Designing Open Projects: Lessons From Internet Pioneers

By David T. Witzel

Using Open Project Design at the Office of the National Coordinator for Health Information Technology

The Department of Health and Human Service's Office of the National Coordinator for Health IT (ONC) is working to expand adoption of electronic health records, connect physicians to each other and to a national information network, involve patients in their health care, and broadly improve public health. To achieve these ambitious goals, ONC has been using Internet-like, open project approaches in a number of programs and even outlined similar concepts in their Design Principles document that has guided recent project efforts. This case study provides a brief overview of two initiatives, using ONC's experience to illustrate what the tips from Internet pioneers look like in practice.

Background

In 2004, President George W. Bush called for widespread adoption of interoperable electronic health records and established the Office of the National Coordinator for Health IT to make it happen. The mission and scope of ONC greatly expanded in 2009 with the passage of the American Recovery and Reinvestment Act (ARRA), which established the Medicare and Medicaid electronic health record (EHR) incentive programs providing billions of dollars to providers and hospitals that adopt and "meaningfully use" health IT. The first set of requirements for meaningful use include recording medications, sharing patient health records for referrals, implementing clinical decision support, and reporting quality results.

ONC has worked with collaborators to define standards, services, and policies for communicating health information, collectively dubbed the Nationwide Health Information Network (NwHIN). ONC's goal with NwHIN is to "provide a secure, nationwide, interoperable health information infrastructure that will connect providers, consumers, and others involved in supporting health and healthcare. This critical part of the national health IT agenda will enable health information

to follow the consumer, be available for clinical decision-making, and support appropriate use of healthcare information beyond direct patient care so as to improve health."

ONC's challenge is to get a wide variety of organizations, including more than two dozen federal agencies, state and local governments, hospitals, insurers, patients, and some 800,000 doctors, to coordinate so that:

- Health data are securely shared
- Health care and health improve
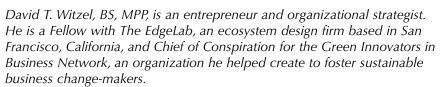- Costs go down

Major components of the NwHIN effort include:

- Negotiation of definitions, standards, and policies to support various kinds of information exchange

- Development, prototyping, and adoption of software to support exchange engagement with a diverse community of health professionals, vendors, patients, and government staff to refine, test, and implement these approaches

CONNECT Software

CONNECT is the current incarnation of a software development effort that started in 2007 to share health-related data among the more than 20 federal agencies that house and use it. It is an open source package that implements NwHIN standards. The project claims "more than 2,000 organizations—including federal agencies, states, healthcare providers, insurers, health IT vendors—all working together to improve the CONNECT solution."

Started as a traditional government software effort developed by interested federal agencies under the auspices of the Federal Health Architecture, CONNECT was developed under a contract with Harris Corporation in 2008. The software was released as open source code in 2009 under a license that places few restrictions on modification or redistribution. As of March 2012, it is in release version 3.3. The Department of Veterans Affairs, Department of Defense, and Thayer County,

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Nebraska are among the organizations that have begun to implement components of the CONNECT package.

The CONNECT project was actively engaged in building a software developer community for its product, and hosting a series of code-a-thons around the country. In addition to providing access to all source code online, the project offers a wiki, online forums, and online issue tracking open to contributors. Project managers are available for direct contact and questions, the projects host webinars and training seminars, and even architecture discussions are held on open conference calls.

In May 2011 a forked version of the software was released as Aurion in a project managed by the newly formed Alembic Foundation. Started by two of the original CONNECT architects, the new foundation is developing open source software starting from a CONNECT codebase while extending decision-making for the direction of development beyond federal agencies.

ONC has announced a new generation of Connect, Connect+, that will, among other things, be restructured to simplify deployment. In 2012 ONC intends to spin off both NwHIN Exchange and the Connect software into external, public-private organizations. These new homes will manage governance and planning as well as development of the software.

NwHIN Direct

As the *New York Times* explains, "A basic challenge is for doctors, hospitals, patients and public health authorities to be able to easily and securely share information—things like a person's vital signs, diagnosis, lab tests and drugs prescribed. A fancy electronic patient record, unconnected, is just an expensive way to capture data."

The NwHIN Direct Project, launched in 2010, is intended to address this challenge and replace the fax machine with an easy, standardized way to exchange health care information electronically. Currently, even doctors using the same brand of health record software might not be able to exchange information, while those with different brands of software have little hope of electronic exchange. Direct is intended to improve quality, speed transfer, and security, and lower costs for sharing patient data.

With Direct, ONC took an even more dramatic step toward open systems development. Foregoing responsibility for any software development, ONC focused on defining technical standards and services with the expectation that project partners would implement.

Representatives from electronic health records vendors, medical organizations, health delivery networks, federal and state governments, and consultants have participated. Work has proceeded in a series of work groups convened by ONC, with over 200 organizations committed to active involvement and implementation.

