



# The evolution of life science ecosystems

*Five effective innovation approaches for academia*

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IBM Institute for Business Value

## Executive Report

Life sciences

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## Innovating effectively

*The life sciences industry, like many others, faces broad disruption and challenges on fronts ranging from technology to regulation to product resourcing. Traditionally, innovation has been a key driver of success for life sciences organizations, and it will continue to play a critical role for an industry that seeks to sustain this momentum. So it is not surprising to learn that most life sciences leaders, including those in academia, believe that defining an innovation strategy is critical for their success. But why are some organizations more accomplished in devising and implementing effective innovation? This report identifies five strategies that differentiate the more successful academic life sciences institutions from the rest.*

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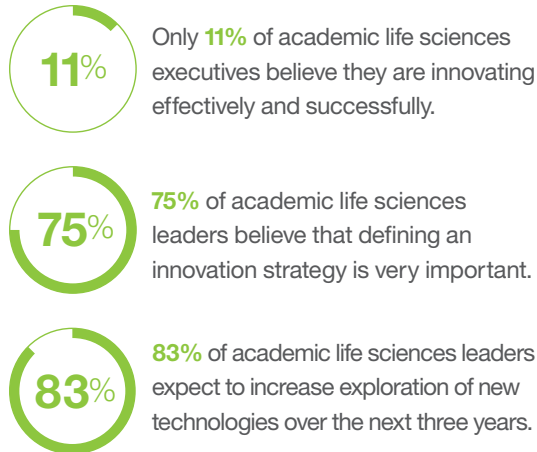
## Executive summary

The life sciences industry, which includes pharmaceutical, biotechnology, medical device, academic and other entities, has been among the most successful and profitable industries for decades — and innovation has been central to this heritage. However, disruptive forces across life sciences, healthcare and technology are changing industry dynamics and driving the emergence of new life sciences and healthcare ecosystems.

Set against these changing circumstances, life sciences leaders in academia are expressing a lack of confidence about their organizations' abilities to continue to innovate successfully in the future. These leaders recognize the need for new innovation strategies. And being academics, they measure the success of innovation in terms of *effectiveness* — an organization's ability to achieve its stated mission — instead of *financial performance*.

So how are leaders at academic life sciences institutions addressing the need for innovation while continuing to strive for greater effectiveness? To learn more, the IBM Institute for Business Value analyzed findings from the Life Sciences Innovation Survey of 750 industry leaders, including executives from pharmaceutical, biotechnology and diagnostics organizations. For this report, we brought particular focus to the subset of 152 respondents from academia.

The results demonstrate that academic institutions are dedicating themselves to innovation. Seventy five percent of those we surveyed said that defining an innovation strategy is very important. And when we asked academic leaders to assess the effectiveness of their organizations' life sciences innovation compared to that of their peers, three distinct groups emerged: The 26 percent of academic life sciences organizations that were *highly effective*; the 52 percent of the survey sample that were *moderately effective*; and the 22 percent of respondents who were *less effective*.

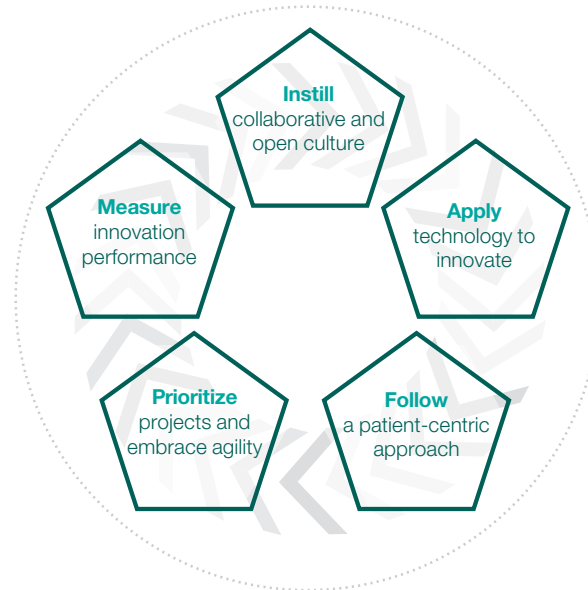


So what factors differentiate the more innovative organizations from their less effective peers? We discovered several strategies that the most successful of surveyed academic institutions tend to embrace: Instill a collaborative and open culture; apply technology to innovate; follow a patient-centric approach; prioritize projects and embrace agility; and measure innovation performance.

