WHITE PAPER

Build or Buy?

Six Questions to Consider When Investigating NGS Informatics Solutions

DNAnexus®

Contents

Introduction 01

Build or Buy? 02

Six Keys to Success 03

Scalability & Complexity 04

Support for Multi-Omics Research 05

Security, Privacy & Compliance 06

Streamlined Process for Optimal Efficiency 08

Reliability & Extensibility 10

Manageable Operational & Support Costs 11

Future-Proof Your Investment 12

Key Takeaways 13

About DNAnexus 14

Introduction

A bioinformatics solution is the backbone of any successful precision medicine initiative. A scalable, reliable, full-featured solution provides research and clinical teams with functionality that's critical to their work. That makes it vitally important to choose the right one.

Build or Buy?

As part of a new precision medicine initiative, your institution has begun to collect a considerable amount of next-generation sequencing (NGS) data. This brings exciting research and clinical opportunities but also new challenges.

Key among these challenges is handling the sheer amount and complexity of data you'll collect and work with. Equally as pressing is ensuring that you are set up to handle the critical security, compliance and privacy requirements, and track data provenance.

As you tackle these challenges, you need to decide whether to improve, augment or entirely replace your existing bioinformatics systems. Each approach has its advantages and disadvantages. Before you choose, start with an evaluation of your current and future needs.

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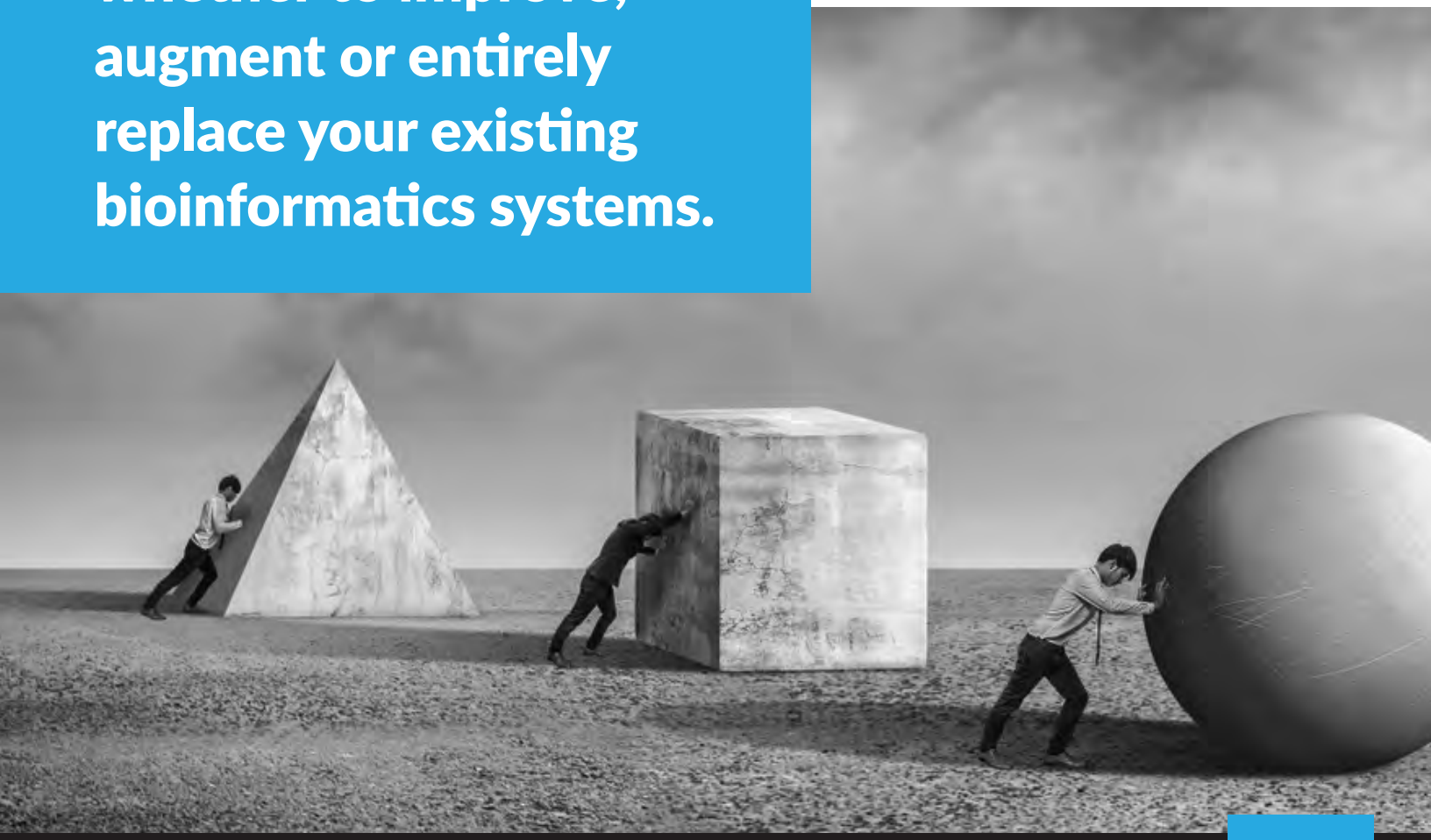


