



In cooperation with
UC San Diego

Reinventing life sciences

How emerging ecosystems fuel innovation

IBM Institute for Business Value

Continuing a strong innovation history

Persistent disruptive forces in life sciences are beginning to threaten traditional business models. While high rates of return and strong performance may have masked these forces in the past, today they must be recognized and addressed. Organizations need new ways to continue to thrive despite such hurdles.

But alarmingly, just 25 percent of life sciences executives say their organizations are effective at innovation – so where is the spark they need? This report outlines a new target innovation model that can guide organizations to achieve operational efficiencies, nurture new growth opportunities and position strategically in emerging life sciences and healthcare ecosystems.

Executive summary

The global life sciences industry has faced a series of wake-up calls over the past decade. Yet, despite volatility, the industry has generally continued to deliver successful returns to shareholders. Even so, old and new challenges continue, including untamable cost growth in traditional research and development (R&D), slow time-to-market and ever-growing expectations for value and effectiveness from increasingly empowered consumers – compounded by complex R&D challenges from expiring patents and constraints on cost recovery. So, life sciences companies need to reevaluate the nature of traditional business models, processes and operations.

In fact, the industry is rapidly evolving into a new type of ecosystem model that requires a level of cooperation and inter- and intra-collaboration that organizations have not engaged in before. While there are many potential benefits from participating in the emerging ecosystem, most companies struggle to both understand the full impact of these changes, and take the steps necessary to benefit fully from them.

To help organizations navigate the uncertainty, the IBM Institute for Business Value in collaboration with the University of California, San Diego and Oxford Economics surveyed 750 executives in seven countries and nine life sciences-related areas (see “How we conducted our research” on page 16). We found that most executives acknowledge the needs and benefits of the changing business environment. Yet many are unprepared to prioritize new ways of working that better leverage the expanding life sciences and healthcare ecosystem.

In this first report in a series addressing innovation in the life sciences industry, we conclude that adopting a target innovation model can help organizations reap greater benefits through a more deliberate approach to innovation across the enterprise. A robust model will encourage innovation across the enterprise, including cost-sharing opportunities, expanded capabilities through learning and partnerships, extended reach across industries and markets, and risk sharing in product development and distribution.

77%

of life sciences executives *completely agree or strongly agree* that their research is not aligned with their business strategy.

70%

of industry executives told us their organizational culture makes it difficult to be innovative.

64%

said they struggle to establish partnering relationships.

Life sciences: Success despite challenges

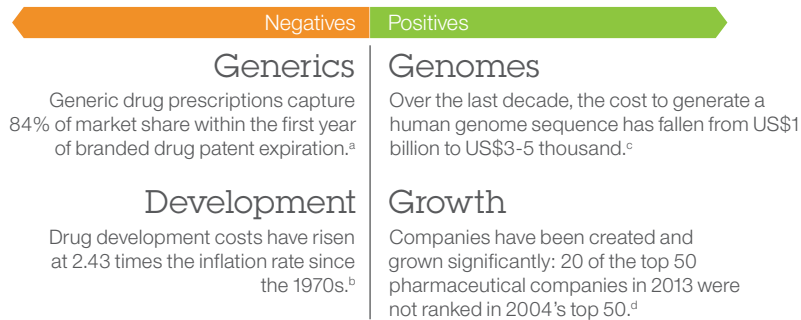
While the life sciences industry has faced challenges, companies have still been able to produce positive outcomes, delivering to shareholders a premium over the Standard and Poor's index as a whole for the past five years (see Figure 1).¹ But despite its successes, the industry faces new and difficult challenges including:

- *Intellectual property (IP) rights* – How can companies deal with IP in an environment of fluidly changing connections? Divergent attitudes on IP and its importance in innovation can hold back open innovation. But mechanisms exist to enable partners to balance openness about research results with the ultimate need for a clear IP position on products requiring major investment.
- *Outcomes-based pricing* – This is a fundamental method for driving cost-reducing innovation among healthcare providers and achieving a financially sustainable healthcare system. While already tried and tested in Europe, outcomes-based pricing is still relatively new in the United States.
- *Disease prevention shift* – A shift of payer focus from cure to prevention has resulted in the growth of vaccine sales from a US\$12B market in 2006 to US\$30B in 2014, with more companies investing in vaccine development, particularly for adult vaccines.²

Activity among traditional players and new entrants highlights a change of guard in the life sciences industry. Many large pharmaceutical companies have undergone major changes: 17 of the 50 top pharmaceutical companies from a decade ago have merged or been acquired.³ And companies from other industries, such as Apple and Google, are beginning to participate in the life sciences as part of their cross-industry go-to-market strategies.

