

Making Open Innovation Ecosystems Work: Case Studies in Healthcare

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Foreword

On behalf of the IBM Center for The Business of Government, we are pleased to present *Making Open Innovation Ecosystems Work: Case Studies in Healthcare*, by Donald E. Wynn, Renee M.E. Pratt, and Randy V. Bradley.

The challenge of innovation has received increased attention in recent years in both the public and private sectors. This report addresses two key components of innovation:

- How an organization can bring external ideas into its organization that improve its ability to develop new products and services
- How organizations can disseminate their internal innovations through external channels

Both aspects of innovation—the taking in and the releasing of innovative ideas and approaches—are challenging and require organizations to change the way they operate. It's about increasing the value of organizational innovations, and the authors present ten best practices that you can use to capitalize on open innovation and realize a significant return on investment. These best practices include encouraging openness and transparency, minimizing internal friction and bureaucracy, and continuously monitoring external conditions.

To illustrate how open innovation can work, the authors employ the concept of the technological ecosystem to demonstrate that fostering innovations cannot be done alone. It depends on a network of consultants, service providers, and other partners to develop, integrate, deploy, and maintain a software enterprise. This report presents two examples from the healthcare sector that describe how technology ecosystems work and can effectively stimulate the development and dissemination of innovation, both internally and externally. The first case study, The U.S. Department of Veterans Affairs (VA) and the Open Source Electronic Health Record Alliance, outlines how the VA worked with vendors and partners to *create* an open innovation ecosystem. The second case study, the West Virginia Department of Health and Human Resources, describes how that organization *joined* an open innovation ecosystem to improve patient care via implementing electronic health records.



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This report continues the IBM Center's long interest in innovation as a key tool for government organizations to use to improve the creation of new services and to improve existing services to the public. Previous IBM Center reports have examined other approaches to innovation:

- In their report to the IBM Center, *A Guide for Making Innovation Offices Work*, Rachel Burstein and Alissa Black discuss how government organizations are creating new offices dedicated to fostering innovation, often headed by a Chief Innovation Officer.
- In his report to the IBM Center, *The Persistence of Innovation in Government: A Guide for Innovative Public Servants*, Sanford Borins analyzes the experience of the Kennedy School Innovations in Government award winners to present key factors in fostering innovation.
- In his report, *Challenge.gov: Using Competitions and Awards to Spur Innovation*, Kevin Desouza describes how the federal government is using the web platform Challenge.gov to hold competitions to develop innovative solutions.

We hope that government leaders interested in innovation will find the case studies and the concept of open innovation ecosystems helpful to them as government organizations seek to find new ways to innovate and improve services to the public.



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Executive Summary

Despite calls for more efficient utilization of declining public resources, government agencies are being asked to deliver innovative solutions to operational and strategic problems. One way to address this dilemma is to participate in open innovation through technological ecosystems as discussed in this report.

Technological ecosystems can be defined as the set of individuals and members surrounding a given technological product or platform from which an organizational system can pursue open innovation. Open innovation is based on two approaches to increasing the value of organizational innovations:

- **Approach One:** Adopting external ideas from private firms, universities, and individuals into the agency's innovation practices
- **Approach Two:** Pushing innovations developed internally to the public by reaching out to external channels

Successful technological ecosystems create value through the combination of five key elements:

- **Element One:** the resources contributed by and exchanged among the participants of an ecosystem
- **Element Two:** the characteristics of the participants
- **Element Three:** the relationships among the participants
- **Element Four:** the organization of the ecosystem as a whole
- **Element Five:** the external environment in which the ecosystem operates

By monitoring these elements, it is possible to evaluate the overall ability of a technological ecosystem to achieve a positive return on contributed resources.

This report examines both strategies by studying two cases of government-sponsored participation in technological ecosystems in the health care industry. In the first case study, the U.S. Department of Veterans Affairs (VA) built a new ecosystem around its VistA electronic health records software in order to better facilitate the flow of innovation practices and processes between the VA and external agencies and private firms. In the second, the state of West Virginia selected a variant of the VistA software for deployment in its hospital system, saving a significant amount of money while introducing a number of new features and functionality for the seven medical facilities. In both of these cases, the report focuses on the five key elements listed earlier.

As a result of these studies, we have identified 10 best practices for agencies seeking to capitalize on open innovation:

Resources

1. Define clear goals and expectations for open innovation
2. Manage and motivate resource flows across agencies
3. Manage intellectual property rights

Participant Characteristics

4. Seek and encourage diversity among ecosystem participants

Relationships Among Members

5. Establish effective positioning within the ecosystem
6. Be an active team player

Ecosystem Organization

7. Establish and observe effective governance and leadership
8. Encourage openness and transparency

External Environment

9. Minimize friction and bureaucracy
10. Continuously monitor external conditions

Introduction

In recent years, government agencies have been faced with the following challenge: finding innovative approaches to deliver technological solutions to agency operations while at the same time dealing with declining tax revenues and calls for more efficient utilization of public resources. In the private sector, there has been a steady flow of technological advances being developed among organizations and individuals.

One attempt to address this challenge is the idea of open innovation. It is a “paradigm that assumes that firms [and government agencies] can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.”¹ This concept has proved to be successful in allowing firms such as IBM, Cisco, and Proctor & Gamble to capitalize on ideas generated outside their boundaries and transferring ideas developed internally to external markets. Similarly, several agencies have attempted to sponsor and fund collaborative private-public innovation projects (such as software platform development) through the development and maintenance of a technology ecosystem (e.g., a set of individuals and organizations operating to exchange information, resources, and technologies (IRT) to develop and support a common technological platform). Analogous to biological ecosystems, these ecosystems revolve around the interdependent nature of the participants as well as the flows of IRT among the members. These flows between actors and organizations aim to ultimately affect the quality and use of the software or other technology platform, which leads to increased operational, financial, and social benefits for agencies and organizations that are developing or using the software.

In this report, we argue that government agencies can increase the benefits from their open innovation efforts through the use of sponsored participation in technology ecosystems. This report presents two examples from the health care sector that describe how technology ecosystems work and can effectively stimulate the development and dissemination of innovation, both internally and externally. The report is based on the authors' examination of several open innovation projects in which local, state, and federal agencies have been able to capitalize on available resources within their ecosystems. As a result, participants in these ecosystems have experienced increased flows of knowledge and information, which ultimately produced increased operational and financial benefits. The health care industry is an especially compelling case study because it faces many of the same concerns that government agencies will also need to address: loss of productivity, lack of capital resources, rising costs, and perceived lack of financial return. Given that health care organizations are cash-flow dependent, open-source software (OSS) is an attractive option that helps health care providers overcome the most common barriers to the adoption and implementation of open innovation.

1. Chesborough (1984).

Understanding Ecosystems

In biology, an ecosystem “involves the circulation, transformation, and accumulation of energy and matter through the medium of living things and their activities.”² This definition includes the flow of energy and materials among the various living creatures and non-living components such as water, air, and soil in a given environment.³ Metaphorically, a technological ecosystem suggests a flow of information, resources, and technologies (IRT) among the various individuals and organizations that interact as members of the ecosystem in order to deliver and support a given technology or technological platform. The flow of IRT enables the members to achieve both their personal objectives as well as the shared objectives of the ecosystem at large.

An example from the computer industry is the ecosystem surrounding the Apple iPad, which includes not only Apple Inc., but also thousands of independent developers, peripheral suppliers (e.g. cases, keyboards, etc.), content providers, delivery companies, service technicians, and other individuals and organizations whose products and services provide value for iPad users. Each of the aforementioned groups, individuals, and organizations are considered to be members of the ecosystem. In return for their contributions to the ecosystem, the majority of these members will receive something in return as compensation (e.g. licensing fees or individual reputation) for what they provide.

