From Bits to Bio

Reimagining the Engineering of Living Systems

Radar chart of capabilities with axes: Artificial Intelligence, Human Machine Interfaces, Microfluidics, Cloud Software, Bio Design Automation, Computational Biology, Standards, Electronics. Rings labeled Nascent, Competent, Mature.
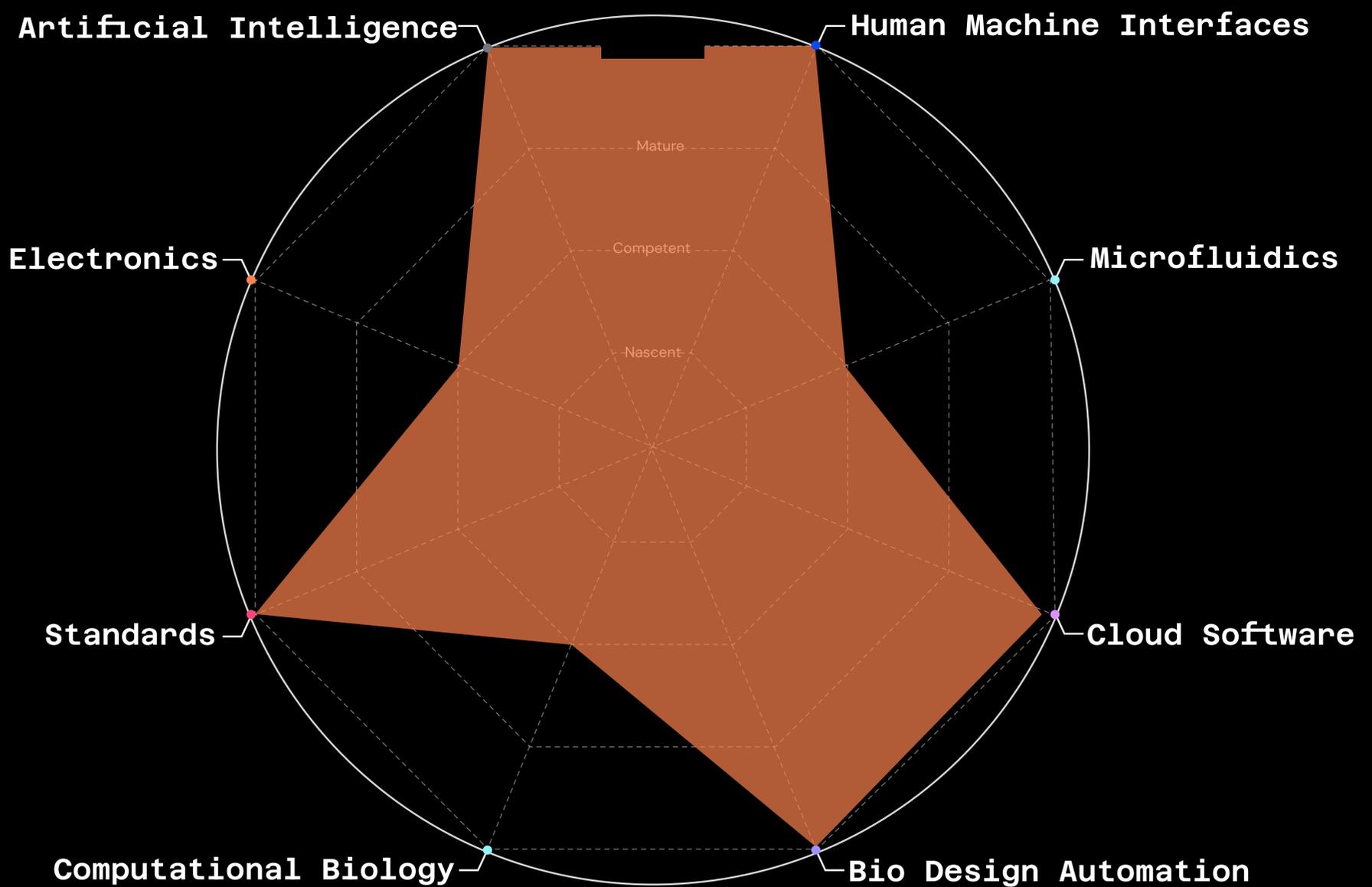
Our capabilities at a glance

Aegion Dynamic

The Challenge

The pharmaceutical and biotechnology industries are under immense pressure. Discovery pipelines are becoming longer, regulatory scrutiny is increasing, and the economics of commercialization demand faster, leaner operations. While many organizations have turned to Global Capability Centers (GCCs) to address resourcing challenges, this model often falls short: GCCs deliver capacity, but rarely deliver innovation.

The result is a persistent gap between scientific potential and operational reality. Digital transformation has the power to close this gap — but only when approached with an applied sciences lens, deeply integrated into the workflows of R&D, manufacturing, and commercialization. At Aegion Dynamic, **we go beyond capability**. We build **Global Innovation Centers (GICs)** that transform how science is executed, scaled, and translated to impact.

