White Paper

Customer Engagement in the Era of Unlimited Data and Artificial Intelligence

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Table of contents

Introduction 1

Prerequisites for success in the market of 2030: Microsegments and personalization 2

The other transformation: Data and technology 4

What is to be done? 7

- Data management 7
- Distribution/decentralization 7
- Cross-functional collaboration 9

References 11

About the author 12

Acknowledgments 12

Introduction

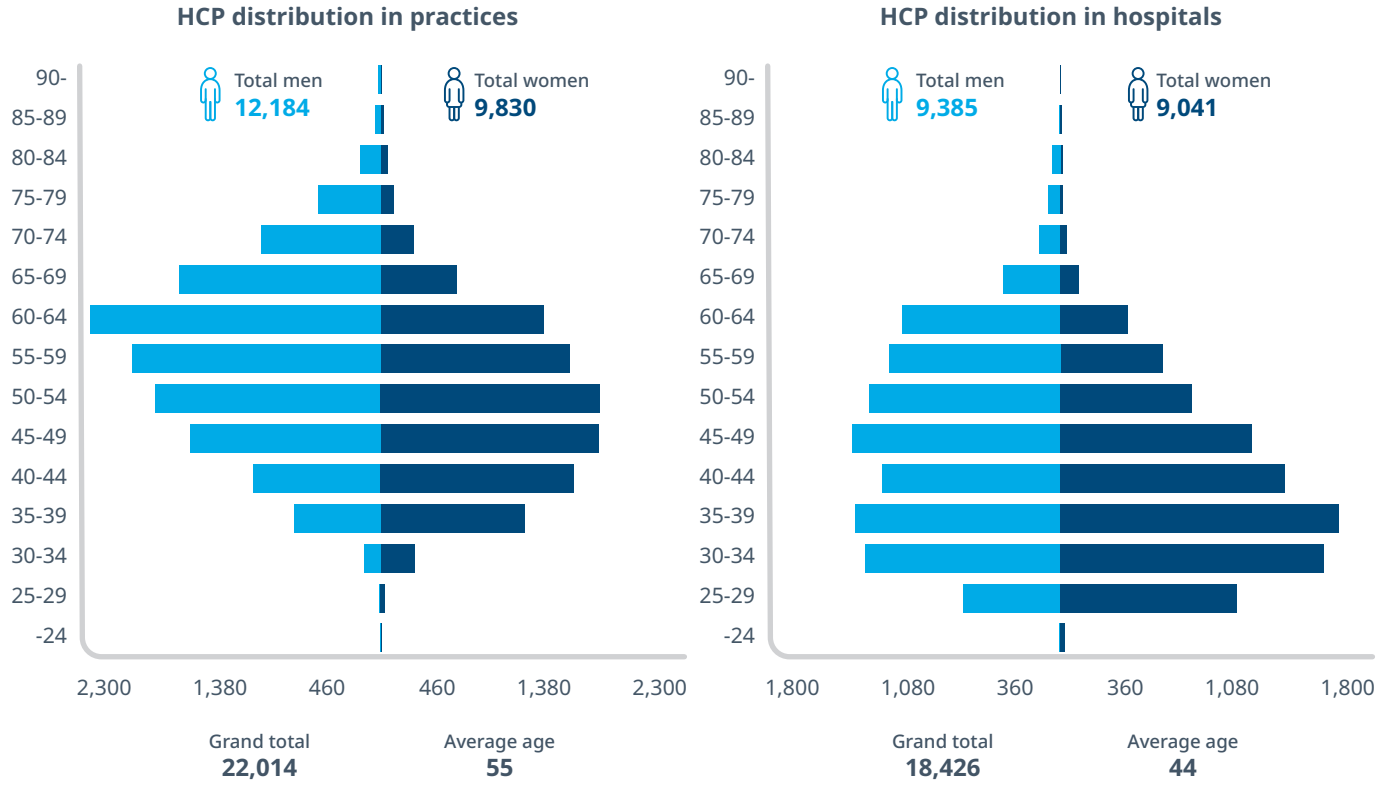
Today the life sciences industry faces profound and disruptive shifts in the competitive and commercial environment. While companies have faced headwinds before, today's challenges are more fundamental, simultaneously intensifying competitive pressures and reducing the effectiveness of the industry's toolkit in managing them. It is akin to antibiotic resistance: as the risks grow, the effectiveness of available interventions steadily erodes. Addressing these challenges necessitates an elemental rethinking of its foundational assumptions and ways of working, all the way down to the operating processes and technology architectures built up over decades.

