



SUSTAINABILITY OF OPEN ACCESS SERVICES

Phase 3: The Collective Provision of Open Access Resources



SPARC®, the Scholarly Publishing and Academic Resources Coalition, is an international alliance of academic and research libraries working to correct imbalances in the scholarly publishing system. Developed by the Association of Research Libraries, SPARC has become a catalyst for change. Its pragmatic focus is to stimulate the emergence of new scholarly communication models that expand the dissemination of scholarly research and reduce financial pressures on libraries.

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Knowledge Exchange is a co-operative effort that supports the use and development of Information and Communications Technologies (ICT) infrastructure for higher education and research. The Knowledge Exchange partners are: CSC – IT center for science in Finland, Denmark’s Electronic Research Library (DEFF) in Denmark, German Research Foundation (DFG) in Germany, Joint Information Systems Committee (JISC) in the United Kingdom and SURF in the Netherlands.

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Executive Summary

This report is the third in a series which examines issues relating to the economic sustainability of critical infrastructure services that support the operation and growth of open-access dissemination of scholarly and scientific research. This report is intended to guide funders and project planners in constructing and coordinating collective funding models capable of supporting open-access infrastructure resources. The report:

- reviews the fundamentals of robust sustainability modeling (Section 2);
- outlines the economic and institutional issues that confront those seeking to sustain free infrastructure services and discusses the implications of free models for an initiative's ability to provide an optimal level of service (Section 3); and
- identifies strategies for overcoming institutional free ridership in the design of funding models and describes practical mechanisms for coordinating the collective provision of infrastructure services (Section 4).

Key points on sustainability planning:

- A sustainability model defines the economic logic of an infrastructure service and explains why the service should exist. A nonprofit initiative seeking to maximize mission impact requires this logic as much as a commercial firm seeking to maximize profit.
- Sustainability planning should be treated as an integral element of a service's design and purpose. Launching a service with a subsidy, with the assumption that a long-term funding model will manifest itself once the service has demonstrated its value, can limit sustainability options.
- Initiatives converting from direct subsidy support will often need a change of organizational mindset in order to transition successfully to a new funding model.

Key points on implementing a free-to-user model:

- Providing infrastructure services as public goods has inherent challenges that differ from market-based approaches and that impose specific requirements on the design of a sustainability model. If not enough institutions support a service, this can result in the service not being sustainable, or being provided inadequately, with lower utility for all users.
- There are two critical elements to designing an effective sustainability model for a free-to-the user infrastructure service: 1) inducing potential participants to reveal their demand for the service, and 2) getting organizations to contribute voluntarily to its provision.

- There are several approaches for generating sufficient support for a service: altruism or reciprocity (the service is provided despite the costs of the service outweighing the economic benefits enjoyed by the provider), self-sufficient return (a contributor gains a private benefit from providing the service that makes self-interested investment worthwhile), collective action (groups act collectively to provide a service through voluntary contributions), and cross-subsidies (exclusive benefits to contributors generate income capable of cross subsidizing a service's provision).
- Individually and collectively, librarians and other open-access advocates tend to be sympathetic to non-market and collective solutions to the provision of infrastructure services as public goods. However, libraries as institutions—operating as economic entities—do not act altruistically, at least not consistently or reliably.
- In some cases, a sustainable fee-based model—that enables an initiative to deliver key infrastructure services to those organizations in the value chain that most require them—may be preferable to the free dissemination of a less-robust service to a broader audience.

Key points on collective sustainability approaches:

- Where market-based solutions are impracticable and institutional subsidies are unsustainable, initiatives may need to consider organizational designs that combine the collective provision of open-access infrastructure services with market-like mechanisms for efficient resource management.
- Ensuring broader support will typically require that an initiative defines, in explicit terms, the financial conditions under which the collective action will succeed. Therefore, designing a collective sustainability model requires that an initiative establish, at the outset, the financial hurdle that must be cleared for the initiative to be sustainable.
- Group size and dynamics will affect the potential success of a collective funding model, making definition of a collective action's field of membership a significant element in the design of a sustainability model. A collective initiative will need to include as many institutions as are needed to bear the financial responsibility, but as few institutions as possible to simplify the coordination of the collective funding model.
- Assurance contracts provide a practical mechanism for coordinating collective support of an initiative by making each organization's participation commitment contingent on a specified total contribution level being reached. An institution agrees to contribute to the development of a service on the condition that enough other institutions participate so that development of the service is guaranteed.
- Constructing an assurance contract capable of generating a high level of participation will require that the initiative segments targeted institutions into discrete subgroups and sets participation fees to ensure that the cost of participation aligns with the value the service delivers to each subgroup.
- Exclusive benefits to participating institutions may be of sufficient value that they can generate income adequate to cross-subsidize provision of a free-to-user service. Tangible benefits include differentiated service levels or functionality, complementary add-on services, governance



participation, and sponsorships. Intangible benefits include social incentives and reciprocity motivations.

By reviewing the key elements that comprise a sustainability model, the economic realities that affect free-to-user distribution, and practical approaches for coordinating collective funding, this report seeks to provide a framework to guide individual initiatives in developing successful sustainability plans.

1. Report Context & Structure

1.1 Context

Knowledge Exchange is coordinating a multi-phase project to examine issues relating to the economic sustainability of critical infrastructure services that support the operation and growth of open-access dissemination of scholarly and scientific research. These services include policy and permissions registries, journal and service directories, search services, metrics initiatives, technical services and publishing platforms (including repository and journal software), preservation services, and domain-specific open-access collections. A report on the first two phases of the “Sustainability of Open Access Services” project, prepared by Alma Swan of Key Perspectives, Ltd., was released in December 2011¹.

The Phase I & II Report describes the free-to-user services and value chains that support open-access research dissemination channels, documents stakeholder perceptions of the types of infrastructure services considered critical for the growth and acceleration of the open-access dissemination of scholarly and scientific research, and identifies potential future services. That report discusses a variety of issues relevant to sustainability planning, including the open-access value chain, competition and complementarity between initiatives, and stakeholder roles and perceptions.²

In support of the Knowledge Exchange project, SPARC (the Scholarly Publishing and Academic Resources Coalition³) is contributing this review of sustainability planning issues that affect the provision of open-access infrastructure services.⁴ This review intends to guide funders and project planners—for both new and existing projects—in constructing infrastructure sustainability models capable of supporting open-access resources. Specifically, this report focuses on how infrastructure initiatives can coordinate collective funding models to sustain themselves in the long-term.

¹ <http://www.knowledge-exchange.info/Default.aspx?ID=536>

² We use the term “sustainable” to mean economically viable, whether supported by a market or non-market model. In the sense we intend, if a service is not sustainable, by definition, it cannot exist. This clarification is necessary, as “sustainability” is sometimes regarded as synonymous with market models.

³ <http://www.arl.org/sparc/>.

⁴ We use the phrase open-access infrastructure services to denote services that advance the dissemination of open-access to research information, without the assumption that the infrastructure services themselves are available via a free-to-the-user model. To minimize tedious repetition, this document uses “infrastructure services” synonymously for “open-access infrastructure services.”



