

Applying participatory action approach to integrating professional librarians into open source software communities

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Abstract

This article theoretically explores how participatory action research might support integration of library professionals into open source software development communities. The author makes a case for the integration of library professionals into open source software communities to help develop better, context-specific, customizable software for use by libraries and advocates for inclusion of library professionals in open source software communities to produce high quality, customizable software. The value of open source software for libraries is discussed and the importance of this integration is articulated by the impacts of this approach. A plan for integration of library professionals into open source software communities is presented.

Keywords

LIS curriculum, LIS education, open source software, OSS communities, participatory action research

Introduction

Open source software (OSS), is a software system for which the code and design is free to use and modify. Unlike proprietary software, OSS adoption enables users to customize and modify the software to their context. For libraries, this can result in software that is deeply knowledgeable about the system that it is created for. OSS is very important for libraries as it permeates all aspects of library technology, ranging from behind the scenes infrastructure to full-fledged applications (Breeding, 2016). OSS is well established as a significant component of the library technology industry (Breeding, 2017); products like DSpace, Fedora, and Hydra in institutional repositories and Koha and Evergreen in integrated library systems (ILS) represent a major part of the market. The use of OSS offers great potential for effective tailoring and customization of software to particular needs, improving accessibility in various ways. It also offers the potential for innovative solutions involving the combination of more than one software product, rather than hoping that an existing off the shelf product already meets a particular need. It would be beneficial for librarians to have a say in the development of OSS and to be active participants in the development of these tools. A key gap in the open source infrastructure is that there is no established mechanism of collaboration between open source developers and professionals interested in contributing to the design, development, tailoring,

and maintenance of OSS. The approach to use participatory action research to integrate professional librarians into OSS development aims to bridge this gap by bringing together library professionals and professionals active in OSS communities. Empirical research is needed for understanding how such an approach will facilitate these reported benefits. The OSS developer community will also benefit from the involvement of the library professionals because library professionals draw from a much wider skillset than coding, such as user testing, graphic design, information organization, documentation, user services, etc. Developing awareness and establishing strategically organized collaborative efforts among library professionals and OSS communities is critical for enhancing librarians' professional engagement in OSS. Many librarians feel too intimidated to participate in the OSS development process because they perceive that they lack the technical knowledge needed to contribute successfully; some lack confidence and/or do not know where to start. This approach would help such professionals in finding suitable roles in OSS communities.

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Value of OSS for libraries

For libraries, adoption of OSS means independence from vendor lock-in and it is a great motivator to engage with OSS communities. The never-ending cycle of paid upgrades, high maintenance and subscription costs, and complete dependence on a for-profit corporation are some of the sore points with proprietary software use among libraries. The use of OSS offers great potential for effective tailoring and customization of software to library-specific needs and improving accessibility in various ways. OSS can be lower cost (Choi and Pruet, 2015) especially if in-house expertise is developed by the libraries adopting the software. OSS provides a platform for innovation and sharing because one can build on existing work within the OSS community. Customization and tailoring software for local use contexts is another striking benefit of OSS. Not only does the customization and tailoring cater to the specific needs but it also provides a basis of skill-building activities for librarians who are engaged in the adoption and management of software. It provides an opportunity to learn and build by working on real world meaningful projects. Once a library develops a customized solution that works for their setting, they can share the product with the wider community. This type of sharing and contributing is integral to both OSS culture and library culture, which is why it is an excellent match of shared values and enables a community of sharing ideas and expertise. OSS offers a potential for innovative solutions involving the combination of more than one software product, rather than hoping that an existing off the shelf product already meets a particular need. Libraries do not prefer closed technology products that hamper access to underlying data and cannot be easily integrated into related business systems; they are not always content with the products bundled by proprietary vendors². This leads to customizing interfaces using open source products. For example, Nashville Public Library has adopted Pika, an open source discovery environment based on VuFind to support the public-school system (Breeding, 2017). As this example demonstrates, in order to effectively use OSS tools, librarians need to be active participants in the development of these tools. Once involved in OSS development, library professionals can actively impact the future course of relevant software. They can improve information access, create additional functionalities and interfaces, and they can experiment with alternative provisions of organizing information. Librarians can tailor software for people with different disabilities, build and adapt digital libraries, contribute to software internationalization, and multilingual interfaces. In academic libraries, it can be used for building, combining, and tailoring technologies to support data repositories, data curation, digital collections databases – and the development of sufficiently detailed metadata to enable reuse of the resources contained in the