The industry's pipeline today exhibits an unprecedented level of competitive intensity with every Therapeutic Area (TA) and potential indication contested. Whereas in 2020 fewer than one in five druggable targets had more than five candidates in

development against them, by 2022 that figure had grown to more than two-thirds.[1] This "pipeline herding" risks slowing both clinical development as sponsors compete for patients and sites and intensifying competitive pressure downstream. At minimum, most TAs will be battlegrounds — as evidenced most recently in the obesity and cardiometabolic risk reduction markets — requiring best-in-class commercial precision. And that assumes companies will have satisfied an increasingly rigorous, converging global evidence standard.[2]

Figure 1: One-third of Swiss physicians is expected to retire by the end of the decade

Demographic changes will accelerate the need for the industry to deliver new experiences



Source: FMH, 2023

Should they successfully navigate the development and regulatory journey, these assets will enter a healthcare landscape vastly different from that prevailing a decade ago. A transformational — even epochal — generational change is currently underway. In some markets such as Switzerland, nearly one in three physicians is expected to leave practice by the end of the decade, replaced by a younger, digital-native cohort, often practicing in a group or institutional setting. Further, the customer base is more heterogeneous and exhibits a range of prescribing personæ reflecting differences in practice setting, digital activity, specialty, channel, and content preferences, and more. Consequently, companies need much more agile systems for characterizing their customers, developing tailored customer journeys, and deploying better engagement strategies.

Adapting to this more competitive commercial environment requires better evidence, deeper insights, richer understanding of customers, and, above all, speed. Intense competitive pressure increases the importance of speed and agility, potentially conferring advantage on the company that identifies a customer need faster, or more adroitly converts field-generated insights into more powerful content. Companies must also contend with a customer base that is increasingly technologically enabled to harness its internal, proprietary data and draw its own conclusions about which therapies work best, and in which sequence. This creates additional challenges for customer engagement models that must surface insights about real world product use and enable collaborations with the customers analyzing the data. In other words, deploying traditional promotional strategies faster will not work. Customers need information faster, but not the same information as in the past. This, in turn, requires tech and data architectures that can ingest, link, analyze, and distribute insight at pace.

Prerequisites for success in the market of 2030: Microsegments and personalization

So how should companies prepare for this market? Where should they start? Let us first imagine the market and indeed an individual prescriber in 2030. While an affinity for technology and digital content offers the possibility of new ways of engaging with physicians, it also creates additional challenges. Most obviously this can manifest as a preference for "pulling" content rather than having it "pushed" to them by a company. For many physicians, the first online port of call might be Medscape or PubMed — and increasingly Copilot or ChatGPT — rather than a company's branded product website or scientific content hub. Less obviously, this younger generation has adopted innovative technologies quickly, recognizing that shared case notes and easy access to institutional practice recommendations can enhance patient care.

All these changes have driven an important evolution in physicians' broader engagement preferences. Looking at Canada, for example, IQVIA research identified five distinct physician personæ, reflecting differences in setting, channel, content, and call frequency. While one of these groups — "traditionalists" — aligned well with companies' prevailing commercial models and strategies, it represented a shrinking minority of physicians in most specialties. In contrast, other groups characterized by strong digital engagement preferences and reduced interest in promotional engagement represented larger — and growing — shares of the post-pandemic prescriber population. Research in other markets, from China to the US to Spain, yields similar findings.