Figure 1

The industry faces challenges, but has still been able to find success^d



The result of all of these influences is that the future for life sciences will look radically different from the past. Imagine this future:

- Organizations can predict and avoid a molecule's failure in phase III clinical trials before beginning development
- Resources flow freely across organizations where and when they are needed to enable rapid, dynamic innovation
- Late-stage failures are analyzed across the ecosystem to unlock new pathways and discover new combination therapies.

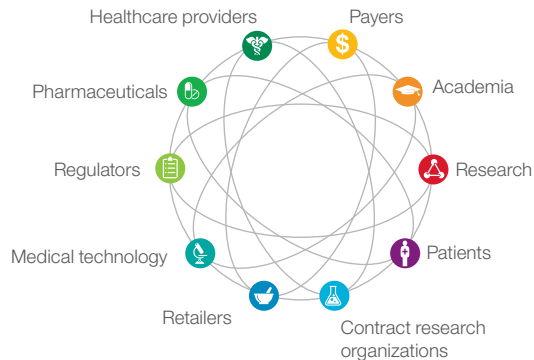
While these capabilities portend a bright future, today many in the life sciences industry are struggling to adapt to the speed and effectiveness of new types of innovation.

The impact of biosimilars

In March 2015, the U.S. Food and Drug Administration (FDA) announced the approval of the first non-brand, complex biopharmaceutical – “biosimilar” – in U.S. pharmaceutical history. Europe has been marketing biosimilars for 10 years now, and the FDA is currently developing long-awaited standards. However, biosimilars are costly to make. And since they will not be identical copies, doctors and patients may be slow to accept them as substitutes.⁵

Figure 2

The life sciences ecosystem spans multiple activities, geographies and industries, including public and private institutions as well as patients



Source: IBM Institute for Business Value.

Emerging ecosystems

New technologies are driving radical disruption – value chains are fragmenting, industries are converging and ecosystems are emerging (see Figure 2). New entrants from other industries are blurring the traditional definition of life sciences:

- Healthcare: University Hospitals is developing new medical technology⁶
- Information technology: Google Ventures is investing heavily in life sciences⁷
- Consumer electronics: Apple has launched iWatch and health apps.⁸

As ecosystems continue to evolve, companies have to decide the level and nature of their participation. Ecosystems can provide numerous opportunities for participants and our study shows that many life sciences executives understand this. Life sciences ecosystems possess three major characteristics.

1. Boundary transcendence: Ecosystems transcend traditional boundaries – by geography, product/service and industry – helping participants to break down barriers that separate silos. Our study reveals nearly half of respondents (47 percent) of life sciences executives expect that expanding into emerging markets will stimulate industry innovation. And 38 percent expect partnering with organizations from other industries will energize innovation.

For example, Roche and the telecommunications company Qualcomm formed a partnership to improve remote chronic care management and drive patient engagement. With Roche using Qualcomm's 2net Platform to wirelessly capture data from patients' medical devices, healthcare professionals can remotely keep in touch with patients, helping reduce therapy complications and total cost of care for chronic disease patients.⁹

2. *Openness*: Ecosystems provide a free flow of ideas, knowledge and resources among participants across the system. Open innovation – the integration of knowledge and expertise from multiple sources to aid in developing new technologies, products and processes – is a defining feature of the life sciences ecosystem. And most respondents recognize the importance of openness: 79 percent of executives say that open innovation plays a role in their innovation process. Sixty-one percent said that it makes the development of ideas better and faster.

