SPARC Europe

10 Key Interviews

INSIGHTS INTO THE SUSTAINABILITY OF OPEN INFRASTRUCTURE SERVICES

An Invest in Open Infrastructure project
More info: www.sparceurope.org/ioiinterviews

ABOUT THE PROJECT

Gleaning Insights

Research and scholarship is underpinned by a variety of tools, technologies and services ranging from for-profit commercial solutions and offerings from vendors to community-owned, open technologies and infrastructure. We often hear about the challenges for open infrastructure tools and services to scale, maintain, and compete in the broader market.

The 10 interviews comprised in this project highlight some of the key decision-making points, funding mechanisms and models, and other learnings from a series of commonly used services and technologies used to support research and scholarship. These include both for-profit and not-for-profit services, highlighting perspectives on sustainability across the sector.

This work is supported by Open Society Foundations and SPARC Europe, in collaboration with Invest in Open Infrastructure.

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WHO WAS INTERVIEWED?

Overview

"Constant innovation is what makes a service sustainable."

Eleonora Presani, Executive Director, USA

ARXIV

Eleonora Presani, Executive Director, USA

At a Glance

Type of activities:
E-print server with the mission to be 'the world's premier Open Access platform for dissemination of scientific knowledge'.

Life-cycle stage:
arXiv was founded in 1991 by Paul Ginsparg, now a mature start-up, reinventing itself.

Current legal structure and funding model:
A service hosted by Cornell University, which contributes some funding and indirect costs. Funding is evenly split among recurring funding sponsorship (mostly Simons Foundation), an international membership programme, and indirect support from Cornell University. Some additional contributions come from individual donors. This allows the service to be free for individual users.

Technology:
All the new code is open source.

Sustainability

'Continuous innovation is what makes a service sustainable. Needs evolve, but it is also important to understand that your services should evolve as well. If you can significantly innovate the life of researchers, you don't need to worry as much about sustainability; it will come.'

'Part of sustainability is being able to adapt quickly to a situation, a new reality. That is true for a small organisation like arXiv, but it is also true for a giant (like Nokia or Blackberry). Even if you have tons of money in your reserve, you can still fail anyway.'

'The sustainability of arXiv is really relying on the love of the community. That is from a financial perspective, but also from a usage and engagement perspective. You have to keep people happy about your service and have them see the added value you bring for them.'

Piece of Advice

'The concept of open infrastructure is that third parties can build things on top of it.'

'When a digital product starts to become a teenager, you have accumulated enough technical debt that it needs a major re-platforming. That has been true for all (technological) products that survive for more than a decade.'

'The most important thing: engage with the community. If you want to build a service that is sustainable, you need to be sure that the people you are serving see the value of it and, understand it has a cost.'

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ARXIV

arXiv is an e-print server, with the mission to be 'the world's premier Open Access platform for dissemination of scientific knowledge.' It was founded in 1991 by Paul Ginsparg and has been part of Cornell University since 2001. Its funding comes (evenly) from recurring sponsorship (mostly the Simons Foundation), an international academic membership programme and indirect support from Cornell University.

Original vision

arXiv began as a project of Paul Ginsparg in 1991 when he was a member of staff at Los Alamos National Laboratory. Executive Director Eleonora Presani explains that his main goal was to solve the distribution problem of academic papers: 'At the time, it was difficult for people to get their hands on papers. It was not just about cost or access; it was really a physical issue, because you had to go to the library to read papers, or ask your department to obtain a copy.

'arXiv was founded before the advent of the World Wide Web. 'It was extremely innovative and disruptive; it really changed the way people could access papers and know what papers were coming up in their field. Today, this is something that – albeit not at the same speed – every publisher can offer (through websites, platforms, etc.), but at that time, it was really the only place where this was possible.'

Growth and sustainability challenges

According to Presani, arXiv's biggest challenge has been re-platforming the service. 'In my experience, when a digital product starts to' become a teenager, you have accumulated enough technical debt (i.e. the code and features that have been developed that are technically no longer acceptable but that users expect and so need to be re-written) that it needs a major re-platforming. That has been true for all (technological) products that survive for more than a decade. In the case of arXiv, it took longer than that to hit this milestone, but now we are about halfway. We really need to restructure the code base in a complete way, by changing the language, changing the architecture of the software, and changing the type of hardware that we are using (migrating to the cloud, for example, and relying less on local servers). That is an immense challenge, not just for not-for-profits, but for everyone. It's one of the main reasons why Netscape failed and disappeared. It is the biggest obstacle that any digital product can face: you basically have to rebuild it while still running. You cannot just shut down service for two years, fix it, and then come back.'

Funders are less likely to finance an operation like re-platforming, Presani says. 'It's a big challenge, also from a funding perspective, as it is something that is less appealing. Big funders are especially motivated by the impact they can have in the community. So, if you have something that will improve the life of researchers, they will be happy to contribute. But if you are saying we're moving to the cloud, or we're changing some of our APIs, it is not necessarily as enticing to invest in. In that sense, it is a bit of a challenge.'