In this report, we use the following definition of a technological ecosystem:

“the set of individuals and organizations (i.e. members) operating within a given market space in order to provide a complete value proposition to the end customers, who are also part of the ecosystem.”

Open Innovation

For our purposes, open innovation is about getting external ideas into an organization to improve its ability to develop new products and services. Open innovation is also a way to take internal innovations to market through external channels. These two approaches can be used by government agencies that are interested in improving and increasing the value of their innovation processes; a vital area of emphasis in recent years.

This definition highlights the two approaches by which agencies can benefit by adopting open innovation practices:

- **Approach One: By adopting or using innovations that were developed externally, agencies can capitalize on industry best practices.** Because these resources already exist, there is often less incentive to spend time and funding on conducting basic research and development internally within the organization.
- **Approach Two: By allowing their intellectual property (IP) that is developed internally to be released to the external markets, an agency can gain legitimacy, additional support options, and complementary products and services.** In addition, releasing an innovation may attract additional ideas and components to the agency contributed by external parties. These contributions can be included in subsequent innovative projects.

Open innovation introduces three managerial challenges. First, an agency must be able to motivate administrators and line employees to contribute intellectual property that is developed internally to those outside their organization. Unless these individuals can see the benefits of

2. Evans (1956).

3. Chapin et al. (2002).

disseminating innovations internally generated, it may be difficult to ensure enough participation to fully take advantage of the open innovation paradigm. This can be resolved by incentivizing employee participation and carefully marketing the cost/benefits associated with the new changes. Second, the agency must be able to identify and access promising ideas developed outside the organization that can benefit its internal processes. An agency can implement different programs and channels to identify new ideas or potential partners with which it can develop working relationships and share IP. Third, the agency must develop the capability to incorporate these external ideas, along with internal resources, to improve its innovation processes. This includes finding ways to increase the value of the resulting innovations developed within the agency and decreasing the cost of research and development (R&D) required to bring the new products or services to fruition.

This report discusses a particular type of health care information technology—an electronic health records system (EHR)—that is an open-source software platform. Open-source software has been described as a particular manifestation of open innovation,⁴ based on two elements of the open source model:

- Collaborative development of the technology (i.e., a software platform)
- Shared rights for everyone to use the technology

Typically, open-source software projects generate revenues through the sale of complementary products and services, such as additional licensing fees for commercial support options.⁵ However, this is typically not an option for government agencies pursuing an open-source model, because the products are developed using public funding (making it illegal to sell them back to the public). However, despite not being able to generate revenues directly, agencies can derive significant benefits by establishing the technology as a de facto standard. The agency would achieve this by:

- Releasing the technology for public use
- Attracting improvements and additional products from external adopters of the technology
- Generating mindshare and goodwill within the industry market surrounding the technology
- Increasing the support options for the technology that are available to external adopters and the agency

Open innovation allows the agency to solve a number of important issues related to the value of its innovative practices, but perhaps the most crucial issue is how to attract and motivate external participants to help with its innovation practices. To address this issue, we first introduce the concept of a technological ecosystem.

Technological Ecosystems

In the early days of software development, a dominant vendor was able to provide all of the products and services without the assistance of other firms. The current organizational environment, however, depends on a system of consultants, service providers, and other partners to develop, integrate, deploy, and maintain a given enterprise software application. Each entity contributes services and/or products that are combined with the contributions of others, ultimately providing a portion of the net benefits available to the end-users of the software. The originating software organization relies heavily on third parties for software development and

4. West & Gallagher (2003).

5. Watson et al. (2006).

services. These complementary members are necessary for both the development and commercialization of a given software package, particularly for enterprise-class software platforms such as electronic health record applications. Collectively, we consider these members to be part of a broad ecosystem surrounding a given technology, application, or platform.

In this report, we use the ecosystem concept as a means of developing an understanding of the impact of innovation. We define an ecosystem as:

The set of individuals and organizations operating within a given market space in order to provide a complete value proposition to the end customers, who are also part of the ecosystem.

Specifically, this includes:

- The agency
- Any external vendors and support providers
- Individual researchers and developers working on ideas related to the product
- The commercial firms or other organizations that pay these individuals' salaries
- The organizations that adopt the innovations externally
- Many other potential ecosystem participants

The ecosystem concept represents an interesting perspective through which researchers and practitioners can view the social and technological elements involved in the creation, development, distribution, and support of technological products, such as commercially oriented open-source software applications.

Five Key Elements to Managing an Organization's Ecosystem

The ability to achieve the successful implementation and operation of technology-based innovation, such as an enterprise software platform, requires more than merely putting technologies, service providers, and users together in an ecosystem. Instead, there must be something about the combination of these elements, in concert with the salient contextual characteristics of the environment in which the ecosystem exists, that leads to an ability to generate value and outcomes that exceed those that are possible from individual action alone. We define this enhanced ability as the *synergy* of the ecosystem.

Based on our research, we have found that this synergy can be managed by paying attention to five key elements of an organizational ecosystem (see Table 1). The five elements are:

- **Element One:** the amount and types of resources available within the ecosystem
- **Element Two:** the characteristics of the ecosystem's participants
- **Element Three:** the relationships among these participants
- **Element Four:** the organization of the ecosystem
- **Element Five:** the constraints of the external environment surrounding the ecosystem

By managing these elements effectively within an ecosystem, the participants can realize an increased level of functionality and enhance operations that, in turn, enable them to achieve a sustainable level of value creation. In the section that follows, we discuss these elements in more detail.

Table 1: Ecosystem Elements

Aspects	Definition	Components
Resources	Basic elements introduced, exchanged, converted, and disseminated among participants	Money
		Skills & Expertise
		Social Connections
Participant Characteristics	The individual participants of the ecosystem.	Heterogeneity
		Commitment
		Level of Involvement
Relationships	Working and exchange relationships among the participants.	Power Differentiation
		Trust
		Respect
		Conflict
Organization	Organization of the ecosystem as a whole.	Leadership
		Management
		Governance
External Environment	External factors outside the ecosystem's control.	Public Policy
		Organizational Policy
		Industry Conditions

Element One: Resources

The resources of an ecosystem are the basic elements that are introduced, exchanged, converted in, and disseminated through the actions carried out by members of the ecosystem. For instance, there must be some degree of skills and expertise that are utilized by the developers (and other participants) to write the software itself. These human capital resources are contributed by the participants in exchange for some other value to be created and captured as an output of the process. Other possible resources include money, equipment, information, skills, social connections, and expertise necessary for the ecosystem to function. In order to achieve synergy, there must be sufficient resources as inputs to ensure the synergistic creation and appropriation of value by the participants.

Element Two: Participant Characteristics

The participants are the primary source of most of the resources introduced into the ecosystem.⁶ Synergy requires sufficient participation to provide the resources needed to create and adopt the value desired by the participants. It is not necessarily the number of participants, but the correct distribution and involvement of the participants that make up the ecosystem. As such, we are interested in the level of involvement and heterogeneity of participants. The more involved participants are, the more likely they are to contribute at a higher level toward the collaborative efforts of the ecosystem. Multiple, diverse participants ensure that the ecosystem will have access to an abundance of ideas, resources, and available actions.

Element Three: Relationships among Participants

By definition, an ecosystem involves a complex web of interaction and collaboration among the participants. The working relationships between them must, therefore, permit a high degree of cooperation in order to foster a synergistic arrangement in which each member is

6. Lasker et al. (2001).

allowed, not only to contribute, but to adopt benefits accordingly. Several aspects of these relationships are crucial for this to occur. In many ecosystems, one or more members have a high degree of resource control and power. If this power is wielded unfairly, causing less powerful members to be unable to participate in the manner they desire, there will be little incentive for them to continue to contribute, even if their participation is crucial for the ecosystem to survive. As a result, the most powerful members must be careful about how they exercise their power. In an ideal ecosystem, each member has an equal voice, and thus, equal influence in the functionality and outcomes. Anything less limits members' comfort and their perceived value of contribution.