Our Approach

1. BioDesign Automation
2. Digital Transformation
3. Digital Twins
4. Build–Operate–Transfer
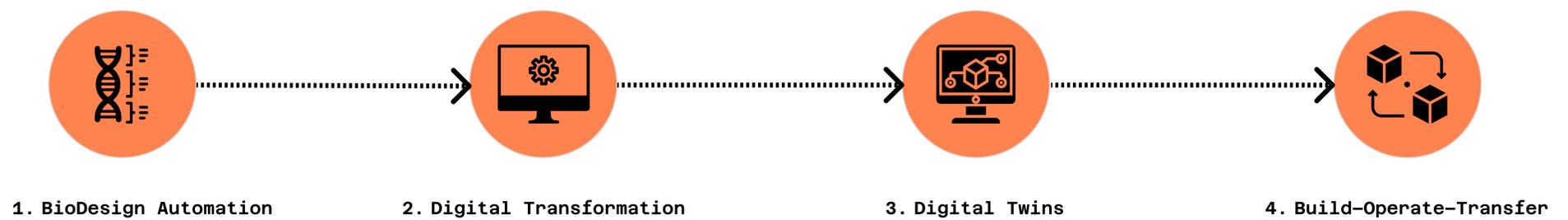
1. BioDesign Automation for R&D Workflows

Our approach begins with the Design–Build–Test–Learn (DBTL) lifecycle, widely used in both synthetic biology and engineering. By importing principles from BioDesign Automation (BDA), we treat R&D pipelines not as static processes but as iterative design systems. This enables us to identify inefficiencies, modularize complex tasks, and propose computationally assisted redesigns of experimental and manufacturing workflows. The result is a systematic framework that reduces iteration cycles, increases reproducibility, and creates measurable acceleration in discovery-to-commercialization timelines.
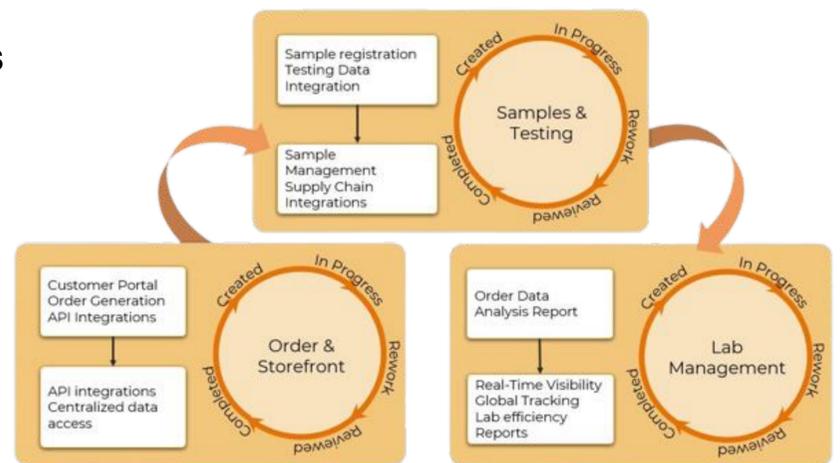

Figure 2 - Model for capturing LIMS as a part of a modular framework. Models allow us to increase interoperability and connectivity across engineering teams.
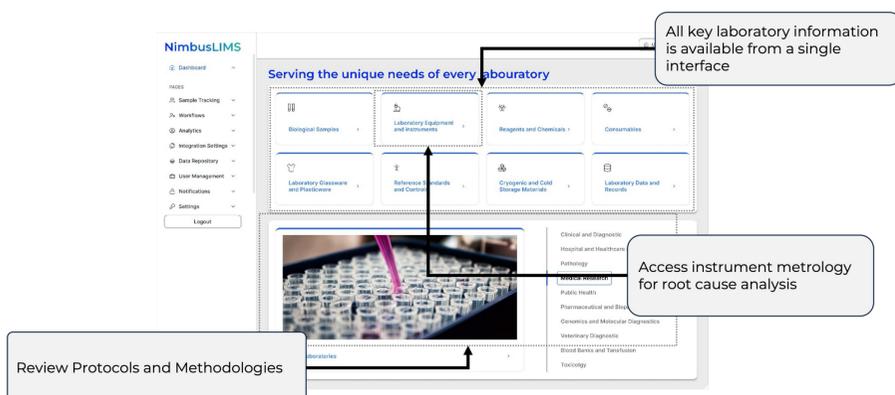

Figure 3 - Example for a LIMS management interface. We take the HMI approach developing modular UI that can interact with complex data models in the cloud. This way we can rapidly iterate on the user experiences.

2. Digital Transformation with Generative AI and Modular Infrastructure

Digital transformation in biotech cannot stop at digitization. In the age of generative AI, we develop an AI layer capable of accessing and reasoning over unstructured data — laboratory notebooks, experiment logs, progress reports, and regulatory documents. By integrating this with structured operational datasets, we enable richer, context-aware insights across the R&D and manufacturing continuum.

This capability is accelerated by infrastructure we have already developed in projects like Nimbus (schema-driven SaaS frameworks) and Constellation (modular ML pipelines). Together, they provide a plug-and-play architecture for cloud and AI services, allowing rapid deployment of tailored solutions without reinventing the stack for each organization.