Presani is reassured that arXiv's funders are in fact willing to come forward. 'We are lucky, as our major funders have been very supportive of this. They see the importance of the stability of our operation and in making sure that arXiv keeps existing.' arXiv gets its main funds from three sources: a quarter comes from its membership programme (contributions of institutions, societies, consortia), another

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quarter are grants from the Simons Foundation and the Allen Institute for Artificial Intelligence (usually for specific aspects, e.g. the re-platforming in the last couple of years), and the rest comes from donations from individuals, who donate via the website, or from large donors. Moreover, Cornell provides a large in-kind contribution in terms of HR resources, legal, finance, and IT support, space, and support for the Executive Director position.

The grant from the Simons Foundation came when arXiv put out a major call for funders about 8 to 10 years ago, Presani says. 'arXiv wanted to move and grow more organically, and the Simons Foundation was the first to respond and contribute.'

The membership programme is more recent, about seven years old, and corresponds to arXiv's mission of serving the community. The Simons Foundation matches members' contributions. 'The idea is to really involve the community and to benefit from the "matching" of the member contributions by the Simons

Foundation. The membership programme gives arXiv a lot of independence, because we are being paid by the people we are serving. And that's what we want to do: serve this community in the best way possible, so getting the funding directly from them allows us to really innovate and explore with their primary interest in mind. It also helps to give priority to the right things. We're starting to differentiate between members and donors, as it sometimes has been a bit of a grey area. The membership programme is designed for university libraries and we have tiers based on arXiv usage from their institution. Yet, we are often approached by organizations such as academic societies and funding bodies who want to financially contribute. They do not directly represent users, but they have an interest in arXiv existing so we need a model that works for them.

'They are also experimenting with different types of funding. 'That gives a sense of how arXiv is evolving into a modern tech organisation. We are, for instance, working with Semantic Scholar, which is part of the

Allen Institute, who fairly recently started to support us financially. In time, the type of funding has changed, with our move into digital services for the research community and impacting that community, not just the publishing aspects.

'The challenge for arXiv has not been to get funding, however, but rather to make the membership model sustainable, Presani says. 'It has not been hard to get the funding needed. What is hard is the membership, as the institutions are heavily regulated on how they can spend their money. Funders are much more flexible: as long as you make a good argument and they see the impact that you have on research, they are usually happy to contribute. Even though arXiv still looks rather old, and has many opportunities to develop, it is still seen as heavily impactful for research.'

Opportunities, considerations and choices

Paul Ginsparg ran arXiv for the first few years. 'There was no legal entity associated with it; it was just a tool that Paul made,' Presani says. When he became a professor at Cornell University, however, things changed. 'He brought arXiv with him and then gave control of arXiv to Cornell University library, who maintained it thereafter.

'This set-up remained the same for many years, until arXiv moved to the College of Computing & Information Science in January 2019. 'Some of the people who were in charge of arXiv at the library left, so it was a good time to innovate and move arXiv. Besides, during the years arXiv's role and how it operated changed a little bit. It was less of a library tool and more like a digital tool for users, readers and authors. It is now much more like a digital service that is offered, so we want to interact directly with users. It made sense for arXiv to find a new home in the College of Computing & Information Science, an area where arXiv is growing exponentially.

"The other aspect to it is maintenance and development. When Ginsparg built it in 1991, he wrote the code himself. The IT people from the library would maintain it, but now there is the need for a bigger jump. That's why the connection to Cornell Tech specifically is also relevant, because it is a really practical technological product that we want to build. Having access to the fostering environment is important because of the type of contacts we have, the networking environment, and the capabilities of people.

"I joined three months ago as the Executive Director, and the Dean, Greg Morrisett, Vice Provost, Cornell Tech, is a kind of sponsor or promotor of arXiv. We are both at Cornell Tech in New York City, so now arXiv spans between Cornell Tech and the Cornell College of Computing & Information Science in Ithaca.'

In this way, arXiv 'grew organically into an organisation of new people,' Presani explains. 'There is me, the first full-time arXiv director, working on the operational and everyday health of the product and the website. I partner with the Scientific Director, who is more involved in the editorial aspects of it (which fields to work with, what are our standards of moderation, organising the moderation, etc.)'

Presani explains that the operation is based on three main pillars: 1) communication and development (one person); 2) technology (a tech lead, three engineers and a UX person); 3) operations (a head and three other people, plus some students that work part-time) – consisting of communication with moderators, a helpdesk for authors, and everyday operations for production. 'All of these people are employed by Cornell and work only on arXiv, except the Scientific Director, who is professor at Penn State University. Cornell pays part of his salary so he can work on arXiv.' arXiv is an organization within Cornell University: 'In a lawsuit with an author a couple of years ago, it was concluded that arXiv is a private collection owned by Cornell.'

Currently, Presani is working on expanding the geographical reach and diversity of arXiv. 'The challenge I am seeing today, where I want to change something, is diversity and especially geographical diversity. The richer and more active institutions contribute more, and so they also have more representation on our advisory board. So their voice is often the stronger voice, although not officially. I am therefore trying to extend the concept of membership beyond financial contribution, to encompass being part of the community that builds arXiv together.