In addition, the members must trust each other to act in accordance with the expected levels of contribution and participation. Anything less introduces uncertainty into the ecosystem, increasing each participant's risk of failure. Similarly, the members must respect and value each other's contributions, perspectives, and involvement. When issues and conflicts arise, as they inevitably will, they must be managed and controlled in order to foster discussions that may lead to new ideas and suggestions rather than discord and dissent.

Element Four: Ecosystem Organization

After formation, the structures, patterns, and characteristics of the ecosystem differ from those of the individual members. These emergent characteristics derive from organizational functions such as leadership, management, and governance that set the stage for the overall functionality and operations of the ecosystem. Leadership is needed in an ecosystem to encourage open communication, inclusiveness, creativity, freedom of expression, and the establishment of a common goal toward which the ecosystem (and thus, each member) is striving. Owing to the autonomous nature of members, the nature of leadership in ecosystems is typically less authoritative and more inspirational or motivational. This often resembles a 'benevolent dictator' model, in which one party has a significant degree of power, or a more broadly shared approach, in which members' status is roughly equal. Management includes such activities as planning, monitoring, organizing, and controlling the resources available within the ecosystem. In the current context, this includes such functions as establishing and maintaining the tools and processes needed for the contribution and availability of source code and documentation. Governance includes the formal and informal decision-making processes within the ecosystem. This includes potentially issuing guidelines, such as rules for who participates in decision making, what media are used (e.g., formal meetings, discussion groups, e-mail distribution, etc.), and how the decisions are made and enforced. The governance of an ecosystem influences nearly every aspect of its operations, including the ways in which each participant's resource contributions are combined, distributed, and eventually disseminated throughout the ecosystem.

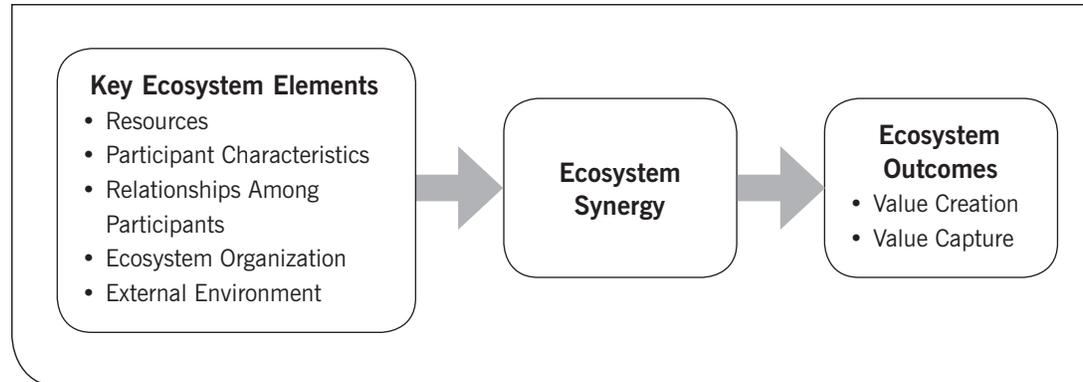
Element Five: External Environment

An ecosystem does not exist in a vacuum; rather, it must interact with factors outside its boundaries, many of which cannot be controlled by the participants or the ecosystem as a whole. Because the ecosystem is typically an open system in which these outside factors may have a significant impact on internal policies or operations, the potential for both adverse and favorable effects must be taken into consideration continuously throughout the life of the ecosystem. For instance, government agencies and other large bureaucratic organizations may be bound by a number of political and administrative policies that affect who may participate, how the agency may interact with participants outside the government (and vice-versa), and how resources can be allocated within the agency to allow it to participate in a meaningful way. An effective ecosystem must find ways to act within these constraints while continuing to achieve the desired level of functionality. Furthermore, commercial participants (as well as public agencies) may be subject to industry, competitive, and market conditions, which may

necessitate changes in the levels of resources available or affect the participants' ability to remain engaged in an open ecosystem.

Taken together, it is the combination and configuration of elements of these inputs that determine ecosystem synergy. In addition, it is the level of synergy, by way of these elements' configuration, that determines the ultimate value created by and derived from membership in the ecosystem (see Figure 1). The value creation and realization resulting from ecosystem synergy is often presumed to exceed those resulting from individual action.

Figure 1: Ecosystem Synergy



Achieving Open Innovation with Technological Ecosystems

In this report, we discuss the means by which a government agency can capitalize on open innovation via an open source software-based technology ecosystem. Although we discuss a specific form of ecosystem in open source software, we stress that it is a manifestation of open innovation in general and as such, similar issues and practices are applicable across a wide range of alternative open innovation programs. Based on our research, government agencies can capitalize on the available benefits in one of two ways, depending on whether or not they have existing technologies around which to base an ecosystem.

For government agencies with previously developed technologies or systems which are effective for their internal needs, one strategy for capitalizing on the existing technologies would be to create an ecosystem of external participants around the technology in an effort to capture the innovation that exists elsewhere. This requires attracting and retaining a wide range of potential participants and making the technology available to them in order to encourage and appropriate the resultant innovation. This strategy is exemplified by the US Department of Veterans' Affairs attempt to sponsor a new ecosystem around its existing VistA software.

An alternative strategy is to join an existing ecosystem. This strategy is appropriate for agencies seeking to develop new technological innovations from scratch, and will allow such agencies to utilize the resources available within the existing ecosystem in combination with their own resources. By developing a position within this existing ecosystem, an agency can harness the resources and relationships already established in an existing ecosystem in order to bring externally developed innovations inside its boundaries. This strategy is exemplified by the State of West Virginia's attempt to join the existing Medsphere OpenVistA ecosystem to cost-effectively deploy an electronic health records system across the seven hospitals in its health system.

We discuss both examples (VA and State of West Virginia) in more detail using the ecosystem evaluation framework presented on page 8.

Creating an Open Innovation Ecosystem: The U.S. Department of Veteran Affairs and Open Source Electronic Health Record Alliance

Background

In the late 1970s, programmers and clinicians working for various VA facilities developed a number of software applications for their in-house usage. These software applications were intended to support patient care within the hospital in which they were developed. As word spread among the VA hospital network, these applications were shared between facilities to solve clinical and administrative problems as they were encountered. However, opposition to this platform emerged from the VA's administration, which caused much of the development to be banned throughout VA facilities across the country. However, a few dedicated developers continued to develop the applications in a clandestine manner, leading to a number of significant enhancements. Ultimately, the development ban was lifted as the VA's administration realized the value of the software being developed. In 1982, a number of these applications were integrated into the Decentralized Hospital Computer Program (DHCP) platform.

In 1996, the DHCP evolved into the VistA platform, to which a number of key enhancements and features were added. These enhancements included the Computerized Patient Record System (CPRS), a graphical user interface, which transformed the software into a tightly integrated Computerized Practitioner Order Entry (CPOE) system.⁷ Other enhancements have been added since, including Bar Code Medication Administration (BCMA) and imaging applications. In 2007, the VA deployed a set of protocols to support the transfer of data between VistA facilities within the VA system, achieving intrasystem interoperability. The VistA software today is considered one of the best-integrated health information systems in the world. VistA is now in use at more than 1,500 VA Medical Centers, Community-based Outpatient Clinics, Community Living Centers, and Veteran Centers.

The core VistA EHR software is maintained by VA developers. As government-developed and taxpayer funded software, a version of the VistA software is freely and publicly available to anyone, including vendors and private facilities, via the Freedom of Information Act (FOIA). In turn, the FOIA version has been adapted and re-released as a separate, open-source version by independent vendors such as Medsphere, Vx-Vista, and WorldVistA. These vendors contract with hospitals to install, maintain, and support their specific variant of the VistA EHR software, often supported by other independent developers and service providers. Consistent with most open-source software products, hospitals typically do not pay software licensing fees, leading to significant savings compared to proprietary vendors' products. However, support and maintenance fees for both are often comparable.