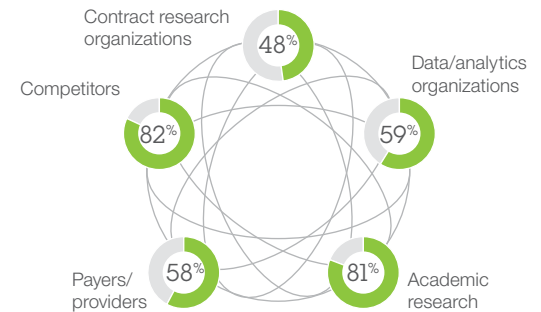
AstraZeneca, for example, has started an open innovation program inviting academic researchers to collaborate in new drug development. It grants UK academic investigators free access to the 22 candidate compounds it developed. External researchers are encouraged to submit research proposals for funding to further develop these compounds into new drugs. Within one year of making these compounds available, the Medical Research Council awarded £7 million in funding for 15 research projects.¹⁰

3. *Collaboration*: The emerging life sciences ecosystem is profoundly collaborative, allowing organizations to communicate, act and work in new ways. These fluid, ongoing relationships are built over time through partnering on new drugs and other projects with mutual value. Life sciences executives are looking to build their ecosystem by pursuing these types of collaborations (see Figure 3).

Shire Pharmaceuticals entered into a five-year research collaboration in rare diseases with Fondazione Telethon (a charity focused on curing rare genetic diseases), coupling Telethon Institute of Genetics and Medicine’s early-stage research expertise with Shire’s capital and developmental capabilities.¹¹ The collaboration between Shire and Fondazione can help accelerate the development of new therapies.

Figure 3

Life sciences organizations look to build the ecosystem through pursuing collaborations



Source: 2014 Life Sciences Innovation Survey. Question: “What ways will your organization choose to reinvent their business models or change their role in the industry?”

“In order to advance the business model, we need to use an open innovation platform for both the inflow and outflow of knowledge.”

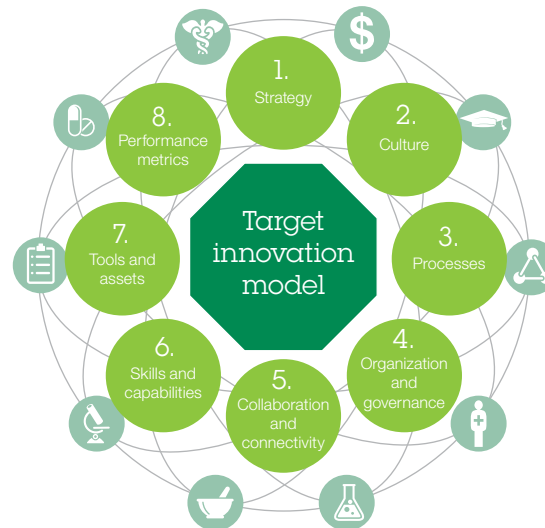
Faculty member located in China for academic institution headquartered in the US

Taking charge of innovation

So, what can an organization do to gain these benefits? It can introduce a target innovation model to start down the path of strategic and systematic innovation. The target innovation model comprises eight elements: strategy; culture; processes; organization and governance; collaboration and connectivity; skills and capabilities; tools and assets; and performance metrics (see Figure 4).

Figure 4

Target innovation model within the life sciences ecosystem



Source: IBM Institute for Business Value.

1. Strategy



Align innovation business plans and policies

Today, most life sciences organizations do not have an integrated approach to innovation across their business. And the industry could not see this more clearly: of the 750 life sciences executives surveyed, an alarming 100 percent recognized at least some mismatch between their organization's prevailing strategy and its research activities (see Figure 5).

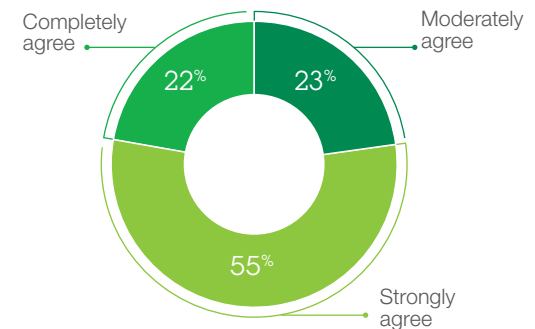
Recommendations: Strategy

Organizations need to more clearly align business and innovation strategies. To help facilitate the alignment of strategy to drive innovation, they can:

- Direct specific innovation efforts by appointing a head of innovation, either in the C-suite or reporting directly to an influential member of the C-suite, to support oversight of the entire innovation portfolio.
- Review the innovation profile of all businesses in your organization and consider alternatives for those that do not fit the innovation strategy.
- Develop an inclusive innovation strategy driven from the top that covers business and areas across the value chain – from research through clinical and pharmaceutical development, through technology transfer and production into sales and marketing.

