content construction and page layout, while addressing challenging issues in theme customization and website upgrades. 【Results】 Using Drupal, the "Open Resource Construction" website was built and populated with content within a short timeframe and at low cost. 【Conclusion】 Drupal can effectively satisfy the needs of libraries for rapidly constructing small-to-medium scale project websites or thematic service platforms.

Full Text

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Project Website Construction Based on Drupal —A Case Study of the "Open Resources Development" Website

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Abstract

[**Objective**] To rapidly construct a project outcomes management and dissemination website for the "Open Resources Development" initiative using Drupal. [**Context**] The "Open Resources Development" project required establishing

a platform for publishing project outcomes under constrained time and technical resources. Drupal, with its flexibility, simplicity, and robust module support, was identified as capable of meeting these requirements. [**Methods**] We employed Drupal' s core and contributed modules to accomplish content construction and page layout, addressing key challenges in theme customization and system upgrades. [**Results**] The "Open Resources Development" website was successfully built and populated with content in a short timeframe and at low cost. [**Conclusions**] Drupal effectively satisfies libraries' needs for rapidly constructing small-to-medium project websites or specialized service platforms.

Keywords: Open source software; Content Management System; Open resources; Drupal
Classification Codes: TP393; G25

Since 2013, the National Science Library of the Chinese Academy of Sciences has conducted a series of theoretical studies and practical explorations on open resources development and reuse through a dedicated project, generating various types of outcome documents and accumulating substantial open resources. To ensure timely dissemination of these project results and provide references for library professionals, the project team needed to establish a specialized website for effective management and publication of the aforementioned content. However, accomplishing this under limited time and technical resources presented a significant challenge. The popular open-source Content Management System (CMS) Drupal, renowned for its operational simplicity and powerful extensibility, offered a viable solution. This paper introduces the methodology for rapidly constructing the "Open Resources Development" project website (http://openresources.las.ac.cn/), demonstrates the process of utilizing Drupal' s distinctive features for project outcomes management and content presentation, and validates Drupal' s advantages in supporting small-to-medium library websites.

2. Drupal Applications in the Library Domain

Drupal is an open-source content management system based on PHP that provides robust module support, enabling low-cost, high-efficiency website construction with straightforward system operation [1]. Drupal' s development is deeply rooted in the library community—it was first applied to large-scale library website reconstruction projects after its inception in 2002. Currently, Drupal' s primary application scenario in libraries is portal website construction [2]. Beyond portals, Drupal also effectively supports mobile library development. For instance, Bi Jian et al. attempted to build a mobile portal for Yunnan University Library using Drupal, implementing responsive web design [3]; Su Ye et al. utilized Drupal+PhoneGap to achieve information push functionality for mobile libraries [4]. Functionally, Drupal not only implements basic services such as bibliographic services and user interaction [5], but has also progressively advanced toward semantic web support. Since Drupal 7, RDF has become a core module capable of publishing platform data as linked data [6]; Xia Cuijuan et al. conducted theoretical discussions and practical demonstrations on linked

data publishing based on Drupal [7], while Ren Ruijuan et al. explored semantic organization and linked publication of multi-type academic resources using Drupal [8].

Notably, Drupal has increasingly demonstrated advantages in supporting specialized library services and small-to-medium project website construction in recent years, adapting well to librarians' needs for rapid website deployment and continuous service innovation. For example, Liu Wei proposed a targeted rapid website construction solution based on Drupal [9]; Simon Fraser University in Canada established a Learning Commons booking website using Drupal [10]; and Mudanjiang Medical College Library developed an online interactive learning platform for new student library orientation based on Drupal [11]. The current website construction represents a beneficial attempt at utilizing Drupal for library project websites.

3. Requirements Analysis and Construction Approach

3.1 Requirements Analysis

The "Open Resources Development" website aims to centrally showcase project outcomes and provide references for peers. Therefore, library professionals engaged in related work constitute the primary audience, while project team members are responsible for backend content publishing and regular maintenance. This requires the website to effectively support content entry, organization, and maintenance while enabling users to quickly locate needed resources. Core functionalities include: publication of document-type outcomes, clustering and display of 11 types of open resources, regular updates of project news, and publication of librarians' perspectives. The core functionalities are illustrated in [Figure 1: see original paper].

3.2 Construction Approach

This practice fully leveraged Drupal's "content-presentation separation" (Model-View-Controller) architecture through the following three steps: (1) The underlying infrastructure employed a PHP runtime environment with core and contributed modules enabled. (2) Content construction comprised two phases: "entry" and "organization." First, administrators established content types and performed data import using either the Smart Import contributed module or manual entry; subsequently, the Taxonomy module was utilized to create vocabularies for classifying this data, or content was organized through book pages. (3) Page layout design was accomplished through selected themes, Blocks, Views, Panels, and other modules, with the Slideshow Creator module employed to enrich page effects. The construction approach is illustrated in [Figure 2: see original paper].

