It Takes a Village

Open Source Software Sustainability

It Takes a Village:
Open Source Software Sustainability

A Guidebook for Programs Serving Cultural and Scientific Heritage

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SERVICES

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Our advisory group supported us with thoughtful advice and expertise. We appreciate their unflagging support and guidance.

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Our forum facilitator, Christina Drummond, was dedicated to making sure we had the best possible forum to serve the larger grant and community goals.

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Executive Summary

This Guidebook is designed to serve as a practical reference source to help open source software programs serving cultural and scientific heritage organizations plan for long-term sustainability, ensuring that commitment and resources will be available at levels sufficient for the software to remain viable and effective as long as it is needed.

One of the most significant themes of this Guidebook is that sustainability is not a linear process, with set beginning and end points. Program sustainability shifts and evolves over time across a number of **phases** and **facets**. The phases speak to where a program is in its lifecycle: *getting started, growing,* or *assessing and evolving*. The facets describe the different components of sustainability, each of which is critical to overall program health, but may have different timelines, goals, and resource needs. The facets deemed most critical by the Guidebook's authors and contributors are: G*overnance, Technology, Resources* (Financial and Human), and *Community Engagement*.

Sections of the Guidebook will:

- Define the phases and facets of sustainability;

- Identify goals, characteristics, and common roadblocks for each phase in each facet;

- Provide guidance for moving an OSS program to the next phase in a given facet, with the understanding that the same program may be in different phases along different facets of sustainability; and

- Highlight case studies and additional resources to help a program's research and decision-making process.

The Guidebook is intended for a broad audience. While certain paths may be of more interest than others, we would recommend reading through each of the facets before returning to the one that aligns most closely with a specific role, e.g., governance for a program manager, technology for a technical lead, engagement for a community manager, or resources for an administrator. The worksheet in Appendix A can help identify the specific phase a program is in along each facet.

The open source landscape is wide and varied. Bringing open source programs serving cultural and scientific heritage together under one shared umbrella can provide us all with the power to better advocate for our needs, develop shared sustainability strategies, and provide our communities with the information needed to assess and contribute to the sustainability of the programs they depend on.
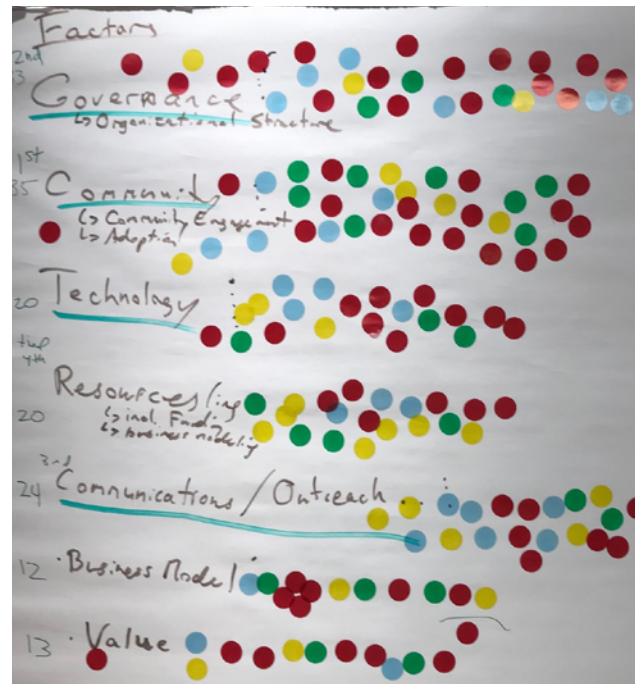
Results of the exercise to determine the most critical facets as voted upon by forum participants.

Background

Organizations that support cultural and scientific heritage – the archives, libraries and museums that collect, preserve and provide access to the artifacts, specimens, documents, data, and other tangible and intangible knowledge of communities – are investing significant resources into open source software (OSS).

Technology supports mission critical functions for cultural and scientific heritage organizations in the acquisition, organization, description, preservation, dissemination, and management of collections, content and information. The tenets of OSS – that is, software that can be freely accessed, shared, used, changed and/or modified[1] – fit well with the missions of organizations dedicated to documenting, preserving, and providing access to cultural and scientific heritage. Libraries, archives, and museums create and adopt OSS as a way to customize and adapt technology to their own community's needs. In addition, many publicly funded organizations and grant-making agencies prefer, and sometimes require, that new technology be open source, as an investment in the public good.

Much of the OSS created and used by cultural and scientific heritage organizations is developed and maintained through a community support model that is largely field- and sector-specific. The open source license may be provided by an individual or institution, but a larger community of users, programmers, administrators, governing agencies, and sponsors are involved in setting development priorities, providing user support, fixing bugs, defining policies, encouraging adoption, and otherwise maintaining a viable product. This is often referred to as "community-based open source software." This community and its diversity is a critical factor in the long-term sustainability of OSS, ensuring the software's ability to upgrade, adapt and grow to meet new needs and evolve with advances in technology.

Some OSS initiatives serving cultural and scientific heritage have been very successful at creating robust products with widespread adoption and engaged communities, while others have struggled to determine what strategies will work once development funding ends or when costly upgrades are needed. Programs that are initially successful might struggle later as other technologies evolve to offer new features and functionality, diverting stakeholder support. A sustainability strategy that works for one community and OSS product now may not work as well in the future or at all for another community or product. OSS requires continuous attention to sustainability to ensure that commitment and resources will be available at adequate levels for the software to remain viable and effective for as long as it is needed. Such continuous attention is challenging for community-based OSS, with the diverse perspectives, capacities, levels of engagement, and priorities among potentially many stakeholders.

There are a variety of largely ad hoc OSS sustainability models currently operating in the cultural and scientific heritage sector, each working within specific communities and impacted by where the OSS application is in its lifecycle. As cultural and scientific heritage organizations become increasingly invested in and dependent on OSS-based technologies, understanding the complexities of sustainability becomes more important. To deepen the cultural and scientific heritage field's understanding of sustainability and encourage OSS programs to share and learn from each other, LYRASIS applied to and received support from the Institute of Museum and Library Services (IMLS) to convene a national meeting of OSS stakeholders (National Leadership Grants for Libraries award LG-73-17-0005-17). The "It Takes a Village: Open Source Software Sustainability Models" forum (ITAV) was held on October 4-5, 2017. The goal of the grant project and the forum was to develop a guidebook for new and existing OSS initiatives to strengthen planning, promotion, and assessment of sustainability. In addition to providing OSS stakeholders with a path to evaluate the health of their software, the project sought to provide potential adopters of OSS applications with a structure within which to measure sustainability and risk, and identify opportunities for growth. This Guidebook represents the combined contributions of forum advisors and participants, who shared their experiences and knowledge to help define a sustainability framework for the field as well as their own OSS programs.

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[1] See the Open Source Initiative for the complete Open Source Definition at https://opensource.org/osd

ITAV Project Assumptions and Activity Summary

While libraries, archives, and museums use a wide variety of OSS (WordPress, Linux, MySQL relational databases, etc.), the assessment and forum focused on OSS developed specifically to serve cultural and scientific heritage organizations. The ITAV project assumed that while there is no single approach to sustainability, there may be common threads among programs serving cultural and scientific heritage organizations that would lead to common needs, and strategies for meeting those needs. The project also assumed that sustainability strategies evolve as the OSS life cycle progresses, technology advances, and community needs change.

A volunteer project advisory group provided advice in regard to which OSS initiatives to invite to the ITAV forum, the forum agenda, and content of this report. This group also served pivotal roles as discussion leaders and facilitators during the ITAV forum. Advisors were: Rob Cartolano, Associate Vice President for Technology and Preservation for Columbia University Libraries; Tom Cramer, Assistant University Librarian and Director of Digital Library Systems & Services at Stanford University; Michele Kimpton, Director of Business Development and Senior Strategist for the Digital Public Library of America; Katherine Skinner, Executive Director, Educopia Institute; and Ann Baird Whiteside, Librarian and Assistant Dean for Information Services, Harvard University Graduate School of Design.

The advisory group and ITAV project co-directors Laurie Gemmill Arp, LYRASIS Director of Collections Services and Community Supported Software, and Megan Forbes,

James Beach describing Specify's financial shift.

CollectionSpace Program Manager, selected and invited 37 individuals representing 27 cultural and scientific heritage OSS initiatives to the forum. Diverse perspectives were sought by including a mix of program/governance leaders, community leaders (users), and technical leaders. The participant list of 49 attendees is included in Appendix C. Prior to the ITAV forum, background information was collected from the invited OSS programs to provide context for the forum discussions. Information was collected in such areas as mission and purpose of the OSS, date of first and most recent releases, size and make-up of the community using the OSS, licensing terms, where the OSS is currently housed/hosted, size of the development community and a description of how development is managed, governance structure and roles, current sources of financial support, and investments made throughout the software's lifecycle. The original survey results were compiled in 2017 and reflect info from that time. Given the many changes since then, we have removed the results from the guidebook but they are available online at https://itav.lyrasis.org. In addition to providing a means for sharing information among participants, the background survey responses inspired directions and themes for the forum discussions.

The agenda format was focused around small working groups that were formed, disbanded, and reformed with new participants each session to spawn more engagement. For each topic, the project's advisory group facilitated open and direct conversations about project lifecycles, governance, financing, resources, community building, outreach and communications, and bumps in the road. For a worksheet that replicates one of the activities and can help identify your program's place, see Appendix A. Consultant/Facilitator Christina Drummond assisted with agenda design and served as overall facilitator. Presentations given during the forum are available on the It Takes a Village website at https://www.lyrasis.org/programs/Pages/IMLS-OSS-National-Forum.aspx.

Using the Guidebook: Facet and Phase Definitions

To get the most out of the Guidebook, begin by reading through the following definitions for each phase and facet. Once you have identified the facet you'd like to learn more about, and the phase that best describes your program's current status, jump to that section of the book to view core goals, characteristics, common concerns, roadblocks, and potential objectives. Outside resources – books, websites, journal articles, etc. – are also listed for each facet.

Defining Facets

There are many elements that go into OSS sustainability, but in the course of ITAV forum discussions, most participants coalesced around four main facets: governance, technology, resources, and community engagement. Each are described more fully below.

Defining the Facet: Governance

"A governance model describes the roles that project participants can take on and the process for strategic and tactical decision making within the project. In addition, it describes the ground rules for participation in the project and the processes for communicating and sharing within the project team and community."[2]

Defining the Facet: Technology

The core of each of these programs is open source software or systems serving cultural and scientific heritage organizations. There are parallels with proprietary software development processes, but working within the open source world brings its own challenges around community, resources, and governance that affect the software development process.

Defining the Facet: Resources

In order to launch, grow, and thrive, OSS programs need resources both human and fiscal. Human resources encompass engineers writing code, community members providing use cases, colleagues or consultants providing assistance with strategic planning, or organizational homes with fiscal stewardship. Financial resources come in and go out in a wide variety of ways – in via contributions, grants, dues, sponsorships, etc., and out via salaries, servers, telecommunications, and overhead.

Defining the Facet: Community Engagement

The Community Engagement facet reflects efforts to facilitate and foster involvement within a community. It is focused on encouraging users to become stakeholders. Those who have a sense of investment and ownership become champions who want the program to grow and succeed. A component of this facet also includes communication and outreach efforts to the community itself as well as the wider world of decision makers, potential users, funding agencies, and others.

Nota bene: For the purposes of this report, we've created bright lines between the facets. The real world, of course, is never so clean. In reality, facets overlap, prop each other up, and may have competing or complementary aims. The goal of the Guidebook is not to imply that each facet can be moved along independently; rather, it is to counter the idea that sustainability is a monolith, and that in fact by breaking it into facets it can be easier to define, plan, and evaluate our programs.

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[2] Gardler, Ross and Gabriel Hanganu. "Governance Models." OSS Watch. http://oss-watch.ac.uk/resources/governancemodels (accessed 29 March 2022).

Using the Guidebook: Facet and Phase Definitions

Defining Phase I: Getting Started

Phase I is generally used for OSS programs that are at the early stages of planning, design, and development. At this phase, work is often grant funded and therefore focused on fulfilling the terms of the grant. Program staff are often pulled from the initial stakeholders, and there is a strong focus on determining the core values of the software community. In the event of a major transition, such as a technology re-architecture, a mature OSS program may return to the Getting Started Phase along a specific facet.

Main themes include:

- Focused goals;
- Small set of strongly committed stakeholders, typically one sponsoring organization; and
- Seeking agreement on core values and alignment around a core purpose.