In 2009, a working group was selected to develop recommendations for the VA to update and modernize the VistA code. Among the group's findings was a recommendation that the VA formulate a strategic policy to convert VistA to a fully open-source model. This would

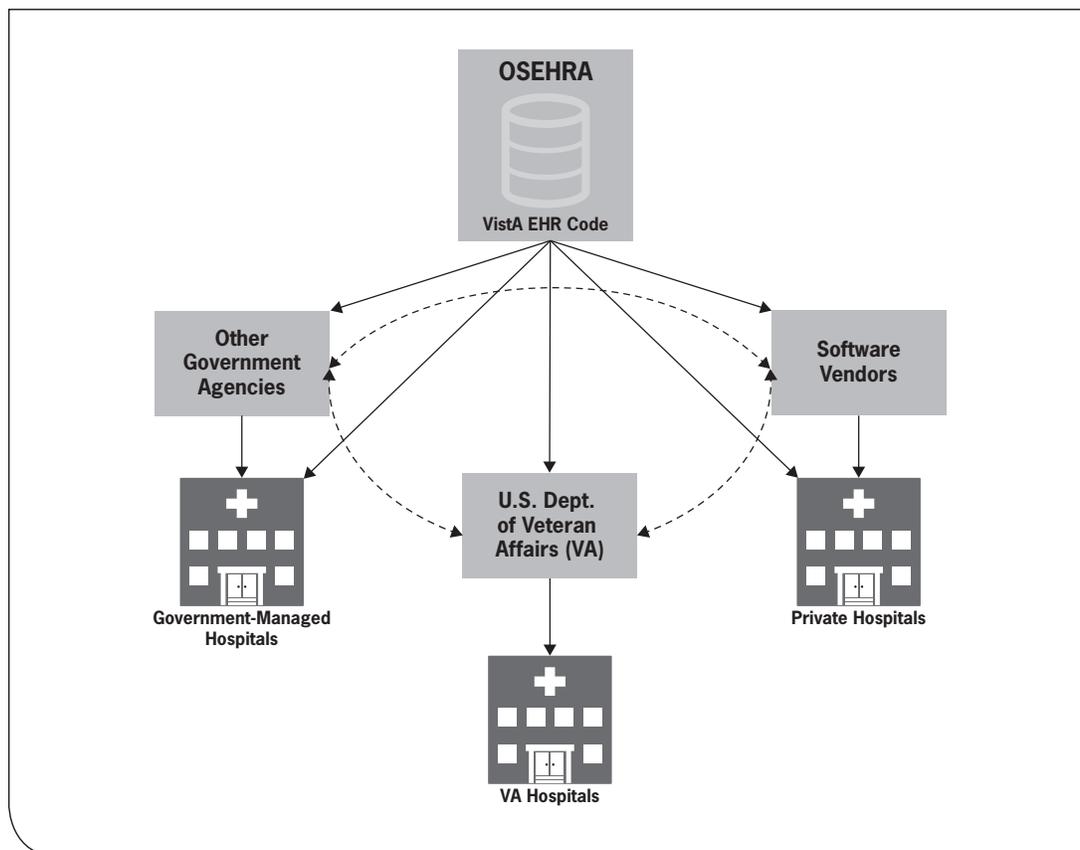
7. VistA Monograph (http://www.ehealth.va.gov/VistA_Monograph.asp).

enable some of the innovations that commercial vendors and nonprofit organizations have developed based on the VistA code to be funneled back into the VA's implementation of VistA code. To better facilitate this conversion, the working group recommended that the VA create an open-source foundation to manage, operate, and maintain the overall VistA ecosystem.

In response to the latter recommendation, the Open Source Electronic Health Record Alliance (OSEHRA) was created to serve as a custodial agent. Custodial Agent is the specific term used in the official documents, so we are inclined to keep it in the paper. However, please add the following as the second sentence in the paragraph cited: "As the custodial agent, OSEHRA would be responsible for serving as a central body to manage (or take custody of) most open source related activities for the VistA code. These activities include accepting or rejecting code, initiating or terminating open source projects, and facilitating interactions among the various members of the VistA ecosystem.

OSEHRA was tasked with creating a climate that is conducive to interaction and collaboration among the various stakeholders, including the VA. Ultimately, OSEHRA has been charged with taking possession of the base VistA code and certifying that innovations and enhancements can be integrated by other members of the ecosystem. Figure 2 details the various entities that form the software ecosystem surrounding the typical installation of a commercial, VistA based EHR.

Figure 2: VistA Ecosystem Overview



Evaluating the VistA Ecosystem

In this section, we evaluate the VistA ecosystem, based on the five key elements that compose the framework outlined in this report.

Resources

There is a tremendous amount of resources available within the VistA community, especially in terms of the technical skills and expertise required to evolve and maintain the base VistA code and add-on modules. For example, there are more than 1,300 developers within the VA who are working on the VistA code. In addition, each vendor and agency that adopted a variant of the VistA software made changes and modifications to fit the needs of their customers or other users. For instance, Medsphere's OpenVista code includes a number of functional enhancements to the FOIA code, including a physician portal and pricing modules.⁸ DSS, another commercial vendor, has spent more than \$6 million to develop VistA enhancements to incorporate in VxVista, its proprietary version of the software. Similar enhancements have been deployed by other vendors and government agencies; often without much collaboration with each other or the VA.

From the VA's perspective, this highlighted two issues. First, although a huge amount of expertise was present, it was highly fragmented and disconnected. Second, even if the additional modules were available to VA developers, they often had been customized by a particular agency or vendor to work with their customized implementation of the VistA code, making them difficult (if not impossible) to adapt it for use by the VA. From these agencies' and vendors' perspectives, there was clearly a lot of code being developed within the VA that could be deployed elsewhere and a lot of knowledge that would be useful if shared outside the VA.

By converting VistA to a completely open-source software model, the VA could easily share its developers' expertise. This conversion could also provide a degree of legitimacy and credibility for the software, especially in the eyes of external hospitals that were considering investing in VistA as an EHR but were afraid of a possible dearth of developer support if things go wrong or modifications are needed. The VA also had the power to unite VistA users because its code was the wellspring from which other variants were developed. More importantly for the VA, the innovations being implemented by external developers could be introduced into the base VistA code that was being deployed at VA medical centers. However, this would require more than just an investment of developer expertise by the VA. Establishing a shared platform for everyone to participate on common ground would require money, headcount, and other resources from the VA. To facilitate this common ground, the VA provided a \$4.9 million contract to establish OSEHRA in an attempt to create a new, cooperative ecosystem surrounding the VistA code.

Participant Characteristics

An ecosystem requires a wide range of diverse participants in order to function at its best. Recruiting and retaining a diverse pool of members from multiple organizations becomes a high priority in order to ensure a breadth of perspectives and opinions rather than being restricted to a monolithic view. OSEHRA and the VA have been able to encourage participation from a number of organizations and individuals familiar with various aspects of the VistA software. This includes other government agencies (e.g., the Indian Health Service), commercial entities (Medsphere, WorldVistA, DSS, and others), developers and staff from a number of hospitals deploying the VistA software, and independent consultants. In addition, there are a

8. <http://www.medsphere.com/sites/default/files/whitepapers/From%20VistA%20to%20OpenVista.pdf>

number of officials within the VA who are actively participating in the process to open source the VistA code.

Of course, just being a member of the ecosystem means little without being engaged, active in the operation, and sharing knowledge within it. An ecosystem requires the members to be engaged in order for there to be an open exchange of ideas and resources. In return, the members expect more benefits than drawbacks from their involvement. To encourage active participation, OSEHRA has established a number of working groups that allow members to focus their efforts on specific areas within the ecosystem where they are able to contribute most effectively and obtain the most significant return on their involvement. There are also several conferences and forums in which the members can collaboratively engage in the development and planning processes for the future of VistA.