Direct is based on widely adopted Internet standards, including e-mail protocols for transport (SMTP), content sharing (MIME), and security (X.509). The approach is intended to be widely applicable and able to be integrated with existing electronic health record packages and health information exchange platforms, as well as foster new products and services.

ONC had a clear focus to drive its efforts—coming up with an easily adopted mechanism for two providers to securely share patient health information. Arien Malec, former coordinator for NwHIN Direct, says the project has had an "iron mission, flexible tactics." He explains, "We had a goal (universal addressing and transport for content-neutral, secure, directed exchange for health care) and stuck with it, through thick or thin, but were willing to try almost anything and compromise on almost anything to get there."

This meant deliberately not including other potentially important but potentially distracting issues. The design

What is an Open Project?

The concept of openness is used in a number of disciplines. In systems theory, an open system is one that continuously interacts with its environment. In technology, it is one that supports open standards and can therefore be made to interoperate with other computer systems. In science, it means a system that allows matter or energy to flow across system boundaries.

We now talk about open source software, open data, open standards, even open education. For our purposes, the concept of "open" can be used to modify projects or organizations as well. An open project or organization tends to have porous, flexible boundaries and is receptive to contributions, resources, ideas, and direc-

tion from the outside. This is in contrast to "closed" projects and organizations which have internally defined objectives and tightly controlled resources, participation, and information flows.

Most of the organizations we work in—government and nonprofit—are traditional closed organizations, with clear-cut boundaries for employment, funding, and responsibilities. This report imagines closed organizations exploring the possibility of managing open projects that have more fluidity and exchange with their environments and with other organizations and projects. The hypothesis is that, in some situations, this approach will increase the value created for society while sharing the cost of production.

Contrasts between Closed and Open Management Approaches

Closed	Open
Tight control	Loose control
Clearly defined objectives	Fluid, emergent objectives
Enforceable deadlines	Flexible deadlines
Proprietary assets	Non-proprietary, shared assets
Secrecy expected	Secrecy discouraged
Resources are capped, tightly controlled, closely held	Resources are shared, without central control, distributed
Formal methods and processes are implementable and enforceable	Processes are harder to enforce
Superior in static settings	Superior in complex, dynamic settings
Implements known approaches	Discovers unknown approaches
Responsibility clear	Responsibility hard to identify

principles of Direct Project state, "Don't let 'perfect' be the enemy of 'good enough;' go for the 80% that everyone can agree on … before focusing on the more obscure" interpreted as "when in doubt, cut it out." For example, questions about how to find doctors' Direct addresses (similar to e-mail addresses), while interesting and probably valuable, was an issue deliberately defined as out-of-scope.

ONC has encouraged participation by a wide range of affected and interested organizations and people. Technology providers like Microsoft and Google, health data companies like Surescripts and Allscripts, representatives of medical providers like the American Academy of Family Physicians, consultants, and regional health agencies are involved.

To help manage participation, ONC has used a variety of communications channels. However, it is through their wiki and code archives that much of the detailed learning is

shared and practical decisions made. The Direct Project wiki, actively used for documentation and coordination, lists over 800 members. ONC has conducted face-to-face boot camps attended by state partners. Notes and recordings from those sessions are available online.

One of the benefits of open participation has been innovation from the edges. Malec recalls being approached at a conference by someone wanting to participate in The Direct Project. Malec says, "He was from an obscure company in Minnesota that I'd never hear of before and clearly wasn't on my hit list of folks I wanted to get involved. I told him: we've got a wiki; the best way to get involved is to go participate and add value." The new participant proceeded to provide a helpful test model for how the architectural components could be provided and his company ended up being the first to launch in production.

ONC Results: A Preliminary Assessment

While ONC's work is still young, some early indicators are positive. The open source CONNECT Project reports that over 2,000 organizations have downloaded or contributed to it. Whether the forking of the CONNECT codebase to Aurion will advance HHS's objectives is yet to be seen. It is possible that moving Exchange and Connect to private organizations will respond to external demands.

Meanwhile, live implementations of the Exchange protocols are in place across the nation, with 35 companies implementing in 2011 and over 40 states building Direct into their strategies to support health information exchange. Over two dozen companies are developing products and services to integrate or build upon ONC's efforts. Direct has been incorporated into the proposed regulations for the second stage of "meaningful use" to provide a ubiquitous mechanism for information exchange.

HHS's Office of the National Coordinator is an example of a government agency taking the lead to explore, demonstrate, and benefit from open project approaches like those that built the Internet. Projects like CONNECT and Direct that involve diverse organizations, coordinate the efforts of many people, and create products that can be widely used and reused, demonstrate new ways of thinking about government service provision. ▫

TO LEARN MORE

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The report can be obtained:
- **In .pdf (Acrobat) format at the Center website, www.businessofgovernment.org**
- **By e-mailing the Center at businessofgovernment@us.ibm.com**
- **By calling the Center at (202) 551-9342**