Defining Phase II: Growing/ Getting Established

Phase II is the broadest in terms of breadth of range, as elements of an OSS program can take a long time to grow along a number of pathways. This can be considered the "danger zone" – programs can easily stall here or go away entirely if their efforts fail to take root and engage community members. In this phase, it is critical to complete the transition from grant or niche project to sustainable program. Each program needs to find its own "special sauce" or unique blend of qualities to work for its own community. During Phase II (if not before), it is critical to set up collaborative tools to empower engaged stakeholders. Program staff and governance may need to let go of some control to enable other stakeholders to fully engage and take part in ownership of the program.

Main themes include:

- Transitioning control from founding stakeholders and sponsors to multiple stakeholders representative of the growing community;
- Creating structure, process, policies, and channels for engagement; and
- Increasing transparency.
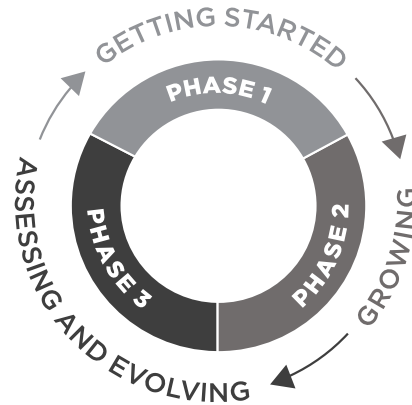
Defining Phase III: Assessing and Evolving

Phase III reflects a more mature program, one that has reached a more established stage with some predictable elements (such as revenue streams, business apparatus, and/or technology), but in which stakeholders will need to be vigilant, as it is easy to be complacent and potentially stagnate or be replaced by more novel technologies. This is the phase at which things are going well, but may or may not stay that way. Continued progress may require shifting back to the beginning of a facet. For example, the technology platform chosen ten years ago, which took a long time to build and is now fully functional, may be out of date in the next two or three years. Fully updating the platform may require a return to Phase I in the technology facet. This may have a ripple effect in other facets as well. While resources might have been sufficient for supporting the existing technology platform, gathering the resources for a major overhaul might involve shifting the resource model.

Main themes include:

- Ongoing measurement to assess functionality, impact, and engagement;
- Flexibility to modify/adapt;
- Level of committed resources;
- Potential for offshoots and mergers; and
- Acknowledgement that the community may need to go back to Phase I or II for renewal.

Sustainability Wheel
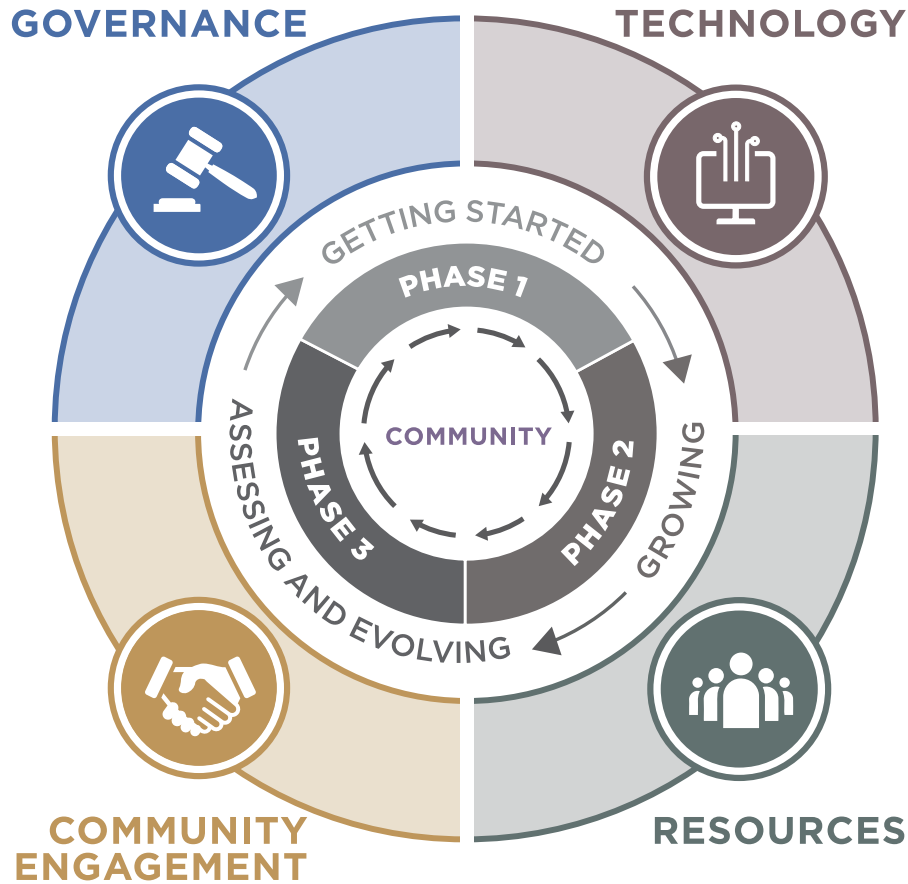
GOVERNANCE

Phase I: Establishing
Working with original engineers, project staff, or organization. Go to page 11.

Phase II: Stabilizing
Functional but limited in one or more aspects. Go to page 12.

Phase III: Evolving
Strong management structures; not necessarily formal governance. Go to page 13.

TECHNOLOGY

Phase I: Laying the Groundwork
In design, pre-release or early beta testing phase; small set of early adopters. Go to page 20.

Phase II: Expanding and Integrating
Have more than one public release. Go to page 21.

Phase III: Preparing for Change
In production, well-adopted, supported. Technology stack stable. May be looking to next generation. Go to page 22.

RESOURCES

Phase I: Creating Consistency
Funded by single organization, grant-funded or volunteer operated. Go to page 26.

Phase II: Diversification
Distributed resourcing; meeting expenses, small number of revenue streams. Go to page 27.

Phase III: Stable, but not Static
Diverse staff support and income streams; focused on long-range strategy. Go to page 28.

COMMUNITY ENGAGEMENT

Phase I: Getting Beyond Initial Stakeholders
Focused on primary stakeholders; lack of engagement with broader communities. Go to page 32.

Phase II: Establishing CE Infrastructure
Determining how to facilitate engagement that works for community. Go to page 33.

Phase III: Evolving CE
Established infrastructure to enable engagement. Go to page 35.

Facet: Governance

Phase I: Establishing Governance

Core Goal

Plan and implement the governance model or models that best reflect the values of the program and community.

Characteristics

Phase I programs are generally still working with their original software engineers, project staff, funder, or sponsoring organization. The application may not have end users yet, leading to a "good faith over governance" approach. Although it may be unclear what type of governance model a community wants or needs, making plans early in a lifecycle can contribute positively to a program's overall sustainability.

Governance is not one-size-fits-all.

Concerns and Roadblocks

Program staff may be concerned that governance will remove the decision-making process from the primary stakeholders or those who are doing the day-to-day work, slow down the pace of development, or that efficient operations will be bogged down in bureaucracy. These are legitimate concerns. It is critical to understand that governance is not one-size-fits-all. Programs must do the hard work of understanding what types of governance models are out there, and what the benefits and drawbacks of each are in relationship to the community they want to serve with the OSS program, in order to choose the approach that best serves the program and community.
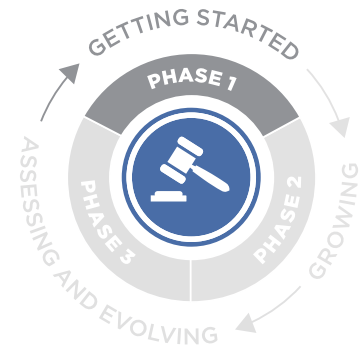
Moving Forward: Objectives

- **Define a need for governance**

  Program staff may ask and answer a series of questions to determine what type of governance structures are necessary, such as: Where is the program having issues that a consensus policy could help mitigate? Is there tension between functional and technical teams that requires a conflict resolution mechanism? Are potential code contributors unsure of the process? Do community members receive regular updates about the program? How is the community engaged with respect to governance and what role do they represent?

- **Review existing governance models**

  Examples of existing governance models to evaluate can be found in the resources section of this Guidebook. To learn about models in use at other OSS programs serving cultural and scientific heritage, reach out to their staff and community members – the participant list for the forum that led to this Guidebook is a great start (Appendix C). Consider convening an advisory group to assist with the governance development process.

- **Select the governance model that works best now for the program**

  Once the program's needs have been defined and governance options reviewed, draft a governance model. Put it to the test with use cases from the program's day-to-day work. Will the draft model provide pathways to solve the issues identified? It is okay to start small and evolve governance over time as needed.

- **Communicate changes to stakeholders**

  After the plan has been drafted and approved by the governance team, share it with program stakeholders, current users, and potential users. A governance plan should be easily findable and understood by the people it affects – users, contributors, funders, potential adopters, and others.

Facet: Governance

Phase II: Stabilizing Governance

Core Goal

Evaluate existing program governance to identify strengths and weaknesses, and determine whether current structures support the needs of a growing program.

Characteristics

Phase II program governance can best be described as functional, but limited in one or more aspects. Documented policies and procedures for community contributions, technical oversight, and budgeting exist, but often still exhibit a strong influence from program founders, funders, and/or specific staff or community members. Moving a program forward requires succession planning to ensure program continuity.

Concerns and Roadblocks

Governance is a balancing act. Governance adds overhead, and when a program is growing, it may seem like too much. Ceding decision-making authority to community members or advisory groups can lead to a loss of autonomy among program staff or sponsors. Governance can slow down the pace of development. Programs need a clear strategic vision for the application and community to properly evaluate whether governance policies and processes are contributing to the success and value of an OSS program or adding an unnecessary burden.

> It is not uncommon for a program to outgrow its founding or sponsoring organization.
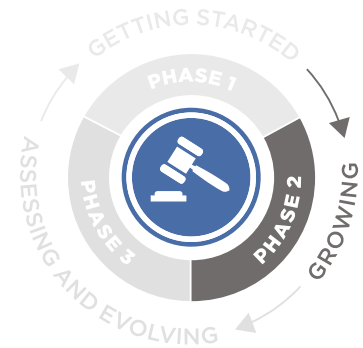
Moving Forward: Objectives

- **Document existing governance policies**

  Make sure that existing policies for code contribution, technical roadmapping, strategic planning, policy decision-making, etc., are all documented and available for the community to access and use. Even if you don't have formal governance in specific areas, documenting how program decisions are made is still a useful exercise and valuable for building trust within the community.

- **Evaluate each element of existing governance**

  Once you have proper documentation, ask staff and the community to evaluate if the structure and policies are working. Are the needs of critical stakeholders effectively addressed? If not, then why not? Is the policy resilient – would it still work if a key program or community member left? Have confidence in de-prioritizing, sunsetting, or changing the scope of governance policies that aren't working. It can often be helpful to look for outside advice to evaluate governance policies and processes.

- **Increase level of community engagement**

  To avoid an echo chamber where governance appears to be working because it is working well for the program team, look to increase the level of community engagement with the program. This may mean adding formal volunteer positions or advisory groups. Improved documentation may bring new contributors into the fold. Existing community members may be enlisted in outreach efforts to gather more program leaders.

- **Evaluate long-term home organization options**

  It is not uncommon for a program to outgrow its founding or sponsoring organization. Many open source programs explore expanding partnerships, or engaging fiscal sponsors or nonprofits to serve as home or sponsoring organizations providing administrative structure around program activities.

Facet: Governance

Phase III: Evolving Governance

Core Goal

Continue to evaluate and evolve the program governance model to keep up with new technologies, communities, and collaborators.

Programs should not confuse consistency with stagnation.

Characteristics

Phase III OSS programs benefit from strong management structures, although not all have formal governance. Many are part of umbrella organizations that provide the structures needed to move initiatives forward, such as marketing and communications, fiscal stewardship, and grant writing. Phase III programs generally have tried-and-tested business models, which lead to more predictability and a better ability to plan ahead.

Concerns and Roadblocks

Phase III programs often expand their focus outside – outside their country of origin for new communities and implementers, outside their domains for new partners and opportunities. With these shifts in focus, programs without strong management and governance structures risk mission drift or losing focus on core functionality. Governance must evolve to adapt to new cultures and languages.
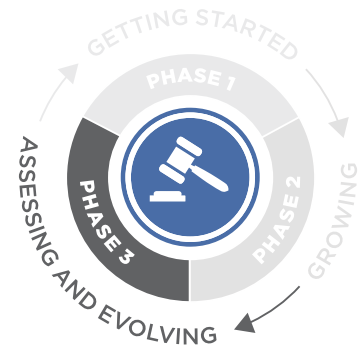
Moving Forward: Objectives

- **Support consistent structures**

  Consistent governance structures provide the community with a trusted place for making contributions of time, effort, and funds, and help new implementers overcome resistance to open source solutions at their institutions. It can be beneficial to have written "job" descriptions for Board members or other elected leaders, so that their responsibilities are clear, both to them and the broader OSS community. This also facilitates succession planning. Training opportunities for boards are available (e.g. BoardSource), and can be useful for those who are new to OSS program governance.