1.2 Scope & Structure

This report is structured as follows:

Section 2 reviews the fundamentals of robust sustainability modeling that apply whether an initiative acts independently or coordinates a community-based response to fund a service collectively;

Section 3 outlines the economic issues and institutional behavior that confront those seeking to sustain free infrastructure services, discusses the implications of free models for an initiative's ability to provide an optimal level of service, and notes the professional culture barriers that can complicate the implementation of sustainability models; and

Section 4 identifies strategies for ensuring broad support in the design of collaborative funding models and describes practical mechanisms for coordinating the collective provision of infrastructure services. It also discusses the issues that confront attempts to develop collective approaches to funding multiple infrastructure projects.

2. Sustainability Model Components

2.1 The Centrality of Sustainability Planning

Sustainability planning should be treated as an integral element of a service's design and purpose. Whether based on a market model or a collective funding approach, proper sustainability planning requires that an initiative consider carefully the value that it creates for its intended audience. Ideally, sustainability planning tests and validates the key assumptions subtending an initiative before the service is created, and establishes feedback loops to keep the service aligned with user needs. From this perspective, sustainability planning can be seen to be as central to an initiative's concept and design as the services it provides.

Initiatives developed and operated heretofore with direct subsidies will often need a change of organizational mindset in order to transition successfully to a new funding model based on sustainability planning. Developing and implementing new funding streams requires that entrepreneurial energy and organizational resolve be channeled to ensuring their success.

Sustainability planning, therefore, should not be treated as a separate and secondary process to creation of the service itself. Launching a service with a subsidy, under the assumption that a long-term funding model will become evident once the service has demonstrated its value, can limit subsequent sustainability options.

Deferring sustainability planning can:

- Reduce leverage in coordinating participation—The coordination mechanisms capable of overcoming the tendency of potential contributors to understate the extent to which it values a service (see §3.3) that can cause underfunding are most effective when applied prior to the provision of the service. Upfront planning can provide greater leverage for assurance contracts (§4.5) by making provision of a service contingent on the successful validation of the sustainability model.
- Inflate operating costs—Delaying sustainability planning, especially for projects funded by direct subsidies, can allow an initiative to develop an ongoing operating cost structure that will be difficult or impossible to support in the long-term, even with collective support.
- Underestimate costs—Without adequate planning, an initiative might not recognize the long-term resource implications of providing a service, thus underestimating costs. This can lead to the service being underfunded and inadequately provided in terms of quality and/or quantity.

Regardless of whether the funding model involves collective institutional funding, market-based income, subsidies, or some combination, planning for sustainability from the outset will yield a model with greater stability and longevity than one introduced after the initiative has been launched.

2.2 Sustainability Model Overview

A sustainability model must reflect the key operating characteristics of the service it provides.⁵ It describes the audiences an initiative serves, the value being delivered to each of those audiences, the activities, resources, and cost structure required to create and deliver that value, and the mechanisms used to translate that value into funding to sustain the value-creating activities (see Figure 1). In other words, a sustainability model defines the economic logic of an infrastructure service and explains why the service should exist. A nonprofit initiative seeking to maximize fulfillment of its mission requires this logic as much as a commercial firm seeking to maximize profit.

Although sustainability models may have many components,⁶ the critical elements of a model include:

Audience or client segments—the various audiences, clients, or constituencies that derive value from the service.

⁵ Elements of this section are adapted from Crow 2009b.

⁶ Besides those discussed here, other business model components include client relations, partnerships and alliances, supplier networks, and distribution channels.



Value proposition—the value that a service delivers for which a specific client segment is willing to pay, whether payment assumes the form of a financial transaction or an in-kind contribution.

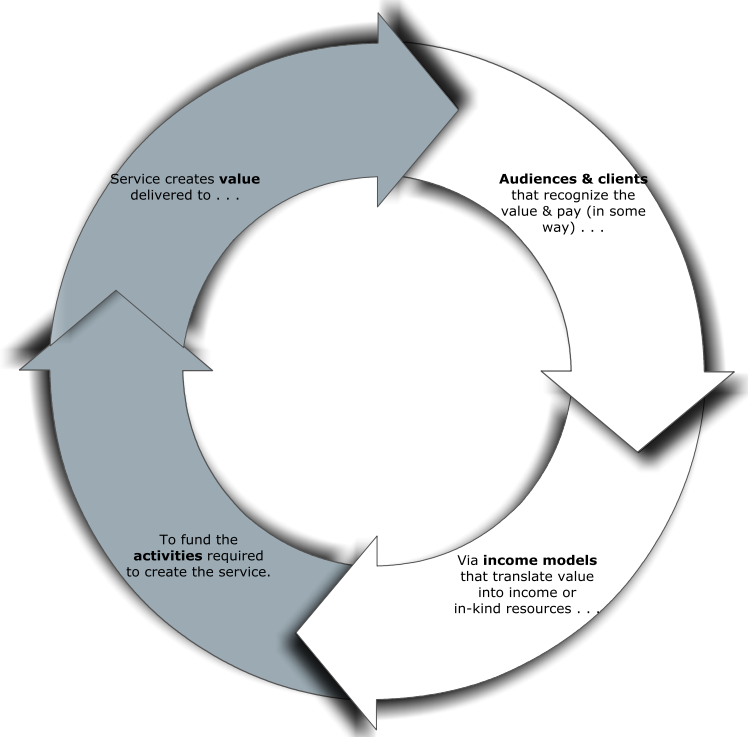
Core activities and resources—the set of activities required to produce the service and to support the funding model itself.

Resource streams—the mechanisms by which a service generates income and other resources from the client segment(s) to which the service delivers value.

The long-term stability and funding potential of any service, whether supported by a market or non-market model, depends on how well the above components are explicitly defined and integrated.

A service must create real value that the service’s audiences recognize and, in some way, are willing to pay for; the funding models—whether supply-side or market based—must efficiently capture the value perceived by the service’s audience(s); and the resources (whether monetary or in-kind) captured by the income models must be allocated to those activities critical to generating the service’s value.

Figure 1: Sustainability Model Components



2.3 Resource Models

Resource models represent the mechanisms by which a service generates income and other resources from the client segments to which it delivers value. Depending on the type of service offered, income streams for infrastructure initiatives can include in-kind resource contributions, direct financial subsidies (e.g., from a host institution or external grant), collective support fees, value-added service fees, advertising or sponsorships, secondary licensing fees, and other sources. A service may require multiple income streams to sustain itself, and generating income from several sources can add stability to an initiative’s resource base.

Many infrastructure services will represent a multi-sided market, wherein the infrastructure service stands between two or more distinct client bases, with one client partially or fully subsidizing another. In the context of open-access infrastructure services, this type of model is seen when an institutional,

governmental, or philanthropic funder directly subsidizes free access to the service on behalf of all users or a segment of users. Sponsorships and advertising represent additional examples of such a synergistic multi-sided model. Sponsors or advertisers may pay for access to the free users of the service, who “pay” with their attention to the service. To support such a model the initiative would need to respond to the requirements of the funder—for example, by demonstrating that it is reaching the audience targeted by a granting agency or by delivering the attention of a specific set of readers to sponsors/advertisers—as well as serving the needs of the users of the service themselves.

Open-access dissemination can reduce or eliminate some costs that would be incurred in some market-based models, such as the cost of administering user authentication and access to the service. However, with the possible exception of projects funded by single-source subsidies, supply-side models—especially those that require extensive community organization— can entail launch and support costs of their own.