Figure 5

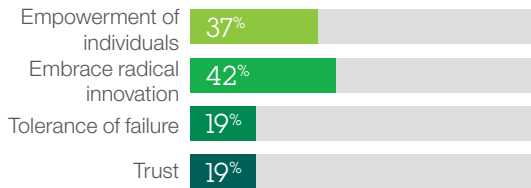
Without exception, industry executives recognize a rift between research and the prevailing strategy of the organization



Source: 2014 Life Sciences Innovation Survey. Question: To what extent do you agree with the statement "Research is not aligned with strategic initiatives of the business.?"

Figure 6

Cultural elements that are crucial to innovation are undervalued by life sciences executives



Source: 2014 Life Sciences Innovation Survey Question: What cultural elements do you believe are the most crucial for successful innovation?

2. Culture



Create an environment that fosters innovation

Creating a culture and environment that encourages and supports innovation across and beyond the organization is paramount for repeatable innovation. Executives agree that poor culture can impede innovation (see Figure 6). Seventy percent of leaders in life sciences agree that the culture of their organization makes it difficult to be innovative.

Recommendations: Culture

Organizational culture should encourage all employees to behave innovatively and conceive innovative ideas. To operate effectively in an ecosystem, organizations need to create environments that support innovation in all areas of the business, not solely R&D. To be open to the internal and external influences that can promote idea generation, organizations must create an atmosphere for all employees that fosters confidence, creativity, engagement, enthusiasm, flexibility, a sense of urgency and a willingness to explore. Specifically:

- Demonstrate that innovation is not just the domain of R&D scientists by building a culture of innovation around the patient's needs or opportunities, rather than focus on specific drugs.
- Build innovation into the day-to-day activities of employees, giving them time, space, environments and tools to collaborate and share new ideas.
- Encourage employees to reach outside their "four walls" to experience other innovative cultures and bring the best parts back into the organization; for example, innovation clubs or tours of duty in other organizations (even potentially in other industries).

3. Processes



Create structure to support innovation

Formal processes and a structured approach to innovation can direct and facilitate development of ideas without stifling creativity. But our survey suggests much of the industry lacks the structure needed (see Figure 7).

Recommendations: Processes

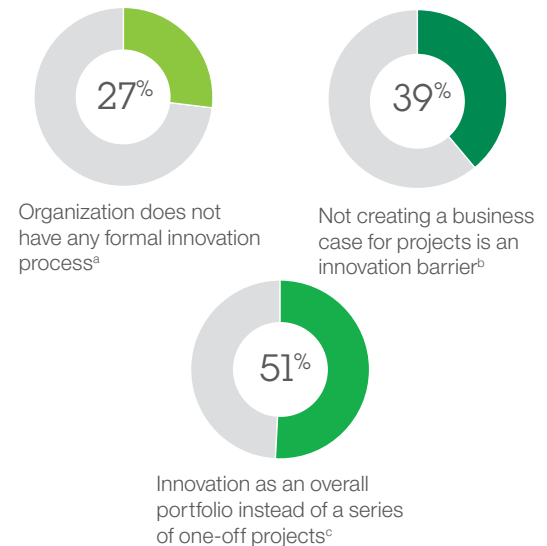
Creating and communicating innovation processes and structures to employees and ecosystem partners can spur more innovation. Innovation processes should be formed to support the major steps of the innovation cycle. For example:

- Develop creative ways of sourcing new ideas, both across and from outside the company. Use social media, attend conferences, join organizations outside the life sciences industry or participate in local communities and engage with local, regional or international bodies.
- Verify that innovation processes are transparent, consistent and communicated to everyone who participates in them. Take a birds-eye view of all ideation projects across the organization, and share selection and evaluation criteria and information on the innovation portfolio itself.
- Roll out treatment, operations processes or new business models. Implement processes that help ensure new initiatives remain aligned with business priorities.

Throughout the entire process, organizations must be willing to stop projects that do not meet standards to avoid draining resources from the innovation portfolio.

Figure 7

Industry players lack the structured avenues to guide innovations



Source: 2014 Life Sciences Innovation Survey. Questions: (a) and (b) What barriers to innovation do you see for your organization? (c) Thinking of how your organization deals with innovation, does your organization treat innovation projects as part of an overall portfolio or a series of one-off projects?