- **Continue to evaluate and evolve governance practices**

  Programs should not confuse consistency with stagnation. In order to support program expansion, new partnerships, and worthy collaborations, governance practices must evolve to meet the needs of growing and changing communities. Programs should continue to engage in regular evaluations of governance models as priorities, funding streams, and technologies shift.

- **Expand community participation in governance**

  Well established programs should ensure that their governance representation matches the makeup of their community and key stakeholders. It is easy to be dominated by a few well-funded community members. Having participants take on leading roles in working groups or councils can lead to senior leadership positions or "train-the-trainer" style onboarding for new participants in program governance, which can help mitigate this issue.

Governance Resources and Tools

- Benkler, Yochai. *The Penguin and the Leviathan: How Cooperation Triumphs over Self-Interest.* New York: Crown Business, 2011.

- "Boardsource Home." BoardSource. Accessed 29 March 2022. https://boardsource.org/.

- "Community Explorer." REALISE Project. Accessed 29 March 2022. http://fullmeasure.co.uk/REALISE/.

- Fay, Randy. "How do Open Source Communities Govern Themselves?" RandyFay.com. Accessed 29 March 2022. https://randyfay.com/content/how-do-open-source-communities-govern-themselves.

- Gardler, Ross and Gabriel Hanganu. "Governance Models." OSS Watch. Accessed 29 March 2022. http://oss-watch.ac.uk/resources/governancemodels.

- Resnick, Pete. "On Consensus and Humming in the IETF." Internet Engineering Task Force. Accessed 29 March 2022. https://tools.ietf.org/html/rfc7282.

OSS organizational homes and incubators:

- "Apereo Incubation Process." Apereo. Accessed 29 March 2022. https://www.apereo.org/content/apereo-incubation-process.

- "Educopia Institute: Our Work." Educopia Institute. Accessed 29 March 2022. https://educopia.org/about/.

- "LYRASIS Open Source Organizational Homes." LYRASIS. Accessed 29 March 2022. https://www.lyrasis.org/programs/Pages/default.aspx.

- "Projects at CS&S." Code for Science and Society. Accessed 29 March 2022. https://codeforscience.org/sponsored-projects/.

- "Software Freedom Conservancy Projects." Software Freedom Conservancy. Accessed 29 March 2022. https://sfconservancy.org/projects/.

Governance documentation examples:

- "Apache Corporate Governance Overview." Apache Foundation. Accessed 29 March 2022. http://www.apache.org/foundation/governance/.

- "ArchivesSpace Governance Board and Councils." ArchivesSpace. Accessed 29 March 2022. http://archivesspace.org/governance-board-and-councils/.

- "Governance." DSpace. Accessed 29 March 2022. https://dspace.lyrasis.org/governance/.

- "MetaArchive Resources." MetaArchive. Accessed 29 March 2022. https://metaarchive.org/documentation-resources/.
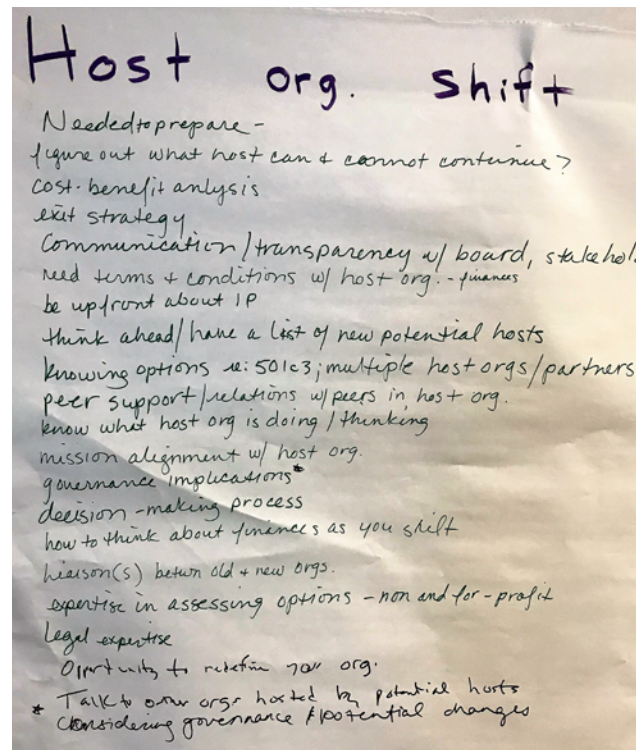
Whiteboard notes captured the forum discussion on governance and organizational shifts.

Governance Case Studies

Guidebook case studies provide first-hand accounts from forum participants about their program's work toward sustainability. Governance case studies are from the Islandora, Material Order, OLE, and VuFind programs.

Islandora[3]

By Mark Jordan
https://islandora.ca/

Islandora's governance model offers opportunities for institutions and individuals to participate in the community at a variety of levels. Institutions can join the Islandora Foundation at the Partner, Collaborator, or Member level. At each of these levels, an institution commits to paying a membership fee but also earns the privilege of appointing a representative to the Islandora Foundation Board of Directors, the Islandora Coordinating Committee, and the Islandora Technical Advisory Group (the fee and the committee depends on the level of membership). Each of these bodies has a specific focus: the Board is primarily concerned with legal and financial aspects of the Islandora community, the Coordinating Committee acts as the operational governing committee for the Foundation's activities, and the Technical Advisory Group provides recommendations regarding Islandora's technical roadmap.

Individuals participate in other ways. The most common, and easiest, is answering other users' questions in the discussion groups. Other ways include testing bug fixes, joining the biweekly committers' calls, volunteering at an Islandora Camp, and becoming involved in the semiannual software releases as documenters, auditors, or release managers.

We find that this two-part model works well. Institutions can participate by helping support the Islandora Foundation financially (and gain a direct voice in governance at the same time), while individuals can become involved in the more general Islandora community in ways that require a variety of levels of commitment.

Looking forward, the Islandora Foundation is working on refining its strategic goals for 2018 so that they articulate achievable ways to improve our software and to strengthen and broaden our community. The new goals will highlight even more ways for institutions and individuals to participate in our community's governance and sustainability.

> "Institutions can participate by helping support the Islandora Foundation financially … while individuals can become involved in the more general Islandora community."

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[3] Original publication date February 2018

Governance Case Studies

Material Order[4]

By Ann Baird Whiteside
https://materialorder.org
Material+Order

The Material Order Consortium grew out of a collaboration between the Harvard University Graduate School of Design (GSD), the Fleet Library at the Rhode Island School of Design (RISD), and CollectionSpace to design a collection management system for materials samples collections. The team developed a Materials Profile in CollectionSpace based upon earlier work between GSD-RISD. The earlier work included in-depth studies of the GSD written Materials Classification Protocol, which developed into a broader and more relevant materials taxonomy and database schema. Key concepts of the taxonomy provide multiple points of access to meet material research needs – composition, form, properties, material ecology, process, typical uses, and associated geo-locations.

In 2016, we opened the doors to institutions hosting materials samples collections across the US with the statement that Material Order provides a community-based approach to management and access to design materials collections utilizing and developing standards and best practices. This includes an open source collection management database and an access system that allows searching across international materials collections to support research and applications in the design fields. Current work in 2018 includes bringing in additional collections, and the development of a user front-end.

As the GSD and RISD were developing the concept of a consortium of materials collections, we understood that we were entering into the development of an organization, and that we were going to require tools and processes to support a consortium if it is to be viable. We had team members who had previously been involved in consortia that shared technology tools, one project of which had high

level structures around it (RLG) and the other which was very informal (one reason it did not survive over time).

In early 2016, we were led to a consultant who had strengths in identifying the needs of "start-up" organizations. We hired the consultant to help us map out the first few years of Material Order as a full consortium. Our work with the consultant helped us to articulate our vision and mission, and the scope of the consortium. Further work also outlined a complete organizational structure – governing structure, requirements for participation, benefits of participation, and intellectual property rights. We developed a governance structure that outlined charges for all potential sub-groups, operating principles, and deliverables – from the steering team through working groups.

For the year and a half after we drafted foundational documentation for the consortium, we felt that given we were

> "... Because we laid our groundwork in developing a framework early on, we have something to fall back on."

still only two organizations, the prescriptive structure that we had developed was unnecessary.

In the last year, we have had several institutions express interest in the consortium and we are in the process of bringing two new consortium members into the organization. This is leading us to think about governance issues again, and because we laid our groundwork in developing a framework early on, we have something to fall back on.

Having guidance as we started the consortium helped us think through how we want to work as a consortium, setting the stage for our future. In 2018, we will begin implementing some of the formal structure of the consortium as collective decisions will need to be made regarding further development.

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[4] Original publication date February 2018

Governance Case Studies

Open Library Environment (OLE)[5]

By Michael Winkler

The Open Library Environment (OLE) formed in late 2008 under funding from the Andrew W. Mellon Foundation and leadership from Duke University. OLE conducted community workshops to determine the interest in a community-supported, open source library management system to replace increasingly monopolistic market choices. The review of the workshops and input of hundreds of librarians found solid support and enthusiasm for an open source solution.

Encouraged by these outcomes, in 2010 OLE and a new set of partner libraries formed the OLE Partnership and sought further funding from the Mellon Foundation to pursue building a next-generation, open source library management system with utility and availability to libraries worldwide. The OLE Partners sought membership in the Kuali Foundation, a not-for-profit organization with a mission to deliver open source administrative software for higher education. The OLE Partners prospered under the administrative umbrella of the Kuali Foundation, adding five new members and developing and releasing our first production release in 2013. By 2015, three of the OLE Partners had deployed the Kuali OLE software to manage their libraries.

The OLE Partners adopted the Kuali community governance model that included a governing board of directors that oversees vision, goals, and resourcing for the partnership. OLE formed functional and technical councils to guide specifications and requirements for developing software. The Partners hired a project management team to coordinate the activities and operations of the project, with development outsourced to a commercial partner to provide velocity and deep software development expertise. The Kuali community was based on a buy-in model of membership and relied on participant institutions to bring sufficient capital to the project to underwrite the cost of software development. The OLE Partners fulfilled our budget requirements with a mix of grants and self-funding that mobilized over 7M USD by 2015.

In 2015, the Kuali Foundation community undertook a review of its open source business. Their Board determined that a new business model was necessary to improve software quality and uptake. The Foundation formed a for-profit corporation, KualiCo, to "professionalize" software development and implementation. While retaining an open source license going forward, Kuali software products would seek to have an exclusive relationship with KualiCo as the sole service provider. Further, the Kuali Foundation decided to stop development and support for the critical middleware component, Kuali Rice, on which Kuali OLE was developed.

These changes at the Kuali Foundation prompted a moment of reflection for the OLE Partners, assessing our community, our resources, and our software. We found that while we were successful as a community with over seven years of collaboration, growth and production, our software was difficult to implement and operate, we were missing critical functionality required to encourage further adoption of the software, and we had failed to internalize sufficient technical understanding of our software to allow delivery of our vision of modular and flexible software for widescale adoption. The decision by the Kuali Foundation to abandon the Kuali Rice middleware would require a complete refactoring of our software, and the OLE Partners had few available resources to begin that task. Additionally, the OLE Partners felt that the new Kuali business model did not match the OLE community's values for openness nor with the need to encourage a rich and diverse commercial support ecosystem.

Coincident with these assessments about the state of the Kuali OLE community was a new opportunity for collaboration through a partnership with EBSCO Information Services. Together, we have developed concepts for what has become the FOLIO project and community. FOLIO was to be a "green field" development thus addressing the technical debt resident in the Kuali middleware stack.

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[5] Original publication date February 2018. The Open Library Environment is now known as FOLIO, https://www.folio.org/.