Issues relevant to identifying appropriate resource models include:

- Identifying an explicit financial objective—for example, whether the initiative requires full cost recovery (direct and overhead costs), direct cost recovery, a specific subsidy level, etc.—as a basis for quantifying the financial hurdle that the resource model needs to clear (§4.2); and
- Assessing the initiative’s business management capability and risk tolerance. For example, a fee-based model will require the availability of adequate accounting processes and resources.

Again, the strength of a sustainability model will depend on the extent to which all the sustainability components are integrated as a coherent whole.



3. Context for Open-Access Infrastructure Sustainability Modeling

3.1 Open Access & Infrastructure Services

Infrastructure services may be available without charge to end users, or they may be fee-based, or they may represent some combination of the two. Our goal here is to identify how to make such services economically viable for the long-term, while maximizing the quality and quantity of the services they provide.

Amongst open-access advocates—including the organizations sponsoring many open-access infrastructure services—there is an understandable philosophical predisposition that infrastructure services themselves ought to be available free to end users. However, such support is not always (or even usually) available. In some cases, therefore, a sustainable fee-based model—that enables an initiative to deliver key infrastructure services to those organizations in the value chain that most require them—*may* be preferable to the free dissemination of a less-robust service to a broader audience.⁷

In any event, implementing a free-to-user model:

- will impose specific requirements on the design of the sustainability model—providing infrastructure services as public goods has inherent challenges that differ from market-based approaches;
- should not reduce the utility of the service being provided—providing services as public goods can lead to their being underprovided, thus working against the principal objective of expanding open access to research; and
- may involve non-free components—there may be components of an infrastructure service that do not require universal accessibility to be effective, and this opens opportunities for viable sustainability approaches—for example, as exclusive benefits in a collective model or as fee-based services in a cross-subsidy model.

We will discuss each of these issues, in turn, below. Our point here is that free models should be designed and implemented so as to optimize the effectiveness of a service, and that limited-access components should be introduced where necessary to ensure that the service provided is of adequate quality and quantity.

⁷ This does not mean that institutions in developing countries and elsewhere that need the service, but that do not have an ability to pay, must be excluded. An initiative offering some or all of its services as a club good can make reasonable provisions for such institutions, by offering deeply discounted fees or by waiving payment entirely.

3.2 Open Access Infrastructure Services as Public Goods

An infrastructure service provided on a free-to-the-user basis assumes the qualities of a public good. Reviewing the issues around the collective and private provision of public goods will demonstrate the challenges of free access models, while providing insight into how economically viable free access models can be constructed.

Two key aspects of the provision of public goods is that they are nonrivalrous in consumption (they are not consumed or reduced by use) and nonexcludable in supply (their use cannot be practically confined to those who pay for them). Commonly cited examples of pure public goods include national defense, lighthouses, radio broadcasts, and clean air.

One of the principal roles of government is the provision of public goods through compulsory taxation. Where government does not intervene, public goods can be provided privately,⁸ and the free provision of an open-access infrastructure service falls into this category. Anyone (with internet connectivity) has access to the service, and use of the service by one party does not reduce the quality or amount of the service available to be consumed by others. The nonrivalrous nature of public goods means that they can be provided broadly at little or no marginal cost. At the same time, however, their nonexcludability creates challenges in funding their initial provision.⁹

In constructing funding models to sustain free infrastructure services, nonexcludability manifests itself as the “free-rider” problem. Stated simply, while collective provision of a service might benefit a group of institutions, once the service has been provided as a public good, there is no way to exclude those who did not contribute from the benefits the service affords. Thus, while all members of the group would be better off if they contributed to provide a service of optimal quality and quantity, many members of the group—acting in economically rational self-interest—will not contribute, and will enjoy the service’s benefits, free-riding on the contributions of others. This behavior can result in the service not being provided, or being provided inadequately, with lower utility for everyone.

As we will discuss below in more detail below, there are several approaches through which this free-rider problem may be overcome:¹⁰

⁸ “Private” here means non-governmental. In this discussion of the private provision of public goods, infrastructure service providers are, effectively, “private” providers, even when they represent public institutions. Unless an organization has the power to tax its members, it acts as a private provider.

⁹ In economic terms, goods are categorized based on the characteristics of excludability and rivalrousness: private goods are both rivalrous and excludable, public goods are neither rivalrous nor excludable, and club goods are excludable but non-rivalrous. For club goods, there is non-rivalrous consumption, but with an exclusion mechanism (for example, a membership fee and access control). Clubs enable members to exploit economies of scale in sharing the cost of providing a good. See Buchanan 1965 and Olson 1971.

¹⁰ Overcoming free ridership does not necessarily mean eliminating free riders entirely. Rather, it refers to a model that controls the effects of free ridership to an extent sufficient that the model is capable of sustaining a service.



- 1) Altruism or reciprocity: Organizations and/or individuals can provide a service without charge to all other users motivated primarily by altruism. That is, the service is provided despite the costs of the service outweighing the economic benefits enjoyed by the provider. The success and stability of this approach is typically a function of the cost of the service relative to the resources of the provider. The approach can succeed where the service provision cost is small relative to the resources of the provider. However, if the service costs represent a financial strain, such an approach often becomes untenable for the long-term.

Reciprocity differs from altruism in that reciprocity assumes that individual institutions will act cooperatively if, and only if, other institutions do so as well. In this sense, reciprocity differs from altruism in that it reflects a form of self-interest: that is, individual institutions that practice it will, in the long run, be expected to benefit to a greater extent than an institution that acts solely and consistently out of self-interest. Although universities and libraries and may be more inclined to reciprocity than other types of organizations, relying on such social behavior alone will typically provide a weak basis for a sustainability model.¹¹

- 2) Self-sufficient return: In some cases, a contributor will gain a private benefit from providing the public good that makes self-interested investment worthwhile. In other words, the direct benefit to the contributing organization is sufficient to make the leakage of excess benefits to free-riders tolerable.¹² For example, an infrastructure service might increase the effectiveness of a foundation's mandate policy to such an extent that the foundation would be willing to fund the service on its own.
- 3) Collective action: Groups of individuals or organizations can act collectively to provide a service through voluntary contributions. As we will discuss below, such voluntary collectives require concerted effort to establish and maintain, which makes this approach most suitable to small, homogenous, socially cohesive groups. However, collective action can be combined with exclusive participation benefits that facilitate the collaboration of larger, more diverse groups.
- 4) Taxation: Governments can compel the payment of taxes to fund public goods, such as defense, schools, policing, and public health. For open-access infrastructure services, such government support will typically manifest itself indirectly via subsidies from public institutions.
- 5) Cross-subsidies via joint goods: An infrastructure service can offer exclusive (private) benefits to contributors in order to generate income capable of cross subsidizing the provision of the public good, or a mission-driven organization might fund a service, out of member dues or other revenue streams, to fulfill or maximize its mission.

¹¹ See Schmidtz 1991, Miller 1993, and Sugden 1984.

¹² See Olson 1971 and Baden 1998.

As the above discussion suggests, the free-rider issue raises practical challenges for developing funding models capable of sustaining infrastructure services. Section 4 provides guidance for constructing sustainability models that can effectively overcome free ridership.