In this report, we explore the distinct strategies that help academic institutions become more essential to the rapidly evolving life sciences ecosystems (see Figure 1).

**Figure 1**

*Which innovation strategies differentiate life sciences projects among academic institutions?*





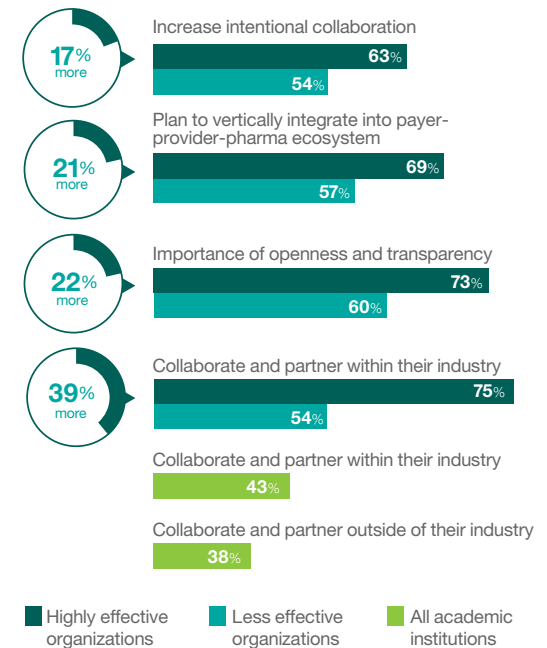
## Instill a collaborative and open culture

Highly effective academic institutions establish an open and collaborative culture that is conducive to innovation and, in return, drives higher value from innovation activities and investments. A good governance structure is one important prerequisite to successful open innovation. The IBM Institute for Business Value study, “More than magic: How the most successful organizations innovate,” found that across industries globally, 37 percent more of the most successful organizations pursue open forms of innovation throughout their innovation life cycles.<sup>1</sup> Further, a recent paper by the Massachusetts Institute of Technology pointed to “convergence as the blueprint of innovation” for the life sciences industry.<sup>2</sup>

Open innovation can transform many of the challenges and roadblocks of traditional life sciences R&D by realigning incentives and behaviors, and promoting organizational and cultural change. New ideas, collaboration and investment can flow across ecosystem partners to enhance and expand effectiveness, as well as to share innovation risks, costs and benefits. While academic institutions reported that much of their success hinges on their own internal collaboration, many plan to integrate themselves into healthcare ecosystems over the next few years (see Figure 2). Often a partner or ecosystem can provide resources and incentives for bringing internal groups together to collaborate.

**Figure 2**

*The value of openness, transparency and collaboration when pursuing innovation.*



### **UC Davis and the AOCC collaborate to fight malnutrition and poverty<sup>3</sup>**

The University of California, Davis (UC Davis), a leading cross-disciplinary research and teaching institution, has joined forces with the African Orphan Crop Consortium (AOCC), an international group working to improve the nutrition, productivity and climatic adaptability of some of Africa's most important food crops. The partnership is making great strides in its ambitious attempt to map and make public the genomes of 101 indigenous African foods.

The genomic data on African orphan crops will help plant breeders more quickly select for traits that improve the nutritional content, productivity and resilience of Africa's most important food crops. The project focuses on the food people eat, not the food others think they should eat, from a global commodity perspective. The ultimate goal of the consortium is to eradicate stunting — a medical affliction resulting from chronic malnutrition that affects about 195 million children around the world. The group collaborates with researchers all over the world, and it plans to post all of its sequence information online for anyone to use.

## **Recommendations**

### **Open your internal and external innovation processes to assure routine communication, remove barriers and enable formal governance.**

Support researchers by providing the tools and the physical and virtual environments necessary to easily engage in open collaboration. Establish a governance framework to facilitate joint oversight and decision making. Establish a single point of contact internally and externally whose responsibilities include project and alliance management.