4. Implementation of the "Open Resources Development" Website

4.1 Underlying Infrastructure

The Open Resources Development website adopted the stable and widely-used Drupal 7 version, with the Drupal installation package downloaded and extracted onto a server with a PHP runtime environment. Based on requirements, the website installed and enabled core modules including Drupal Core, Chaos Tool Suite, Views, and Panels, and downloaded additional contributed modules from the Drupal official website for specific needs such as data import. The enabled modules are listed in .

4.2 Content Construction and Page Presentation

Drupal offers numerous unique advantages for website construction. For instance, its powerful templating system separates content from presentation, enabling convenient control over website appearance; its internal structure implements a rich hook mechanism using simple PHP features, allowing extensive information exchange between modules; and it provides built-in news aggregation tools such as RSS. This website' s content construction and page design fully leveraged these distinctive features.

(1) Achieving Orderly Storage and Efficient Organization of Project Outcomes

Drupal provides functionality for storing and organizing resources by content type. Consequently, the "Open Resources Development" website defined content types based on project outcome characteristics, as shown in . The "Basic Page" type is used for publishing text-based resources, with content entry utilizing the freely editable Full HTML format; this type also includes functionality for adding attachments and images. The "Book" type enables structured content organization, displaying relationships between parent and child book pages. Leveraging this feature, the website creates a book page for monthly updated open resources news and associates it with the parent page "Industry Trends Scan," thereby achieving rapid content aggregation. The 11 open resource types include fields for title, language, source, discipline, etc., as illustrated in [Figure 3: see original paper].

A key Drupal feature is establishing vocabularies through the Taxonomy module to create a complete classification system for the website. The "Open Resources Development" website utilized the Taxonomy module, based on the Ministry of Education' s discipline classification, to establish a "Discipline Vocabulary" comprising 18 first-level categories and 89 second-level categories for the 11 types of open resources. This vocabulary can be directly associated with the "discipline" field in content types, assigning machine-readable discipline attributes to resources and providing a foundation for generating Views by discipline.

(2) Coordinated Use of Multiple Modules for Dynamic Page Presen-

tation
Based on content construction, the Open Resources Development website employed Panels, Views, Block, and Slideshow Creator modules, utilizing their respective strengths to accomplish page design and content display.

Views aggregates and displays resources with specific characteristics in list format; generated Views can be displayed independently or as specific content within Panel pages. For example, when centrally displaying mathematics open journals, a new View is created with a page path, selecting the "Open Journal" content type, corresponding fields, and filter criteria "Has taxonomy term (= Mathematics)." [Figure 4: see original paper] shows the RSS Feed code snippet and generated interface for the mathematics category. Additionally, building upon generated Views, the website produced RSS feeds for open journals and open data in five disciplines including astronomy and microbiology by adding Feed functionality, enabling convenient customization for librarians at relevant institute libraries.

Panels and Blocks rapidly accomplish page layout design and content filling. Panels primarily implement webpage region division, defining content for each region; Blocks are more flexible, capable of containing content, serving as navigation, and freely distributed across various page positions. Their coordination achieves excellent page design effects. In the "Librarians' Perspectives" section (shown in [Figure 5: see original paper]), the left-side navigation comprises Blocks with HTML code content; the upper and lower browsing interface on the right is styled by Panels, with content being the pre-generated "Librarian Perspectives" View.

Furthermore, the website homepage employs Slideshow Creator 7.x-1.12 to implement scrolling display of open access images, enhancing webpage visual appeal.

4.3 Handling Technical Challenges

(1) Theme Construction Using Contributed Modules
After Drupal system installation, the default theme' s page style and font size did not fully meet the "Open Resources Development" website' s requirements. Therefore, we utilized Drupal's theme engine by modifying the "filename.tpl.php" files and code of the default PHPTemplate engine to align with website requirements.

(2) System Upgrade Simplification Using Drush Module
As an open-source system written in PHP, Drupal has security vulnerabilities requiring regular upgrades. However, upgrade methods in Drupal' s official documentation have certain drawbacks. For instance, the "download latest version and overwrite old version" approach causes file location changes and resultant chaos; the "download latest version, copy custom files and sites directory to new version, delete old directory, then replace" approach requires backing up configuration files from the old version, necessitating maintenance of a checklist of files

to review after prolonged updates, thereby increasing maintenance costs. To address these issues, we employed the Drush module' s `drush pm-update` command to upgrade all Drupal modules to stable versions, significantly simplifying the process.