3.3 Maximizing the Provision of Open-Access Infrastructure Services

Even in instances where it is possible to provide an infrastructure service as a free good, such an approach may not be optimal from the perspective of maximizing the service's effectiveness. As noted above, if potential beneficiaries cannot be excluded from the benefits of a service, then they may not have an incentive to contribute to its provision. In market environments, predicated on the willing consent of self-interested participants, such goods would either not be provided at all or would be underfunded and thus provided to a less than optimal extent.¹³ For open-access infrastructure services, applying a free-to-user model inappropriately could not only result in economic inefficiency, but—by providing an inadequate service—could impede the growth of open access to research.

There are two critical elements to designing an effective sustainability model for an infrastructure service offered on a free-to-the user basis: 1) inducing potential participants to reveal their demand for the service, and 2) getting organizations to contribute voluntarily to its provision.

The demand revelation issue concerns the difficulty of getting potential contributors to reveal the actual value an open-access service has for them. It is in the self-interest of any individual contributor to understate the extent to which it values the service, including a claim that it perceives no value. This behavior, while rational on the part of each contributor individually, can lead to the initiative being underfunded and underprovided. As a result, sustainability planning for services provided on a free-access model must anticipate and counter this behavior. The coordination approaches described below (see §4.5) can provide incentives for participants to reveal more fully their actual demand for a service.

The contribution coordination problem concerns how to get institutions to participate voluntarily in the collective provision of a free service. An individual institution has no incentive to contribute to the collective funding of an infrastructure service until it is convinced that enough other institutions are willing to participate to ensure the success of the collective action. Fortunately, assurance contracts and other coordination mechanisms can provide practical instruments for overcoming free-rider inertia in setting up sustainability models for open-access services.

¹³ See Olson 1971, Brubaker 1975, and Baden 1998. Market mechanisms allow organizations to determine accurately the nature and quality of a good or service that should be delivered. Offering infrastructure services as a public good typically circumvents such feedback loops, and, absent some type of market surrogate, makes it difficult to determine the optimal quality and quantity of the service to deliver.



3.4 Unbundling Infrastructure Services

Some infrastructure services, such as advocacy programs, are pure nonexcludable public goods, while other types of services, such as registries, open-access content providers, and digital repositories—although technically excludable—need to be operated as open systems to have any value at all. Some infrastructure services, however, comprise complementary services, not all of which require free access to be effective. For example, some registries and directories offer application programmer interfaces that facilitate uploading and/or downloading content, and some repository and journal platforms offer add-on publishing services.

Identifying the specific value being delivered to various client segments is critical to developing a robust sustainability model. Unbundling a previously unified service—differentiating the types of services being delivered and to whom—to identify exclusive benefits for collective action participants or value-added services capable of fueling cross-subsidies, can be key to designing a sustainability model that is both economically efficient and politically viable.

3.5 Librarian Ethos & Library Policies

Individually and collectively, librarians and other open-access advocates tend to be sympathetic to non-market and collective solutions to the provision of infrastructure services as public goods. However, libraries as institutions—operating as economic entities—do not act altruistically, at least not consistently or reliably. Library purchase decisions reflect all of the self-interested economic behavior outlined in the preceding sections. Further, the policies of many publicly funded institutions, at both the local and national levels, prohibit voluntary payments for services that would otherwise be available for free. The inconsistency with which such policies are sometimes applied demonstrates the demand revelation problem described above, and it can be difficult to determine when such policies are invoked out of a genuine need for regulatory compliance and when they serve as camouflage for free riding.

This dissonance between the professional ethos of librarians on one hand, and the fiscal responsibilities of libraries on the other, can cause practical problems in constructing sustainability models capable of overcoming free ridership. To be effective, such models must raise the cost of free riding—for example, by applying social pressure or by introducing exclusive benefits in the form of differentiated service levels—in ways uncomfortable to many librarians. However, assuming that libraries will not act in their economic self-interest can lead to the design of sustainability plans that are theoretically appealing, but practically unworkable.

Section 4 describes collective sustainability approaches that realistically address rational economic behavior and, where appropriate, exploit market realities, to maximize the effectiveness of open-access infrastructure services. The focus will be on models that balance economic sustainability with the greatest possible utility and access.

4. Collective Funding Models for Open Access Infrastructure Services

4.1 Collective Models

In a global environment of institutional budget retrenchment, single-source institutional subsidies are becoming increasingly unreliable for sustaining open-access infrastructure services that deliver most of their value beyond the host institution. At the same time, university-based initiatives often have difficulty incorporating market-oriented income models to support open-access infrastructure services. This difficulty derives from not having the personnel and administrative apparatus necessary to implement market-facing models effectively, compounded by the philosophical aversion with which such models are sometimes regarded.

Where market-based solutions are impracticable and single-source institutional subsidies are unsustainable, initiatives may need to consider organizational designs that combine the collective provision of open-access infrastructure services with market-like mechanisms for efficient resource management. A diverse set of initiatives—including arXiv, ORCID, the Stanford Encyclopedia of Philosophy, SCOAP3, HABRI Central, and others—are experimenting with novel collective sustainability approaches. Most of these initiatives are international in scope, and some are cross-sector, reconciling the interests of nonprofit and commercial entities.

As noted above, an infrastructure initiative may integrate several income streams into its sustainability model, including subsidies, value-added service fees, and sponsorships. As these income models have been described in detail elsewhere,¹⁴ we focus below on the issues involved in organizing collaborative funding models, including descriptions of practical mechanisms for coordinating collective funding for open-access services. Such collective responses will often require exclusive benefits—including, for example, sponsor recognition or value-added services—to overcome the effects of free-rider tendencies, and we will discuss how these elements can be integrated into collective solutions. However, we will focus on the organizational, economic, and social challenges that confront an initiative seeking to create a successful, collectively funded model.

4.2 Defining Success Criteria

Many of the tactics described below for overcoming free ridership assume that an initiative requires a specified level of collective financial support in order to survive. In other words, they presuppose that an initiative's administrators have exploited or exhausted other potential income sources and reached the limit of the financial support available from the current institutional supporters. Therefore, designing a sustainability model requires that an initiative establish, at the outset, the financial hurdle that must be

¹⁴ Crow 2009b.



cleared for the initiative to be sustainable. In some cases, an initiative may make the level of service provided contingent on the amount of funding available.

Figure 2 summarizes the range of income and capitalization strategies that would typically be appropriate for the host institution for a nonprofit infrastructure service.

Figure 2. Financial Target Strategies

Financial Objective	Full external support	Partial self-sufficiency	Cash-flow self-sufficiency	Operating self-sufficiency	Financial self-sufficiency
Income Target	No external income generated.	External income covers some operating expenses.	External income covers all incremental operating expenses, but without covering fully loaded overhead costs & without recovering development investment.	Operating breakeven. External income covers all direct & indirect operating expenses, but does not generate a surplus.	External income covers all direct & indirect operating expenses. Generates surplus to provide an operating reserve.
Host Institution Subsidy Required	Requires 100% subsidy for operating expenses & future development.	Host institution subsidizes most operating expense & all future development investment.	Host institution provides in-kind overhead subsidy. Initial development capital either grant-funded or subsidized. Future capital investment subsidized by host institution or external funding.	Initial investment capital either grant-funded or subsidized. Future capital investment subsidized by host institution or external funding.	Over time, host institution recovers initial development investment & covers future capital requirements. No host institution subsidies required after initial launch support.