### **Provide a single place for internal collaborators to gain knowledge about where assets exist in their organizations to facilitate collaboration.**

An open innovation platform serves to further and more purposefully connect individuals — both internal and external — that have special skills or assets, or who are researching in the same areas. Bring people from different backgrounds together to work on projects, providing a diverse set of mindsets.

### **Educate legal function partner organizations about the unique nature of open innovation initiatives and help to develop the most enabling legal structure.**

Acknowledge know-how from universities and reward co-commercialization activities. Collaborate with pharmaceutical companies, healthcare organizations and regulatory bodies to support the sharing of resources and infrastructure needed for conducting research. Working closely within regulatory guidelines, instead of in fear of them, helps organizations incorporate changes quickly to avoid unnecessary termination of research projects.



## Apply technology to innovate

Technology can be one of the most significant enablers in an organization's push to innovate. Successful organizations, including those in the academic life sciences arena, embrace rapid digitalization and new technology to drive innovation. The 2015 IBM Institute for Business Value study "Redefining Boundaries: Insights from the Global C-suite Study" found that life sciences CxOs overwhelmingly agree on the importance of technology, with 72 percent identifying it as the top external force affecting their organizations.<sup>4</sup> Respondents identified cloud and mobile, along with bioengineering and advance manufacturing technologies, as the technologies most likely to revolutionize their businesses.<sup>5</sup>

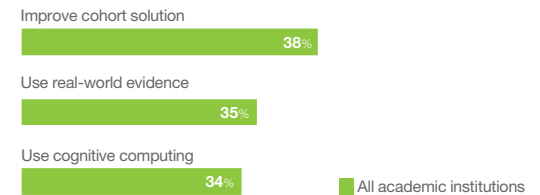
In another recent survey of life sciences executives, more than one-third of respondents said they planned to invest in cognitive computing, and 50 percent said they wanted to invest in predictive analytics (see Figure 3).<sup>6</sup> In our current survey, respondents indicated that social media and crowdsourcing will increase in importance over the next 3 to 5 years. The highly effective organizations place more importance on social media and are 24 percent more likely to use it to identify and evaluate ideas.

Technology should typically reside at the center of innovation. Companies can achieve advantage by applying these latest technologies. These tools can help organizations glean insights from available and real-time data, and can support innovation by enhancing integration of internal and external processes.

**Figure 3**

*Cognitive computing is among the top three technologies to stimulate innovation in the future.*

### Approaches to stimulate innovation



### **URMC neurologists develop app to assist thousands of Parkinson's disease patients<sup>7</sup>**

Neurologists from the University of Rochester Medical Center (URMC), an academic medical center based in Rochester, New York, and Sage Bionetworks, a Seattle-based nonprofit biomedical research organization, wanted to understand Parkinson's disease more fully and sought a way to gather more complete data from patients. Working together, the scientists developed an app for the Apple iPhone called mPower, which gathers real-time data and helps patients track symptoms and treatment effectiveness.

Researchers can now follow the day-to-day fluctuations of symptoms and garner data and insights that wouldn't be possible when examining patients at six-month intervals. More than 12,000 patients have been using the app, giving URMC and Sage neurologists data from what has become, in effect, one of the largest studies of Parkinson's disease.

## **Recommendations**

### **Chose open innovation platforms.**

Develop an open, flexible idea-generation platform to collect innovative thoughts both internally and across the ecosystem.

### **Integrate cognitive solutions for sourcing new ideas and deciding on innovation projects and clinical decision making.**

Cognitive computing helps academic institutions find insights and connections and understand the vast amounts of information available. The technology can also generate bias-free, evidence-based information that organizations can use for more effective decision making.

### **Use digital technology to facilitate innovation projects.**

Collect "real-world data" from clinical trials and larger patient populations and analyze it for insights so that projects can be adapted and personalized on an ongoing basis.