repositories. Also, there is a growing emphasis on the importance of data and code sharing in scientific research, with some funding bodies moving from encouragement to requirements specific to data sharing. Academic libraries via sub-groups such as scholarly commons and repositories are in the vanguard of supporting greater data and code sharing. Having more librarians with skills in OSS development, and particularly with improving the usability of shared scientific software, OSS will greatly contribute to the mission of the library, of the university and to the whole scientific endeavor. OSS innovation is not just about building things from scratch. Rather it is the ability to tweak, tailor, and connect different programs together that is a key attraction of OSS for libraries. The benefits of libraries working with OSS communities are very appealing and mutually beneficial, but due to lack of understanding of the barriers/challenges faced by librarians and due to lack of training for librarians to join OSS communities it poses a real challenge in achieving these benefits.

All this interest and positivity for the OSS is not to diminish the challenges that libraries sometimes face when adopting it. This paper acknowledges that OSS might not be best suited for all libraries and library professionals. We are aware that poor usability, poor documentation, lack of extensive user experience testing, lack of awareness among library professionals and lack of networking with OSS communities are some of the barriers to OSS adoption in libraries. Developing awareness and establishing strategically organized collaboration efforts among library professionals and OSS communities is critical for enhancing library professional's engagement in OSS.

Gap in LIS education: Lack of formalized librarian-OSS community collaboration

According to Michael Breeding (2016: 17):

Direct participation by those in the libraries who will use the software narrows the chasm between developers and users. In some cases, the developer can actually be a user. People who work in a library bring intimate knowledge of the tasks that need to be accomplished and the broader context of the organization's strategies and priorities.

The Institute for Museum and Library Services (IMLS, 2015) report on the National Digital Library Platform asserted that OSS is important for libraries and that there is “the need for engagement beyond simply making code available” and “cultivating relations between developers working in libraries around the country”.

This key gap of a lack of established mechanism of collaboration between open source developers and library professionals interested in contributing to the design, development, tailoring, and maintenance of OSS is very detrimental to the OSS community and librarians. This

article aims to bridge this gap by providing a strategy to bring together library professionals and professionals active in OSS communities. Developing awareness and establishing strategically organized collaborative efforts among library professionals and OSS communities is critical for enhancing librarians' professional engagement in OSS. Many librarians feel intimidated (Mehra et al., 2010) because they perceive that they lack the technical knowledge needed to contribute successfully, some lack confidence and/or do not know where to start; the PLOSS will facilitate such professionals' integration into OSS communities. This article proposes a *synergistic collaboration* among library professionals and OSS community members. The process of being engaged in OSS development to improve the software will be an empowering experience for librarians involved as it will enhance their technical skillset. This empowerment could potentially be a stepping stone for more advanced stages of information processing and continued education efforts for these individuals. Also, it will be a step in the right direction to raise overall awareness of OSS products in libraries and to establish collaboration between product designers, developers, and users. The OSS developer community will benefit from the involvement of the library professionals because library professionals draw from a much wider skillset than coding, such as user testing, graphic design, information organization, documentation, user services, etc. The contributions from library professionals to the design, development, and improvement of OSS targeted for libraries will go a long way in developing relevant OSS products and their adoption by libraries. Research focused on the top 25 ALA-accredited Library and Information Science (LIS) Master's programs discovered a severe lack of course offering regarding OSS specifically and technology in general (Riewe, 2008).

In this proposed plan, the integration process would begin with a one-month intensive boot camp for select library professionals. This boot camp would facilitate learning of customized competences and selection of a relevant OSS community. Each of the library professionals would then be paired with a liaison from the selected OSS community/project. This would be the beginning of an embedded experience for the library professionals where they would learn the process of contributing to OSS communities. The liaison will introduce the library professionals to the community, to the projects and would serve as a mentor to the librarians. This would be a structured participation for 10 months with 10 distinct one-month long projects. In this 10-month phase, the library professionals will learn through real world OSS community projects. At the end of the 10 months, the liaison and the library professionals will present their experiences at a professional librarians' conference such as the American Library Association conference. More specific details of the plan are presented in the following sections.

Participatory action research

Participatory action research (PAR) is derived from an interplay of research and practice and originates from several research approaches that are based on communities collaborating with researchers and the researchers developing a relationship of equals with participants as opposed to the expert-novice relationship which is found in traditional research paradigms (Chavez et al., 2003; Gatenby and Humphries, 2000; McNicoll, 1999; Maguire, 1987; Yoshihama and Carr, 2002). We believe that PAR is the best framework for integrating librarians into OSS communities because PAR defines all stakeholders as experts with important knowledge and perspectives and the researcher role can include that of educator and activist (Gatenby and Humphries, 2000; Maguire, 1987). The PAR process is collaborative and the co-construction of knowledge is emphasized. We have identified a need for training and research in the area of library professionals and OSS community collaboration and are taking a PAR approach to solve this problem.