Innovating R&D productivity¹²

AstraZeneca adopted a “5R Framework” for innovation project approval decisions. The 5R Framework defines five “gates” of approval for R&D projects: right target, right tissue/exposure, right safety, right patients, and right commercial application.

Employing this framework has reduced the size of the company’s innovation portfolio, allowing them to focus resources on projects that have already passed approval gates and therefore have a higher chance of success. Having a defined R&D approval process has improved AstraZeneca’s innovation project success rate by eliminating projects that do not pass initial approval checkpoints.

4. Organization and governance



Facilitate and manage innovative projects

Today, executives report that their innovation projects struggle to generate momentum within their organizations. Thirty-seven percent of life sciences executives say that innovation projects suffer from organizational inertia, which creates resistance to innovation. Organizational inertia ranks third out of 12 barriers to innovation in the life sciences industry.

Recommendations: Organization and governance

Create a dedicated innovation SWAT team to manage, guide and support cross-organization innovation. In addition, form an innovation oversight team of senior leadership from across the organization to make decisions on funding and oversight of the innovation portfolio. Steps these teams can take:

- Build the expertise and skills needed to run effective ideation sessions and innovation processes, including facilitation skills, financial skills, creative and operational capabilities. Representation should be from both inside and outside the organization.
- Survey leading practices in innovation management and introduce new innovation models, including incubator/“side” organizations or other entrepreneurial models that might comprise part of an overall innovation strategy.
- Build structure that looks within and beyond the organization for innovation ideas and opportunities that fit with the innovation portfolio.

5. Collaboration and connectivity



Build new relationships

Open collaboration across and between organizations is critical to innovating in the age of ecosystems. Our findings show that a lack of collaboration across organizations is a barrier to innovation. Sixty-four percent of executives for example, report that their organization struggles to establish partnering relationships.

Recommendations: Collaboration and connectivity

Collaboration is the building block of ongoing relationships. How can companies prepare for collaborating in an ecosystem?

- Get to know how new players in the ecosystem work and partner (for example, electronics companies for medical devices), and draw lessons from a partner's own unique methods and models.
- Initiate innovation advisory groups that include a range of ecosystem players, including the end users (such as patients and care-givers).
- Confirm that goals of new innovation projects and collaborations are shared, understood and agreed upon before kick-off.

Collaborating to create innovative products¹³

University of California Center for Accelerated Innovation (UC CAI) is a consortium of the five University of California medical campuses with the objective to create innovative new products to benefit patients. It has been designated a Center for Accelerated Innovations by the National Heart, Lung and Blood Institute (NHLBI). The five campuses accounted for 7 percent of NHLBI's fiscal year 2012 grant funding, providing a rich research base to support a diverse pipeline of diagnostics, devices, therapeutics, and tools for heart, lung and blood diseases.

“Freedom, intuition and synergy are the ideals that create magic in innovative organizations.”

Manager located in Switzerland for medical device company headquartered in the UK

6. Skills and capabilities



Connect the right people with the right skills

Organizations struggle to connect the right individuals with the right skills and capabilities necessary to innovate. Life sciences is known for its brilliant scientists, but many organizations lack true innovators. Thirty-nine percent of executives report that they have insufficient skilled human resources or the wrong skills portfolio for innovation.

Recommendations: Skills and capabilities

Organizations must find and nurture individuals with the necessary capabilities to conceive and develop ideas. To verify that people fit with and support the organization's objectives and direction:

- Recruit and plant “innovation seeds” from outside the life sciences industry; for example, bring “best practice thinking” from the auto industry to innovate the technology transfer process.
- Recognize the level of support and training needed to convert ideas into results. Not everyone is an innovator, but everyone can have a good idea.
- “Cross-pollinate” skills across the organization. Bring together teams of scientists from research labs, process engineers from manufacturing and sales reps who interact with doctors to drive innovation focused at the end user.

7. Tools and assets



Provide the right material

Providing the necessary tools and assets to employees can help facilitate and support innovation efforts. Life sciences executives have underestimated the value of tools that help employees to innovate. Only 40 percent stated that using social media as a tool to identify and evaluate ideas is very important to their innovation efforts today, and just 34 percent said that big data and analytics is an important adjunct to successful innovation today.