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## Follow a patient-centric approach

For successful organizations across industries, consumers are becoming a major driver in decision making processes.<sup>8</sup> As the IBM Institute for Business Value study “The Customer-activated Enterprise — Insights from the Global C-suite Study” notes, more than half of surveyed CxOs believe consumers have a considerable influence on their enterprises.<sup>9</sup> Seventy-one percent of respondents in another survey agreed that customers are a critical part of the innovation process.<sup>10</sup> And more recently, the IBM Institute for Business Value study “Redefining Boundaries: Insights from the Global C-suite Study” reported that successful organizations pay more attention to their customers, with 60 percent of them incorporating feedback from consumers.

Accepting consumers as stakeholders in determining an enterprise’s future has huge cultural and organizational implications. The approach requires that organizations create fully reciprocal relationships with consumers and become ready and willing to change course to pursue those paths that create mutual value. Organizations must continue to find ways to include consumers in key decision-making processes.

Focusing the research on patients and involving them early in the research helps academia to innovate better and make more effective decisions more quickly. Our survey shows that the highly effective organizations embrace a patient-centered approach to innovation (see Figure 4).

### UCSF seeks to personalize breast cancer treatment<sup>11</sup>

In 2015, the University of California at San Francisco (UCSF) announced that it had won a USD 14.1 million award to study the effectiveness of more personalized approaches to breast cancer screening. The award, from the U.S.-based Patient-Centered Outcomes Research Institute (PCORI), a non-governmental institute investigating the relative effectiveness of various medical treatments, funds a five-year study of approximately 100,000 women aged 40 to 80 to evaluate a more targeted approach to breast cancer screening based on risk. Women determined to be at a higher risk receive screening more, often and those at lower risk receive screening less often. Annual screening will be weighed against a personalized schedule of screening based on each woman's individual risk.

The ongoing trial, called the WISDOM study, will help UCSF scientists to discover who is at risk for what types of breast cancer while refining the approach to screening. Investigators also want to determine whether women will readily accept personalized screening and whether knowledge of their own risks will change how they feel about their diagnoses. Ultimately, UCSF scientists hope to equip women with more personalized and informed options to better manage their medical care.

Figure 4

*Highly effective institutions seek to involve patients as they strive to innovate.*



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## Recommendations

### **Listen, study and obtain data from those who will use the technology or take the medications.**

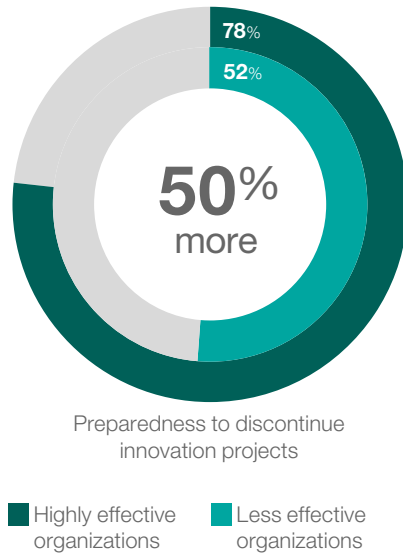
Invite patients, patient advocacy groups, caregivers and providers to participate and have a voice in the research so you can incorporate their feedback during the course of the research using a design-thinking approach.

### **Take advantage of the plethora of social networks and social networking tools.**

Social approaches make it easier to capture new ideas from anyone who interacts with the institution. Mine social interactions to identify future innovation needs and trends and embed innovation events and social data into the ongoing innovation process.

### **Use digital technology to aid innovation projects.**

Connect with end users and apply digital technologies to adapt and personalize projects on an ongoing basis.

**Figure 5***Preparedness to discontinue underperforming projects.*

## Prioritize projects and embrace agility

By rigorously prioritizing projects, academic institutions can expedite the allocation of resources to those projects with the highest potential. Likewise, if institutions deprioritize projects that don't meet objective criteria at decision gates, they can release and shift funds to maximize overall benefits. The IBM Institute for Business Value study "More than magic: How the most successful organizations innovate" found that across industries, global organizations that perform most successfully are 45 percent more likely to fund innovation within a separate dedicated budget, and 48 percent are more likely to measure ROI from innovation spending.<sup>12</sup> However, even among the most successful organizations, funding for innovation is not unlimited. To maximize returns from innovation funds, difficult allocation decisions and vigilant monitoring are necessary.