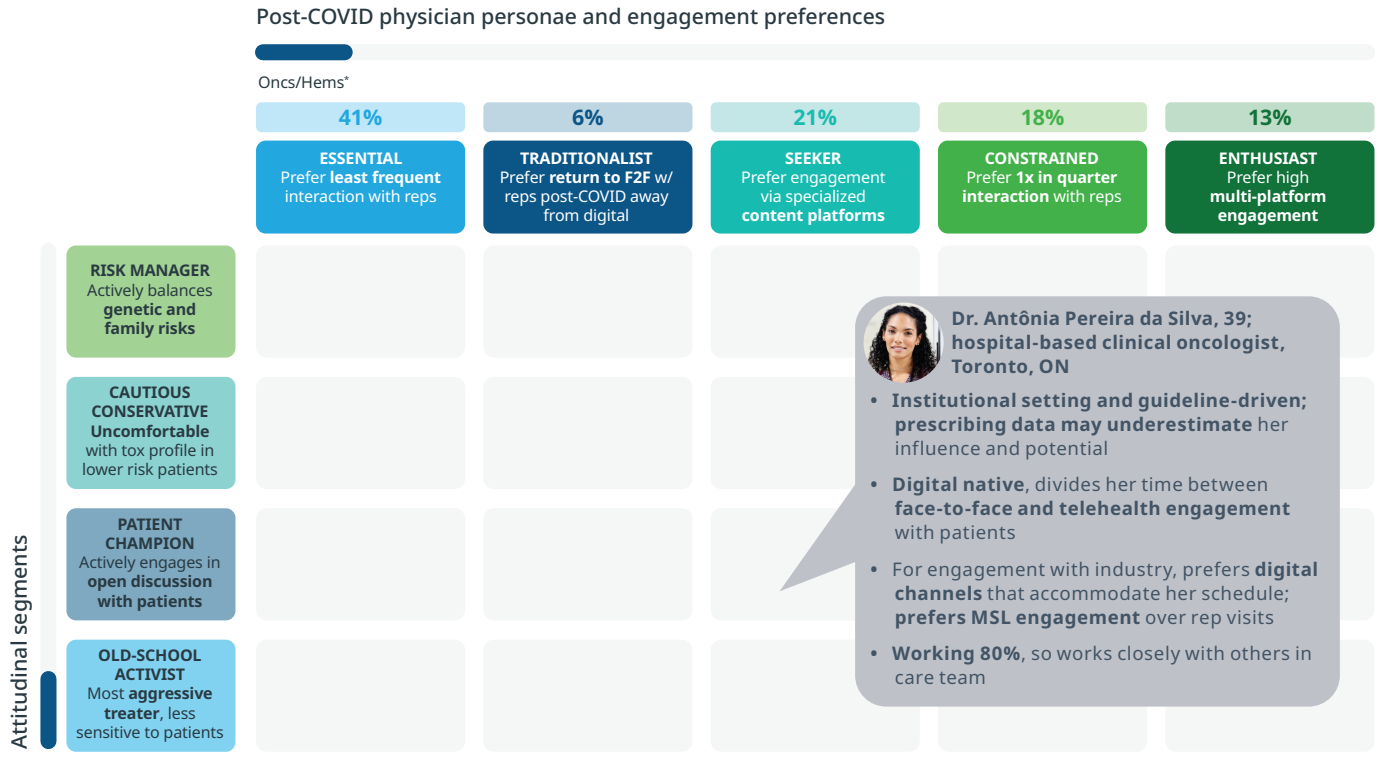
From our research we can develop a portrait of a potential representative prescriber of the future. Dr Antônia Pereira da Silva is a hospital-based oncologist. Originally from Portugal, she came to Canada for medical school and has stayed. Married with a young family, she works four days a week, reliably logging detailed case notes in her Hospital's Information System (HIS) or Electronic Medical Record (EMR) system to ensure care continuity. Well-respected for her clinical insight, Dr. Pereira da Silva has developed a strong online presence, where her followers look forward to her commentary on emerging treatment strategies and her assessment of recent trial results. She actively seeks out information from different content platforms and will interact with Medical Science Liaisons (MSLs), but relatively infrequently. Her hospital does not allow access to promotional reps.

