In 2014, a 5000-person survey of US principal investigators and leaders in the academic community showed that science gateways are used across all domains of science and for a variety of purposes. Fifty-seven percent of survey respondents were involved in gateway development in some way. But beyond the survey response, gateways play a pivotal role as a connector of resources and services in an increasingly complex research environment. Leading uses include gateway interfaces to educational tools, computational tools, data analysis tools, and data collections. Despite widespread use and a role as connectors of services, gateways have sometimes followed an unproductive cycle in which they were developed for research projects and then used by early adopters, only to falter as they reached greater traction with the community because the initial research grant had ended. This led to the creation of the Science Gateways Community Institute (SGCI) in 2016.

The National Science Foundation's Office of Advanced Cyberinfrastructure funds its flagship software institutes in two(but really three) phases. There are separate awards for conceptualization and implementation phases. In the award, the same team involved in the conceptualization phase was selected for implementation. The Institute's Bootcamps are held twice a year for 5-day periods — all day, each day — to help attendees form bonds that they may carry outside of the intense week. The focus is both on providing knowledge and working on practical exercises on how to apply that knowledge.

SGCI's Extended Developer Support (EDS) is modeled after the NSF-funded XSEDE project. EDS is designed to help new gateways come into existence and existing gateways add major new capabilities that are needed for growth and sustainability. Gateways can be most beneficial in communities where datagenergysm is exploding (cryo-EM), the need for powerful computation is great, and the experience of the user community with large-scale computation is limited. Gateways can also help infields with access to newly digitized data. XSEDE's aim is to provide overviews of technical solutions to common problems so that gateways can evaluate and adopt solutions on their own without needing full EDS support. EDS also works closely with the Scientific Software Collaborative to get client gateways listed in the software catalog.

SGCI's Scientific Software Collaborative (SSC) is our response to that but delivers much more. The goal of the SSC is to promote science gateways, simplify development, and expand the capabilities of science gateways. Moving past infrastructure for the project, the SSC team developed and released the new SGCI Science Gateway Catalog and the SGCI Hosting Environment. Users also can create an account, log in, and contribute their own science gateway and software to the listing. The components of the Scientific Software Collaborative will be leveraged by the Incubator and Extended Developer Support to help researchers build and improve their science gateways.

Community Engagement and Exchange (CEE) supports the heart of the gateway’s community, as a way for people to connect with, support, and learn from each other. The two primary events organized by CEE include an annual conference and a Webinar series. CEE's program to promote and support campus-based gateway development groups has the goal of helping campuses build a more cost-effective, sustainable, and efficient way of supporting a growing number of gateway projects. These groups, such as XSEDE Campus Champions and ACI-REF, have individuals who are particularly well-positioned to identify the need for and facilitate the creation of campus-based development groups. Going forward, the CEE team will continue to look for opportunities to shape our services to meet the needs of our community as well as look for new opportunities to expand our community’s boundaries.

Transforming the frontiers of science requires users and developers who are trained and motivated to tackle the difficult challenges of working in uncharted territory. SGCI works to build the nation's capacity to generate the workforce needed to meet these challenges. The move into the execution phase will be based on lessons learned and guided by a skills development report, which has identified non-technical, basic-technical, and advanced technical topic areas. The service delivery model for non-technical and basic technical skills will include face-to-face training during the academic year, a summertime 4-week coding institute, and conference workshops, and hackathons will continue with the content closely tied to non-technical and basic technical skills topics. Using these models of service delivery, Workforce Development will educate the next generation of users and developers who will create the software that cyberinfrastructure requires to advance gateways and will engage underrepresented minorities who are less likely to self-identify as contributors to or users of Gateway services.

In addition, as a community-designed organization, the SGCI had to be ready to adapt to the changing needs of the community. It needed a system that was lightweight and flexible. SGCI settled on the Entrepreneurial Operating System™ (EOS) approach to planning and execution and a suite of low-cost or free tools to efficiently collaborate and communicate. The EOS approach to management is based on the book Traction by Gino Wickman. EOS breaks down the components of any business into 6 pieces: vision, people, data, issues, process, and traction. All projects need a technology infrastructure to function. SGCI uses Trello to run the weekly L10 meetings. They have a Trello board for the Leadership Team as well as boards for each area within GCI. Trello is also used for its Project Schedule. Afterward, they implemented a customer relationship management (CRM) system to better keep track of their interactions with clients.

The Quantitative Undergraduate Biology Education and Synthesis (QUBES) science gateway's mission is to foster a community of math and biology educators who share resources and methods for preparing students to use quantitative approaches to tackle real, complex, biological problems. It operates as a virtual hub that consists of online learning communities that connect teachers with quantitative biology projects, resources, and expertise while also supporting implementation in the classroom. Since its founding in 2014, the QUBES platform has evolved and grown, and so has its need for support. When the SGCI launched in 2016, they were among the first to submit a request for services and have, since its initial request, engaged with each service area offered by the SGCI. The QUBES team is not quite done evolving, and they anticipate requesting further services from SGCI to take their platform to the next level.

First, methodically reach out to researchers, educators, and scholars who can benefit from our services, particularly from underrepresented demographic groups and underrepresented disciplines. Finally, and perhaps most importantly, the SGCI needs to work with the community to develop expertise independent of SGCI offerings. One way they can accomplish this is by establishing a science advisory panel (in addition to our existing Steering Committee) to engage representative members of our community in shaping the opportunities and impacts that we pursue. On a strategic level, SGCI will continue to engage new partners who can extend the services and expertise that we offer and the communities that we serve. SGCI also plan to continue our methodical approach to goal setting, moving forward toward its long-term goal to support science gateway developers as they radically change the way science is conducted.