Besides its obvious relevance for financial planning, establishing a minimum operating threshold will force an initiative to confront—and, if necessary, adjust—organizational and cultural expectations about the design of its sustainability model. As noted previously, academic institutions in general, and libraries in particular, favor collaboration and seek to avoid the producer-consumer oppositions inherent in market offerings. However, as explained in Section 3, providing a free-to-the-user infrastructure service requires that an initiative overcomes free ridership, and this will typically require an initiative to define, in explicit terms, the financial conditions under which the collective action will succeed.

For new initiatives, this can be as simple as stating the “provision point”—that is, the minimum funding commitment required to provide the service in the first place. In economic terms, the same situation pertains for an existing infrastructure service. However, imposing a *sine qua non* threshold on an existing service implies that the service would be reduced or discontinued if the financial requirement is not met, and initiative sponsors will seldom be comfortable articulating their needs in such stark terms. Nevertheless, unless the initiative has access to alternative funding, this is exactly what must be done.

An initiative must articulate an unequivocal participation threshold required to sustain the service, otherwise institutions will have no compelling reason to contribute to its support, and the potential for a successful collective sustainability model will be vastly reduced. This requires that a sustainability plan for an existing initiative 1) specifies the exact extent of the financial support required from other institutions, and 2) conveys an existential threat to the service sufficiently plausible to induce institutions to participate in the collective action. The initiative’s exit strategy in the event of insufficient participation can be stated as an absolute *terminus ad quem* or presented as a schedule for transitioning responsibility for the initiative to another organization.¹⁵

Setting a soft target for the success of the collective action would risk the action’s underperformance (if not outright failure) and the need for successive rounds of appeal to generate sufficient participation. At the very least, this approach would incur additional time and effort. At worst, it could diminish the perceived legitimacy of the collective offering and lead to outright failure. Repositioning a soft target as a hard target can cause embarrassment if the participation threshold is not reached and the offering institution does not carry through on its announced exit strategy. Moreover, such feints can undermine the credibility of other initiatives’ attempts at collective funding.

In sum, it is necessary for an existing initiative to frame its financial requirements explicitly, both as an internal motivation to implement potentially unattractive elements of a collective offering and as a credible participation threshold for external institutions.

4.3 Designing a Model

For the reasons outlined in Section 3, a collective funding model must overcome free ridership to an extent sufficient to render the initiative viable. This means that the model must make free riding less attractive and, in effect, increase the cost to an institution of free riding. As economist George Stigler has noted, the free rider problem may be more accurately described as the “cheap rider” problem, as there is

¹⁵ See, for example, the arXiv operating principles, §6.7 (<https://confluence.cornell.edu/download/attachments/127116484/arXivPrinciplesMarch12.pdf>).



typically a cost to free ridership.¹⁶ The cost to an institution of free riding on the collective funding of a free-to-user service includes the risk that:

- the institution's non-participation will reduce the probability that the collective action will succeed, thus reducing the gain the institution might expect from not participating; and
- even if the collective action is pursued, non-participation could lower the quality or quantity of the service that would be provided, or result in a service less to an institution's liking, than would have otherwise been available had the institution joined the action.

An institution may still abstain from participating in a collective action, despite these costs, but the institution's ride would not be entirely free. To improve the probability of a collective funding model succeeding, the participation coordination mechanism (for example, an assurance contract, as described in §4.5) must explicitly articulate the implications of non-participation.

4.4 Group Size & Dynamics

Group size and dynamics affect the potential success of a collective funding model in several ways, making definition of a collective action's field of membership a significant element in the design of a sustainability model.

The larger the potential group of contributing institutions, the greater the resources that would be available to produce a service, and increasing the number of participants would lower the cost per participant. For high-cost, non-excludable, infrastructure services, therefore, a large group size would have a positive effect on the probability that the service would be provided.

At the same time, free riders are less easily detected in large groups, and some mechanism is needed to enforce cooperation. Smaller groups tend to be more homogenous and easier to coordinate, free riding behavior is more visible than in larger groups and more susceptible to peer pressure, and the probability that an institution will participate in a collective action is increased when the group targeted for participation is small.¹⁷ The reasons for this are similar to the costs to institutions of free riding:

- with a small group, the probability of the collective funding model succeeding will depend to a greater extent on each institution's participation—that is, the cost incurred (or benefit forgone) by the institution if the collective action fails is more likely to be greater than the cost of participating; and
- the scale of the service provided will be reduced to a proportionately greater extent given non-participation within a smaller group.

¹⁶ See Stigler 1974.

¹⁷ See Ostrum 2003 and Stigler 1974.

Asymmetry within a group can lend another dimension to small group size and affect how an initiative might define the target group of institutions for its collective funding model. When institutional characteristics, such as frequency or intensity of use or institution size, differ significantly within the group, the large or heavy use institutions may themselves represent a distinct subgroup. In such a situation, an initiative could define its target audience by focusing on a smaller group of institutions (with a higher average participation cost) and/or construct a differentiated membership model with tiered participation fees.

Differences within the group of targeted institutions can provide other practical inducements to participation. If the differences between the potential participating institutions are sufficiently pronounced, an institution's ceding control of the initiative to institutions with differing objectives may raise the cost of non-participation. This would be the case especially where participation in the collective funding earns an institution a role in the initiative's governance (see §4.5.1). For example, smaller institutions might be inclined to rely on larger institutions to bear the cost of providing a service. However, if smaller institutions were to value different types or levels of service, then non-participants could, in George Stigler's words, ". . . find that their cheap ride is to a destination they do not favor."¹⁸ An institution could thus be induced to participate to ensure that the service will respond to its specific needs.

Practically speaking, in defining the field of membership for a collective funding model, an initiative needs to include as many institutions as are needed to bear the financial responsibility, but as few institutions as possible to simplify the coordination of the collective funding model. Although Web-based tools are available to support the coordination of large, distributed social networks, and facilitate the collective provision of open-access infrastructure services, the larger and more diverse the group, the more extensive and expensive the coordination effort that will typically be required.

4.5 Using Assurance Contracts to Coordinate Collective Funding

4.5.1 About Assurance Contracts

The cost of providing an open-access infrastructure service typically represents a step function; that is, the service cannot be provided at all until sufficient resources become available to create the service in the first place. In such cases, there can be no free riding until the service is created. However, the sustainability model must be designed to convince institutions that their contributions are critical to the provision of the service.