Now let's imagine that your company is preparing to launch a novel targeted therapy for early breast cancer. Based on your company's pre-launch segmentation, targeting, and profiling work, you have identified five distinct attitudinal segments, one of which — "Patient Champions" — likely includes Dr. Pereira da Silva. Your customer profile for this segment characterizes these physicians as the most likely to engage their patients in discussions of treatment strategies and more likely to express concern about possible toxicities and side effects, particularly in an early setting.

Dr. Antônia Pereira da Silva, 39; hospital-based clinical oncologist, Toronto, ON

- **Institutional setting and guideline-driven; prescribing data may underestimate** her influence and potential
- **Digital native**, divides her time between **face-to-face and telehealth engagement** with patients
- For engagement with industry, prefers **digital channels** that accommodate her schedule; **prefers MSL engagement** over rep visits
- **Working 80%**, so works closely with others in care team

If we overlay the prescriber personæ atop the attitudinal segments, we have now twenty distinct target groups, each with distinct priorities, accessibility, and engagement preferences. Traditionally we would worry that this is too many groups and would seek to combine some and to deprioritize others.



But now let us assume your launch is near-simultaneous to that of a competitor with a similar molecule in the same class, and that a third may be only twelve months behind in some geographies; 3-4 comparable therapies remain in early phases. Now the competitive challenge is greater. Condensing segments may be attractive operationally, but it does not allow you to optimize customer journeys effectively. And what if your competitor is ahead of you in terms of digital engagement? Or your internal Competitive Intelligence (CI) indicates they have hired extensively for field-based MSLs in your priority geographies? And how can you engage Dr. Pereira da Silva as an emerging Key Opinion Leader (KOL)? She has an important following, but how can you tap into it?

The good news is that there is an enormous amount of data with which to inform your engagement strategy, and advanced analytics methods — including generative AI and AI-enabled agents — to help accelerate insight capture, content optimization, and other critical elements of the customer engagement process. The unwelcome news is that all of that data risks overwhelming your organization's legacy Information Technology (IT) and analytics systems. Indeed, too much data and insufficient strategic clarity risks slowing you down at precisely the time you need to accelerate.

The other transformation: Data and technology

It has been clear for some time that the explosion of health care data sources and the rapid democratization of analytic technologies would present a threat to the industry's commercial model. In particular, as proliferating data allows tech-enabled actors in the health system — hospitals, payers, providers, patient groups, etc. — to form ecosystems around a shared priority, the role to be played by biopharma grew less assured.[3] While many companies assumed that their products and the expertise built up around specific diseases would ensure them a central role in these emerging ecosystems, in reality many found themselves on the outside looking in, with a set of commercial and medical capabilities misaligned to customers' emerging priorities.

All the while, the volume, velocity, and variety of data have continued to rise while a "Cambrian explosion" in analytic technology — most prominently the emergence of generative AI — has further shifted the dynamics between biopharma and other stakeholders within the health system. Companies have raced to identify use cases and to pilot a vast range of initiatives and programs designed to leverage the potential of the new technology. Many, in fact, jumped straight from

awareness to pilots, without clarifying strategy and governance. Further, initial experience has made clear that the sheer amount of data that can be analyzed using new analytic techniques will quickly overwhelm most companies' legacy IT architectures. Generative AI comes with a range of complex governance challenges that require organizations to address security and privacy in new ways.[4] In healthcare, these risks take on greater importance, given the potential consequences of data leaks or the identification of individual patients. This, in turn, puts greater pressure on companies to upgrade their master data management capabilities, beyond their legacy systems.

Legacy organizations were built for a different healthcare environment, with different customers and different expectations. Yet to meet the rising expectations of a changing customer base, organizations must overcome limitations built into their legacy architectures. This includes everything from relational database systems based on data elements stored as columns in tables to the absence of an effective semantic layer that creates a common data language and enhances a shared understanding and the discovery of data for all users.[5]

Because of the urgency of building speed and agility into commercial operations, company executives identify improving their underlying technology capabilities as a key priority, and initial experience with generative AI (GenAI) has served to reinforce this. On the one hand, the deployment of innovative analytic tools that could enhance competitive agility will be of limited value without "abundant, high-quality, and easily accessible data."[6] On the other, collecting massive amounts of data is not enough to create a competitive edge in the market; data must be transformed into something valuable. Simply put, most companies' legacy IT structures, built for a different era and saddled with years, even decades of technical debt, cannot quickly adapt and scale to the new market prerequisites.

