Author: Cedric Berger, Knowledge Management Lead

Category: Innovation & Technology
Estimated read time: ~15 min

Basel, Switzerland – July 16, 2025

The Future of Growth in Life Sciences and Biotech Lies in a Genuine Data-Centric Transformation

Introduction

Growth is a central concept in economics and a complex phenomenon in biological systems, where its implications can be both beneficial and detrimental. Be it applied to economy, business or sociological, physical, or biological systems, growth is inherently linked to complexity, rendering growing systems increasingly challenging to comprehend and/or deliver. Growth and complexity are intrinsically linked, yet they are not boundless: the constraints of economic expansion are delineated by the finite resources of our planet (Earth beyond six of nine planetary boundaries) and the limits of complexity are set by our cognitive abilities to grasp it.

Life Sciences, Biotech and Pharmaceutical organisations are no exception to these foundational principles. This is especially true for large pharmaceutical companies that have reached a considerable complexity, leading to various inefficiencies that hinder their ability to generate more value. This becomes especially evident in their efforts toward digital transformation and the implementation of data-centric ways of working, which hinders their ability to fully leverage the vast data accumulated over the past 30 years.

This article outlines the key challenges and underlying complexities faced by Life Sciences, Biotech, and Pharmaceutical companies. With a particular emphasis on the digital aspect, the final section urges managers to equip their organisations with the resources needed to achieve data-centric transformation goals, especially amid the AI hype. Companies that can navigate and master digital complexities will secure a competitive advantage. The race is underway, and it is poised to introduce disruptive new contenders to the field.

Inventory of Complexities

Complex Biology: The treatment of easily targetable diseases has significantly progressed, leveraging insights into the bio-mechanistic functions of approximately 1,600

proteins (Wishart, D. S., et al. 2018). However, many unmet medical needs persist due to the intricate, multifactorial nature of their underlying mechanisms, often involving multiple proteins and complex biological pathways.

These complexities render traditional R&D approaches less effective, necessitating the adoption of more advanced methodologies and technologies. Additionally, the limited understanding of how disease heterogeneity, interplay between (epi)genetics, dynamic molecular interactions and fast-changing environmental factors further complicates drug discovery and research.

Reliable Scientific Findings: As the pharmaceutical industry always relied on public research findings, it is nowadays increasingly challenged by a decline in the reliability and quality of foundational research outcomes, exacerbated by the recent "replication crisis". This issue is partly fuelled by shortcomings in the peer review system, which prioritises mainstream topics and impactful results, influenced by publishing practices that prioritise high-impact results, occasionally at the expense of broader transparency and reproducibility. As a result, companies must invest additional resources to validate and complement research findings, prolonging timelines and inflating R&D costs.

Twisted Patent Logic: The patent system, originally designed to safeguard R&D investments and encourage innovation, is at times used in ways that may hinder competition and slow the pace of innovation. Many companies file patents not with the intent to develop the protected molecules or biochemical processes but to strategically block competitors from pursuing those avenues. This practice ("patent thickets" or "evergreening") slows the pace of innovation, contributes to inflated drug costs and often diverts resources from potentially fruitful collaborations.

Regulatory Hurdles: Drug safety incidents have historically acted as catalysts for regulatory changes, prompting authorities to implement more stringent monitoring systems. Driven by an increasingly complex biology to address (as described above), evaluating the safety and efficacy of modern therapies requires an increased amount of tests yielding numerous and complex digital artefacts to review. In addition, as new markets emerge, the variability in regulatory standards increases across different countries and drug providers must satisfy growing and more diverse regulatory requirements.

Heterogeneous Pricing and Reimbursement: Outcome-based pricing models tailored to a country's income levels present opportunities for broader access but also create operational complexities in implementation and evaluation. The emergence of personalised medicines, such as CAR T-cell therapies, highlights sustainability concerns, as these high-cost treatments are designed for small patient populations, straining healthcare budgets.