Reason (1994) has described PAR as a system for knowledge production in which participants have a role in setting the agenda for the research, participating in the data gathering and analysis and are empowered through the construction and utilization of their own knowledge. According to Vollman et al. (2004), the purpose of PAR is to foster capacity, community development, empowerment, access, social justice, and participation. The collaboration of individuals with diverse knowledge, skills, and expertise fosters the sharing of knowledge development and therefore PAR is the best suited approach for this research. Individuals also learn by doing, which strengthens their belief in their abilities and resources, as well as further developing their skills in collecting, analyzing, and utilizing information (Maguire, 1987).

We propose that library practitioners and OSS community members come together to solve the puzzle of integration of those two communities. PAR is a well-established research approach and has been successfully applied in areas of inquiry such as education, sociology, anthropology, social psychology, philosophy, feminist research, health and community-based research. For further descriptions and examples of PAR application in diverse settings, please refer to MacDonald (2012) and McGarvey (2007).

Practical *action research* will happen when outside facilitators form cooperative relationships with library practitioners, helping them to articulate their own concerns, plan strategic action for change, monitor the problems and effects of changes, and reflect on the value and consequences of the changes actually achieved. This approach will have a three-prong impact. Firstly, it will be valuable professional development for library professional and will increase awareness of OSS among libraries.

Secondly, a guided process for establishing and strengthening collaborations between library professionals and OSS communities will enrich OSS communities because of the presence of talented, motivated library professionals. Finally, the curriculum developed during this research can be released under a Creative Commons license and will be made available at Open Education Resources (OER) Commons website.

Integration approach – PAR + library professionals + OSS communities

For the purposes of this theoretical exploration of applying PAR to integrate professional librarians into OSS communities, the author of this article collaborated with two additional LIS educators to develop a baseline approach. Collectively, the three educators have over 40 years of experience of teaching in multiple highly ranked LIS Master's programs in the United States: their relevant research and teaching expertise includes open source software, technology adoption and community engagement.

To achieve this integration, we believe that PAR is the best approach and in this theoretical exploration, we provide a plan for achieving such integration. This plan could be adopted by LIS educators, in the form of continued education certification in OSS, in courses for integrating graduate students into OSS communities, developing practicum opportunities for students to implement their learning from their courses, etc. The OSS communities that are interested in increasing participation in their communities could sponsor such an integration plan and add this to their outreach programs. The libraries that have a plan for adopting large-scale OSS could use this plan to train their staff members to become knowledgeable about software and future adoption and maintenance of the OSS.

The integration plan

The plan would start with identifying interested and qualified library professionals collectively developing a curriculum, a month-long boot camp for identifying areas of interest for each library professional, a gap analysis of their skillsets to develop a customized curriculum plan for each of the library professionals. The one-month-long boot camp will then be followed by the actual *embedded experience* for library professionals. For this experience, the library professionals will be paired with one OSS community member for a period of 10 months; each month will have a customized activity to successively introduce and integrate the library professional into the OSS community. The OSS community member will work as a liaison for the library professionals and will integrate them into real work projects in OSS communities.

Successful implementation of this plan would start with curriculum development which will be done by surveying OSS educators, library professionals, and OSS community

members. This global survey is to collect data to identify the skillset that is essential for library professionals to contribute to OSS and also identify attitudes and concerns of librarians. The survey will seek responses from LIS educators, OSS communities, and librarians. The curriculum should be developed based on the survey results and with the underlying belief that along with a technical skillset, equally important is the demystification of OSS development process. Based on our collective teaching experience, we believe that some librarians may have nearly all the skills already, but just lack confidence in getting started in participating and therefore the curriculum will be designed to achieve both. Selected library professionals and OSS community members will be interviewed to review and provide feedback on the draft curriculum for verification and approval. In keeping with the PAR framework, viewpoints from all stakeholders should also help understand the workflow and information flow for the current contributors of OSS. Once the curriculum is developed it should be offered to interested library professionals in a one-month online boot camp to acquire the requisite skills for contributing to OSS communities along with developing an understanding of the OSS development process. This boot camp will also be the time when the library professionals, along with the educators, will establish an area of interest and conduct a gap analysis of their skills and competences. Along with the identification of skills, this time can also be used to identify specific projects to work on and to match the library professionals with collaborators in the OSS communities.