These are the 6 key success criteria for evaluating a bioinformatics solution:

01 Scalability & Complexity

02 Support for Multi-Omics Research

03 Security, Privacy & Compliance

04 Streamlined Process for Optimal Efficiency

05 Reliability & Extensibility

06 Manageable Operational & Support Costs

A Future-Proof Investment

1 Scalability & Complexity

Don't Be a Victim of Your Own Success

With the rise of genomic and other omics testing, many medical centers find they are collecting far more, and more complex data than ever before. Often, their existing data-management and analysis systems can't handle the load. Once-rare annoyances quickly become everyday problems – including backlogged jobs, unplanned downtime, and challenges in finding and accessing data.

If this sounds familiar, you need a bioinformatics solution that can scale with your computational and storage needs, and can also handle increasingly complex research and analysis workflows. You need a solution you can count on to stay performant, while handing steep increases in workload.

Cloud Architectures Provide Scalability

A modern cloud platform automatically provisions and manages new resources as demand increases, preventing computational delays. A well-designed cloud platform will also let you run hundreds of analysis jobs in parallel, with overall execution time only slightly more than you'd need to run just one.

Automate Sample & Data Tracking

If you have an in-house lab with a sequencer producing NGS data, you need to be able to track every sample, and all data related to it, throughout every stage of testing and analysis. As part of this, you'll want to connect your LIMS to your analysis platform. That way, you can track your data all the way from your sequencer to the final report.

A world-class bioinformatics solution will move data automatically from your sequencer to your analysis platform then through secondary analysis, applying metadata to every file. This makes retrieval easier, and full traceability is ensured. As your teams run more tests, leading to more complex analyses, automated metadata tagging is essential to staying on top of all of your samples, and all of your data.

> ***World-class bioinformatics solutions will automate data flow from the sequencer to your analysis platform, through secondary analysis.***
> "

2 Support for Multi-Omics Research

Genomics and Beyond

When it comes to advancing health science and delivering precision medicine, genomics is just one piece of the puzzle. Researchers and clinicians rely increasingly on insights from transcriptomics, proteomics, metabolomics, and other -omics disciplines.

The Promise of Multi-Omics

Multi-omics analyses hold particular promise in the search for actionable biomarkers, which are critical to precision medicine-based decision making. Yet many bioinformatics systems can't effectively handle the analysis and annotation of a full range of multi-omics data types.