Additionally, escalating drug prices have, in some cases, turned essential medicines into "luxury products," increasing risks of theft, counterfeit production, and cross-border trafficking. The growing use of generics and biosimilars further complicates this landscape, as these alternatives introduce competitive pricing pressures while raising questions about market access and the sustainability of original therapies. These challenges are exacerbated by stark differences in pricing and reimbursement policies across countries, complicating global market strategies.

Vulnerabilities in Supply Chains: Globalisation has exposed supply chains to heightened risks, including geopolitical tensions and pandemics, which can cause significant disruptions. Initially considered a cost-saving strategy, relocating key operations such as safety monitoring and production to low-income, low-regulation countries has shown its limits. Rising wages in these regions, coupled with the growing complexity of supply chains involving an increasing number of intermediate players and channels, threaten the sustainability of this model.
Furthermore, the heavy reliance on active pharmaceutical ingredients (APIs) from specific countries, has highlighted the fragility of the system during the COVID pandemic. The emergence of new therapeutic modalities like cell and gene therapies has added additional pressure, as these require specialised manufacturing facilities not always available in existing production plants, making it harder to scale and meet demand.

Mindset, Talents and Business Practices: With the rise of digital natives in generation Z and Alpha, employees increasingly seek jobs that align with their values and offer flexibility (e.g. working from home). This shift often leads to misalignment with traditional line management and other non-agile practices.
In addition, there is heightened competition for skilled talent, particularly within the Finance, Tech and Life Science sectors offering attractive opportunities for employees who combined both a strong business acumen and digital skills. On top of that, there is mounting pressure to improve diversity and inclusion, not only in the workforce but also in clinical trial populations, to ensure equitable access and representation in the development of new therapies.

Challenges or Opportunities?

While the above-mentioned complexities apply to specific domains (fundamental research, clinical development, drug manufacturing, marketing and sales...), they all result in an increase of overall digital complexity i.e. the amount, heterogeneity and intricacy of digital artifacts required to address these businesses. Since the advent of personal computing in the 1990s, experts in various business domains have increasingly relied on specialised IT systems to manage their operations in a siloed manner. While these systems are designed to address specific tasks within their respective domains, they often fail to provide cross-domain solutions, and in many cases, they even complicate the integration process further. For

instance, the pharmaceutical business being by essence a multi-domain business, this approach has resulted in the use of thousands of different IT systems, each with its own vendor-specific internal logic and formats. Consequently, millions of datasets are managed in diverse and inconsistent ways, leading to a fragmented, disorganised data landscape of varying quality. The data is often locked within proprietary structures and logic dictated by the technical constraints of proprietary systems. This fragmentation has created a situation where no single individual is likely to have a comprehensive, end-to-end understanding of the data landscape, hence of the business it is underpinning.

Companies, regardless of their size, generate internal data and utilize external data; the level of digital intricacy increases with the size of the organisation. However, with growing complexity comes inefficiency: how much can a system or an organisation complexify before it loses its ability to perform the tasks it was originally designed for? Historical industry leaders, which thrived in an era characterised by one-drug/one-target therapeutic approaches, simpler regulations, uncomplicated global trade, prosperous economies, relatively low geopolitical tensions and analogical (i.e. non-digital, paper-based) workflows, are now confronting unprecedented challenges.

Recognising this situation, organisations face a pivotal choice: continue with existing structures and ways of working or pursue a strategic digital transformation plan. With the rise of AI (Artificial Intelligence), companies that have fallen behind in digital transformation now have a unique opportunity to ask themselves difficult questions, make strategic decisions, and get equipped with the resources necessary to first harness and then leverage the complexity of their digital ecosystem. In 2017, L. DalleMule and T.H. Davenport concluded their HBR article with this statement: "Companies that have not yet built a data strategy and a strong data-management function need to catch up very fast or start planning for their exit." Given the added value of AI mostly relies on high-quality data, this statement is more relevant than ever. An organisation’s ability to adapt will depend on its financial resilience and willingness to engage in sustained data-centric digital transformation.

Turn complexity into capability

Book a strategic consultation to map your digital ecosystem, assess gaps in AI preparedness, and determine your first high-impact implementation path.