An individual institution will have little incentive to contribute to the collective funding of a service until it is convinced that enough other institutions are willing to participate to ensure the success of the collective

¹⁸ Stigler 1974, 362.



action. An institution that thinks that another organization will make the pivotal contribution has an incentive to delay its participation. If too many institutions were to adopt the same strategy, the collective funding would fail because each institution would only participate if its contribution were truly pivotal, and would then fail to participate because low participation would make the target funding threshold appear unattainable. In other words, an individual institution would not know how much of the service its contribution would buy, leading the institution to assume that the quantity of the service would be worth less than the amount the institution would pay. Thus, a step production function creates what is called, in game-theoretic terms, an assurance problem.¹⁹

Many open-access infrastructure services will represent such step investments, in that the service will not deliver value unless it is complete. As already noted, in developing new services, it can be difficult to secure voluntary contributions because potential contributors will fear that their contributions will be wasted unless other institutions also contribute. Assurance contracts (also known as provision point mechanisms²⁰) provide a practical mechanism for overcoming this initial inertia by making each organization's participation commitment contingent on a specified total contribution level being reached. An institution agrees to contribute to the development of a service on the condition that enough other institutions participate so that development of the service is guaranteed. This commitment can be signaled through a letter of intent setting out the terms of participation.

An assurance contract works as follows: Members of the target participation group pledge to contribute to creating a service contingent on a total contribution level being reached (stated either as a financial threshold or as a minimum participation percentage) within a specified timeframe. If the threshold is reached by the target date, the service is created and the open-access service is provided. If not, contributors are not obligated to participate, and any monetary commitments are rescinded or refunded.²¹

Assurance contracts are not limited to the launch of projects. They can also be used iteratively to fund new development and service upgrades, or they can be implemented after the fact for existing services, although such an approach presents its own challenges (see §4.5.3.1).

¹⁹ See Hardin 1982.

²⁰ Threshold pledge systems (also referred to as the "street performer protocol") differ from assurance contracts in that they tend to be open-ended, while assurance contracts are time-limited offerings.

²¹ Depending on the size and nature of the targeted group, the binding mechanism for the commitment could be an informal pact or a contract enforced by a mediator acting as an escrow agent. Several online services now provide coordinating tools that an initiative could use to manage a collective funding model. See n. 27.

4.5.2 Designing an Assurance Contract

Technically speaking, even within assurance contracts, non-participation remains the dominant strategy, as the contract only addresses the coordination problem without solving the underlying free-rider problem. Absent reciprocity, the only time when this would not be the case would be for assurance contracts that make provision of the open-access service contingent on the entire group agreeing to contribute.²² Research indicates that, even where universal participation cannot be achieved, setting higher participation thresholds will increase the perceived importance of each contribution and yield higher success rates.²³

Constructing a strong assurance contract—that is, one contingent on a very high level of participation—will require that the initiative offering the contract is able to identify legitimate non-participants. Legitimate non-participants would include institutions that would benefit from the service if it were provided, but could justly claim that the service would be worth less to the institution than the contribution cost.²⁴ Therefore, in constructing an assurance contract, an initiative will need to segment the targeted group of institutions, using mutually recognized differentiating characteristics, such as institution size, anticipated use, and/or mission centrality. In other words, the targeted group will need to be segmented into discrete subgroups and the initiative's participation fees will need to be tiered to ensure that the cost of participation aligns with the value the service delivers to each subgroup.

The more compelling this differentiation, and equitable the participation fees, the larger the overall group of participants that the initiative will be able to target. In effect, segmenting the targeted institutions into discrete subgroups will allow an initiative to create the positive small group dynamics described above (§4.4), and to define a set of subgroups, within each of which it will be easier to achieve a high level of participation.

4.5.3 Additional Assurance Contract Design Considerations

An assurance contract can be constructed to make the level of service provided conditional on the participation level. For example, the contract could guarantee that an adequate level of service would be provided at the lowest funding threshold and that superior levels of service would be provided at higher contribution thresholds. Whether this approach would provide flexibility, or simply introduce unnecessary

²² See Stigler 1974, Schmitz 1991, and Miller 1993.

²³ See Marwell and Ames 1979, and Isaac *et al.* 1989, Schmitz 1991, Ch. 6, and Miller 1993.

²⁴ See the discussion of the demand revelation issue discussed in §3.3.



complication, will depend on the nature of the service being funded, as well as the size and composition of the targeted group of participating institutions.

An analysis of a service's development and operating costs will determine the funding threshold(s) the initiative will need to clear (§4.2), and the target audience segmentation will inform how the participation fees and terms should be structured (§4.4). For example, the financial participation commitment might be structured to include a one-time development fee and/or a recurring annual support fee.

Often, the details of the assurance contract will need to be adjusted after preliminary discussions with the initiative's principal stakeholders and participation targets. Further, the participation terms may need to be sufficiently flexible to accommodate multiple participation contingencies, such as various participant distribution scenarios by organization type and size.

Even when an initiative can offer sufficient exclusive benefits (see §4.6), the formal structure of the obligation can be important. While it is prudent and reasonable for the service provider to request a contributor to commit to supporting the initiative for a specified multiyear term, some libraries and library consortia may require that a participation agreement include an opt-out option after a specified period of time. In practice, as long as the service delivers the value it promises, the initiative might expect that such an opt-out clause would rarely be invoked. Still, an opt-out clause would introduce a level of uncertainty, especially if a relatively small group of funding institutions contribute a significant proportion of a service's income.

4.5.3.1 Post hoc Assurance Contracts

Direct subsidies tend to be especially important in the development and launch phase of an initiative. However, as already noted (§2.1), it would be a mistake to assume that an initiative can defer sustainability planning subsequent to release of a service, after it has proven its value.

An assurance contract works especially well in the pre-development stage for a service, as an initiative can make provision of the service contingent on adequate collective funding. For an existing service seeking to transition from a single-source subsidy to a collective funding model, the free-rider issue surfaces again. Although an existing service will have already demonstrated its value to users, it may be necessary to communicate to potential contributors that the service would need to be degraded, or even discontinued altogether, if the contribution commitment were to prove inadequate.

While logically effective, some library-based initiatives might consider such coercion to be philosophically repugnant. However, as lack of a credible threat can undermine the effectiveness of the assurance contract, an initiative will need to evaluate carefully its financial position. If an initiative's host institution can truly no longer afford to subsidize a service on its own, it will need to lower the quality or quantity of

the service provided, discontinue the service, or identify another institution willing to assume responsibility for the service. Articulating these unattractive options as explicitly as possible will be necessary to convey urgency and the need for collective action to continue the service.

4.5.3.2 Funder Support of Assurance Contracts

Grants from foundations and other philanthropic organizations (including corporate foundations²⁵) may be available to cover one-time costs that attend the introduction of a collective funding model. Although grants typically support project development for a set period of time, an initiative might seek a grant to cover the planning and implementation costs that it incurs during conversion to a new collective funding model. The financial risk of such a transition can be quantified and limited to a specific time period, and the return on the granting agency's investment can be clearly articulated.

Given the difficulties inherent in organizing a *post hoc* collective funding model to provide ongoing operating support, funding agencies interested in supporting the initial development of an infrastructure service may find it more constructive to make such support contingent on a collective funding model for operating support being in place *before* creating the service.²⁶ This approach could provide an initiative's organizers leverage to motivate other institutions to contribute to collective operating funding.

Structuring philanthropic funding to be contingent on the participation of individual institutions would also help ensure community commitment and demonstrate that adequate demand for the service exists prior to the commitment of development resources. For existing services, a funder might support the transition to a collective funding model by offering support in the form of a matching grant. In such cases, the funder could make additional development funding, and/or short-term support during the conversion to a collective funding model, conditional on a sufficient level of institutional commitment.