For academic life sciences institutions, following clear, transparent evaluation and decision-making criteria to optimize funding across multiple innovation projects is important. Academic organizations need to accurately estimate the value of the potential benefits to determine which projects are worth investing in. And when partnering with pharmaceutical companies, academic institutions need to be aware that project funding might evaporate if they don't meet defined milestones.

Highly effective institutions place robust governance structures around decision-making criteria and decision gates. They are also better prepared to discontinue low performing projects (see Figure 5).

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## Recommendations

### **Evidence-based value to the patient and differentiation in the marketplace should lead the prioritization of projects, not technology alone.**

Real-world data can help provide a clear picture of a new research project's future value and help you make rapid decisions about whether to halt work on a project. Corporate and early venture capital investors require academia to provide strong biology, clinical relevance and differentiation in the market to justify maintaining at-risk investments.

### **Rethink the reward environment for people pursuing innovation: Highlight clear milestones to reward interim achievements and not just end stage outcomes.**

Build a culture of transparency in which clear steps in innovation processes are articulated and understood. Foster an atmosphere in which researchers are not afraid to experiment, and resist penalizing any failures that may arise during the vigorous pursuit of innovation. Actively promote knowledge sharing around best practices and lessons learned.

### **Aim to drive the maximum value from all project assets and seek ways to partner to bring value and support the future of these assets.**

A project may not have delivered the results you were seeking, but the research may have provided new knowledge or insights that could otherwise benefit the public.

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### **University of Illinois at Chicago supports entrepreneurs as they bring innovation to market <sup>13</sup>**

Formed in 1982, the University of Illinois at Chicago is Chicago's largest university, with 15 colleges. The university examined the funding of innovation on its campuses and noted a gap, which it called the "valley of death." This gap occurs after government backing of early research runs out and before private sector funding of demonstrated concepts kicks in to bring products to market. In an effort to close this gap, the university's office of technology management launched two programs to help fund development projects and keep them moving forward.

The initiatives, the Illinois Proof of Concept (I-POC) fund and the Faculty Entrepreneurial Fellows program, provide funding support and commercialization resources, guidance and services. The goal is to help innovations spawned within the university overcome specific hurdles to transfer successfully to the private sector. So far, the effort has netted USD 1.3 million in campus proof-of-concept (PoC) funding since 2009 and has helped launch 11 startup companies with USD 50 million in venture and angel funding.

**Figure 6**

*Outperforming academic institutions maintain a clear focus on performance.*

## Main goals of innovation



## Measure innovation performance

Globally, the most successful organizations actively measure the financial returns on their investments in innovation. In fact, across industries, the organizations that perform most successfully are 49 percent more likely to explicitly measure the financial returns on innovation projects.<sup>14</sup> These organizations are also 47 percent more likely to assess the impact of innovation on their respective marketplaces.<sup>15</sup>

For academic life sciences organizations, innovation projects need to meet clear criteria based on predefined performance metrics. Measuring the performance of projects in a timely manner helps academic institutions reduce losses and mitigate unnecessary costs. Organizations need to find ways to determine the impact of innovation projects according to specifically defined key performance indicators (KPIs) (see Figure 6). The time that elapses from conceptualization and execution is important, and early, strategic input between industry collaborators or investors and academia is key.

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## Recommendations

### **Build models to objectively assess and compare the effectiveness, financial returns and profitability of innovation projects.**

Develop clear metrics and build expertise to measure financial potential and explicitly compare value across all innovation projects. Clearly delineate benefits that might accrue immediately versus more strategic value that might only be realized in the medium to long term.

### **Assess the effects of innovation projects on the marketplace, either in terms of commercial benefit or some broader social objective**

Innovation projects can have a direct effect on a variety of stakeholders, such as patients, as well as indirect effects through improved public health or disease incidence. Institutions need to identify probable impacts from innovation and calibrate investments or activities to maximize benefits.