Handling the Data Types Your Teams Need

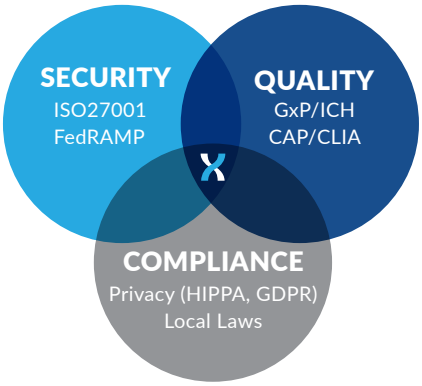
When choosing a bioinformatics solution, look for a system that allows you to integrate complex datasets, and analyze the widest possible array of molecular data types. An industry-standard solution will also allow you to import your own custom-built applications, making it easier to explore and analyze the specific omics data that's relevant to your work.

Many bioinformatics systems can't effectively handle the analysis and annotation of a full range of multi-omics data types.

3 Security, Privacy & Compliance

Three Key Dimensions

Every day, every medical center faces the challenge of protecting patient privacy and managing patient data in compliance with a maze of ever-more stringent security, privacy, and regulatory requirements. To help cope with this challenge, it's essential to choose a bioinformatics solution that you can rely on to ensure the confidentiality, integrity, and availability of patient data, in compliance with regulatory requirements for research, development, and clinical care.



Don't DIY Security, Privacy, and Compliance

Managing a do-it-yourself (DIY) bioinformatics system might not seem so difficult. But a DIY system can actually increase the burden on your staff, when it comes to security, privacy, and compliance, and significantly increase the risk of a patient data incident. The time and effort needed to design, roll out, and maintain processes and tools to protect patient data, and meet applicable regulatory and security requirements, can easily overwhelm staff that should be focused on supporting bioinformatics, not managing risk.

The specific compliance requirements that apply to your operations will depend on where you do business. In the US, for example, all medical centers need to comply, at minimum, with HIPAA, CAP/CLIA, and 21 CFR § 11 regulations. In Europe, you'll have to keep up with GDPR and, starting in 2022, IVDR as well.

Many cloud platforms comply with key regulations, but building a compliant DIY system on top of cloud infrastructure is still a significant effort, and requires expertise that you may not have in-house.

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>
> "

3 Security, Privacy & Compliance

Designed to Be Ready

A world-class bioinformatics solution should incorporate robust authentication and authorization functionality. It should also support fine-grained, systematic and comprehensive tracking of users, objects, and data, at all times. In short, it should empower you to monitor and control access to everything in the system, by anyone who uses it. With these features in place, you'll have a much easier time addressing new security and compliance requirements, as they emerge.

Choose a Trusted Partner

Rather than doing DIY security, privacy, and compliance, follow the lead of medical centers that partner with DNAnexus. The DNAnexus Platform is designed to meet all the compliance and security requirements involved in storing and tracking the use of genomics and multi-omics data. The system-level compliance that cloud providers inherently can't provide, and that you might not be able to build, DNAnexus delivers right out of the box.

4 Streamlined Process for Optimal Efficiency

The Problem of Siloed Teams

Often, research and clinical teams working on related projects will take different approaches to using the same multi-omics data. This can lead to difficulties for anyone trying to integrate their datasets or compare their analyses. When each team is using a different toolset for storing and analyzing data, tracking, versioning, and finding data can become incredibly difficult.

Standardization Is Critical

Start by standardizing data with a bioinformatics solution that lets you follow the FAIR Principles - keeping your data Findable, Accessible, Interoperable, and Reusable. Your solution should also allow you to easily define and roll out standard analyses and workflows, and track which versions of different pipelines are being run. By doing this, you can help ensure consistency of practice across teams. You'll also make it easier to integrate datasets and analyses when conducting retrospective studies.

Choose a bioinformatics solution that follows FAIR Principles.