It is important for organizations that are committed to participating in the ecosystem to allow their members adequate time and authority to participate and share knowledge and other resources with other members. These employees ideally would identify themselves as members of the ecosystem as opposed to mere employees of the sponsoring firm. This commitment reinforces the member involvement level that supports the ecosystem's ability to survive jolts and continue moving toward achieving its goals.

Relationships Among Members

As discussed earlier, open innovation thrives by encouraging and enabling a complex web of relationships among the various participants within the ecosystem. This includes such functions as knowledge sharing, collaborative innovation efforts, and coordinated research and development projects. Proposing such projects can often be met with cautious questions or outright objection by officials in organizations that are used to more closed innovation models; this includes many government agencies. These objections are often based on competition-based or trust issues which, if undeterred, would undermine the cooperative working relationships needed for maximum effectiveness and efficiency within the ecosystem. Issues and solutions that are evolving within the new VistA ecosystem are described in this section.

There was a huge concern originally among the vendors regarding the existence of a freely available, standardized version of the VistA code along with freely available enhancements or add-on modules. Most of the vendors (e.g., Medsphere and DSS) built their business models around plans to provide implementation, training, and customization services related to their specific adaptation of the FOIA VistA code, which was not the easiest version for hospital customers to utilize. A more user-friendly version of the code would undermine a significant portion of their business. However, all of these vendors have decided to participate actively in OSEHRA's efforts because they realize that they stand to gain as much or perhaps more than they would lose by gaining access to the combined development and customization efforts of the thousands of other developers to which they did not previously have easy access. They would also gain cost savings in not having to spend as much money on developing their exclusive versions of the code. Rather, they could continue to provide the same services at what might be a lower cost by searching for existing solutions to specific issues that may exist at a given customer's site. For instance, not every vendor needs to develop a module to interface with a particular insurance payer. Rather, if one vendor has already solved this issue, it can be adapted into the standard base code with less customization required (meaning lower cost). Although this new ecosystem will change the competitive basis within the VistA market, the vendors seem to have accepted the new roles they will play and made adaptations to their business models.

There is also some concern among the non-VA members that the VA still holds much of the power in the ecosystem due to the size of both its resource contributions and its specific software needs. The prevailing concern would be that, if there is a conflict between the VA and some other member of the ecosystem, the VA's needs would be granted primacy over smaller vendors' needs. To combat this effort, OSEHRA has attempted to make all decisions transparent and open to the entire ecosystem, to allow everyone to see how any such decisions are made. OSEHRA is also attempting to ensure that the other members have an equal opportunity to join the various working groups and committees to avoid any undue influence by any single member, including the VA.

However, the previously mentioned lack of code input by the VA has been somewhat concerning. In addition, many VA developers are not allowed to share some of the more specific adaptations that they have made to resolve specific local issues within the VA Medical Center system, due to concerns that any software developed in-house may contain portions that must remain proprietary to the VA for security or privacy reasons, in addition to licensing and IP rights concerns. Redacting these specific portions prior to releasing the software apparently leads to significant delays or obstacles that have been proved to be detrimental to the overall mission of code transfer across agency boundaries. Although this problem is certainly not consistent with the open source model, it is consistent with many concerns that may exist within public agencies or other large organizations. Conversely, much of the vendors' code is open source, which makes it open for VA developers to use—once the agency-required testing and screening processes can be completed. Ironically, the establishment of OSEHRA was intended to facilitate this transfer but, in practice, it has proved to be difficult to get past the red tape. For a completely open innovation ecosystem to be established and for it to thrive, the keystone member (the VA in this case) must be willing to make its code available to others more freely (although security, privacy, and IP concerns are legitimate), and it must develop more agile processes to more freely adopt externally developed innovations into the agency.

Ecosystem Organization

Within an open-source ecosystem, such as the one being established by OSEHRA, governance can be defined as “the means of achieving the direction, control, and coordination of wholly or partially autonomous individuals and organizations on behalf of an OSS development project to which they jointly contribute.”⁹ There are several approaches to carrying out this governance, but the OSEHRA/VA model focuses on the establishment of a nonprofit organization to handle many of the decision-making processes within the ecosystem. In this way, the control and coordination of the ecosystem is more shared than it would have been had the VA chosen to manage the project directly. By design, members can feel free to contribute on a more-or-less equal standing to the direction and action of the ecosystem. Of course, with the VA being the largest customer in the ecosystem and the most bureaucratically rigid, its influence plays an undoubtedly significant role in the direction of the ecosystem. However, other smaller members do remain able to voice their opinions and exert some influence.

Leadership in this context can be defined as the ability to instill a shared vision to influence members to contribute toward the common goal; here, the goal is the development of a common open source VistA code to be shared across the entire health care industry. Although OSEHRA has been charged with this responsibility, the leadership has been shared across the many organizations that are actively participating in the ecosystem, including many at the VA itself. Clearly this began with former VA Chief Information Officer, Roger Baker, who initiated open source efforts at the VA despite a barrage of skepticism at the outset. Currently, the responsibility for evangelizing the project is shared between various members of the VA executive team

9. Markus (2007).

and OSEHRA President and CEO, Seong K. Mun, PhD. These efforts include such ambitious projects as attempting to unite all of the versions into a single certified version, and convincing the Department of Defense to build a version of VistA for its next-generation electronic health record platform.

One of the most glaring obstacles at this point is the inefficiency of the ecosystem. As of early this year, very few modules of code have been introduced into the VA's implementation of VistA from the outside, primarily due to the problems in getting through the procedures and bureaucracy within the agency. The VA developers are able to canvass the open source community to see if there are existing solutions to any new problems that arise, but it requires internal funding to get the new functionality added into the VA's code base. This is a frustrating issue to several of the external participants we interviewed. In a perfect world, there would be few barriers to prevent VA developers from implementing promising and innovative ideas from outside the agency in their code base. However, as recent events concerning the VA's scheduling software have shown, there is little room for error if the software does not perform exactly as expected and with little effect on other modules. Therefore, the strict testing and approval processes will likely continue to be a necessary barrier for the foreseeable future.

External Environment

Creating an ecosystem requires an awareness of the environment in which it would exist, including the existence and availability of the potential members, organizational and public policies, and industry concerns. Before the existence of OSEHRA, the VistA community members were able to cooperate on various projects and implementations. Many of these members have attended VistA Community Meetings, which have been held roughly twice per year since 2001. During these meetings, members from various involved organizations (including the VA) discuss technical and organizational issues that are of interest to the community at large. The VA was able to capitalize on this collaborative spirit as they started to build the new ecosystem.

Perhaps the biggest issue to contend with is the bureaucracy of the various agencies involved in the ecosystem, particularly the VA. As a large organization with a federal-government-controlled budget, the VA has many rules and regulations with respect to how it interfaces with other agencies, commercial firms, and other organizations. Many of these rules preclude the VA from getting any of the innovation back from the community, even though the community started with the VA's code, which is one of the primary reasons for the establishment of OSEHRA as the custodial agent. But these regulations were not formulated without reason; they are based on the importance of the VA medical centers to the health and welfare of nearly six million patients each year.

In 2014, delays in veterans receiving medical care at VA hospital centers received national attention and became a major political issue. These delays were blamed at least partially on the scheduling software written into VistA. As a result, several politicians called for the VA to consider efforts to modernize the software, presumably even by implementing a commercial EHR solution rather than VistA, which would certainly mean the end of the OSEHRA-VistA ecosystem. But this is not expected to take place for many years.