Recommendations: Tools and assets

Many different tools can support innovation in different ways. Specific tools relevant to the organization's innovation can be investigated and adopted to:

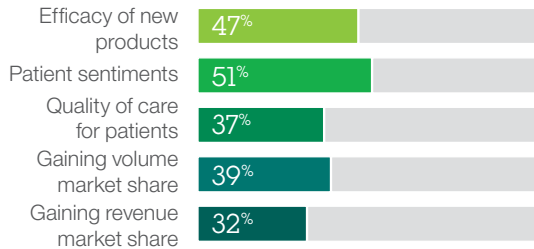
- Extract insights from available information to support ideation processes, and innovation development, refinement and launch.
- Enable accessibility of innovation platforms and tools within and outside the organization, while complying with industry compliance and regulatory standards.
- Enable rapid and reliable transfers of information through collaboration and knowledge sharing.

IBM Watson diagnoses cancer¹⁴

IBM Watson leverages cognitive analytics to synthesize structured and unstructured data to support faster, more accurate diagnoses. Watson technologies access patient profiles to rapidly analyze high volumes of medical documentation to diagnose medical conditions with great accuracy. Over time, Watson's artificial intelligence capabilities and analytics improve accuracy as it develops a knowledge base and learns from both mistakes and successes. In a recent test, Watson successfully diagnosed lung cancer 90 percent of the time – compared to only 50 percent for doctors.

Figure 8

Across the industry, organizations use various ways to measure success of innovations



Source: 2014 Life Sciences Innovation Survey. Question: Please select the factors that you use to evaluate success of your organization's innovations.

8. Performance metrics



Monitor innovation projects

The IBM Institute for Business Value study, “More than magic: How the most successful organizations innovate,” concludes that innovation projects should be monitored and measured with clear financial and other metrics, the same as any other project.¹⁵ Yet, only 31 percent of life sciences executives said that having a clear focus on performance is crucial to the success of innovation (see Figure 8).

Recommendations: Performance metrics

Clear performance metrics allow life sciences organizations to quantify outcomes and the effectiveness of innovation, making it easier to prioritize projects on the basis of their success, and helping decisions about continuing funding. Specifically, organizations should:

- Evaluate innovation across various stage-gates with financial and other quantitative and qualitative criteria.
- Develop a shared set of outcome and activity metrics that are acceptable and achievable by all ecosystem partners.
- Demonstrate how and where value has been created across the entire lifecycle of projects, providing real-time feedback interaction with other projects in the innovation portfolio.

Are you ready to thrive in the ecosystem?

Life sciences has been one of the most successful global industries for a generation. But many of the incumbent organizations have succeeded so well in the traditional life sciences model that they are struggling to find a new path within the profound disruption that the industry is beginning to experience. Unless they change, they will either be subsumed by new and more dynamic players or simply cease to be.

In the emerging life sciences and healthcare ecosystems, organizations require a renewed focus on their strengths as they prepare to play new and different roles. They need to reinvent the industry's traditional innovation heritage. The following questions can help them get started:

- What role does your organization currently plan to play in life sciences?
- What is your approach to innovation today?
- How will you formalize operational processes to promote more innovation in future life sciences and healthcare ecosystems?
- How can you cultivate the skills and capabilities within your workforce to innovate for openly, collaboratively and effectively?
- What will be your most effective innovation processes and tools in the new era of ecosystems?

“Innovation can come from anywhere and anyone. Some of the best ideas and solutions are residing outside your company and hence it’s very important to have an open business model.”

Research leader located in the UK for a biotech company

How we conducted our research

The survey, designed by the IBM Institute for Business Value and the University of California at San Diego, was conducted by Oxford Economics with 750 respondents, including 255 pharmaceutical, 154 biotechnology, 152 academic, 106 medical device, 34 medical services, 33 diagnostic manufacturer, 12 medical distributor, 3 generics producer and 1 consumer healthcare respondent. It was conducted in October and November of 2014 in seven countries: Belgium, China, Germany, Japan, Switzerland, United Kingdom and the United States.

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Fraser, Heather and Anthony Marshall. “The new age of ecosystems: Redefining partnering in an ecosystem environment – Healthcare ecosystem edition.” IBM Institute for Business Value. February 2015. <http://www-935.ibm.com/services/us/gbs/thoughtleadership/healthcareecosystems/>

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