Governance Case Studies

Open Library Environment (OLE)
(Continued)

EBSCO and Index Data as partners bring new resources to blend with OLE resources to marshal sufficient capacity to undertake new software development. The FOLIO community model of wide inclusiveness and low barriers to participation – that encourages a growing and healthy ecosystem of librarians, developers, and service providers – matched OLE's concern about an exclusive business model. The remaining issue for OLE was to find a host organization to enable the collaboration and community ownership of the effort. The OLE Board developed a plan to take action. The plan, which we began in the spring of 2016 was to:

- Join with EBSCO and Index Data as founders of the FOLIO Project

- Leave the Kuali Foundation and form a new not-for-profit – the Open Library Foundation – with broad library services/collaboration mission

- Complete Kuali OLE software to provide sufficient stability and capability for implemented partners

- Implement a hybrid business model that combines cash and effort contributions from Partners

As OLE enters 2018, we have completed our pivot. Our partnership is strong and growing, adding three new partners in the second half of 2017. We are enthusiastic about our work in FOLIO and looking forward to software releases in 2018, and potential implementations in 2019. Our business model is still evolving, but we are adopting a hybrid model of mixing cash contributions with contributed staffing. The lessons that we learned during this hard turn can be summarized into several primary takeaways. OLE is powered by the commitments of its Partners. To sustain efforts for years requires a business model that is easy to join without extraordinary financial burdens on participants. It is important to encourage and reinforce deep staff engagement and invest in our own expertise in technology, functionality and leadership. OLE's experience demonstrates how the web of dependencies resident in complex networked applications can have dramatic impact on how a community is governed. OLE not only survived shifts in the environment and in our project, but prospered. I attribute this to the Partnership's commitment to openness and inclusiveness. For us, these were not simply platitudes, but formed the reservoir of strength that allowed us to hold together and support our partners who had taken a risk to implement the OLE code, to assess and endorse a pivot to the FOLIO project, and to empower the many functionalists and technologists within our partnership to take leadership roles and work together towards a more sustainable future.
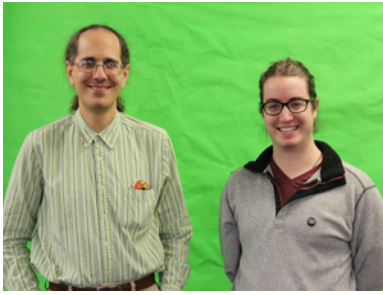
"It is important to encourage and reinforce deep staff engagement and invest in our own expertise…"

Governance Case Studies

VuFind: Community History[6]

By Demian Katz and Christopher Halberg
https://vufind.org/vufind/

The VuFind project began in 2007, when a team at Villanova University began developing an open source discovery tool, inspired by the faceted search capabilities of North Carolina State University Libraries' commercial Endeca system. The largely unsatisfactory state of most commercial OPACs at the time inspired substantial interest, and an informal community of developers quickly formed around the project.

Despite a strong start, the project faced a crisis shortly after issuing its first release candidate late in 2008: the project's lead developer, Andrew Nagy, left Villanova for another position and could not maintain the full-time effort of his former leadership role. While this scenario can kill a project, in this case, Villanova was able to hire another developer to continue Nagy's work. Demian Katz took over the lead role in July of 2009, and, with the support of Nagy and the existing community, was able reinstate a reasonably regular release cycle before the year ended, reaching a stable release 1.0 by July 2010.

Despite receiving the community's trust and support, Katz wanted to create a formal mechanism for community decision-making. After discussion on the project's mailing lists, the community decided to create an administrative decision-making group. Volunteers filled out a "skills survey" showing how they could contribute to the project, and an election was held to select administrators. By September 2009, a dedicated VuFind-admins mailing list was created to facilitate this group's decision-making.

This initial experiment with an administrative group proved largely unsuccessful, simply because there was insufficient conflict within the project to require a formal voting body. Problems were solved and decisions were made organically on the technical mailing lists, and the admin list stagnated.

A year later, VuFind held an in-person conference at Villanova University to discuss plans for the next generation of the software. This conference highlighted the importance of real-time conversation to the community and development process. To allow conversations started at the conference to continue on a regular basis, an online developers' call was established by November of 2010. This call quickly superseded the admin mailing list as the forum where major decisions were discussed.

The pattern established in 2010 has held to this day. Annual in-person meetings create the long-term plans that drive the VuFind project. Bi-weekly online calls create an open dialogue where developers and users report progress, discuss problems, share ideas and make decisions. A coding philosophy that welcomes additions that are modular and configurable also contributes to the success of this model. The contribution of ideas and code is encouraged when the core team focuses on improving all viable contributions rather than choosing which to include or exclude.

This inclusive, contribution-driven model is not without costs. While it does offload most of the steering away from the core team, it also brings a heavy code-review load. This can create a bottleneck when contributions are particularly complex. Additionally, the success of the project is dependent on the limited number of developers capable of performing critical review and integration work.

VuFind has been very fortunate to have the support of Villanova University funding core developers throughout its development. While there are no signs of this support waning, it would be irresponsible to count on it forever. One of the clearest future steps is to secure VuFind in an institutional home separate from its sole source of financial support. This may require some new ideas about governance and the development of succession-planning contingencies.

The success of VuFind to date is not an indication that formal governance is unnecessary; it is certainly conceivable that a situation could arise where the current informal system would prove to be a liability. Yet, this history does demonstrate the difficulty of establishing governance in the absence of a pressing conflict or need. When a community consists primarily of software developers working in a collegial environment, the focus tends to be on solving problems and meeting goals, and if this is happening organically, it is difficult to impose a formal structure on top of it in the absence of any external pressure to do so.

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[6] Original publication date February 2018

Facet: Technology

Phase I: Laying the Groundwork

Core Goal

Turn an idea for an application into a viable product that serves the needs of the community.

Characteristics

Programs in Phase I are in the design, pre-release, or early beta-testing phase of software development. These programs may have no users yet, or a core of committed early adopters or beta testers. New development may also be based on newer or unproven technology, require staff training, and may exhibit considerable technical or resource challenges.

Concerns and Roadblocks

Programs in the early phases often suffer from the need to be all things to all people – in order to get funding, they often promise the moon to sponsors. This leads programs in the early phases to be very susceptible to scope creep. A focus on trying to cram in every last feature may leave critical elements behind, such as testing, documentation, and community building. It can also be difficult to accurately assess the amount of time new development will take in a new environment.

Moving Forward: Objectives

- **Understand core community needs**

    OSS for cultural and scientific heritage is often developed in response to a specific institutional or community need. Programs should evolve from working within a single organization to gathering input and feedback from the broader community. This feedback can help define community-based functional needs, influence the architectural approach, and help refine core needs that require coordinated development. Programs can gain community confidence by articulating a broader vision; regularly releasing small, solid updates that allow funders and stakeholders to visualize the bigger picture; communicating how feedback influences development; and by focusing on overall quality.
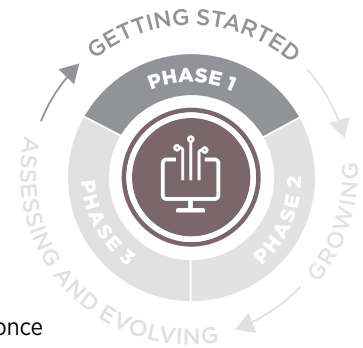
- **Continue to gather data**

    A community needs analysis does not end once a program moves from design to development. Reach out directly to users. Continue to have conversations with the end users of applications. While it may be too early to ask for input on software improvements or new features and functionality, community members can provide valuable feedback and engagement by assisting with testing and documentation.

Early openness with stakeholders and other investors will provide a good foundation.

- **Communicate process and progress with stakeholders**

    Museums generally do not let people view exhibits until they are completely installed. Archivists prefer to process a collection before making it available to researchers. Until fairly recently, scholarly data was not made available until the journal article was published. Contrary to these approaches, the best OSS development is open and transparent. Program staff need to counteract the tendencies of subject matter experts to play things close to the vest during design and development. By using an open code repository, public bug tracking and regular releases, OSS developers can inspire confidence and engage stakeholders. This kind of transparency may be somewhat counter to the culture of wanting to present completely finished work, but early openness with stakeholders and other investors will provide a good foundation for opening up the program to the wider community in future phases.

Facet: Technology

Phase II: Expanding and Integrating

Core Goal
Refine the application: identify and strengthen areas that are working well, identify gaps that can be filled with new features and functionality, and phase out elements that are not working.

Characteristics
Phase II programs have had more than one public release, developed a formal release process that includes a numbering system or other method for identifying major and maintenance releases, and the application is being used in production outside of the founding organizations. Programs are generally adding new features and functionality to their software packages and exploring integrations with related applications.

Concerns and Roadblocks
Once an application has been developed and released, it can sometimes be difficult to evaluate it with an objective point of view. Making the decision to deprecate or redesign features that took several sprints to design and develop can be complicated, especially if the features were championed by important project stakeholders. Programs that do not engage with their communities at this phase run the risk of developing features the community does not care about, and can be seen as only serving their own interests.

Long-lived OSS programs spend as much effort on the process of producing code as they do on producing code itself.

Moving Forward: Objectives

- **Engage the community**

  Community involvement in the requirements gathering and functional specification process is paramount. Sitting down, either physically or virtually, with the people who use the application frequently can provide development teams with a clearer view of what is working, what features and functionality are most heavily used, and how the application may be improved or expanded to better fit user needs.
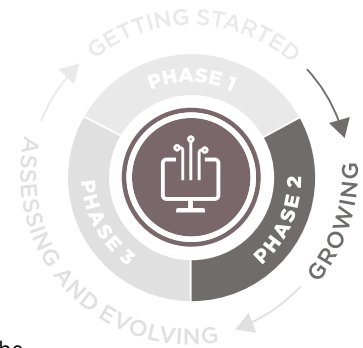
- **Grow thoughtfully**

  Once an application has been released and a community of users begins to grow, the program team must learn to balance community feedback and interest in exciting new features with maintaining stable, up-to-date, and well-documented software. Programs that can communicate clearly about architecture and infrastructure can form a common understanding with the community of the importance of backend maintenance and support. It is also important during this phase to cultivate the community of developers and committers (with commit rights) outside of the core organization and stakeholders. Outside contributors add not only valuable code to the application, but also new perspectives that keep the program from becoming an echo chamber.

- **Consider integration over new development**

  We have communities and we are a community. There are many organizations working to develop open source solutions to address cultural and scientific heritage problems, and it may be that one of the problems an OSS program needs to solve has already been tackled by other members of our community. Leveraging existing open source solutions can not only add functionality, but also open up a program to a new set of users, developers, and stakeholders. Instead of using scarce resources to develop new functionality which may or may not be integral to the software's core purpose, explore if integrations with existing platforms with appropriate functionality can serve this function. It may be possible to increase the sustainability of the core product, especially if these ancillary platforms have significant user communities, development communities and strong governance. This leveraging of other communities allows the program to grow in functionality and potentially serve new audiences without having to necessarily invest a large amount of resources.

  Invest in testing, documentation and training. Long-lived OSS programs spend as much effort on the process of producing code as they do on producing code itself. Robust and efficient testing, documentation, and training (both of developers and end users) are critical to scalability and sustainability.

Facet: Technology

Phase III: Preparing for Change

Core Goal

Determine how the core application's technology stack and functionality will serve the future needs of the community; plan ahead for expansion, integration, re-architecture, or retirement.

Characteristics

Phase III applications are in production, well-adopted, and well-supported. Design and development of the core technology stack is stable, with few changes to the application's architecture with each release. Programs typically have a stable supply of developers and committers, and a published and predictable release schedule. Program staff in this phase are generally looking to the next generation of the application. The existing application may be nearing the end of its useful life due to changing market circumstances or require a technology overhaul to bring the code up to date with new technology or community needs.

Concerns and Roadblocks

Some community members may feel comfortable with the current platform, it is stable and has been proven as a production-ready application for some time. For others, Phase III can feel like a return to the drawing board. New communities and stakeholders or technology obsolescence may require re-architecting or retiring elements of an application. Program staff must balance the needs of stakeholders invested in and comfortable with earlier versions with the need for significant refresh and potential expansion to new communities.

Moving Forward: Objectives

- **Reassess community needs**

  The demand for software re-architecture or retirement must come from stated community requirements, balanced with the community's ability to support and keep up with change. Program staff must ask themselves

> Sustainability is not synonymous with perpetuity.
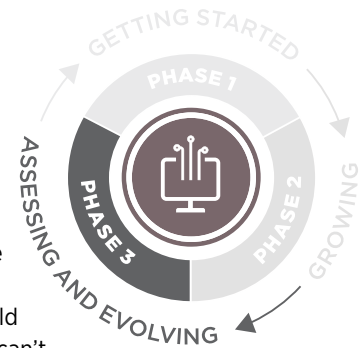
how re-architecture or retirement will serve the community. Are there things users would like to accomplish but can't with the current architecture? Are things fine the way they are but underlying technology is sunsetting and must be replaced? Is there an opportunity to migrate current users to an OSS application built on newer technology? Users of OSS for cultural and scientific heritage rely on these applications to care for information held in the public trust, and must be part of any decision-making process that would affect their ability to create, maintain, and preserve that information.