4 Streamline Process for Optimal Efficiency

DNAnexus Apollo

Powering Translational Research

Translational informatics, focusing on the exploration and analysis of combined molecular and clinical data, has become an essential aspect of translational research. The multi-omics and phenotypic data requirements for these studies are extensive, and complex and legacy tools have a hard time handling this scope. Translational research programs are also commonly hampered by siloed data sources, and insufficient collaboration between teams.

DNAnexus Apollo is a purpose-built bioinformatics solution that supports the wide-ranging, silo-busting work that's essential to any translational research effort. Leveraging Apollo's innovative Cohort Browser, researchers, clinicians, and bioinformaticians can visually explore and analyze clinical and multi-omic data, securely, and in a single, integrated view. Clinician-researchers can explore complex datasets, and build cohorts they can easily and securely share with their bioinformatician colleagues. Bioinformaticians can use these cohorts as the basis for advanced analyses, such as GWAS or PheWAS. They can leverage their favorite Python or R applications within a Jupyter Notebook without leaving Apollo. Sharing their results with collaborators is streamlined and secure, thanks to Apollo's powerful project-based access control feature.

5 Reliability & Extensibility

Focus on What Matters Most

Automating bioinformatics tasks can significantly reduce overall project turnaround time. In addition to moving data automatically off your input source, and through your analysis pipeline, a world-class bioinformatics solution will perform necessary QC steps, run the proper analyses, and generate reports - all without human intervention. That way, your teams can focus on what matters most: their research and clinical work.

Extending Your Platform In Whatever Way You Choose

What about integrating your bioinformatics system with other software used by your teams? While some systems offer integrations, many are too rigid when it comes to working with analytics applications. Further, it can be difficult to integrate with any applications you've built in-house that are custom-tuned to suit the needs of your researchers and clinicians.

To make life easy for your development team, you should also look for a platform that has an open API, and a comprehensive, well-documentedSDK. To ensure that your pipelines are fully portable, your platform also needs to support Docker application packaging, and workflow definition protocols like CWL and WDL. DNAnexus Apollo delivers all these features, along with a performant, secure, cloud-based development environment. With Apollo, your bioinformaticians can work securely with your data, as they build the custom applications that are essential to your researchers and clinicians.

6 Manageable Operational & Support Costs

The Lure of DIY

Building a bespoke bioinformatics system custom-crafted to your organization's needs might seem like an easy call. DIY can be especially alluring if you have a talented, experienced development team.

