

Managing “Open”: An Oxymoron or Formula for Success?

Geneva Henry, Rice University
Executive Director, Digital Library Initiative
Rice University
P.O. Box 1892, MS 44
Houston, TX 77251-1892
713.348.2480

Brent Hendricks
Chief Architect, Connexions
Rice University
P.O. Box 1892, MS 375
Houston, TX 77251-1892
713.348.3629
brentmh@rice.edu

Abstract

The Connexions project at Rice University has successfully implemented a scalable, robust open source and open content system. This presentation takes a look at how the project has evolved and what organizational structure has been most effective in working with open source and open content cultures.

1. Statement of the issue:

Open source, to the naïve onlooker, appears to be chaos in operation: anyone anywhere can make changes to a base of software to have it do what they want, then make it available to anyone else to use for free. And the idea of open content that allows anyone to take someone's work and change it to be what they want it to be would seemingly lead to pandemonium. As one delves into these cultures, however, there are established norms and policies that guide the communities of software developers and content creators who participate in these activities to ensure that a form of order is maintained.

The Connexions project started as an idea in the fall of 1999 to provide a set of open source software utilities and an open repository of content that authors, instructors and students could use and contribute to in order to foster the growth and exchange of knowledge. As prototyping for the system got underway and functional components began to take shape, the project team began to grow from the professor who originally had the idea and his one programmer to a few programmers and a lab of students to help in achieving the project's goals. The challenge became managing the project in a way that would lead it to success yet not compromise the values of the open source and open content communities that would be vital to the growth and sustainability of the project. Traditional project management with well-defined requirements and strict adherence to software development practices, software and content licensing agreements that the university's general counsel would agree with, and assessment techniques that could be used for effectively measuring the impact of teaching with a new approach introduced by Connexions were just some of the key issues the project struggled with in trying to create an organization that would stay true to its values, yet provide a robust and scalable system for global use.

2. Description of the Connexions project management approach:

The issues facing the Connexions team as it began to mature required innovation in the way the project would be organized, yet sufficient discipline to ensure that progress would be made, leading to a successful system that could attract funding for development and growth. The following is a brief overview of the project and a description of the organization developed to lead to its success

Overview of Connexions

The Connexions project began in the fall of 1999 as an idea, building into a vision, for moving teaching and learning from a static, linear progression through a set of topics to a dynamic “ecosystem” of shared knowledge. In Connexions, communities of instructors, authors and learners share knowledge, continually updating it and weaving together various concepts to

provide a greater view of how topics across disciplines interrelate. Today, Connexions hosts a repository, known as the *content commons*, of openly licensed knowledge modules, with over 1,600 modules available for free. The goals of Connexions are to enhance teaching, learning and research by (1) facilitating collaborative development of educational and research content in a broad range of disciplinary communities; (2) providing free access to distributed repositories of educational and research content and curricula; and (3) empowering diverse cultural communities to join in the development of knowledge.

Achieving these goals requires a solid core of enabling technologies that provide a foundation for supporting the needs of Connexions participants. Connexions has been available to anyone to use since the project's inception, but in January 2004 the project announced Release 1 of the system, signaling a maturity and level of functionality available in the software to ensure its robustness and scalability. The Connexions roadmap, course composer/instructor interface, and authoring interface tools, along with a powerful knowledge repository provide an environment to encourage knowledge sharing and reuse, supporting collaboration and building of communities across geographic, cultural and disciplinary boundaries.

By collaborating both within and across disciplines, communities of authors work together to pool their expertise so that courses, created by stringing together knowledge chunks, are authored by many, with each author receiving attribution for his or her contributions. Information can be modified under an open license to tailor the material for the audiences of learners. This approach invites contributions by authors, whether they are senior or novice, recognizing that each may have valuable insights that will advance overall knowledge and learning. In this environment, the peer review communities collaborate directly with each other, modifying contributions as they go and keeping the knowledge current. Authoring becomes a much simpler task. Rather than write an entire book or article, individuals can write on a single topic in which they are expert. Reuse of knowledge is encouraged and new ideas can readily evolve without waiting for the long pre-publication peer review process to take place. While initially focused on creating customizable courses, the Connexions concept works just as well for the publication of research articles. As new findings are published, the relevant concepts can be picked up by multiple disciplines that may be affected and can be quickly integrated into the curriculum or used in further research activities to promote new discoveries at an increasing pace.

Getting Organized

As Connexions began to grow, it was clear that a management approach was needed to ensure that functional needs were defined and could be implemented, while content would flourish, populating the content commons with useful knowledge modules that instructors could draw from in creating courses. Each of the two main areas – software development and content development – presented unique challenges in and of themselves, but needed to be addressed concomitantly with one another. The faculty member that started the project, Dr. Richard (Rich) Baraniuk, was from the Electrical and Computer Engineering Department (ECE) at Rice, specializing in digital signal processing research. The initial funders of the project, however, had strong, successful careers in managing technology businesses and advised Rich to bring a manager on-board to run the project.

What does an electrical and computer engineering professor know about hiring a manager? Well, not much at first, but they learn fast! The initial person hired into this role had neither a software development background nor a legal background needed to address licensing issues associated with the content. The licensing issues were two-fold: 1) knowledge modules created by university faculty were to be made available for free to anyone in the world to not only use but also to modify and contribute back, and 2) Rice University would now be providing a software system that would host content that a world of people could contribute to. This combination of managing a software development project and tackling the challenging legal issues, together with understanding and cultivating the open source/open content cultures, required skills and experience not commonly found in a single individual.