- **Plan for evolution**

  Once the need for change has been identified, the community needs to review whether incremental improvements to the OSS application are sufficient or whether a complete refactoring and re-architecture is required. If the core requirements that inspired the original development of the application still exist, but the language, libraries, or hardware platform used to create the application are obsolete, it may make sense to refactor or re-architect the application. It is sometimes the case, however, that requirements have evolved, and at the time of refresh, additional functionality or a fundamental restructuring is needed. Thinking ahead rather than waiting for crises allows program staff to get buy-in from the community, secure necessary funds, and develop transition and migration plans for existing implementers.

- **Document an exit strategy**

  Sustainability is not synonymous with perpetuity. There are cases where a program has been successful, but served its purpose, and should be gracefully retired. Programs that no longer meet the needs of their communities or have been supplanted by alternatives may need to develop plans to communicate the end-of-life decision to the community and organize support or migration services for remaining users.

Technology Resources and Tools

- Dombrowski, Quinn. "What Ever Happened to Project Bamboo?" *Literary and Linguistic Computing*, Volume 29, no. 3 (2014): 326–339.

- Fogel, Karl. *Producing Open Source Software: How to Run a Successful Free Software Project.* Beijing: O'Reilly, 2009. http://producingoss.com/.

- Ries, Eric. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.* New York: Currency, 2017.

- Rosenberg, Scott. *Dreaming in Code: Two Dozen Programmers, Three Years, 4,732 Bugs, and One Quest for Transcendent Software.* New York: Three Rivers Press, 2008.

Software documentation examples:

- "Avalon Media System Documentation." Avalon Media System. Accessed 29 March 2022. http://www.avalonmediasystem.org/documentation.

- "Koha For Developers." Koha Community. Accessed 29 March 2022. https://koha-community.org/get-involved/for-developers/.

- "A Guide for the Samvera Community." Samvera. Accessed 29 March 2022. https://samvera.github.io/.

Technology Case Studies

Guidebook case studies provide first-hand accounts from forum participants about their program's work toward sustainability. Technology case studies are from the Fedora and LOCKSS programs.

Fedora[7]

By David Wilcox
https://wiki.lyrasis.org/display/FF/Fedora+Repository+Home

The first public release of Fedora (version 1.0) was made available in 2003. Through a combination of grant funding and community contributions the software matured over time; version 2.0 was released in 2005 and 3.0 in 2008. But like most software projects, a considerable amount of technical debt built up over time as a distributed community continued to build on top of a now-aging codebase, and by 2012 it was time to consider a major project re-architecture. This initiative, dubbed Fedora Futures, focused on five key priorities:

- Improved performance, enhanced vertical and horizontal scalability;
- More flexible storage options;
- Features to accommodate research data management;
- Better capabilities for participating in the world of linked open data; and
- An improved platform for developers—one that is easier to work with and which will attract a larger core of developers.

These priorities represented challenges based on the then-current version of Fedora, but the Fedora Futures initiative also provided an opportunity to re-think the Fedora software based on lessons learned and emerging technologies and standards. Early on, the development team decided to focus on a robust REST-API built on top of an existing open source software platform, thereby reducing the amount of custom code the Fedora community would need

to maintain. The API would also be aligned with modern, well-adopted web standards, such as the Linked Data Platform, which would help Fedora move beyond the walls of the library into the world of the web and linked data. These decisions provided great opportunities for the Fedora project and community, but there were also several challenges to overcome.

The biggest challenge of a complete software re-architecture is how to support the existing community of users. Specifically, many institutions were already using Fedora in production, often with client applications that were built based on expectations of functionality that would change in Fedora 4. A considerable amount of community energy has been put into supporting migrations, including tooling, documentation, metadata mapping, and training. However, migrations are often an institutional resourcing problem as they inevitably take considerable, dedicated effort. Supporting migrations continues to be a high priority for the Fedora community as we try to move everyone forward to the latest version of the software.

Fedora 4 has now been in production for over three years, and our focus has shifted toward stability. Ideally, Fedora is a dependable piece of infrastructure that works well and doesn't change very often. To this end, we are committing to

> "The biggest challenge of a complete software re-architecture is how to support the existing community of users. "

a slower release cycle of only one major release per year, and publishing a formal specification of the Fedora REST-API that will provide additional stability for client applications.

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[7] Original publication date February 2018

Technology Case Studies

LOCKSS[8]

By Nicholas Taylor
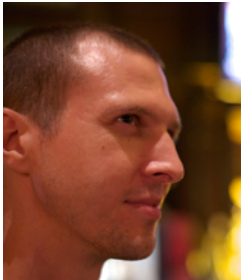**https://www.lockss.org/**

Photo: Ben Chernicoff

For nearly two decades, the Stanford University LOCKSS (Lots of Copies Keep Stuff Safe) Program has supported community-based, distributed digital preservation through its eponymous software. Changes in the larger technical environment in the intervening time have lately prompted a major re-architecture effort, currently underway with substantial funding from the Andrew W. Mellon Foundation, with the goal of bidirectional integration of LOCKSS with the broader ecosystem. This move will support the sustainability of the LOCKSS Program by broadening the communities that are sharing costs to maintain functionality upon which the LOCKSS software depends.

> "The gains to sustainability from the re-architecture have as much to do with community strategy as with technical insight."

The LOCKSS software was originally developed in the nineties, at the inception of web archiving by memory institutions. Like other web archiving applications of this era, e.g., the archival crawler Heritrix and archived web content replay engine Wayback Machine, the LOCKSS software evolved into a complex, monolithic Java application. Significant developments in web technologies in the ensuing two decades motivated technical evolution in web archiving. Though the LOCKSS software confronts similar challenges as the broader web archiving field, its architecture has heretofore incentivized implementing independent solutions.

Recognizing otherwise missed opportunities for alignment with extant community initiatives and the long-term sustainability risk posed by a siloed software stack, we are now modularizing the major functionalities of the LOCKSS software into a set of interoperating web services. This will novelly enable existing open source software to be leveraged as part of a LOCKSS system, reducing maintenance costs and simplifying adoption of new technologies. Conversely, it will also allow for the incorporation of individual LOCKSS software components – e.g., the peer-to-peer data integrity and repair mechanism – into non-LOCKSS systems, unlocking the potential for more flexible integration and a broader impact.

These objectives underscore that the gains to sustainability from the re-architecture project have as much to do with community strategy as with technical insight. We have a strong sense of the need to find, align with, and invest in the broadest possible open source software communities focused on our shared challenges if those challenges are to be addressed both effectively and efficiently. We need to further build, engage, and learn from open source software communities with a stake in the unlocked functionality of the LOCKSS software to maximize the good that it can provide for digital preservation broadly.

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[8] Original publication date February 2018

Facet: Resources

Phase I: Creating Consistency

Core Goal

Create a sustainability plan focused on achieving a consistent and sustained level of resources. That may be a mix of reliable, diverse, predictable financial resource streams as well as time/efforts commitments from volunteers or consistently allocated staff time from dedicated institutions. Move program resources from early enthusiasm and grant funding to the next step.


OSS programs do not have to go it alone.

Characteristics

Phase I programs are typically funded by a single organization, grant-funded or volunteer operated, and may not have a long-term plan for ongoing support such as membership or any earned income streams. There is often a single program owner or champion writing grants, shifting internal resources and obtaining necessary internal support. Software development staff may be grant-funded and therefore not permanent members of the team, or may be temporarily re-assigned from other projects. A small number of contributors generally means that a loss of one person has an outsized impact.

Concerns and Roadblocks

In a program's early days, it may be difficult to make the case to those who control the resources that the program is important. Tensions between what users and programs need, such as local vs. community needs, infrastructure, iteration, and exploration of potential uses outside of the original community, may be different from the solid plans funders would like to see. Unrealistic expectations placed on small teams can lead to burnout.
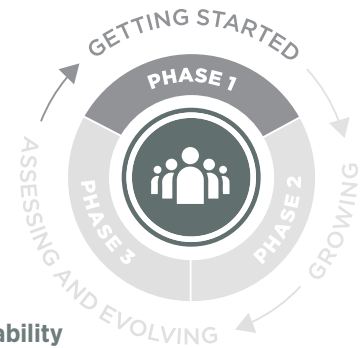
Moving Forward: Objectives

- **Undertake business and financial sustainability planning**

  Understanding a program's market and end users, and the options for long-term dedicated resources, are critical to long-term financial sustainability. Options for obtaining sustainable resources include but are not limited to earned revenue streams, in-kind contributions from multiple organizations, sponsorship or membership programs for active users, and other arrangements for shared revenue. Some programs may have resources that can assist with these efforts in house or at their founding/sponsoring organization, but others will need to look outside for assistance.

- **Determine human resources needed to move forward**

  In addition to financial resources, human resources are needed to develop functional specifications, write code, and perform community outreach. Within the OSS program's business plan, enumerate the people and skill sets required to support program elements in priority order, and be clear about what may be delayed or deferred when resources are focused on one aspect of a program over another.

- **Explore partnerships and collaborations**

  OSS programs do not have to go it alone. Many programs explore partnerships with similar communities or engage with fiscal sponsors or nonprofits to serve as home organizations that provide administrative structure around a program's activities.

Facet: Resources

Phase II: Diversification

Core Goal

Diversify income streams and talent pools to mitigate reliance on one source of income or program member.

Characteristics

Phase II programs have generally moved to distributed resourcing – be it membership fees, cost recovery, value-added services, institutional commitments of in-kind resourcing, or a mix. They are able to meet day-to-day expenses, but may still be reliant on a small number of organizations and revenue streams, and have difficulty funding out-of-the-norm expenses. On the personnel side, Phase II programs have a strong core team and are usually able to recruit diverse team members, but retention can be difficult without long-term funding assurances.

Concerns and Roadblocks

It can be difficult to recognize when things are not working and to identify ways to pivot to more successful paths. Converting users to community members and contributors can be difficult. Transitioning from user support to institutional support is challenging. Expanding into different countries or regions can bring its own set of issues, from the mundane, such as difficulty with financial transactions, to the foundational, such as a lack of understanding of open source contribution models.

Moving Forward: Objectives

- **Expand community of funders and contributors**

  Grant funding and contributions from original stakeholders will only take the program so far. In order to grow and sustain, program staff need to seek a more diverse set of funds and contributors. Programs may explore diversifying income streams via memberships, sponsorships, or providing support and services around their application. New contributors may be identified via bounty models (offering payment or "bounties" for specific work), workshops or hackathons at conferences, student interns and/or the user community's personal networks.
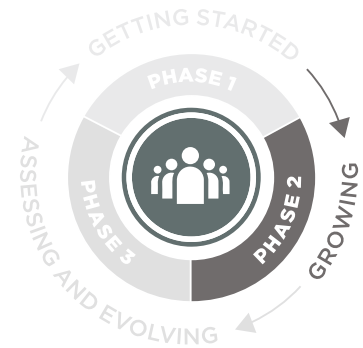
- **Work with vendors to support development needs**

  In some cases, the community of implementers and users for an open source application may have sufficient technological resources to provide code contributions and all the necessary implementation support. In others, however, implementing institutions just don't have the human resources and skills in house – a common challenge for cultural and scientific heritage organizations. In these instances, vendors providing services and support around the OSS may be a good source of development resources for the program. Working with vendors involves considerable requirements analysis on both sides; in the end, the service provider needs to develop the features in a way the implementing institution can use but that is generic enough that other organizations can use them too. If done well, these types of arrangements can provide a high level of community engagement while covering the costs of continuing to develop the software. Some programs choose to create formal registered service provider agreements with outside vendors.

Converting users to community members and contributors can be difficult.

- **Cultivate expectations around community contributions**

  Programs should provide structure to support community contributions, with established expectations around contributions. Community efforts should be encouraged to help with answering technical questions, fostering the development of code committers, supporting regular community gatherings, and assisting with strategies related to software development and community engagement.

Facet: Resources

Phase III: Stable, but Not Static

Core Goal

Focus on resilience – ensuring that the program is aware of changes in the landscape and has plans to address them. In other words, make sure to continue to evolve to meet the community's needs.

Characteristics

Phase III programs generally have diverse staff support and income streams covering daily operations, and can focus on long-range strategy and even endowment formation. Money is available for R&D and infrastructure programs, and the loss of or change to one income stream does not spell disaster. On the human side, Phase III programs have paid staff and a strong contributor model with many skill sets and roles represented.

Concerns and Roadblocks

Large contributions by implementing institutions may be mirrored by expectations around how program priorities are set. Grant funding that allows for more exploratory or experimental work can be hard to come by. Chasing revenue can cause a loss of focus, or move priorities away from the ultimate needs of the end users of the OSS.