However, the federal "meaningful use" standards for hospitals are expected to be an impact in the immediate future as hospitals scramble to adopt new technologies that satisfy the mandated requirements. Failing to do so would result in hospitals' significant loss in Medicaid and Medicare reimbursement, which would be crippling to most facilities. Because VistA-based EHR implementation would be a key part of an adopting hospital's meaningful use certifications, OSEHRA and the other members of the ecosystem must be aware of any changes in

this legislation. They must also guide the ecosystem's development and planning efforts toward including adequate functionality in the software to allow hospitals to attest to adherence to the meaningful use standards.

Joining an Open Innovation Ecosystem: The West Virginia Department of Health and Human Resources

Background

West Virginia's Department of Health and Human Resources' (WVDHHR) Bureau for Behavioral Health and Health Facilities (BBHFF) is the agency responsible for the planning, development, funding, and monitoring of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO)-certified, state-operated acute-care hospital (1 hospital), acute-care psychiatric hospitals (2 hospitals), and the long-term care facilities (5 facilities) in West Virginia (see Table 2). These facilities offer diverse health services in different settings, including outpatient clinics, ancillary services, and emergency care, to meet the needs of the communities they serve. These health facilities include more than 800 beds, 1,500+ employees who have various types and levels of skills, and provide support for diverse communities within West Virginia. Given its budgetary constraints and growing Medicare and Medicaid patient populations (which makes it even more challenging to balance the cost of service with reimbursement), BBHFF had two primary objectives. A major objective was to improve its operational efficiency and effectiveness by:

- Improving automated support for operational processes
- Defining and implementing standardized processes for all facilities
- Developing a common, centralized, and unified health care system to gain economies of scale

Another objective was to leverage technology to improve patient care by migrating to an EHR to replace an existing system (Advanced Institutional Management Software) that no longer met the state's needs and was being retired to make way for a new product.

In an effort to improve the portability and accountability for the management of protected health information, West Virginia began its search for a common infrastructure for all of its health care facilities. Additionally, the potential move to a common infrastructure was seen as a strategic initiative to enable more cost-effective, and a higher quality of, care to its citizens. OpenVista is a comprehensive, integrated EHR, based on VistA. Although the OpenVista product would eventually enable BBHFF to accomplish its goals, the organization's adoption of the product was far from free of charge because the organization was in need of additional third party products to close the loop on some ancillary services and activities that were not native to OpenVista. The list of third party products required included billing, general ledger, accounts receivable, inventory management, and minimum data set reporting for long-term care facilities. Additionally, BBHFF soon realized that the newly adopted solution would also require infrastructure upgrades and changes, as well as role changes with respect to staffing.

Table 2: West Virginia Facilities in the VistA Ecosystem

Facility	Facility Type	Size (in beds)	Description
Welch Community Hospital	Acute-Care Hospital and Long-Term Care Facility	120; 60 acute-care and 60 long-term care	The only acute-care hospital in McDowell County. It is a crucial health care provider for the citizens of McDowell and many surrounding rural counties. Provides JCAHO-certified, acute inpatient and outpatient services to the rural population of southern West Virginia with emphasis on prevention and community education.
Jackie Withrow Hospital (formerly known as Pinecrest Hospital)	Long-Term Care Facility	199	Provides and promotes continuous, individualized quality care to a diverse and unique population by meeting the emotional, spiritual, social, and physical needs of adults requiring long-term and behavioral health care to improve their functioning ability and independence, in a cost-effective and professional manner.
John Manchin Sr. Health Care Center	Long-Term Care Facility and Outpatient Clinic	45	Offers skilled/intermediate nursing, inpatient, and outpatient clinical services at the most affordable cost and in the most efficient and accessible manner, targeting indigent residents who are unable to obtain these services in the community.
Lakin Hospital	Long-Term Care Facility	136	Provides quality, long-term care services to West Virginia residents who have special placement needs due to behavioral, developmental, and other complex problems, and to whom community health organizations will not or cannot provide care.
Hopemont Hospital	Long-Term Care Facility	98	Provides quality, efficient, and economical services to geriatric residents of West Virginia requiring long-term care and behavioral interventions to maximize their functioning ability and independence, enabling them to become successful and satisfied in their environment.
William R. Sharpe, Jr. Hospital	Acute-Care Psychiatric Hospital	150	Provides JCAHO-certified acute care treatment services to persons suffering from mental illness and substance abuse.
Mildred Mitchell-Bateman Hospital	Acute-Care Psychiatric Hospital	110	A training site for future health care professionals attending more than 20 colleges and educational institutions in the tri-state area of southwestern West Virginia, southeastern Ohio, and northeastern Kentucky.

Evaluating the West Virginia Ecosystem

In this section, we evaluate the WVDHHR ecosystem, based on the five key elements that compose the framework outlined in this report.

Resources

With respect to resources needed to join an ecosystem, the hurdle can be relatively low. Although WVDHHR expended substantial resources (mostly due to its anticipated needs at the time), little-to-no financial resources are needed to join an ecosystem, with the exception of funds to support travel to regional and national meetings sponsored by the ecosystem. However, from the perspective of human resources, newly joining organizations would be well advised to start with a select group of experienced and knowledgeable personnel to serve as liaisons between the community and other members within the organization. These liaisons should have the responsibility of exploring the community for viable candidate solution sets and assessing member participation in the community to identify potential partners and collaborators. In addition to the limited financial resources and the experienced human resources needed, political clout within each organization is another important resource that is needed. Political clout will be extremely important when it comes to getting support and buy-in needed to enable the organization to be a fully functioning member of the ecosystem.

Participant Characteristics

The representatives of the agency and facilities we spoke with indicated the beneficial characteristics of ecosystem members, especially those just joining the ecosystem. They are:

- Active engagement of the existing members of the community
- Commitment to the success of the ecosystem
- Openness and willingness to exchange ideas

Active engagement refers to the degree that ecosystem members are meaningfully involved and participate in ecosystem-related and-sponsored events and meetings. The ecosystem is a social organism. Thus, its success and value are predicated upon its ability to enable and support collaboration among all participants and stakeholders.

Related to active engagement is the next desirable characteristic of an ecosystem: commitment. Commitment of existing members, and particularly that of leading/early members, to the ecosystem has an overarching impact on an organization's likelihood to join the ecosystem. This commitment must not take the form of ensuring that control of the ecosystem is dominated by one group of members, but rather that it reflect broad participation. Joining members want evidence of how the ecosystem has evolved, the impetus for the evolution, and the direction in which the ecosystem is heading. An area of concern is ensuring that members of the community are not just self-seeking, and that they see the community as an opportunity to further the ideals of the ecosystem in such a way that, as the ecosystem expands and advances, so does its value to the membership at large. The joining organization also needs to have a clear understanding of its purpose and reason for participating, along with a commitment to providing adequate resources and information to ensure that its participation is valued and effective.

The ability to tap existing members within the ecosystem to leverage their collective intelligence serves as a strong signal to outsiders who are considering whether to join a particular ecosystem. The strength of the VistA ecosystem is the willingness of its members to band together to address/solve complex issues that may not be germane (at the time) to their respective organizations, even if the issue is of importance to another member organization.

This culture of open innovation typically leads to remarkable improvements in the product(s) of interest and benefits the community as a whole. In addition, this openness and willingness to exchange ideas should be undergirded by a solid, scalable integration platform that connects all members of the ecosystem and makes it relatively easy to find relevant information in a timely manner.

Relationships Among Members

There are several key attributes associated with the working relationships an organization must establish when joining an existing ecosystem. First, an organization must be able to trust other participants to perform as they are expected to and not attempt to favor one organization over others. Second, they must contribute and participate to earn the respect of other members. Third, they must be able to manage conflicts effectively to foster healthy discussions that may lead to increased innovation. Finally, there must be a minimal exercise of any differences in power, to avoid alienating other members.