"Companies that stand-up next-gen data architectures and analytics stacks capable of moving at speed will have a meaningful competitive advantage in the biopharma market now emerging."

Unsurprisingly, the magnitude of these challenges has given rise to some innovative new strategies — even philosophies — about the management and use of proliferating data in service of companies' business objectives. Concepts like Data Mesh and Data Fabric help organizations access data across multiple platforms and technologies, leveraging modern analytic and data management technologies as well as organizational transformation. As Zhamak Dehghani, the architect of data mesh, has emphasized, the idea that we can get all the data into a centralized architecture is "almost comically impossible," so modern data and analytics stacks must evolve quickly to adapt to the needs of an expanding data and analytics user base.[7] Companies that stand-up next-gen data architectures and analytics stacks capable of moving at speed will have a meaningful competitive advantage in the biopharma market now emerging.

Data fabric and data mesh — Differences and implications

Fabric and mesh simplify the complex processes of managing and integrating enormous amounts of disparate data that would otherwise overwhelm legacy IT and data systems. They both help to democratize data access and management and enable self-service capabilities quickly and effectively. While both approaches allow organizations to manage the proliferation of data and enable them to connect and share data across a distributed environment, there are some key differences between them:

	DATA MESH	DATA FABRIC
Architecture	• Decentralized data ownership with domain-oriented design	• Centralized ingestion platform connecting diverse data sources
Governance	• Federated governance with localized accountability • Domain teams adhere to shared standards of interoperability	• Centralized governance ensuring consistency and quality across data sets
Data management	• Domain teams manage their data as products, fostering agility and innovation	• Unified platform for seamless data integration and interoperability
Technology requirements	• Requires domain-specific tools and technologies	• Utilizes integrated data platforms and services for real-time data access
Advantages	• Allows domain teams (finance, sales, etc.) to take responsibility for quality, linkage, and metadata of their product • Agility and scalability, enabling faster responses to business changes • Customer- or business-oriented	• Centralized data governance maintains quality, provides a unified view of data sources and incorporates comprehensive metadata management • Strong centralized governance layer ensures consistency and quality and minimizes risks • Provides a single source of truth for data assets
Disadvantages	• Requires deeper organizational commitment to transformation and behavior change • More complex to manage data and compliance risks across multiple decentralized domains	• Less agile, with potential for bottlenecks or single points of failure • IT- or vendor-driven, and may perpetuate silos

Central to these new philosophies is a decentralization of the technology architecture, effectively moving away from highly centralized structures towards more distributed computing and standardized data or analytic products accessible to key end users at the coal face. This requires close alignment and coordination between IT functions and the business, both on long-term vision about the business and the enabling capabilities necessary to achieve it. For many companies, creating decentralized data and analytic products enabling real self-service represents an attractive future state, particularly if it enables faster, more agile insight capture and customer engagement. At the same time, while a self-service model enabling business users to make data-informed decisions without relying solely on data analysts to provide information, for an industry with complex data privacy and governance challenges to balance, centralized data teams may be the correct approach in some cases. This is especially true for companies that want to prevent data quality issues, require strict compliance, or cannot afford data misuse.[8]

What is to be done?

Faced with a market in which every space — each asset, each prescriber, each patient — will be contested, companies acknowledge a need to move faster, and to operate differently. Nevertheless, despite substantial investments in everything from omnichannel capabilities to GenAI, returns lag expectations. Proliferating data begets nearly unlimited use cases, and complex privacy and governance obligations warrant careful examination of alternatives. Despite the scale of the challenges, some important foundational elements have emerged, which should guide companies as they seek to transform their operations. As we explore these, we will return to Dr Pereira da Silva, and seek to understand how these elements will enable the delivery of a better experience to her.