### **Develop innovation measurement metrics and establish a regular reporting cadence.**

Establish metrics to address the key objectives of innovation initiatives. Financial return from innovation investment should be a central measure, but you may supplement this with other measures including top-line revenue, costs or time to implement concepts. Broader social initiatives may require other broader objectives.

### **The Parker Foundation sponsors an institute to support breakthrough cancer research<sup>16</sup>**

Established in 2015, the Parker Foundation is a private foundation based in San Francisco that pursues large-scale change in life sciences, global public health and public policy. While acknowledging advances in chemical, radiation and targeted treatment options for cancer patients, the Parker Foundation noted that patient outcomes have remained relatively stagnant over 20 years. In 2016, with a grant of USD 250 million, the foundation established the Parker Institute for Cancer Immunotherapy, a collaboration between scientists, clinicians and industry partners to support the development of breakthrough immune therapies.

The institute is providing funding to support the development of core resources and partnerships to give researchers easy access to tools and capabilities to increase their efficiency. One goal is to overcome many of the obstacles that prevent research breakthroughs, thus accelerating innovation. To do this, the institute has sought to support collaboration, bringing together more than 40 labs and more than 300 top cancer researchers, to more quickly translate immunotherapy research into treatment.

## **Ready or not? Using innovation to stand out in academia**

- How open are your organization's innovation structures and processes?
- To what extent does your organization apply technology in innovation processes?
- In what ways is your organization's approach to innovation patient centric?
- How do you prioritize innovation projects and persuade faculty to wind down unsuccessful initiatives?
- Is your organization's innovation approach outcome-oriented?



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## How we conducted our research

Our survey was conducted in late 2014 by Oxford Economics with 750 life sciences, academic and other industry leaders. The respondents included 152 leaders from academia. University activities comprise three major areas: Research, education and healthcare (where the universities maintain teaching hospitals). In addition, the study sample included a range of life sciences organizations: 255 pharmaceutical, 154 biotechnology firms, 106 medical device companies, 34 medical services providers, 33 diagnostic manufacturers 12 medical distributors, three generics producers and one consumer healthcare company. Executives were from Belgium, China, Germany, Japan, Switzerland, the United Kingdom and the United States.

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**About the authors**

Teri Melese is a Professor Emerita in Medicine at the Rady School of Management at University of California, San Diego. Teri is a thought leader in academic and industry partnering strategy and has authored several articles in this area in high-profile journals. Previously, she ran an independent research laboratory at Columbia University and was a NSF Presidential Young Investigator. She was a founding member of a venture-backed startup company, Iconix Biosciences, and has four patents to her name. She holds an A.B., a Ph.D. and was an American Cancer Senior Postdoctoral Fellow — all at the University of California.

Heather Fraser is a Pharmacist with over 30 years of industry experience in pharmaceutical R&D, consultancy and community pharmacy. She leads the Life Sciences and Healthcare team at the IBM Institute for Business Value, where she has published extensively on the future of the life sciences, healthcare and the emergence of the healthcare ecosystem. Heather has a strong interest in partnering and alliance management between pharmaceutical, biotech and academic organization — topics that she has researched, published and consulted on over the past 15 years. Heather holds an MBA from the University of Warwick. She can be contacted at [hfraser@uk.ibm.com](mailto:hfraser@uk.ibm.com).

Anthony Marshall is Research Director at the IBM Institute for Business Value. He has written on multiple topics including innovation, disruptive technologies and business economics. Anthony has more than 20 years consulting experience, working with numerous global clients in areas including innovation management, digital strategy, business transformation and organizational culture. He can be reached at [anthony2@us.ibm.com](mailto:anthony2@us.ibm.com).

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**Contributors**

Lauren O'Donnell, Global Vice President for IBM Watson Health, Life Sciences Industry; Neha Aggarwal, Senior Advisory Consultant – Strategy & Analytics, IBM Global Business Services; Steve Ballou, Director, IBV Research Hub, IBM Global Business Services; Rachna Handa, Senior Advisory Consultant, IBM Global Business Services; Kathleen Martin, Strategy Consultant – Data Strategy, IBM Global Business Services; James Spohrer, Director, Understanding Cognitive Systems; Lilian Wu, Business Programs Manager, IBM Global University Programs.

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