Our vision of digital twins goes beyond process visualization. Combining the founders' distinct perspectives, we build multi-layered twins that serve diverse pharma use cases:

▪ R&D pipeline twins — capture experimental workflows to enable predictive modeling of research outcomes.
▪ Asset monitoring twins — track equipment health and calibration across labs and manufacturing facilities.
▪ Clinical supply chain twins — simulate batch release, logistics, and regulatory compliance scenarios.
▪ Facility operations twins — monitor environmental variables (HVAC, cleanroom standards, biohazard safety) in real time.

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By connecting these domains, we provide holistic, integrative twins that not only reflect reality but guide decisions across the enterprise.

Our philosophy is rooted in open APIs, interoperable data pipelines, and adherence to standards. This ensures that our systems can interface seamlessly with conventional solution providers, enabling organizations to build innovation ecosystems rather than fragmented digital silos.
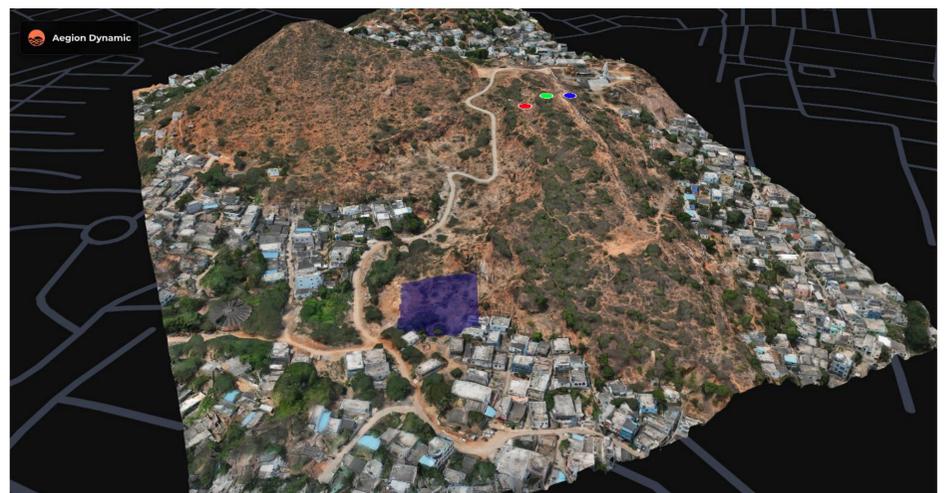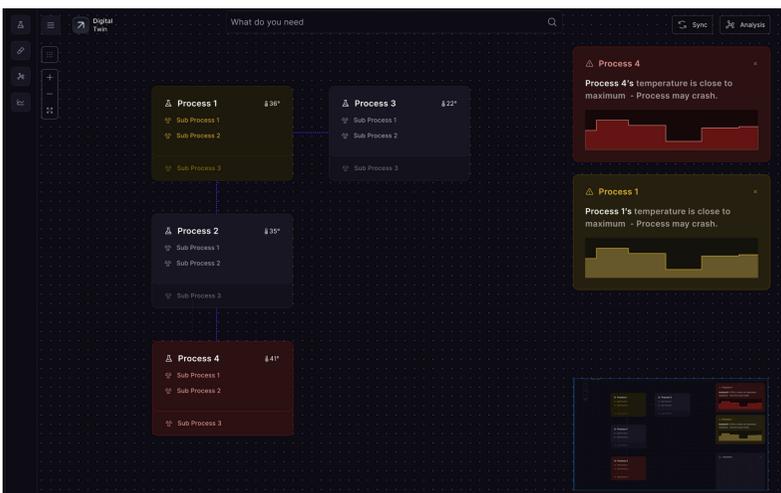

Figure 2 - (LEFT) - Standard Interface for Nimbus Digital Twins allowing the user to get a birds eye view of the entire process flow and allowing one to simulate new parameters against custom built ML models capturing the process flow. (RIGHT) - Standard interface for the Nimbus Digital Asset Twins that show a physical layout of factory floors, plant perimeters, etc. Thus allowing maintenance teams, safety QA/QC systems to digitize their workloads and also provide intelligence that help corelate manufacturing variations.

4. Build-Operate-Transfer: From GCC to GIC

We recognize that scaling digital transformation in pharma and biotech requires not only technology but also people. Through partnerships with local GCC players and developer networks, we can augment manpower quickly and begin scaling workloads as soon as the roadmap is defined.

Our role is to lay that roadmap — ensuring the organization is fully prepared to move from a traditional Global Capability Center (GCC) into a Global Innovation Center (GIC). We de-risk the transition by combining applied sciences expertise with operational execution:

▪ Build — Stand up the digital infrastructure and twin systems aligned to your R&D and manufacturing needs.
▪ Operate — Scale operations with additional capacity through trusted GCC partners, while we stabilize and optimize performance.
▪ Transfer — Hand over a mature, innovation-ready system that can continue to expand under your ownership.

This model ensures rapid scale-up, clear governance, and a structured path from capacity → innovation.

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Reach out to us:
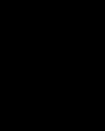
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