Data management

As we saw, the volume of available information about a potential prescriber — prescribing history, setting, digital affinity, channel preference, online presence, etc. — offers the tantalizing possibility of developing highly customized tailored experiences that lead to better outcomes, potentially even getting to "segments of one." Achieving this, however, necessitates upfront investments in modern Master Data Management (MDM), particularly if GenAI or agents will be deployed. As many commentators have pointed out, processing combinations of structured and unstructured data may increase the chance of errors because, while internal teams and subject matter experts have the relevant knowledge, they generally struggle to codify that knowledge, potentially introducing unanticipated risks.[9] Indeed, more data means more challenges.[10] Understanding the journey your data has taken, how and when it changed, and who was responsible for those changes, is vital for data protection and compliance purposes. All MDM systems need to be able to capture and store historical changes to master data, and audit and track modifications as well as implementing role-based access to master data, and providing encryption, masking and access control features.[11]

In a modern, cloud-based architecture, all the relevant information and data germane to Dr Pereira da Silva would be connected and managed in a fully compliant manner. Not only would different pieces of structured and unstructured data be linked to an individual customer record, but a centralized governance layer would facilitate appropriate compartmentalization of medical engagement and promotional communication. Thus, in addition to knowing that Dr Pereira da Silva was a "seeker" and a "patient champion", someone planning a customer journey or an interaction with her would also understand which websites and online journals she prefers and the types of content she has searched for.

Now imagine Dr Pereira da Silva has just received diagnostic results for a patient, confirming node-negative early breast cancer. She is aware of your forthcoming therapy so goes online to do some additional research, to determine if it might be something to discuss with her patient, who has a follow-up appointment in 48 hours. Ideally, you should be able to leverage this information to tailor a scientific engagement journey aligned with her preferences, inclusive of optimized content. A modern, multi-domain master data management strategy, designed with GenAI and agents in mind, represents a critical prerequisite.

Distribution/decentralization

As we have seen, legacy IT structures and data architectures are poorly aligned with company priorities of agility, speed, and precision. While most organizations maintain some central data repository, data often remains siloed and frequently inaccessible to potential users in a different functions or domains. Data from the Customer Relationship Management (CRM) platform might, for example, sit with Sales Operations, while data on customer experience sits with a Marketing team, and the Business Intelligence team owns sales data. Accessing and linking these data to run analytics on overall commercial effectiveness has historically required extracting different data in different formats from diverse sources — occasionally with some diplomacy required — and then significantly refining and transforming them to produce meaningful insights. Unsurprisingly, with the spectacular growth in the scale of available data — volume, variety, and velocity, as well as the range of potential users — these legacy systems and approaches have quickly been overwhelmed.

USING AGENTS TO OPTIMIZE DR. PEREIRA'S EXPERIENCE

Agents represent one of the most exciting applications for GenAI and Large Language Models (LLMs) and offer the potential to accelerate dramatically the design and deployment of the highly personalized experiences customers increasingly expect. Autonomous agents can make decisions and take actions independently and can — from intelligent lead identification to post-contact performance measurement — significantly enhance the impact and effectiveness of omnichannel strategies.

In the specific example of Dr. Pereira, the deployment of agents could have some immediate benefits:

- **Seamless omnichannel experience**: Agents can ensure that the content Dr. Pereira sees reflects her inquiries about early breast cancer and her patient orientation across all channels — email, social media, web, and even face-to-face
- **Precise, compliant handoffs**: Given the importance of compliance with regulations governing medical and promotional communications, AI agents can ensure the flow of consistent and compliant information between teams, including information about Dr. Pereira's pain points and engagement preferences.

The promise of agents is compelling, but companies will need to execute major changes in their data architectures and IT systems. Agents need to be able to interact effectively with the infrastructure and the data, often in non-linear or asynchronous ways. Real-time interactions between, say, an agent focused on content and another focused on surfacing channel preference or digital affinity information, require a flexible, dynamic data architecture spanning multiple domains.