An infrastructure initiative could also solicit foundation grants to fund operating subsidies for specific components of a service or to subvent provision of the service to a specific audience. For example, if a collective model with fee-based benefits might exclude institutions in less developed countries lacking the ability to pay, a foundation grant could be sought to cover the costs for those institutions. As one-time

²⁵ A corporate foundation is a private, company-sponsored foundation that obtains its assets from a for-profit enterprise. While a corporate foundation is an independent entity, with its own endowment and organization, it may maintain close ties with the company that created it. If dealing with corporate foundations or corporate giving programs, an initiative will need to develop underwriting policies (such as those described in §4.6 for sponsorships) to ensure that it avoids any real or perceived conflict of interest between the initiative's mission objective and the granting corporation.

²⁶ To increase the return on their social investment, some private funders insist that projects seeking development funding also undertake sustainability planning. These funders will sometimes fund the cost of the sustainability planning itself.



grants are typically easier to secure than ongoing commitments, the grant might be structured as a one-time award to a restricted fund, which could be drawn down over time.

4.5.3.3 *Dominant Assurance Contracts*

Although assurance contracts can be constructed to reduce free riding and to improve institutional participation, they do not eliminate such concerns completely. To do this would require the use of a dominant assurance contract—“dominant” being the economic term for the winning strategy in game theory.²⁷

In a dominant assurance contract, if a contract’s funding goal were not reached, then those who offered to contribute would receive their money back, plus some additional financial compensation. The sponsoring organization would be willing to risk the cost of failure, via the payment of bonuses to would-be contributors, in exchange for a potential return. Constructed in this way, following economic logic, the public good would always be provided, because it would be in the best interest of institutions to participate.²⁸

If the sponsor of such an approach were a nonprofit entity, such as a foundation, the initiative’s success would presumably be of sufficient mission importance to justify the potential risk. Alternatively, an entrepreneurial organization might be willing to risk the cost of failure in exchange for a potential financial return from a surplus margin built into the contribution levels. Such a contract might only cover initial development of the service, or also cover any ongoing operating costs.

4.5.3.4 *Coordination Tools*

The administrative effort and cost of managing an assurance contract is typically a function of the size and composition of the group of institutions whose participation is being coordinated. Coordinating small groups, or moderately sized homogeneous groups, will typically require little administrative effort. However, large, heterogeneous, or geographically dispersed groups may require considerable management time to coordinate.

Assuming that an initiative’s institutional sponsor is well-regarded, and assuming a reasonable degree of coherence in the composition of the group being coordinated, the level of mutual trust will often be sufficient to allow an assurance contract to accept a pledge to participate—indicated through a letter of

²⁷ That is, in economic terms, rational actors would *always* participate in the contract.

²⁸ See Tabarrok 1998.

intent or similar mechanism—rather than require an actual financial payment. In those instances where the target group is too large or amorphous to allow a commitment pledge, an initiative can use some form of refundable trust as an instrument for implementing an assurance contract.²⁹

Web-based escrow services and project-oriented threshold pledge facilitating services, designed to simplify the implementation of assurance contracts, are now available.³⁰ Such services allow an institution to hold group contributions to the project in escrow. If the group goal is not met, the contributions are returned. If the group goal is met, the escrow service pays the funds to the initiative organizer.

4.6 Exclusive Benefits

As noted above (§3.5), some library policies, particularly for public institutions, forbid the payment of voluntary fees. As social incentives would be largely unavailing for these institutions, securing their participation will often require the explicit and forceful articulation of one or more exclusive benefits.

Exclusive benefits can link a private good with a public good; for example, linking governance participation or an enhanced service level (private good) with a contribution to support an open-access initiative (public good).³¹ An exclusive benefit may be of sufficient value that it can generate income adequate to cross-subsidize provision of the free-to-user service. In offering such services, an initiative should ensure that the development and operating costs do not outweigh the benefits gained. Even where the value of offering value-added services justifies the incremental costs, an initiative should be capable of managing fee-based services and be comfortable with the heightened user expectations that a market model will bring.

A collective funding model can succeed even when the cost of participating exceeds the value of the exclusive benefit(s) provided. Although this should not work in theory, it can work in practice, as long as contributing institutions perceive the combined value of the private benefit(s) and the initiative's mission significance to be sufficient *in toto* to justify their contributions. As the perceived mission value of the open-access service will typically be calculated implicitly—and valued differently—by each potential contributor, determining the level of exclusive benefit necessary to attract a critical mass of participating institutions will require feedback from potential contributors.

²⁹ See Twight 1993.

³⁰ Project-oriented escrow and threshold-pledge facilitating web services include: <http://fundable.org>; <http://www.pledgebank.com/>; <http://rockethub.org/>; <http://www.kickstarter.com/>; and <http://www.tides.org/>.

³¹ Of course, if the infrastructure service itself were available only to contributors, the free-rider problem would cease to exist, because there is no public good being provided.



Exclusive benefits can include tangible and intangible benefits. Tangible benefits include differentiated service levels or functionality and complementary add-on services. Intangible benefits include the social incentives and reciprocity motivations described above. Although all benefits, irrespective of type, may be valued differently by various institutions, abstract benefits can prove challenging to articulate and position, and the effectiveness of soft benefits will often depend on the size and composition of the collaboration being formed.

Typical tangible benefits include:

Value-added services—Sometimes referred to as a “freemium” model, value-added services allow an infrastructure initiative to subsidize an open-access service with fees for an upgraded version of the service.³² As the marginal costs of digital distribution are low, a service provider can provide free access to a large audience while focusing its collective funding model on a smaller group of contributing institutions. Such service upgrades can include:

- Enhanced content— Providing contributors access to fuller or more frequently updated content.
- Enhanced functionality— Offering contributors enhanced access, greater convenience, or more ways to manipulate or use the free content. For example, direct access to a service’s content via an API to facilitate incorporation into an institution’s workflow, or automatic deposit of articles submitted to a subject repository into an institution’s repository.
- Enhanced user experience—Providing users at contributing institutions with an improved interface, such as an ad-free version of a service that also uses an advertising model. Similarly, an open-access service could integrate a contributor recognition notice for users visiting from a participating institution.

While commercial firms using value-added models typically target the consumer as end user, open-access initiatives will often deliver their value-added services to libraries and other organizations acting as proxy contributors for end users, rather than to the end users themselves. Another difference between the use of these models by profit-seeking enterprises and open-access initiatives is one of priority: commercial entities use free content to attract customers who will pay for premium services in sufficient numbers to generate a profit for the company,³³ while open access initiatives use add-on services to

³² Although the examples are dated, Shapiro and Varian (1999, pp. 53 – 81) provide a good conceptual overview of versioning information services.

³³ In the consumer market for online services and content, a commonly used assumption is that 5% of users subsidize the rest. Anderson 2009, 27.

subsidize the free service. For commercial firms, the free content is a means to an end; for nonprofit open-access initiatives, it is an end in itself.

Governance participation—In cases where the financial contributions of the participating institutions represent a significant commitment, an initiative may need to grant contributing institutions an active role in the initiative’s governance. The value of this benefit may depend on the size and composition of the collective. A governance role in a collaboration with a limited number of participants, each making relatively large contributions, would typically be perceived as more valuable than such a role in a large collaboration, where the extent of each participant’s influence is attenuated.

