Customization and Localization of DSpace-CRIS in China

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Abstract

Traditional institutional repository (IR) has been broadly used and improved in practice for decades. Current Research Information System (CRIS) is one of the extended systems that broadens the traditional IR systems' functionality by expanding the data and visualization modules. Beyond the basic functions of an IR, CRIS extends to distribute multimedia scholarly publications, manage research data, provide evaluation on research performance, visualize research network, enable research profiling, support project-based activities, integrate citation metrics, etc. This paper introduces the first DSpace-CRIS system that was implemented in mainland China at Wenzhou-Kean University (WKU) and explains the localized efforts of technologies and customized development of modules. The development team has also released the installation of developed modules as open sources on GitHub. The paper outlines the future development plan for the institution.

Keywords: Institutional Repository; Current Research Information System; DSpace-CRIS; Visualization Tools; Readership Map

1 Introduction

In the recent decades, institutional repositories (IR) have been rapidly growing because of the proliferation of the open access movement worldwide [2]; while current research information systems (CRIS) have also been widely spread over the last 40 years [1]. As for IRs, since 2002 when the first DSpace system was developed by MIT, extended solutions and modules have been added to the original system to expand the functions. In the meantime, forty percent of the higher education institutions in the world have adopted DSpace as their digital repository system [4]. One of the extended functionalities that is integrated with CRIS is known as DSpace-CRIS, which was released in 2012 as an open source tool to enrich the DSpace [5].

Originally IR and CRIS were developed for different purposes and have evolved independently. However, the two systems have gradually been added with a broad range of overlapping features that blurred the boarder in between and presented opportunities for enhancement of interoperability and integrations. As noted by scholars, nowadays higher education institutions have run a wide range of both stand-alone systems as well as a combined version of both [3, 6]. It is rare, however, to discover such an integrated system in mainland China; whereas WKU is the first one of the few.

2 DSpace-CRIS @ WKU

WKU is a Sino-American jointly operating university that adopts American curriculums and all-English working environment. Starting from the spring semester of 2019, WKU Library started to explore technologies and service options for its own IR; WKU Library later decided to develop the IR system with DSpace-CRIS in March. After the initial installation, seven major revisions, and 64 functional optimizations, the IR was successfully launched on July 19, 2019 [7].

The IR at WKU is named Wenzhou-Kean University Intellectual Research Environment (WIRE: https://wire.wku.edu.cn), aiming to serve as a traditional IR for disseminating research outputs, as well as a CRIS management portal that brings together a range of activities, projects, grants, people, and organizations into a central place. During the development phase, the development team was made aware that major revisions and technological optimization became inevitable for adaptation in local policies and restrictions.

2.1 Customization & Localization

2.1.1 Customization of User Interfaces. One of the most important customizations is the interface customization and category organization, including scheme rebranding, identity design, and functionality displaying. The three default icons with DSpace-CRIS was kept on the front page of user interface but it was rebranded to be compatible with the color scheme. Moreover, icons, buttons, and navigations in global structures are all customized to reflect the key services that will be provided by WKU Library. Detailed rebranding option and customization have also been applied to sub-pages at each level.

2.1.2 Customization of Management Interface. The customization of management interface includes the designing of workflow, metadata elements, internal authorities, internal directory, ORCID, and bitstream module. The management interface design follows the default workflow that is compliant with the traditional DSpace but is embedded with some linked data functionalities that can aid the metadata implementation. The development team also managed to display natural language of metadata elements on the user interface but implement Dublin Core at the deeper layer.

2.1.3 Localization of Data Visualization. DSpace-CRIS contains many built-in features for statistical metrics and data visualization, which are implemented with Google products that are not supported in mainland China. The restriction on some of the technological features required the development team to replace un-supported technologies with accessible ones. One of the key features is the digital mapping tool which the developers seek to use Leaflet map in lieu of Google map. The mapping application was programmed via JavaScript and allows data loading from JSON files. It was then further styled and aided with interactive layers, e.g. markers with popups upon clicking.

2.1.4 Readership Map on Homepage. Utilizing the Leaflet map tool that is accessible and presentable in mainland China, the developers further used Apache Solr, JavaScript, HTML5, CSS, and Java to develop a readership activity map (Figure 1) that is implemented on the front

page of WIRE, displaying visitor information, outlining visit statistics by months, presenting links to viewed item and collection, providing functions of interaction, and automatic playing.

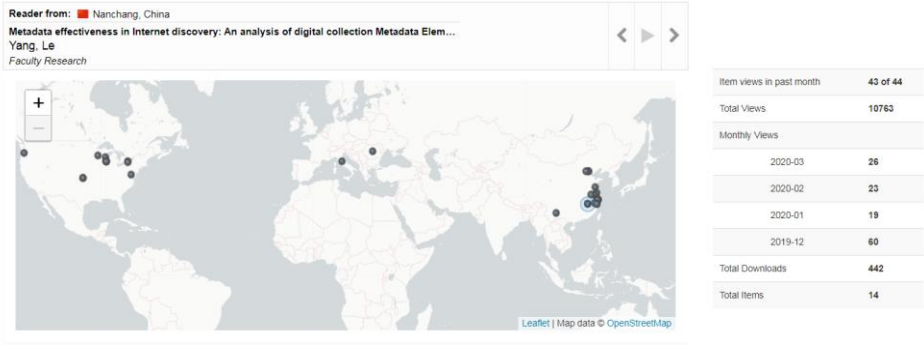

Figure 1: Readership Mapping on Homepage of WIRE

2.2 Technological Contributions to the Field

The development of customized features and localized modules for DSpace-CRIS contributes technologies to the community of DSpace-CRIS, that can be used not only in China but also elsewhere. For any potential users in China they can choose to deploy the technologies without restrictions. For those who are not similarly encumbered might nonetheless consider this solution because of other factors, e.g. privacy, performance, functionality.

2.2.1 Module of Readership Map in China. Leaflet is an open source JavaScript library being widely used to build mapping applications, being designed with simplicity and usability that allow developers without GIS background to conveniently display tiled web maps hosted on public servers. It supports direct loading of feature data from GeoJSON files and styling with interactive layers. The development team utilized Leaflet product and develop such a replacement of Google Map feature in DSpace-CRIS so that users in Google-restricted regions can conveniently download, install, and implement the product on their systems. (https://github.com/john-zhang1/User-Activity-Map)

2.2.2 Apache Solr on Data. Solr is designed to deal with indexes containing millions of documents Text-centric. Solr is optimized for searching natural-language text. Solr is a document storage and retrieval engine, which returns documents in ranked order based on how relevant each document is to the user's query. Information for the readership map is obtained from Solr which is used by DSpace-CRIS for discovery and browsing. Solr indices used by the map include item views in past 30 days, number of item views, total items, total collections, total file downloads, etc.

3 Conclusion

During the implementation of DSpace-CRIS with WKU Library, the development team has made functional optimizations and several major revisions to the system so that its functionalities can be fully realized in mainland China. In the paper the development team aims to describe how some of the key technological changes can be achieved to overcome the restrictions. The development team will be sharing the practical experience and helping with any technological needs, especially for the local practitioners. The team also plans to make enhancement for the DSpace-CRIS project in strengthening data analytics and visualization, and to develop new functionalities to meet the user requirements that are related to media developments, such as video and audio playback, file processing, PDF previewer and reader, and IIIF image service.

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