5. Website Construction Effectiveness Analysis

The "Open Resources Development" website was completed within three months under limited human and technical resources. This low-cost, high-efficiency, and easy-to-operate construction approach enabled the project team to achieve rapid dissemination of research outcomes and improved service timeliness. Since its launch, the website has attracted widespread attention from peers and become a showcase for the National Science Library' s open resources development efforts. The website homepage is shown in [Figure 6: see original paper].

However, the Drupal-based construction process also revealed that website functionality and presentation effects are constrained by the content management software itself, module functionalities, and relatively strong encapsulation, making customization of website styling and service items difficult and inflexible. To better satisfy researchers' needs and further enhance the website' s service capabilities and value, future improvements should focus on: (1) Providing resource customization services. The "one-size-fits-all" resource provision approach no longer meets researchers' needs; therefore, the open resources website must implement discipline-based resource push to designated IPs for researchers. (2) Developing standardized open interfaces. Currently, the website only provides RSS as an open interface; to better support machine utilization of resources, additional standardized interfaces such as OAI-PMH should be developed. (3) Supporting librarian communication. The open resources development website should better facilitate exchange among librarians regarding open resources development and sharing of practical cases, requiring enhanced user interaction functionality. While Drupal' s built-in Forum module and community-provided modules for "form filling" can be leveraged, enabling these modules introduces certain security risks, necessitating strengthened user permission settings and management to mitigate potential risks.

Additionally, leveraging Drupal' s robust module support, the website will continue efforts in search functionality optimization, mobile device support, and enhanced page presentation richness.

As an excellent open-source CMS, Drupal differs fundamentally from commercial software in that open-source software requires continuous learning and research of application methods by technical personnel. Only by continuously expanding system functionality using Drupal' s rich community modules can Drupal' s maximum potential be realized. The "Open Resources Development" website embodies the open-source philosophy of "freedom, openness, and sharing." Libraries should further enhance their technical capabilities in utilizing open-source software to improve service levels, share academic information, and

strengthen digital library development momentum.

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OCLC Research Center and ALISE Announce 2016 Library and Information Science Research Grant Recipients

The OCLC Research Center and the Association for Library and Information Science Education (ALISE) have awarded five research projects led by ten re-

searchers. The grants were announced at the ALISE annual conference awards luncheon held on January 7, 2016, in Boston. The five funded projects are:

(1) Iris Xie and Rakesh Babu from the University of Wisconsin-Milwaukee will investigate universal usability issues in digital libraries and design help mechanisms for blind users. This project will provide both theoretical research findings to understand help-seeking behaviors of blind users and practical deliverables through iterative design of applications that enable better access and usability for blind users.

(2) Abdulhussain Mahdi and Arash Joorabchi from the University of Limerick will develop an algorithm to automatically map FAST subject headings to corresponding Wikipedia articles or topics. This mapping algorithm employs multiple text mining techniques such as string matching, explicit semantic analysis, and citation analysis to find the best-matching articles for given FAST subjects.

(3) Besiki Stvilia from Florida State University, Dong Joon Lee from Texas A&M University, and Shuheng Wu from Queens College, CUNY will investigate social aspects of participation in online research identity management systems. The research findings will inform the design of research identity data/metadata models, data quality assurance measures, and mechanisms for recruiting and employing researchers to maintain identity data.

(4) Zhang Pengyi from Peking University will investigate collaborative sense-making in online knowledge communities. This study addresses how people in online knowledge groups collaboratively construct knowledge structures and populate them with data during collaborative tasks. The proposed research will advance theoretical understanding and empirical investigation of collaborative sense-making and provide guidance for sense-making skills education.

(5) Denice Adkins and Heather Moulaison Sandy from the University of Missouri will examine how Hispanic populations use mobile technology and social media for information seeking, and how this knowledge can be used to create "profiles" for various Latino communities (rural, urban, established, newcomer, etc.) that libraries can use to customize their social media and mobile information activities.

Full-time academic researchers (or equivalent positions) from library and information science departments worldwide are eligible to apply for research funding up to $15,000. Applications are evaluated by a jointly selected panel from OCLC and ALISE. Funded projects are expected to be completed within one year from the grant date, and researchers must provide a final project report upon completion as a condition of the grant. More information about the OCLC/ALISE Library and Information Science Research Grant program can be found at http://www.oclc.org/research/grants.html, and previous grant awards are accessible at http://www.oclc.org/research/grants/awarded.html.

(Compiled from: https://www.oclc.org/news/releases/2016/201603dublin.en.html)
(Journal News)

Note: Figure translations are in progress. See original paper for figures.