The innovative nature of Connexions drew the attention of faculty and staff at Rice, resulting in the formation of an internal advisory council. Included in this advisory council was a new faculty member in Anthropology, Dr. Christopher (Chris) Kelty, whose research interests included the Internet and open source culture; an educational research and assessment psychologist, Dr. Janice Bordeaux; and the executive director for Rice's digital library initiative, Geneva Henry. Several faculty members who were early adopters of Connexions rounded out the advisory council, providing the group with user needs and feedback on the system.

Chris brought a wealth of expertise that proved invaluable in engaging the Rice general counsel's office in the critical intellectual property discussions that would require official legal blessing by the university. As Creative Commons (creativecommons.org) was in the process of becoming an organization that would become key to developing the content licenses Connexions would need, Chris introduced the two projects to each other, allowing both to work together in understanding academic needs in the world of open licenses. Connexions was one of the very first, and initially the largest, users of the Creative Commons licenses. Chris's role as the intellectual property advisor for Connexions has helped the project understand, assess, and provide education about licensing options for authors to consider.

Janice carried an appointment in the Dean of Engineering's office to specifically assess engineering courses at Rice. Intrigued by the interesting possibilities of understanding student learning by how well they could show how concepts relate to one another, Janice developed assessment instruments to measure student learning through concept mapping. Concept maps developed by students could be compared to the instructor's "expert" concept map to gauge how well they understood the interrelationships of the concepts in comprehending the subject more thoroughly. (At the time of this writing, the results are still being evaluated. Data will be available by the time of the Educause conference). Janice also experimented with trying to get faculty to define the main concepts associated with the ECE curriculum; this, however

Geneva came from a strong software development background of 20 years in the aerospace and defense industry, which included complex systems engineering and project management, as well as programming. Her view of Connexions was that it was an innovative digital library for digitally created knowledge, requiring complex software components for appropriately managing the content. Initially helping the project in an advisory capacity, she devoted an increasing amount of her time to the project, becoming the executive director for the team in April 2002 part time. In this capacity, Geneva reorganized the project team to more closely resemble a software development project, creating roles for a systems administrator, test lead, and a documentation and training specialist. A development plan, complete with milestones was put into place, test plans were created, functional requirements were documented, and the various components of the system were documented to help users learn how to use and contribute to Connexions.

The original programmer for Connexions, Brent Hendricks, had been one of Rich's graduate students and became consumed with making the Connexions vision a reality. Having been involved with the open source software development world, Brent brought to the team an understanding of the open source culture that would be critical for making the project a viable as an open source software application. As the project's chief architect, Brent had been responsible from the start for defining the functional requirements and overall system architecture and design.

Connexions has continued to operate as a multidiscipline team, with the advisory members and staff working closely with each other to educate and evolve an efficient and effective project. The more structured organization has resulted in a well defined set of critical functionality that could be tested and documented to ensure full support for end users of the system. The documentation and testing, often minimal in open source projects, has helped to prepare the software for release in the open source development community. This is a group with high standards that demands high quality code if it is to be accepted and worked with to add enhancements and bug fixes as an open source software project. The project's structure has benefited by embracing the open source project approach of, "release early and release often," ensuring that the most recent fixes

to the software are available – after, of course, having gone through a somewhat rigorous test process.

The intellectual property aspects have been central to growing a large base of knowledge modules. At present, the system requires authors creating new modules to agree to a Creative Commons *attribution* license (<http://creativecommons.org/licenses/by/1.0/>) at the time they create a license. It is important for users of Connexions to understand the open philosophy and values in order to understand the power and significance offered by Connexions. From the start, the project team has had to learn a lot about different content licensing options, as well as the default copyright that is automatically assigned to a work at the time of its creation. Understanding fair use, attribution for works, ability to prepare derivative works, public domain, “copy left,” and commercial use are important to understanding how the system must work. Licensing options affect the software that is implemented to manage the content licensed with these varying options. The more options there are, the more complex the system must become to manage the information. Helping users understand these differences continues to be a part of explaining Connexions and its unique offering.

3. Outcome:

Connexions has been available to the world since the initial prototype software was developed in 2000. The rigorous project management has led it to the point where Connexions could be officially “released” in January 2004 as a stable system ready for widespread use around the world. At the end of January 2004, the content commons contained more than 1,600 knowledge modules, with courses being taught using Connexions at institutions globally. The project experienced exponential growth in the average number of daily Web visits from 200 to 2003, with no effort at publicity for the project. With the official release in early 2004 and press announcements issued about the project, that growth is expected to increase substantially. With the proper planning and a strong team in place, the project will handle the demands expected.

4. Importance or relevance to other institutions:

The multidisciplinary team approach has been critical to the success of Connexions. Many people falsely believe that open source projects mean that a hoard of developers will come rushing to you for free if you say you want to develop something. Not only is that not true, but that attitude could be the kiss of death for a project for a very long time. Good, flexible management of the project is necessary, with an ability to draw on expertise in a number of areas. At universities we’re very fortunate to have a lot of experts surrounding us. Harnessing that expertise and learning how to work together to succeed on complex projects can be the difference between success and failure.