In Figure 1 we present a starting point for the proposed curriculum development; this is reflective of the experience of teaching for over 40 years in highly ranked LIS programs in the United States of America. This curriculum draft will then be reviewed, revised, and enhanced on the basis of the feedback from a survey of library professionals and OSS community members. This curriculum plan specifies the details about the boot camp. This will be a four-week training, can be done online or in-person, and will include an intensive schedule for this first month of integration. Each week will have three sessions: each session will have a concept lecture and a hands-on workshop for the topics listed below.

Specific topics to be integrated into the 10-month practice (customized to individual library professionals):

- For library professionals interested in front end management;
- Drupal, PHP, HTML5, CSS, jQuery and jQuery Mobile;
- For library professionals interested in programming for OSS;
- PHP, Perl, Python, Ajax, C, C++, Ruby;
- For library professionals interested in cloud/big data technologies;
- OpenStack.

Week 1 - Insights into OSS

Topics: Introduction to OSS, OSS development process, concept of contributing to OSS

Workshop 1: Develop an inventory of OSS usage in your group; Find development communities for each of the software; Note your first opinion of these sites

Topics: Selected library related OSS Overview; User Centered Design; Universal Usability

Workshop 2: Locate the User Experience groups for 5 selected OSS products; Review and list the current projects that the groups are working on, handling design trade-offs with respect to usability, explaining design rationale,

Topics: Landscape of Contributions to OSS - What are the roles available? Where can you contribute? (Front End Development; Usability testing; Programming; Networking, Documentation; Cloud Integration; Security)

Workshop 3: Report Back on Workshop 1 & 2; Developing an inventory of OSS usage in your library; personal & institutional; Work for next 4 weeks on developing a OSS feasibility study for your library

Week 2 Adoption of OSS

Topics: Download, Compilation and Installation of OSS; Understanding Cloud Integration, software compatibility, etc.

Workshop 4 – Digital Library, multimedia repository, Collections database

Topics: Troubleshooting for OSS; Learning to Search for Answers, to ask questions and fix problems; Learn about Bugzilla and Openstack

Workshop 5 – OpenStack; Locate relevant forums and IRC chats and search for relevant answers, and contribute where possible, How to file a good bug report,

Topics: Learn your Github and Git;

Learning to Contribute to OSS by developing a profile on Github and identifying projects of interest;

Workshop 6: Learn how to read, Evaluate and Interpret Code; Modify a “README” file

Week 3 Customization of OSS

Topics: Internationalization of Software – how and why? Basic Unix/Linux commands;

Workshop 7: Implementing software change examples, Social Q&A for end user tech help

Topics: Rapid Prototyping Of Interfaces,

Workshop 8: practicing tailoring and customization, Providing supporting evidence and rationale

Topics: Creating efficient meta data for existing data curation tools

Workshop 9: Exercise based on Dspace and/or Fedora; how to create a “fork”

Week 4 Maintenance of OSS

Topics: Development of software documentation and training materials

Workshop 10: Development of example materials to facilitate learning of the software

Topics: Creating Screencasts to facilitate learning of technologies

Workshop 11: maintenance of social Q&A forums for providing tech help

Topics: Meeting with OSS practitioners

Workshop 12: Present the feasibility study for your library adopting OSS

Figure 1. Draft curriculum plan.

Embedded experience for library professionals

Once the boot camp is completed the library professionals will then immerse in a 10-month *OSS-embedded activity* in different communities (e.g. the documentation task force for Hydra or the Usability task force for Islandora or the User Experience group for Greenstone). In these 10 months, the library professionals and OSS community members will be paired and they will contribute to OSS communities in real life projects. Each month the library professionals will be expected to spend a total of 10 hours. Nine hours will be focused towards activities related to embedding in the OSS communities and one hour will be dedicated to writing a reflective narrative to describe their experiences. These narratives will inform the embedded experience of library professionals and can be analyzed for challenges faced by librarians to document the things that do not work in in the process of integrating to OSS.

After completing the 10-month exercises, the cohort of library professionals, the OSS community members, and the research team will conduct a participatory evaluation of the entire process and products. This will include collaborative focus groups and interviews, together and individually with both the library professionals and OSS community members. The results from this will be used to revise and improve the integration plan and the curriculum for future. The interviews will specifically focus on the challenges of initially participating in OSS communities, and those of sustaining participation. This will give an insight into the various reasons why people give up or drop out. We believe that a lot can be achieved from understanding these challenges and sharing them with the stakeholders and academic community. An ideal capstone experience would be, selected members from both cohorts and the research team conduct a half day pre-conference workshop at a large conference of library professionals, such as the American Library Association Conference, to share their experiences and encourage more librarians to participate in such a course plan.