In the current case, the state of West Virginia and Medsphere were able to establish a number of relationships among key individuals on both sides. For instance, much of the training for the initial hospitals to implement the VistA software was delivered by Medsphere, including training a number of super users who would later deliver training, replacing the Medsphere staff. In the process, members of the local staff established close bonds with several members of the Medsphere team, even to the point of visiting each other's homes after hours. In addition, several project committees were established to interface with specific functional areas of the system (e.g., computerized physician order entry transcription and coding, or templates and forms). These committees were designed to formalize the interactions between the hospitals and the remainder of the ecosystem. They also served to provide a forum for resolving any disputes and conflicts that may result.

Ecosystem Organization

One might expect that the size of the community would matter most—that smaller communities would be viewed as less attractive than larger communities. However, our findings suggest that of even greater importance than the size of the ecosystem are participants':

- Openness/willingness to exchange ideas
- Active engagement

We found that the openness and willingness to exchange ideas goes both ways. In essence, this can be one of the best and worst attributes. Some participants in the study noted that the members of the ecosystem are almost always willing to contribute to the existing repository of knowledge. However, these same participants voiced their unhappiness with ecosystem members who are not willing to embrace or make use of what's been contributed by the community at large. Further, we found that an inordinate number of ecosystem members have been slow to embrace the sharing of strategic and tactical information, even though the ecosystem creates an environment for collaboration among members rather than a competitive environment. This point is clearer with respect to the other key attribute of the ecosystem: active engagement.

Attendance at ecosystem events is not the only important element of active engagement. Also important is the level of involvement and contribution to agenda topics and conversations during the events. We also found that some members of the ecosystem viewed the sidebar conversations that typically take place during the breaks (including breakfast, lunch, and dinner) to be part of their assessment of the level of engagement by members of the ecosystem.

Many of the structures and policies for project governance were established by way of a contractual agreement, which was part of the contract WVDHHR and the State of West Virginia entered into with Medsphere to deploy its OpenVista software solution. Medsphere specified the establishment of a comprehensive communication plan to include such items as “written project status reports, participation in conference calls and meetings, and an escalation process for problem resolution, including proper end-to-end administration of the process.” The company also specified such things as the WVDHHR staff needed for the project and the Medsphere staff that would be participating. The proposal also established roles for other outside vendors to be brought in as needed for specific parts of the project.

As specified, there was a certain degree of shared leadership, governance, and resource management provided by both sides. In addition, both sides were fully engaged during the implementation process, leading to a largely successful result.

External Environment

One key element of the external environment (i.e., external to the ecosystem) is the organizational and/or governmental policies that could potentially limit the value derived from the ecosystem. For example, policies and regulations that prohibit the sharing and use of information shared via the ecosystem would greatly diminish the value derived from the ecosystem. We also noticed that members of the ecosystem did not hold organizations affected by such policies in high regard. In many cases, contributing members of the ecosystem felt shunned or under-appreciated by community members that would only contribute solutions, not adopt viable solutions contributed by other members of the community.

Best Practices

Based on our study of the two ecosystems, we've identified 10 best practices for organizations seeking to capture significant return on investment from sponsoring innovation through technology ecosystems. We have delineated these practices according to the framework for evaluating and managing ecosystem elements described earlier: resources, partnership characteristics, relationships among members, ecosystem organization, and the external environment.

Resources

1. Define Clear Goals and Objectives for Open Innovation

Agencies participate in open innovation in order to introduce external ideas and solutions into their internal innovation projects and/or to enable the commercialization of internally generated innovations in the external marketplace. Prior to participation, agencies need to know which goal to pursue in order to maintain an adequate level of focus and make decisions accordingly. For instance, the VA was focused on both objectives in order to maximize the ultimate value of the VistA software, both within the agency and in the health care industry in general.

In addition, the agency must clearly delineate which projects and practices are to be included in the open innovation program. It is not necessary for every innovation project in the agency to be open to review. Clear boundaries need to be established to ensure that any open projects are fully open, while closed projects remain closed.

It is also important to ensure that everyone, including the agency's administrative staff and political structure, are aware that the goal is to maximize return on any contributed resources, tangible or intangible. For example, outcomes such as "improved innovation practices" or "better solutions to existing problems" are difficult to quantify but no less important than more tangible ones. Everyone needs to be aware that the benefits may be immeasurable but remain highly valuable to the organization. In the current case, the VA may find that there is a high implementation cost in terms of the amount of money spent on OSEHRA, internal man-hours spent reviewing and certifying code, and other tasks. The state of West Virginia, on the other hand, can easily and quickly discern the cost savings they experienced by participating in the VistA ecosystem rather than adopting a commercial solution. Hence, it is critical for organizations to clearly define their goal, position the projects within the ecosystem, and communicate objectives of the open innovation across members and participants.

2. Manage and Monitor Resource Flows across Agency Boundaries

By definition, open innovation requires the sharing of information and other resources in both directions across the borders of an organization. An agency should not only appropriate resources from other parts of the ecosystem as inputs to their internal processes, but also contribute resources to other members of the ecosystem. However, these flows should not occur in a haphazard fashion. Rather, the agency should take care to measure and observe just how

much it is contributing to the open innovation effort. How many employees are actively (or sporadically) contributing their time and effort to other members? How much money is being spent to manage the organization's participation efforts, or to pay licensing, sponsorship, or other fees? What other resources (e.g., patents, databases, physical space, etc.) is the organization making available to other members of the ecosystem?

In addition, the agency needs to identify and monitor the resources it is receiving from the ecosystem. What ideas, information, and relevant knowledge have been brought from the ecosystem into the agency's internal innovation processes? Similarly, how has the agency's costs of innovation, product development, and support changed? As mentioned, some of the benefits an agency may receive from its participation are less tangible than others. For instance, has the agency's reputation and stature in the overall market improved? Does its participation enable it to access relationships that it would not have otherwise? All of these resources and benefits should be identified as accurately as possible in order to ensure that the agency can make effective managerial decisions regarding its future participation and the resulting resource allocations.

3. Manage Intellectual Property Rights

In many cases, the agency will possess patents, software licenses, and other IP rights on the basis of its past innovation results, which it can use as leverage in the outside market. Government agencies are often incapable of utilizing their IP in the marketplace to generate revenue or other direct monetary gain. However, IP plays a significant role in open innovation projects. One way to entice external parties to participate is by offering to share IP on favorable terms. For example, IBM released hundreds of software patents to the open source community in 2005 in an effort to encourage additional innovations, which it hoped to incorporate into its innovation processes. However, the agency must be careful not to give away access to any IP that it may be able to use for its benefit alone, or that it should retain for security, privacy, or operational purposes. While a full examination of IP strategy is beyond the context of this report,¹⁰ it is important for agencies to strike a balance between retaining and releasing its IP to maximize the benefits of its open innovation and its overall organizational effectiveness.

Participant Characteristics

4. Seek and Encourage Diversity Among Ecosystem Participants

One of the best indicators of a growing, resilient ecosystem is an increase in the diversity of participants. While it is important for an ecosystem to have a large number of participants, it is equally important for it to attract and retain members of many different types to avoid homogenous "groupthink." While this is obviously important for agencies seeking to build new ecosystems, it is also important for agencies joining existing ones. Any potential member must assess the type and amount of participation (including the types of members and their levels of involvement and contribution) as part of their overall assessment of the potential value that they may gain or provide by joining. Even small niche participants can attract additional contributions from other organizations and individuals with which they may have relationships, especially if their contributions are likely to increase the overall value within the ecosystem.