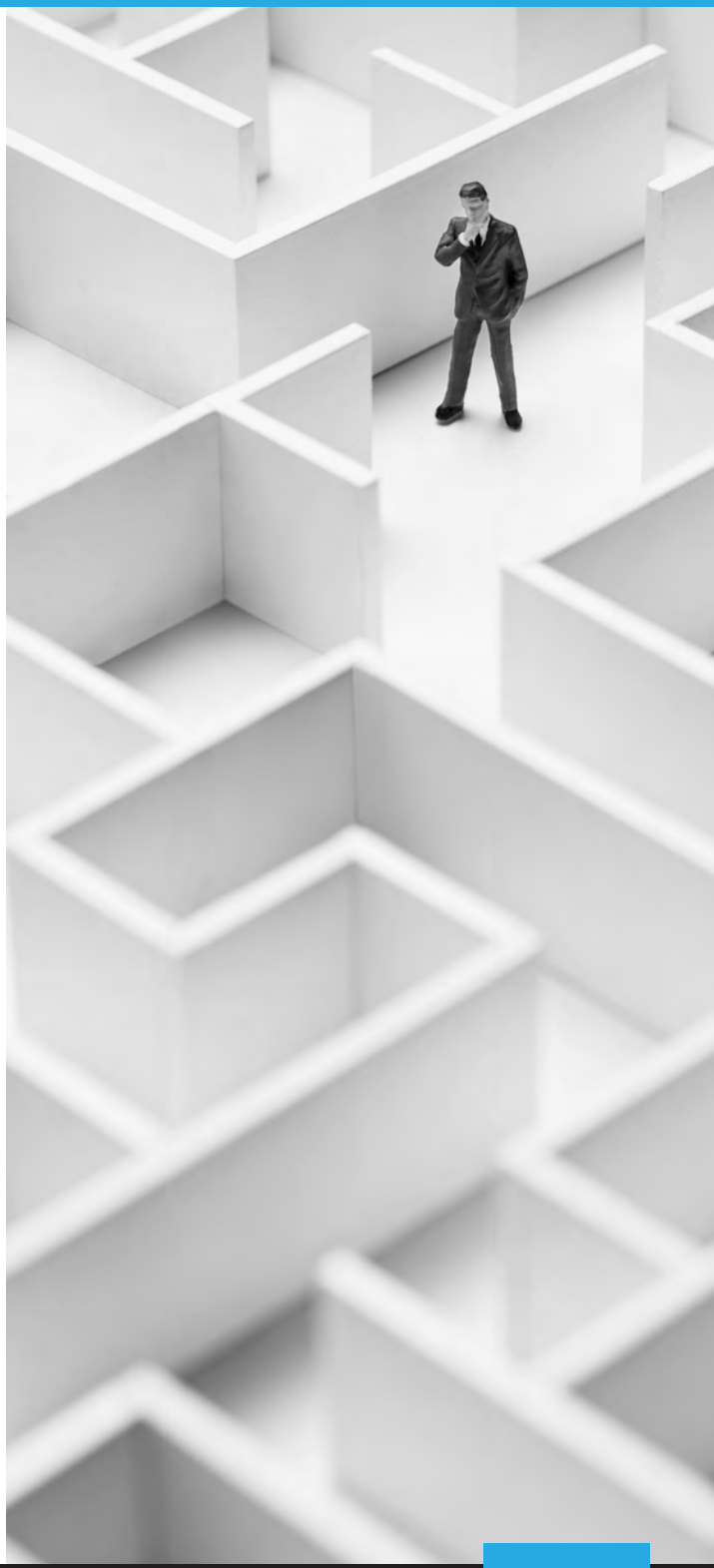
The Costs of DIY

Keep in mind that your costs will go well beyond paying to build the system. You'll also have to pay to maintain and support it, secure it, and scale it as demand expands. Moreover, these tasks may well require expertise that your dev team doesn't have.

Consider also the challenges of keeping up with ever-changing and ever-more complex security and compliance regulations, and with updates to the tools and libraries your dev team uses. Also consider what happens if your dev and support teams can't keep up with this workload. Coping with performance problems and downtime could very quickly turn your DIY system into a bottomless resource drain.

Keep Operational and Support Costs Manageable and Low

Partnering with a trusted provider like DNAnexus will help you keep operational and support costs far more manageable, and also lower than they'd be if you choose to go DIY. Lowering your total cost of ownership frees up resources for spending on other priorities. When looking at your bottom line, DIY might seem appealing up-front, but racks up costs over the long term.