Impacts of this approach

This is a new and innovative project to bring together library professionals and the OSS community and will have a measurable impact on the multiple stakeholders and their respective groups. It will be valuable professional development for library professionals and will increase awareness of OSS among libraries. A guided process for establishing and strengthening collaborations between library professionals and OSS communities will enrich OSS communities because of the presence of talented, motivated library professionals.

Libraries will directly be impacted by the deliverables that the participating librarians will develop as part of this

study. Librarians from each participating library will work on OSS projects (product evaluation, needs assessment, implementation, customization, maintenance, and documentation) specific to their institution. Depending on the contextual need, grounded in their settings, librarians will develop an OSS feasibility study and implementation plan for their own library. These deliverables will be beneficial to the libraries if they are completely new to OSS, or are at a juncture of deciding if to adopt OSS or if they are interested in increasing their OSS count or abandoning it. When calculating total cost of ownership for any OSS product, staff training is a major component; and it lies in the hand of the adopters without much support available, this so this project fills that gap by training librarians that could play an active role in adoption and training of other library professionals.

Librarians are able to contribute to OSS in many ways, including coding, user testing, usability improvement, graphic design, language arts, documentation, and software learning materials. OSS projects facilitate a wider participation in the design, development, and improvement than traditional commercial software, which is a supplier-consumer relationship. By being involved in this study, the participant librarians will build skills and abilities to transform practice and lead a systemic change with their library and hopefully in the field. The use of OSS offers great potential for effective tailoring and customization of software to particular needs and to go from potential to learning, experimentation, improvement, deployment, and experience sharing requires a cohort of information professionals who are as comfortable working with end users as they are with software developers. The librarians involved in the study will be engaged in OSS development to improve the software for everyone and that will be a very empowering experience. This empowerment could potentially be a stepping stone for more advanced stages of information processing and continued education efforts for these individuals, especially those librarians who do not see themselves as hardcore coders and therefore shy away from participating in OSS.

The *OSS developer community* will benefit from the involvement of the library professionals because they draw from a much wider skillset than coding, such as user testing, graphic design, information organization, documentation, user services, technical support (a growing part of librarianship), helping patrons, explaining skills to disempowered and marginalized groups, etc. This type of a course will raise the overall awareness of OSS products in libraries and will provide concrete ways to establish collaboration between library professionals and OSS contributors. The grand vision is to create a mechanism whereby libraries can be facilitators and participants in ongoing software improvement, not as 'overhead' but as part of their core mission of

information access and empowerment. Most of OSS adoption challenges relate to the lack of how-to instructions, documentation, and training. This type of systematic effort to engage professionals with an eye for detail and a background of information organization will be extremely helpful in developing better programs and their adoption. So, library professionals will contribute to improve the adoption rates of OSS by doing the work that is currently not always being done in support of OSS.

Researchers and educators: This research is novel, innovative and one of the first research-library professional and OSS community collaboration and will be very helpful for others in implementing a similar effort. The understanding of the specific skillsets that would enhance the existing skillset of librarians to contribute to OSS, would be very useful in creating curricula in future. The results from the research and the curriculum will be made available as OER and will be communicated to other LIS schools and iSchools, with the objective of improving course offerings at accredited Master's programs.

The key diversity impact of this research study will be on improving the gender imbalance in the information technology workforce and specifically on the gender imbalance chasm in OSS communities. The number of women who participate in technology-related fields is extremely disappointing; with studies showing that only 25–30% of the technical workforce is women (Hill et al., 2010) but the gender gap in OSS communities is even more significant. One recent study on women specifically in free/libre/open source software estimates that the percentage of women working in OSS projects is as low as 2–5% (Robles et al., 2016) and this number has not changed much in 15 years. A study by Ghosh et al. (2002) reported the same percentage (2%) of women participating in OSS. Keeping that in mind, this project will have a tangible impact on the workforce in OSS communities, when it introduces women to the communities. According to the Association of Library and Information Science Education (ALISE) statistical reports (https://www.alise.org/index.php?option=com_content&view=article&id=415), women have formed the majority of students in LIS programs for over a century. By offering these courses and programs at the LIS schools, we will be able to address the gender imbalance in the field of information technology as well as OSS. In the process of improving the diversity of OSS communities, this project will contribute to improved software development by having an impact on innovation, quality, and usability of OSS.

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