Make sure to continue to evolve to meet the community's needs.
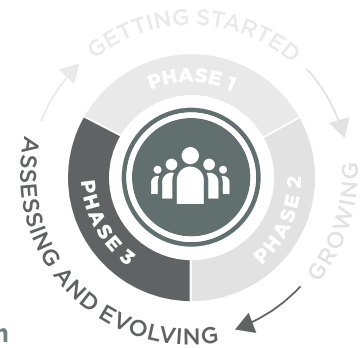
Moving Forward: Objectives

- **Focus on alliances and partnerships with leading institutions**

  Large, well-funded organizations may be drawn to the notion that with OSS, they can have a strong voice in governance and program direction, while supporting the needs of their often-diverse constituents. Partnerships with leading organizations can provide steady sources of income, in-kind contributions such as development resources, and intangible benefits associated with the organization's reputation such as shared ownership and responsiveness.

- **Shift business model in response to external events**

  Programs need to evaluate their resource plans in response to the broader technology landscape and trends in the domain the OSS serves. It is critical to develop a board or advisory group that has the right skill set for identifying trends and determining how to mitigate their effect on a program's viability. Some trends may be positive, such as the current increased focus in higher education on supporting open resources and technologies. Other trends may be challenging, such as cuts to funding agencies.

- **Calibrate revenue streams to a global economy**

  Open source software can be very attractive to organizations in developing economies. Program staff must be flexible in their expectations for financial and in-kind contributions from these organizations; for example, by calibrating financial requirements for governance participation on a sliding scale.

Resources Resources and Tools

- "BountySource Home." BountySource. Accessed 29 March 2022. https://www.bountysource.com/.

- Eghbal, Nadia. "A Handy Guide to Financial Support for Open Source." GitHub. Accessed 29 March 2022. https://github.com/nayafia/lemonade-stand.

- Evans, Duncan. "Three Simple Steps to Make Distributed Teams Work." Scrum.org. Accessed 29 March 2022. https://www.scrum.org/resources/blog/three-simple-steps-make-distributed-teams-work.

- "Financial Management." National Council of Nonprofits. Accessed 29 March 2022. https://www.councilofnonprofits.org/tools-resources-categories/financial-management.

- "Candid Home." Candid (formerly Foundation Center). Accessed 29 March 2022. https://candid.org/.

- Fogel, Karl. "Hiring Open Source Developers." In *Producing Open Source Software: How to Run a Successful Free Software Project.* Beijing: O'Reilly, 2009. http://producingoss.com/.

- "Reports and Resources." Nonprofit Technology Network. Accessed 29 March 2022. https://www.nten.org/knowledge/reports-and-resources/.

- "Planning for Sustainability." OSS Watch. Accessed 29 March 2022. http://oss-watch.ac.uk/resources/planningsustainability.

Katherine Skinner discussing the "Steps" model created by Educopia.

Resources Case Studies

Guidebook case studies provide first-hand accounts from forum participants about their program's work toward sustainability. Resource case studies are from the DuraSpace organization and Specify program.

DuraSpace[9]

By Michele Kimpton and Jonathan Markow

2014 was a year of growth and transition for DuraSpace. DuraSpace's key goals for the year were to increase community participation and engagement in the open source projects, and to increase transparency regarding DuraSpace's role and how funds are allocated to projects and services. To help achieve these goals, DuraSpace transitioned from a sponsorship to a community membership program to support the open source projects. A key objective of the new membership program was to increase community engagement by establishing a robust governance structure for each open source project. By the end of 2014 steering groups and leadership groups had been established for each of the projects. Participants in these groups came directly from the membership.

Continued growth of membership in DuraSpace was a key objective to expanding the organization's reach and engaging with software users both far and near. Thirty-three percent of the membership came from outside the United States. Focused efforts were made to increase engagement with users outside the USA, to better understand their needs,

contribute to and participate in open source projects, and to illustrate how global engagement and contribution drives successful community source software development.

DuraSpace also continued to expand its portfolio of hosted services running on cloud infrastructure. DuraSpace services continued to be developed and expanded based on the goal of providing small to mid-size organizations with services that enabled management, access to and preservation of their digital research and scholarship without having to pay for in-house technical expertise to deploy and maintain technologies. DuraSpace's goal was to enable any institution the capability to access, manage and preserve their digital holdings regardless of the institution's size.

DuraSpace's success was based on a deep understanding of how to advance community source projects through community engagement, and how to continually adapt services to meet the emerging needs of the larger community invested the stewardship of our collective digital scholarship.

> "A key objective of the new membership program was to increase community engagement."

and give them a more democratic way to voice their needs through the governance model established. Significantly reduced membership fees were available for institutions from developing countries, as low as $250 per year. The membership program provided a pathway for DuraSpace to increase awareness and education about how to best

In fiscal year 2014, all revenue was derived from membership and services revenue. No revenue in 2014 came from grant funding, the first time in DuraSpace's history. In 2009, the organization was 100% grant funded and in 2014, 75% of revenue was derived from membership while 25% came from services.

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[9] Original publication date February 2018

Resources Case Studies

Specify[10]

By James Beach
https://www.specifysoftware.org/

For over 400 years, field biologists have explored the world's wild places to discover and document the diversity of life on earth. Preserved animal and plant specimens from those forays provide the physical evidence for describing new species and for documenting species distributions in space and in time. Specify (http://www.specifysoftware.org) museum databases are catalogs of those specimens; they include descriptive, taxonomic, geographic and other types of specimen data.

In 1987, the U.S. National Science Foundation began funding the MUSE Project, the predecessor to Specify. Over the subsequent 30 years the two projects competed for $12M in grants with additional support from the University of Kansas. In 2017, with encouragement from NSF, we began a process to identify an organization/revenue model that would engage biological collections institutions to financially support future costs of the Specify Project's core software development and technical support services.

collections to use inexpensive or free software for the processing the data associated with curation and research.

Specify's open source license is valued by most small and medium-sized collections because the software is free to use. But large university and national museums have told us that open source licensing was a precondition for their adoption of it, because of an institutional commitment to open source software.

In transitioning Specify from grant funding to financial sustainability, our two biggest challenges are: 1) identifying an organization/financial model for generating revenue to sustain the project, and 2) finding a way to keep the project embedded within a research center or university. For the first challenge, a non-profit, membership organization model looks like the most promising option as it will enable us to leverage fees from larger "Founding Member" institutions who are in a position to, in effect, subsidize Specify for smaller collections with meager financial resources.

For the second challenge, being embedded within a university research campus gives us direct access to collections researchers for feedback and to inform priorities.

More importantly, being under the wing of a university or research museum would give us benefits from existing infrastructure, including human resources, financial management,

> "Ultimately, economic sustainability of the Project will depend on the number of research institutions who value open source software enough to help underwrite it ..."

Research institutions with natural history collections range in size from large national museums with tens of millions of specimens, to mid-size university collections (50,000-several million), to small college and free-standing collections (5,000-50,000). The Specify Software Project primarily serves mid- and small-sized museums – a total of about 500 collections in the U.S. and 37 other countries. Generally biological museums are sparingly-resourced; collections in some large U.S. state universities have budgets, exclusive of salaries, of a few thousand dollars per year. Such limiting financial resources drives the majority of biological

payroll services and the like. In addition, staff would enjoy the benefits of university employment which partially compensate for mid-range 'academic' salaries.

Ultimately economic sustainability of the Project will depend on the number of research institutions who value open source software enough to help underwrite it, extreme cost effectiveness for smaller institutions, and our ability to deliver mature and agile software products that keep up with evolving research requirements, community standards and architectures, and commercial computing technologies.

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[10] Original publication date February 2018

Facet: Community Engagement

Phase I: Getting Beyond Initial Stakeholders

Core Goal
Identify and involve a wider group of stakeholders.

Characteristics
Phase I programs are generally focused on their primary stakeholders. There is frequently lack of engagement with the broader cultural and scientific heritage and OSS communities, and lack of an externally focused communications strategy, either from limited experience or a feeling that outreach is not a priority at this point. In this stage, the core stakeholders may still be developing their product strategy and doing a competitive environmental scan. In this early stage, staffing resources are limited and can be dependent on one organization, with a focus on doing core set-up work rather than engaging with a larger audience or establishing communications practices to a wider community.

Concerns and Roadblocks
Insufficient staffing can be an issue in this stage. Work may be done by volunteers and/or overcommitted program staff. This leads to a difficult balance between doing the work and communicating about what is going on to a wider community. There may be tension among the core stakeholders between focusing on critical early set-up functions while at the same time feeling pressure to start seeding the larger community. The software may not be available to a wider audience and there is frequently a lack of documentation to share – thus making it difficult to connect with the larger potential community that the software will need in order to grow.

Moving Forward: Objectives
- **Identify and involve a wider group of stakeholders**

   In order for the open source software to grow, the small group supporting it needs to grow as well. The tight group of dedicated people working on it should determine and define the audience for the software and start involving them in its growth and development. Useful questions to ask and answer as you seek to increase stakeholders include: Who are you serving? What value are you adding? Are there additional communities that can be served by this software?
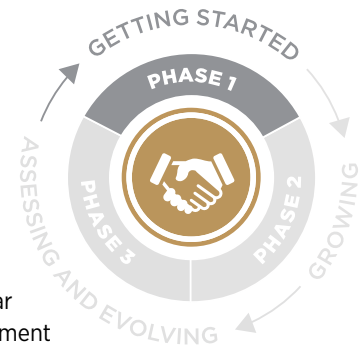
- **Form an outreach committee**

   One strategy for regular and consistent engagement with the community is to form an outreach committee, thus prioritizing this objective. Making a group responsible for it means that community engagement and outreach is no longer a "nice" thing to do when people have time, but rather a commitment for all stakeholders with long-term impact.

- **Formulate a communications and engagement strategy/plan**

   Despite being time consuming, it is critical to create a community engagement strategy at this early stage. Programs should consider it part of their overall strategic and operating plans. Be sure to include specific elements, such as creating mailing lists, conducting member forums, giving conference presentations, and committing to regular blog posts. When considering the OSS program's communications strategy, read through the resources in this Guidebook. Reach out to staff and community members of other OSS programs serving cultural and scientific heritage – the participant list for the ITAV forum is a great start.

- **Implement communications and engagement strategy**

   An iterative and ongoing communications and engagement strategy may be appropriate for many OSS programs. Programs should continue to evaluate and adapt as they go forward. Contributors may find that weekly blog posts are too burdensome or regional in-person meetings are better than online meetings for the community. Find users who are willing to serve as program champions and tell stories of successful use of the OSS. It is not just about communicating out to people; it should be the start of the larger community engaging with and contributing to the OSS program and software.

Insufficient staffing can be an issue in this stage.

Facet: Community Engagement

Phase II: Establishing Community Engagement Infrastructure

Core Goal

Bringing more into the fold – turning users into stakeholders.

Characteristics

Phase II is when program participants determine how to best facilitate engagement that works for the specific community. At this stage, the community may be small and unsure of how to contribute. For example, individuals may be contributing code, but the processes aren't very clear, streamlined or efficient. People may want to help in a variety of ways, but aren't sure how, or they may wait until they are specifically asked to contribute.

Concerns and Roadblocks

Frustration or fatigue may be an issue in Phase II. Efforts take time to pay off and some strategies may need to be shifted. Stale patterns may need to be changed and new methods employed. Potential stakeholders may be unfamiliar with OSS models and may not understand how they differ from the traditional vendor relationship; they may be more accustomed to a "transactional" model wherein a specific price is paid for a specific service. When there are membership fees or sponsorship levels, it may be more difficult to quantify specific benefits and so individuals or institutions new to open source might need help to understand and embrace the model or explain it to their resource allocators. Efforts may be necessary to educate or explain how and why members/participants contribute, and the benefits of being a contributor.

Potential stakeholders may be unfamiliar with OSS models and may not understand how they differ from the traditional vendor relationship.
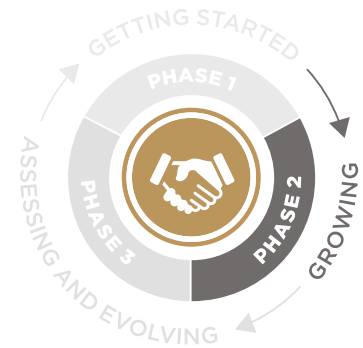
Moving Forward: Objectives

- **Set up processes and infrastructure to facilitate engagement**

  Focus on shifting people from "interested" to "engaged" and "eager to see" to "eager to participate and contribute." Programs in this phase benefit from having policies that guide and foster engagement including contributor guidelines, community guidelines, and best practices.

- **Clear communication practices and policies**

  In this phase, programs frequently need to create and improve communication policies. Examples may include: a code of conduct and onboarding materials. It is a good time to consider if you have branding issues – does the program have a cohesive overall message?