Future-Proof Your Investment

Don't Let Innovation Pass You By

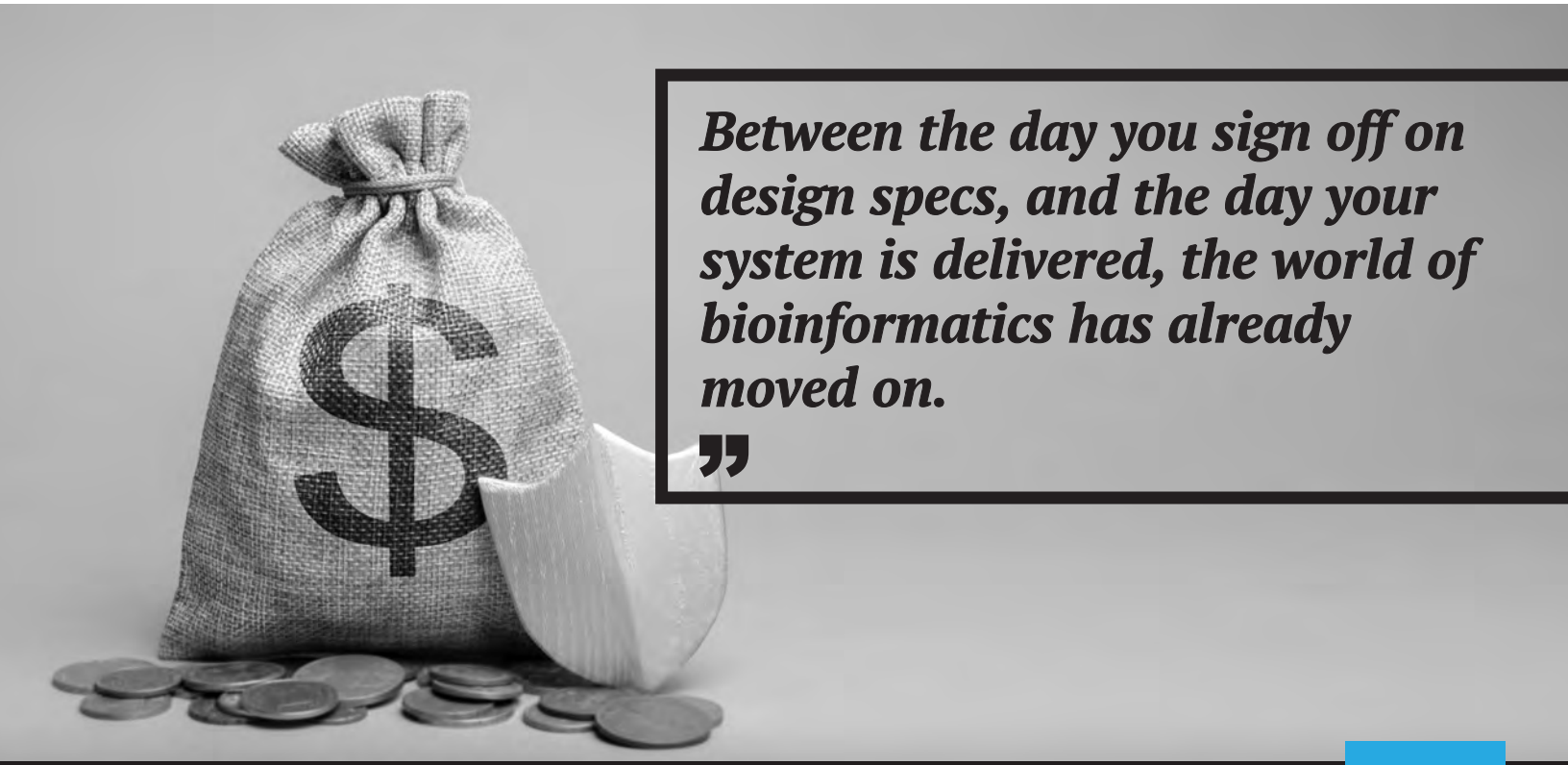
Building a DIY bioinformatics system in-house requires significant time. Technological change won't stop; between the day you sign off on design specs, and the day your system is delivered, the world of bioinformatics has already moved on. Too often, this means that by the time your researchers and clinicians can start using it, it's already outmoded.

You need a solution that incorporates the latest advances in cloud computing, analytics, machine learning, knowledge management, and data visualization, while prioritizing data security and privacy.

Work at the Cutting Edge

When you choose a world-class, cloud-based bioinformatics solution from DNAnexus, you get a flexible and open bioinformatics system, 24x7 technical support, top-notch training and onboarding, and clear SLAs. DNAnexus recognizes that every organization will have unique requirements, and therefore has a track record of customizing solutions to suit each client's specific feature and performance needs.