Contributor participation in the governance of a service will fall somewhere in a continuum between no direct input, where a contributor’s sole recourse is to cease participating in the collective effort, to the full shared ownership of a cooperative structure (see Figure 2).

Figure 2. Governance Continuum

	Provider Sole Control	Shared Governance	Cooperative
Legal & Financial Control	Provider retains complete legal & financial responsibility.	Provider retains legal control & ultimate financial responsibility.	All contributors own & control the service on a collective basis.
Development Input	Provider responsible for service development decisions & strategic planning.	Contributors provide input into key service development options, operating policies & strategic direction.	Contributors provide input into all aspects of service development, operating policies & strategic direction.
Contributor Input	Contributor input similar to market-oriented services; i.e., participation or non-participation.	Contributor input guaranteed through formal participation policies & managed via contributor-selected advisory board. Includes open-source technical platform development federations.	Contributor input guaranteed through one-member/one-vote cooperative governance principles.
Other Characteristics	Easy to administer. High provider autonomy. Risk of service becoming insulated from client needs.	Requires bylaws articulating contributor roles & responsibilities. Trades provider autonomy for stable funding. Provides strong client demand feedback loop.	Requires clear demand from potential participants to launch & separate formal legal structure. No distinction between provider & contributors. Ensures service remains aligned with needs of users.

How a collaborative governance structure is implemented will depend on where an initiative falls in this continuum:

- In many cases, the host institution will retain ultimate financial responsibility and legal liability for the service and, as a result, will need to retain legal control of the infrastructure service. In such cases, the description of the membership structure will need to make clear that contributing institutions will have advisory input, but not legal control.
- The initiative will need to explicitly stipulate the rights and responsibilities of contributing institutions—including the rights specific to any membership types or tiers—in the initiative’s governance. If (as will often be the case) the input of the contributing institutions is advisory, rather than legally binding, then the collective’s bylaws should clearly articulate the types of input that contributors will have. Similarly,



if any members or member classes have special rights, such as reserved governance seats, these need to be laid out in the initiative's bylaws or operating principles.³⁴

- Where a collective is too large to allow all contributors to participate directly in a governing advisory board, the initiative may need to establish procedures for electing or otherwise selecting advisory representatives. The type of voting procedure selected—for example, single vote, multiple vote, or preferential vote systems—will typically depend on the size and composition of the collective.

Steeped in the ethos of inclusiveness and diversity, and loath to disenfranchise less affluent institutions, a university-sponsored initiative might be inclined to include non-contributing organizations in its governance. As long as governance participation is not an important benefit of contributing to the initiative, such inclusivity poses no problem. However, if advisory and/or governance representation is a significant benefit of membership, then including non-contributors could undermine the value of governance as an exclusive benefit of participation. Non-contributing institutions could be included in an initiative's governance without undermining the value of the governance benefit for contributors by identifying a funder willing to sponsor the non-contributing institutions (for example, a foundation with a mission to serve underfunded institutions in a particular geographic region).

Sponsorships—A nonprofit sponsorship program could generate funding from private and public organizations that seek to demonstrate support for an initiative's objectives and affinity with the service's users and other beneficiaries.³⁵ An infrastructure service may combine a collective funding model with a sponsorship program in a couple of ways:

- One approach would be to treat institutions contributing to the collective provision of the service as sponsors and to recognize their contributions with sponsor appreciation banner graphics and other public acknowledgements. While this approach acknowledges institutional contributors, it would not generate additional revenue for the service.
- Alternatively, an initiative could target sponsors beyond the institutions already contributing to the collective action and/or institutions participating in the collective funding of the initiative that are willing and able to contribute beyond the minimum participation fee level. This approach would generate income incremental to the collective action. However, a common objection to such sponsorships is that they could undermine a service's independence, as sponsors might seek to influence the service's content or policies (for example, publisher sponsorship of a directory of publisher open access policies).

³⁴ For an example of operating principles that outline contributor rights and roles, see those developed for arXiv (<http://arxiv.org/help/support/faq#1B>).

³⁵ See Crow 2005.

Whatever the reality, users of an infrastructure service (and/or the user proxies funding the service) may perceive that sponsorships compromise a service's objectivity and legitimacy, and this perception of a sponsor's influence would probably pose a more serious objection than the actual threat of sponsor editorial meddling itself. Although a service could develop policy guidelines that explicitly preserve editorial independence,³⁶ this may not always ensure that users and institutional funders will trust and believe such assurances.

4.7 Federated Funding

Designing a collective sustainability model requires planning resources and capacity-building expertise that are not always available to open-access infrastructure initiatives. At the same time, many infrastructure services serve the same overlapping constituencies and user bases. This situation suggests that research institutions and funders might consider a collaborative umbrella approach to coordinate the collective funding of multiple open-access infrastructure services.

Such an umbrella model could:

- Provide resources and scale economies for sustainability planning—A systematic, integrated approach to funding open-access infrastructure initiatives could increase the return on funders' investments. Organizations that fund the development of infrastructure services would benefit directly from the improved longevity and vigor of the funded services, while research funders would benefit from the increased visibility and impact of the research they fund via improved compliance with open-access dissemination policies.
- Reduce duplicative effort in the design and implementation of sustainability models—Many open-access infrastructure services confront the same set of issues in terms of overcoming free ridership and coordinating collective action. A collaborative, multiple-project planning approach could improve communication and the adoption of sustainability best practices across initiatives.
- Lower administration and transaction costs—Besides the costs of supporting the resources themselves, libraries and other constituents incur the costs associated with negotiating and agreeing on the model and terms for each infrastructure service. A coordinated model could reduce these costs by increasing the efficiency of administering contributor participation.

³⁶ Crow 2005, §2.5.



Although there could be scale efficiencies in an umbrella approach, given multiple initiatives and a large group of potential contributing institutions, such initiatives must be carefully designed to keep the costs of cooperation from becoming unreasonable.

As noted in §4.4, the small group dynamic—that is, the advantage of coherent, culturally homogenous groups in organizing collective funding—suggests that coordinating large, diverse groups, such as international collaborations across many types of organizations, would be difficult and inefficient. Further, an umbrella organization attempting to accommodate disparate types of services would face the same fundamental challenges confronting all collective action: where the good delivered by an individual initiative would only benefit a minority of those in the umbrella group, it would risk not getting majority support and would either not be provided or be provided only to a less than optimal extent.

As a result, an alternative to an umbrella approach to the collective funding of open-access initiatives could entail the coordination of a federated global funding network. Such a network would rely on local/regional/national groups to alleviate the complications of geographic differences and fund the services. An alliance network might provide a somewhat less cumbersome approach to coordination than a formal umbrella organization. An alliance network could be constructed to speed and simplify the consideration and ratification of collective funding models for various infrastructure services.

4.8 Summary

Given the variety and idiosyncrasies of individual open-access services, the planning approaches described above can only provide general guidance. Each initiative will need to translate the particular value that it delivers into a compelling offering capable of attracting collective support from its particular constituency. By reviewing the key elements that comprise a sustainability model, the economic realities that affect free-to-user distribution, and practical approaches for coordinating collective funding, we hope to have provided a framework and perspective that will help guide individual initiatives in developing successful sustainability plans.

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