'This requires a careful balance between sustainability and fulfilling the organisation's mission. 'In that sense it is a bit of a challenge, as you need to survive, so you need money, but part of arXiv's mission is also to democratise science, and to give access beyond the Western world. It is therefore important to involve everyone in contributing to the product. The challenge is that a lot is based on personal networking (in the moderations, in the committees watching

trends, etc.)'

In terms of what helps an organisation like arXiv flourish, Presani points to simple financial forms of support like grants, but also to assistance in terms of understanding policies to help create a global publishing infrastructure. 'Academic publishing is one of the few businesses that is truly global. There is no way you can regionalise it. That is why everyone is struggling so much with all these different policies about Open Access. As a practical example, we were thinking: "What do we need to do to become Plan S compliant?" Talking to parties around the world, we found that people want to support Open Access, but may not like Plan S because it gives too much power to large publishers. So what should arXiv do about Plan S? Do we need to be compliant? Does it matter? A global partner would be very helpful in assisting us to navigate these kind of policies.'

Consequences of current funding model
arXiv is not a separate entity, which had consequences for how its identity developed, Presani states. 'It is not an independent legal entity; it belongs to the university. It took most of the life of arXiv to really understand its own identity. arXiv has, for instance, not thought of trademarking the name or the symbols. And when it did, when other 'arXivs' appeared, it was too late, as it was considered part of the

public domain. So the trademark we have is very limited.'

While some would like to see arXiv become an independent entity, Presani sees more advantages to the current set-up. 'There has been talk by parties who would like to see arXiv as an independent not-for-profit entity, as opposed to being part of the university. The advantage of being part of the university is that even though Cornell doesn't financially contribute directly, the indirect contribution is massive in terms of HR, legal and other resources. That would all have to become part of our cost structure if we went independent. Of course there would be advantages in being independent, but I don't see a reason to rush in that direction. The pandemic, however, does make us think about the fact that Cornell is suffering financially, e.g. with the loss of international students in the United States. arXiv is on a hiring freeze at the moment as a direct consequence. It's always a trade-off between flexibility, security and safety.'

Future vision for sustainability
Presani aims at ensuring the long-term sustainability of arXiv so that it can focus on its mission of being a free community tool. 'We are actively looking for an endowment, to give arXiv a sort of peace of mind for maintaining sustainability in the long term. On top of that, I really want to grow the membership model,

e.g. with academic societies. arXiv needs to be a community tool, free to use for authors and readers.'

To ensure that arXiv will remain a reliable open infrastructure, Presani is considering new kinds of models and funding. 'Our role is going to be infrastructure that people can build upon – open infrastructure that offers high-quality data for third parties to build things on top of. To do that, we'll need funding from different perspectives, beyond the funders we already have. For instance, corporations and other for profit organizations are also benefiting from the existence of arXiv. They read articles, access the data, use the information available. So it makes sense to think about ways where these entities can also financially contribute to the existence and success of arXiv.'

She also sees opportunities in policies promoting Open Access. 'Another aspect is those authorities (e.g. the EU promoting OA) who issue policies and guidelines that include the requirement to put papers on arXiv. They could help us to sustain that type of growth (of authors posting their content on arXiv), acknowledging the operational, legal and financial implications. Moreover, large coalitions like IOI and SCOSS could bring huge value in helping us navigate OA policies, brainstorming with us on new or evolving

funding models.' All these kinds of things will need to be more defined, and we're thinking of different business models to cover the operational cost."

Adapting quickly is key. 'Part of sustainability is being able to adapt quickly to a situation, a new reality. That is true for a small organisation like arXiv, but it is also true for a giant (like Nokia or Blackberry). Even if you have tons of money in your reserve, you can still fail anyway.'

However, Presani has full faith in the long-term sustainability of arXiv. 'The sustainability of arXiv really relies on the love of the community. That is from a financial perspective but also from a usage and engagement perspective. As long as people care about it existing, we will find funding. You have to keep people happy about your service and have them see the added value you bring to them (and understand the cost involved).

'This does mean extending and exploring new business models. I am trying to formalise more aspects in arXiv to understand what it really means to be sustainable in the future. I am really happy to see the interest and enthusiasm from the members and funders, but I have in the back of my head: "This might not last forever."'

Advice for peers
Presani points to the importance of meeting the community's needs. 'The most important thing: engage with the community. If you want to build a service that is sustainable, you need to be sure that the people you are serving see the value of it, and understand it has a cost.'

Also, peers should keep in mind that continuous innovation is what makes a service sustainable. 'Needs evolve, but it is also important to understand that your services should evolve as well. In the history of arXiv, it disrupted distribution. Now, distribution is not an issue anymore. So what's next? That's what we're thinking about now, and that may make it or break it for arXiv. If you can significantly innovate the life of researchers, you don't need to worry as much about sustainability; it will come.'