By partnering with DNAnexus, you empower your research and clinical teams to work at the cutting edge. Backed by the experience and expertise of our scientists and engineers, your teams can deliver the advanced analyses that will take your research and precision medicine efforts to the next level.



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Key Takeaways

Going DIY can have advantages, but also has pitfalls:

+ You can customize your system to your needs
+ Up-front costs may be cheaper
- Scaling can be a challenge
- Handling all relevant data types and analyses can be difficult
- Staying on top of security and compliance requirements is challenging
- Keeping up with technological advances is hard
- Maintenance and support costs can balloon

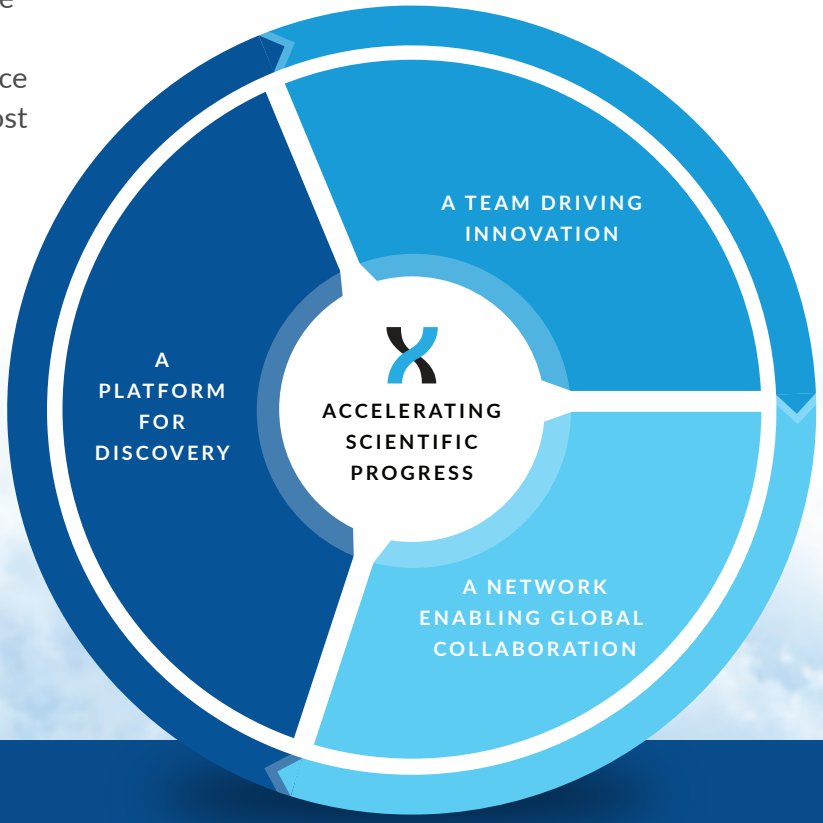
Choose a world-class bioinformatics solution that delivers:

+ Scalability
+ Support for the full range of multi-omics data and analyses
+ FAIR (Findable, Accessible, Interoperable, and Reusable) data management
+ Compliance and security, today and tomorrow
+ Performance and functionality that leverages cutting-edge technology
+ Support for your developers and custom applications
+ Comprehensive - and cost-controlled - maintenance and support
+ Experienced, expert assistance in tailoring your system to your needs

About DNAnexus®

DNAnexus® has built the world's most secure cloud platform and global network for scientific collaboration and accelerated discovery. We embrace challenges and partnership to tackle the world's most exciting opportunities in human health.

We are scientists, engineers, cloud experts, compliance specialists, and thought leaders dedicated to the acceleration of scientific discovery. The work we do enables the world's most important breakthroughs in health science, the development of life-saving cures, and access to critical data needed for new discovery.



Dedicated to Enabling Your Success.

Start the process with a brief scientific consultation to determine how we can help.

Contact us at: info@dnanexus.com

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