- **Increase non-directed community activities**

  Increase active representatives and empower them to be ambassadors. Programs should encourage spontaneous, informal, non-directed, autonomous community activities. Participants should be empowered to do presentations at conferences, start regional meet-ups, organize a working group, etc., and act without explicit directions from program staff or leadership. A culture of shared ownership and responsiveness will also encourage the community to respond to questions. Consider creating "toolkits" or structures to facilitate more effective communication with clear and consistent messaging.

Facet: Community Engagement

Phase II: Establishing Community Engagement Infrastructure (continued)

- **Increase transparency**

  Programs will want to ensure that their activities (ranging from governance to technology) are clear to current and potential community members. The participants need to feel that they understand how decisions are made and what development will occur. Specific ways to foster this include regularly distributed technology roadmaps, annual reports, and updates from governance and committees.

- **Dedicated staffing**

  Many OSS programs benefit from dedicated staffing (commonly product manager and/or program manager and technical lead) in order to sustain their efforts.

- **Engage a more diverse set of engaged participants**

  Sustainable programs need diversity in all forms. Diversity of skill sets (such as training, translation, documentation, programming, etc.) is important. Geographic diversity may also be important to broaden the reach of the program. Programs will also want to ensure they are positioned so that people of all backgrounds feel welcome to participate.

- **Engage with new communities**

  Consider integrations with other communities as a way to broaden the reach and appeal of the software and engage a broader audience. Examples include repository software integrating with digital preservation software or collections management software integrating with another program to offer a discovery layer. The more interconnected the software is to wider workflows and processes, the stickier it is. The more embedded an OSS program is, the more critical it becomes to the institution, and as such, it will be more likely to have audiences and institutions stay engaged. Programs at this stage want to develop a strong network of relationships and partnerships with other programs, institutions, and companies. If the engagement strategy isn't working, governance may want to consider changes to marketing or membership/contributor models.
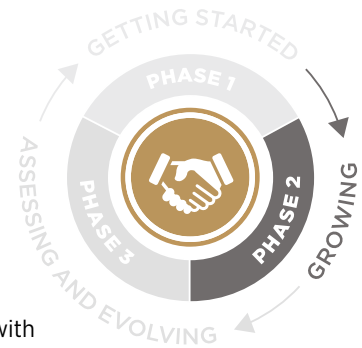
Sustainable programs need diversity in all forms.

Facet: Community Engagement

Phase III: Evolving Community Engagement

Core Goal

Continue to evaluate and evolve the program engagement model to keep up with new technologies, communities, and collaborators.

Characteristics

Phase III programs tend to have a well-established infrastructure to enable participation. They provide a variety of opportunities to engage – such as conferences, user groups, and awards. They have representation from diverse geographic regions, a variety of perspectives and backgrounds as well as different skill sets represented (technical, documentation, training, etc.).

Concerns and Roadblocks

At this point the program may be considering global audiences. In order to support that, the program will need additional resources such as skill at cross-cultural communications and multilingual marketing capability. At the same time, the program needs to continue to work with and continue to meet the needs of existing users. Efforts to engage new audiences shouldn't entail neglecting longtime participants.

There may be perceived lack of communication in pockets.

A strong concern in this stage is burn out – the initial and building enthusiasm may be gone, and the tendency to rely on a few dedicated participants may be wearing them out. It may be time to think in terms of succession planning or new strategies to continue to find fresh people through specific or time-bound projects so they can contribute frequently, but not constantly.

Continue to communicate with all stakeholders and users that the software needs to continue to grow. Programs don't want to be too comfortable and then face massive technical debt.
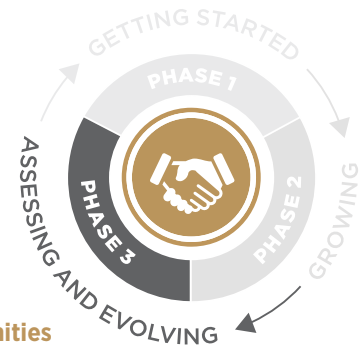
Moving Forward: Objectives

- **Work across communities**

  If they haven't already, programs in this phase should consider infrastructure and tools to enable further communication to new communities.

- **Empower the community supporting each other**

  Ensure there are mechanisms and processes that enable the participants to help each other – supporting blogs, enabling easy-to-update documentation, and hosting arenas for lively discussions are important.

- **Establish ways to continually evaluate community engagement**

  At this phase, continuous improvement is important to recognize, interpret, and adapt to changing environments.

At this point the program may be considering international audiences.

Community Engagement Resources and Tools

- Bacon, Jono. The Art of Community. Sebastopol, CA: O'Reilly 2009.

- Hintjens, Pieter. *Social Architecture: Building On-line Communities*. Self-Published, CreateSpace, 2016.

- Kraut, Robert E. and Paul Resnick. Building Successful Online Communities: Evidence-Based Social Design. Cambridge, MA: MIT Press, 2011.

- McCann, Laurenellen. *Experimental Modes of Civic Engagement in Civic Tech.* Chicago, IL: Smart Chicago Collaborative, 2015.

- Owens, Trevor. *Designing Online Communities: How Designers, Developers, Community Managers, and Software Structure Discourse and Knowledge Production on the Web.* New York: Peter Lang, 2015.

- Severance, Charles Russell. *Sakai: Building an Open Source Community.* Self-Published, CreateSpace, 2015. https://www.dr-chuck.com/sakai-book/.

Program-based examples:

- "VuFind Community." VuFind. Accessed 29 March 2022. https://vufind.org/wiki/community.

Consider tools such as:

- Group messaging and collaboration, e.g. Slack, IRC

- Customer Relationship Management (CRM) – systems to manage engagement

- Source code repositories, e.g. GitHub

- Public wikis for collaboration and communication

- Publicly available issue/bug trackers

- Email lists

Program representatives participating in one of the forum activities.

Community Engagement Case Studies

Guidebook case studies provide first-hand accounts from forum participants about their program's work toward sustainability. Community Engagement case studies are from the ArchivesSpace and Vega programs.

ArchivesSpace[11]

By Christine Di Bella
http://archivesspace.org/

As an open source application, ArchivesSpace is free for anyone to download and use. On the other hand, as we all well know, developing and maintaining an open source application is not itself free. In our organizational model, dues and intellectual contributions from institutional members sustain the application and ensure its future. To maintain sufficient membership to sustain the application, we must demonstrate that membership is not only important, but also rewarding for those who choose it. While our strategies and tactics for accomplishing this have changed over time, we increasingly recognize the degree to which community engagement is an important factor in keeping members satisfied and maintaining their ArchivesSpace membership in the face of financial and other institutional pressures.

ArchivesSpace membership has exceeded projections from the beginning, sometimes by as much as double, which means the community we serve has always been larger than anticipated. The membership program launched in summer 2013 with 54 charter members, which quickly grew to 156 members by the end of the first full year. Membership has continued to grow every year, and now, a little over four years in, ArchivesSpace has over 340 General member institutions, as well as 19 Educational Program Members, and three Registered Service Providers. With this kind of success has also come great expectations on the part of those members. ArchivesSpace is blessed with a vibrant and active community of users. But connecting those users to us and to each other, while keeping the application moving forward, requires continual attention and a good measure of flexibility.

The way we meet our users' engagement expectations has evolved over time. Initially our community efforts were primarily focused on exhibiting and presenting at professional conferences and working with our appointed and elected volunteer groups. In fact, when ArchivesSpace launched as a full program in 2013, it had only two permanent staff members, a Program Manager and a Developer. It was anticipated that the Program Manager would be able to manage any associated community activities in the course of his other duties.

As the community and its expectations grew, recognizing that the Program Manager could not fulfill all needs in this area, in 2015 ArchivesSpace created a position for a part-time Community Outreach Manager. The Community Outreach Manager's original focus was improved communication with and responsiveness to individual users and groups of users and organizing a few face-to-face events, such as training sessions and an annual Member Forum. The scope was somewhat limited, but for the first time, the ArchivesSpace program had a position that was solely focused on the application's users rather than the application itself. Feedback about this change from the user community was very positive; many indicated that since part of what they liked most about being ArchivesSpace members was being part of a community, anything that helped them share and share in the experience with others made membership more valuable to them.

As our community continued to grow and diversify, it was important that our community activities grew and diversified as well. With membership continuing to outpace projections, providing additional revenue for staffing and activities to meet user needs, in 2016, the community position became full-time. In 2017 the position was retitled "Community Engagement Coordinator," in recognition of our increasing

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[11] Original publication date February 2018

Community Engagement Case Studies

ArchivesSpace
(Continued)

focus on not just reaching out to our community members, but also actively engaging them around ArchivesSpace and with each other. Our Community Engagement Coordinator now organizes a full complement of online and face-to-face events, manages communications and social media, and coordinates a range of user-focused resources, in addition to interacting with and supporting individual users around the application. As well as proven offerings like our annual Member Forum, we're trying out new things, including quarterly open calls on Zoom and wrangling contributions for a community-centered blog series. Though our focus has been to engage the entire community in large platform discussions, we are also now looking at opportunities to engage more locally through regional forums. Recognizing that different parts of our community have different needs, we've also launched efforts related to cultivating our developer community, including monthly Core Committers open calls and repositories on Github in which developers can share and collaborate on plug-ins or other kinds of code that extend or supplement the application.

> "When a community comes together around a software application, it is sometimes easy to favor the latter over the former."

Our efforts have been rewarded with greater and broader participation in our activities, and especially notably higher levels of contribution and collaboration on activities that both strengthen the community and feed directly into improving the application.

When a community comes together around a software application, it is sometimes easy to favor the latter over the former. In our program, we firmly believe that while developing and maintaining a high-quality application ensures ArchivesSpace will continue to exist, engagement of our users, and particularly the members that sustain it, ensures that it will thrive. We're fortunate at ArchivesSpace that our community recognizes this, and actively supports and inspires our efforts in both areas.

Community Engagement Case Studies

Vega[12]

By Cheryl Ball
https://github.com/vegapublish

Vega is an open-source publishing system that provides workflows and a range of features and customizations for authors, editors, and publishers to interact with data and multimedia. Although it may be too early to discuss Vega as a fully realized case study on community engagement (its initial release is forthcoming), Vega's origins speak to the importance of informal community engagement. Were it not for dozens of watercooler conversations regarding the failures of existing publishing tools to support, share, and remix content regardless of form, the thought that "there's got to be a better way" might have remained an individual's pipe dream rather than a Mellon-funded tool with a long and diverse list of early adopters.

> "Vega's origins speak to the importance of informal community engagement."

Although the Vega community was formed around mutual unhappiness, we expect our community will develop in a more positive direction as we deliver both a technical solution (the Vega software) and a mechanism for its sustained development (a process to gather and address current and future community needs in digital publishing). While we have relied on our community to describe features and requirements, we have not used a community approach to Vega's technical development, preferring to contract with professional software developers (Bengler) to code our first release. For Vega, this has proved to be the most efficient approach: our community's expertise lies primarily in the publishing domain, and we want to work to our strengths, allowing the design developers to work to theirs. We will turn to our community soon to test our production release and are pleased that our early adopters present diverse needs, testing Vega's ability to create new journals and books, convert old publishing venues, and construct new features to advance digital publishing.

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[12] Original publication date February 2018

Concluding Remarks

Sustainability is one of the most challenging elements that OSS programs serving the cultural and scientific heritage community face. This Guidebook is intended to provide guidance for new and continuing programs, and to serve as a bridge to further collaboration.

One of many benefits of the project was the opportunity to bring together people representing different programs and perspectives. Many of the forum participants found the opportunity to meet others at different phases in their programs extremely valuable. There was consensus that there is strength in working together across programs and many were eager to follow up with others or assist other programs in their future plans.

Near the end of the forum, participants discussed the needs and opportunities they see that cross OSS programs, summarized as:

- Program incubation;
- Community coordination and partnerships across OSS;
- Public Service Announcement (PSA) campaign/materials to promote open source as a value;
- Networking with other OSS efforts and mentoring others;
- Building awareness of open-friendly partners;
- Business modeling and planning; and
- Planning and guidance around if/when/how programs gracefully exit.

Participants were eager to harness the energy and spirit of collaboration in the room. They agreed that in-person meetings provided benefits that virtual communication does not. Some participants already knew each other, but appreciated the opportunity to focus on OSS sustainability in a concentrated way without the distractions or conflicting priorities of a larger conference or event focused on another topic. Avenues for future action could focus around cross program needs and opportunities for in person collaboration.