10. For more on this important topic, see Alexy, Criscuolo, & Salter (2009).

Relationships Among Members

5. Establish Effective Positioning within the Ecosystem

Once the goals and objectives for participation are set, an agency must be careful to build and maintain relationships that will enable it to achieve its desired outcomes. For instance, for an agency or other entity (such as either the VA or the state of West Virginia) to access specific software development expertise, it will need to ensure that it can establish effective working relationships with vendors that possess this expertise. This is extremely important for members that are only able to fill small niches within the ecosystem and cannot necessarily depend on other larger players to seek them out. It is important for participants to take advantage of any shared or individual relationships that would encourage and simplify the flow of resources it requires. This includes such tactics as joining working groups or committees, participating in collaborative R&D projects, and partnering with other members on significant projects within the ecosystem. If an agency cannot gain access to the resources it needs for its innovation practices, it will not be successful in achieving the goals of its open innovation practices.

6. Be an Active Team Player

In addition to establishing the correct relationships, a participant must be a good citizen of the ecosystem in order for other participants to value their contributions and thus, enable them to fully take advantage of any benefits that may be available. This includes a number of attributes and actions an agency can take, such as by being an active contributor to avoid any accusations of “free riding.” It is important for a participant to be committed enough to contribute a significant amount of resources toward the ecosystem as appropriate. Large, powerful members (in particular, government agencies) should take care not to be seen as exercising an undue amount of power and influence to direct the efforts of the ecosystem toward its exclusive benefit. Any such accusations of control would violate both open innovation and open-source models, resulting in a decline in both membership and contributions. For instance, if the VA had attempted to guide the relationships itself rather than establish OSEHRA to include many external members in the direction of the ecosystem, it would have been especially prey to accusations that it was working solely on its own behalf rather than for the good of the entire VistA ecosystem. Earning the trust of other participants through commitment, activity, and altruistic behavior are key attitudes for an agency to model in its working relationships with other participants and the ecosystem as a whole.

Ecosystem Organization

7. Establish and Observe Effective Governance and Leadership

The type of governance model that is established sets the tone for the cooperation and coordination among members of an ecosystem, while leadership establishes its vision and purpose. As such, it is crucial that these be established to enable participants to work together toward a shared outcome, while also enabling them to achieve their individual objectives.

An agency can establish formal and informal governance, as well as leading by setting the vision and purpose in an ecosystem, especially one it has had a hand in creating. However, it must strike a balance between being seen as a cooperative, valuable member of the ecosystem and exerting so much power that it is viewed as being more of a bully. Governance and leadership work best in open source and open innovation when they are established in a shared manner, with each participant having a say in both the ecosystem’s rules of conduct and the overall purpose.

Before joining, a potential ecosystem participant must first evaluate the formal and informal governance that is already in existence. How are decisions made within the ecosystem? Who makes them? Is this governance inclusive or are there a few members wielding all the power? How are decisions communicated throughout the ecosystem? Similarly, the motivation and shared objectives indicative of the ecosystem's leadership must be questioned. How are members encouraged to participate for the good of the collective? Who sets the goals and vision for the project? How are these shared attributes communicated and reified?

8. Encourage Openness and Transparency

Similar to the establishment of effective governance and leadership, an agency should be willing to pursue openness when establishing an open-innovation program. This openness can be encouraged in many different ways. Participants should share their goals and objectives freely with other members without harboring hidden agendas that may lead to distrust if exposed or observed by others. Any plans for future contribution changes should also be shared with others, especially to the extent that these changes may affect participants' future plans.

An agency should be open to considering external ideas and suggestions, and to sharing internal ideas with other members. While this seems obvious given the definition of open innovation, it is important for participants (particularly larger, resource-rich members) to ensure that this is actually the case. In addition, any innovation processes within the ecosystem should be made transparent to the maximum extent possible in order to allow other members to make relevant suggestions and provide useful ideas. However, it is not necessary to divulge any portions of the internal processes or products that are proprietary or otherwise considered to be part of the organization's unique competitive advantage. On the other hand, the more open and transparent a firm can become with respect to its existing processes, the more likely other members are to contribute external ideas that can increase the value of the overall innovation ecosystem.

External Environment

9. Minimize Friction and Bureaucracy

The existence of constraints has been identified as having a positive influence on the creative process. Only by challenging several of the assumptions, habits, and rules that often exist within an organization can those involved learn to see things clearly and find ways to develop creative solutions to a given problem. However, any resistance or roadblocks an agency encounters when attempting to change some of these constraints are essentially innovation killers. For instance, an organization must learn to eliminate any close-minded attitudes toward "not invented here" that employees may have regarding the quality or usability of externally developed ideas. Otherwise, it will be impossible to capitalize on the vast amount of valuable knowledge that invariably exists beyond the boundaries of the organization. Another source of friction in public agencies and other large organizations is the existence of countless rules and regulations that must be followed to precision, despite any complexity or ambiguity inherent in them. In order to capitalize on creativity and innovation, an agency must learn to work through or around these issues to enable external participants to work with the agency effectively and quickly. Without this flexibility, innovation is strongly discouraged and in the worst cases, impossible.

10. Continuously Monitor External Conditions

Changes in regulatory policies, political climates, and industry conditions are inevitable. Moreover, these changes typically affect the relationships, resource flows, and outcomes in any ecosystem. Monitoring the external environment for such jolts is therefore important in

order for members to assess the resulting changes and adjust their participation accordingly. These changes also may necessitate changes in the governance and leadership of the ecosystem as a whole. For instance, changes in the meaningful use regulations and the transition from the ICD-9 to ICD-10 coding system in the health information technology industry will have a significant impact on the research and development being done in the overall VistA ecosystem. As such, it is prudent for members of the ecosystem to begin tackling these issues now to incorporate them into the VistA code as needed.¹¹ Whether it is the responsibility of the dominant member of the ecosystem or each member individually, it is crucial to keep a watchful eye beyond the ecosystem to be prepared for anything that may affect future contributions, coordination efforts, and results.

11. Indeed, two firms (Divergent and Medsphere Systems Corporation) have begun collaborating to incorporate the necessary changes for Medsphere's VistA clients in advance of the regulatory deadlines.

Conclusion

Although this report is based on a study of two open source software ecosystems, it is important to recognize that open source is a manifestation of open innovation in general. As such, similar issues and practices are applicable across a wide range of alternative open-innovation programs. In addition, similar results can be found in other industries. For example, the state of Georgia effectively sponsored an ecosystem surrounding an in-house developed open-source, software-based, integrated library management application.¹² In addition, several universities (public and private) have joined forces to develop the SAKAI learning management system platform,¹³ with new members joining each year. In both of these cases, we still find many of the recommendations that we describe above to be applicable even in industries other than health care.

Agencies must be able to act in bold and proactive ways to be able to execute open innovation successfully. Typically, many agencies tend to be resistant to external participation or to depend on the services of only the largest and most established vendors for assistance. In order to capitalize on these strategies, an agency must be willing to make it easier to collaborate with people and organizations outside the agency, no matter how large or small they may be. Once collaboration begins, there must be equal footing or at least a mutually agreed-upon distribution of power to ensure that both sides are able to use the returns they desire from their participation. Participants often leave when they are unable to attain their desired goals, leading to the unacceptable overall failure of the ecosystem itself. Hence, evaluating the five elements carefully enables an agency to make effective decisions regarding creating, joining, and participating in an open source/open innovation ecosystem.

12. <http://evergreen-ils.org/about-us/>

13. <https://sakaiproject.org/how-open-works>

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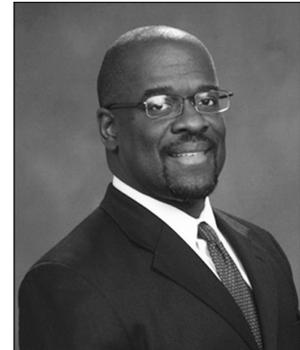
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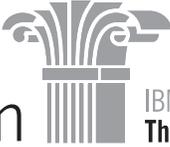
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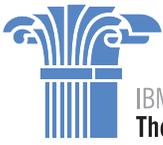
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