The co-directors, advisory group members, and forum participants will continue to explore ways to work together that benefit the larger OSS community. The project website (https://www.lyrasis.org/programs/Pages/IMLS-OSS.aspx) will maintain this Guidebook but will also serve as a place for updates on other potential activities that will arise from the project.
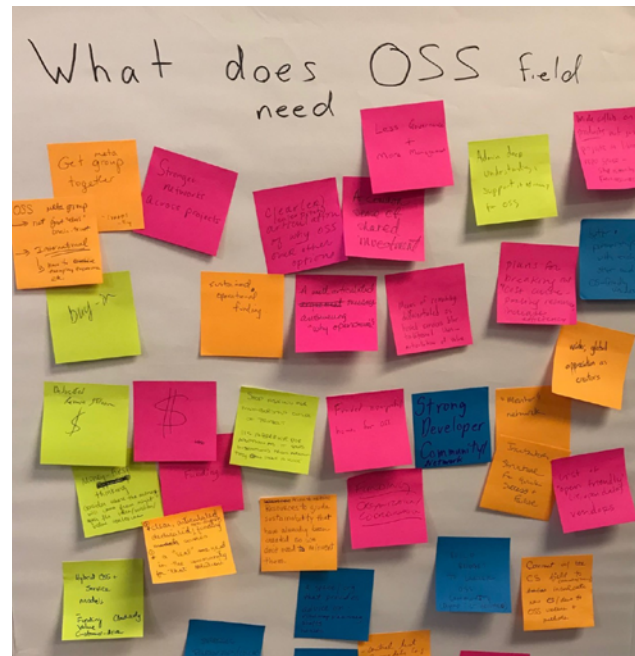
The results of the forum exercise to capture suggestions regarding the needs across the larger OSS landscape.

It Takes a Village in Practice Toolkit

In 2020, the Institute of Museum and Library Services funded a second phase of ITAV work, *It Takes a Village in Practice* (ITAViP), to create an adaptable toolkit for practical use based on the framework laid out in the Guidebook. The toolkit will strengthen the ability of libraries, archives, and museums to sustain community supported OSS programs, which are critical to managing and growing local and national digital infrastructures.

Within the ITAV framework, we divide sustainability up along four facets: Governance, Technology, Resources, and Community Engagement. Each Facet is then divided by Phase: Getting Started, Growing, and Assessing and Evolving. Each Phase includes Objectives to help programs move to the next Phase. For example, an Objective for Governance Phase I is "Define a Need for Governance."

The ITAViP Toolkit contains close to 100 activities – checklists, discussion guides, planning templates, and more – to help program teams identify the Objectives that are most important to them, and then to develop a plan for achieving or sustaining the Objective.

Toolkit content was developed by the ITAViP program team in collaboration with stakeholders from a wide range of different types and sizes of OSS programs. Draft activities were developed and tested through a series of four workshops, one for each of the four facets of sustainability. OSS programs including ArchivesSpace, CC-Plus, CollectionSpace, ePADD, Fedora, Folio, Quire, and VuFind, have beta tested the tools for each facet to identify gaps, challenges, and unaddressed needs. In the summer of 2022, ITAViP as a whole was piloted with two additional OSS programs: Samvera and Mukurtu.

The ITAV framework and toolkit are living resources. The program team is always glad to hear comments, suggestions, critiques, and success stories. Please contact itav@lyrasis.org with specific questions, and consider joining our mailing list to hear about future events and activities: https://itav.lyrasis.org.

Appendix A: Sustainability Worksheet

For each facet, give your program a score from 1-10 based on your knowledge of the program's strengths and weaknesses in that area. Scores between 0-3 will align most closely with Phase I, between 4-7 with Phase II, and 8-10 with Phase III.

Facet: Governance

"A governance model describes the roles that project participants can take on and the process for decision making within the project. In addition, it describes the ground rules for participation in the project and the processes for communicating and sharing within the project team and community." [13]

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0   1   2   3   4   5   6   7   8   9   10
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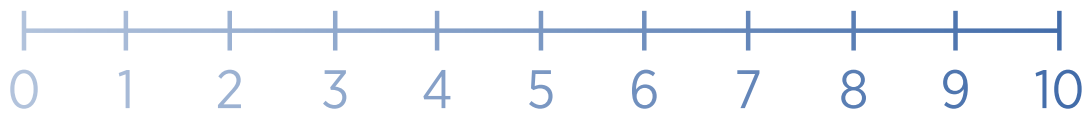
Facet: Technology

The core of each of these programs is an open source software application serving cultural heritage organizations. There are parallels with proprietary software development processes, but working within the open source world brings its own challenges around community, resources, and governance that affect the software development process.

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0   1   2   3   4   5   6   7   8   9   10
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Facet: Resources

In order to launch, grow, and thrive, OSS programs need resources both human and fiscal. Human resources encompass engineers writing code, community members providing use cases, or organizational homes with fiscal stewardship. Financial resources come in and go out in a wide variety of ways – in via contributions, grants, dues, sponsorships, etc., and out via salaries, servers, overhead, etc.

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0   1   2   3   4   5   6   7   8   9   10
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Facet: Community Engagement

The Community Engagement facet reflects efforts to facilitate and foster engagement within a community. It is focused on encouraging users to become stakeholders. A component of this facet includes communication and outreach efforts to the community itself as well as the wider world of decision makers, potential users, funding agencies and others.

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0   1   2   3   4   5   6   7   8   9   10
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[13] Gardler, Ross and Gabriel Hanganu. "Governance Models." OSS Watch. http://oss-watch.ac.uk/resources/governancemodels (accessed 29 March 2022).

Appendix B: Resources

General

Resources in this section provide an overview of OSS program management and development. Some resources are "how-to" or best practices guides, while others provide a retrospective look at a specific project.

- Dolphin, Ian, Douglas Johnson, Laura Gekeler, and Patrick Masson. "7 Things You Should Know about Open-Source Projects." Educause. Accessed 29 March 2022. https://library.educause.edu/resources/2017/8/7-things-you-should-know-about-open-source-projects.

- Fogel, Karl. *Producing Open Source Software: How to Run a Successful Free Software Project.* Beijing: O'Reilly, 2009. http://producingoss.com/.

- "It Takes A Village Home." LYRASIS. Accessed 29 March 2022. https://www.lyrasis.org/technology/Pages/IMLS-OSS.aspx.

- Knight Foundation. "Scaling Civic Tech: How Can We Harness Technology to Promote Civic Engagement and More Responsive Government." Knight Foundation, Rita Allen Foundation. Accessed 29 March 2022. https://knightfoundation.org/features/civictechbiz/.

- Lenhardt, Jan. "Sustainable Open Source." Writing by Jan Lenhardt (blog). Accessed 29 March 2022. http://writing.jan.io/2015/11/20/sustainable-open-source.html.

- Lewis, David. "The 2.5% Commitment." Accessed 29 March 2022. https://scholarworks.iupui.edu/handle/1805/14063.

- Raymond, Eric. *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary.* Cambridge, MA: O'Reilly, 2001.

Governance

Resources in this section provide a nuts-and-bolts look at developing governance plans, including: developing roles and responsibilities for board members, program staff (paid or volunteer), and community contributors; and determining the decision-making process within programs.

- Benkler, Yochai. *The Penguin and the Leviathan: How Cooperation Triumphs over Self-Interest.* New York: Crown Business, 2011.

- "Boardsource Home." BoardSource. Accessed 29 March 2022. https://boardsource.org/.

- "Community Explorer." REALISE Project. Accessed 29 March 2022. http://fullmeasure.co.uk/REALISE/.

- Gardler, Ross and Gabriel Hanganu. "Governance Models." OSS Watch. Accessed 29 March 2022. http://oss-watch.ac.uk/resources/governancemodels.

- Resnick, Pete. "On Consensus and Humming in the IETF." Internet Engineering Task Force. Accessed 29 March 2022. https://tools.ietf.org/html/rfc7282.

OSS organizational homes and incubators:

- "Apereo Incubation Process." Apereo. Accessed 29 March 2022. https://www.apereo.org/content/apereo-incubation-process.

- "Educopia Institute: Our Work." Educopia Institute. Accessed 29 March 2022. https://educopia.org/about/.

- "LYRASIS Open Source Organizational Homes." LYRASIS. Accessed 29 March 2022. https://www.lyrasis.org/programs/Pages/default.aspx.

- "Projects at CS&S." Code for Science and Society. Accessed 29 March 2022. https://codeforscience.org/sponsored-projects/.

- "Software Freedom Conservancy Projects." Software Freedom Conservancy. Accessed 29 March 2022 https://sfconservancy.org/projects/.

Program-based examples:

- "Apache Corporate Governance Overview." Apache Foundation. Accessed 29 March 2022. http://www.apache.org/foundation/governance/.

- "ArchivesSpace Governance Board and Councils." ArchivesSpace. Accessed 29 March 2022. http://archivesspace.org/governance-board-and-councils/.

- "Governance." DSpace. Accessed 29 March 2022. https://dspace.lyrasis.org/governance/.

- "MetaArchive Resources." MetaArchive. Accessed 29 March 2022. https://metaarchive.org/documentation-resources/.

Appendix B: Resources

Technology

Resources in this section, for the most part, do not attempt to explain how to run a successful software development project; rather, they focus on how managing an OSS project is different from other software development projects, and how understanding and working with those differences can lead to a stronger overall project.

- Dombrowski, Quinn. "What Ever Happened to Project Bamboo?" *Literary and Linguistic Computing*, Volume 29, no. 3 (2014): 326–339.

- Fogel, Karl. *Producing Open Source Software: How to Run a Successful Free Software Project.* Beijing: O'Reilly, 2009. http://producingoss.com/.

- Ries, Eric. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.* New York: Currency, 2017.

- Rosenberg, Scott. *Dreaming in Code: Two Dozen Programmers, Three Years, 4,732 Bugs, and One Quest for Transcendent Software.* New York: Three Rivers Press, 2008.

Program-based examples:

- "Avalon Media System Documentation." Avalon Media System. Accessed 29 March 2022. http://www.avalonmediasystem.org/documentation.

- "Koha For Developers." Koha Community. Accessed 29 March 2022. https://koha-community.org/get-involved/for-developers/.

- "A Guide for the Samvera Community." Samvera. Accessed 29 March 2022. https://samvera.github.io/.

Finance

Resources in this section provide guidance on where to find funding and non-monetary contributions for open source projects. Also included are resources on developing earned income streams.

- "BountySource Home." BountySource. Accessed 29 March 2022. https://www.bountysource.com/.

- "Candid Home." Candid (formerly Foundation Center). Accessed 29 March 2022. https://candid.org/.

- Eghbal, Nadia. "A Handy Guide to Financial Support for Open Source." GitHub. Accessed 29 March 2022. https://github.com/nayafia/lemonade-stand.

- "Financial Management." National Council of Nonprofits. Accessed 29 March 2022. https://www.councilofnonprofits.org/tools-resources-categories/financial-management.

- "Reports and Resources." Nonprofit Technology Network. Accessed 29 March 2022. https://www.nten.org/knowledge/reports-and-resources/.

Human Resources

Resources in this section provide guidance on hiring program staff and managing distributed teams.

- Evans, Duncan. "Three Simple Steps to Make Distributed Teams Work." Scrum.org. Accessed 29 March 2022. https://www.scrum.org/resources/blog/three-simple-steps-make-distributed-teams-work.

- Fogel, Karl. "Hiring Open Source Developers." In Producing Open Source Software: How to Run a Successful Free Software Project. Beijing: O'Reilly, 2009. http://producingoss.com/.

- "Planning for Sustainability." OSS Watch. Accessed 29 March 2022. http://oss-watch.ac.uk/resources/planningsustainability.

Community Engagement

Resources in this section provide guidance on building and sustaining effective open source communities.

- Bacon, Jono. The Art of Community. Sebastopol, CA: O'Reilly 2009.

- Hintjens, Pieter. *Social Architecture: Building On-line Communities.* Self-Published, CreateSpace, 2016.

- Kraut, Robert E. and Paul Resnick. Building Successful Online Communities: Evidence-Based Social Design. Cambridge, MA: MIT Press, 2011.

- McCann, Laurenellen. *Experimental Modes of Civic Engagement in Civic Tech.* Chicago, IL: Smart Chicago Collaborative, 2015.

- Owens, Trevor. *Designing Online Communities: How Designers, Developers, Community Managers, and Software Structure Discourse and Knowledge Production on the Web.* New York: Peter Lang, 2015.

- Severance, Charles Russell. *Sakai: Building an Open Source Community.* Self-Published, CreateSpace, 2015. https://www.dr-chuck.com/sakai-book/.

Program-based examples:

- "VuFind Community." VuFind. Accessed 29 March 2022. https://vufind.org/wiki/community.

Appendix C: Forum Participant List

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Appendix C: Forum Participant List

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It Takes a Village

Open Source Software Sustainability