In response — and facilitated by a broad range of innovative new tools for data extraction, storage, management, and transformation — companies are increasingly moving towards alternative models that combine some centralization with decentralized or distributed data access, the standardization of data or analytic products within domains, and self-service. These models not only make it easier for an end user to extract the insights they need quickly and without having to navigate through a complex set of unconnected data assets and silos, but enable the deployment of more sophisticated analytics, including Generative and agentic AI tools.

For Dr Pereira da Silva, who has only two days until her patient's next appointment, the legacy model simply could not deliver any meaningful or actionable insight. In contrast, in a more decentralized model enabled for AI applications and agents, Dr Pereira da Silva's online searches related to your product could be ingested at speed and used to trigger an appropriate action, such as an AI agent pushing curated, relevant data or content to her through a consented channel, triggering an MSL contact within the key time window, or even alerting to an early access program for appropriate patients. Further, interaction with relevant content can then be evaluated to adapt and refine everything from messaging hierarchies to assumptions about the KOL advocacy ladder.

Data extraction grows more complex as data sources proliferate, while at the same time GenAI and other advanced methods require a data infrastructure that is flexible, scalable, and efficient. Dehghani notes that "the dispersed nature of operational data isn't a flaw. It's not an imperfection. It's not the result of poor planning. Dispersal is operational data's natural state. The overall operational data corpus is supposed to be scattered."[12] In contrast, most legacy systems consist of functional silos of customer data with no centrally governed solution, encumbered by complex business rules that make it difficult to establish a single 360-degree view of a customer.

Today, particularly as GenAI and other powerful analytic tools offer the tantalizing potential of faster and richer insight capture that drives commercial precision, companies seek to build more decentralized architectures that effectively enable "self-service" by the end user. Rather than waiting for central teams to ingest, curate, transform, and distribute data in analytics-ready form, modern data architectures balance the need for robust, federated governance and data protection with the commercial priority to enable speed and precision in the field, and within individual commercial or domain-oriented functions. All this rests on an understanding of data as a product, with common, self-describing semantics or syntax, decentralized data ownership, and self-service infrastructure as a platform. In this model, relatively small, cross-functional teams own the development, deployment, and maintenance of all data assets belonging to their business domain. Domain data sets, services, and Application Programming Interfaces (APIs) are developed with a product-driven mentality, putting emphasis on discoverability and usability.[13] Innovative new tools, from GenAI-enabled coding support to knowledge graphs that surface the relationships between the data and model them for the user, allow non-technical users to manage and use data easily as part of their daily work, without the delays and complexities endemic in the legacy model.

Cross-functional collaboration

In our experience, customers implementing new platforms or technologies, from CRM to omnichannel models, often struggle to derive full value from them because they rarely make meaningful changes to their internal ways of working. Further, IT teams and business users often still operate in very distinct and separate functional silos. These different organizations may operate in different ecosystems, each with its own vernacular, providers, and ways of working. And of course, the potential implications of many of these changes may appear threatening or at least uncertain to people in specific affected roles.

Nevertheless, the successful implementation and — more importantly — the effective use of a modern data and analytics architecture represents a critical priority for biopharma companies facing substantially greater competitive intensity across the asset lifecycle. Consequently, there must be greater collaboration between IT, data, and business stakeholders within each company. This prerequisite has, in turn, given rise to new roles, in particular the "analytics translator" or "analytics engineer." These roles combine technical and non-technical skills; they can act like software engineers but have a deep understanding of the business. Unsurprisingly, these unicorn-like profiles are in short supply.

For a busy analyst in Medical Affairs, however, the priority of understanding how best to engage an influential emerging thought leader like Dr. Pereira da Silva necessitates rich, accurate, and near-real-time information about customers. While an IT organization can work to stand up a more decentralized data architecture and modern MDM, it may not have sufficient understanding of the complexities on the ground, ranging from specific compliance requirements for medical engagement to how a busy clinician uses digital tools in practice. An analytics engineer can help to bridge this gap, ensuring that the data or analytic products available to the analyst reflect these complexities, thus enabling effective self-service without the added burden of modifying, cleaning, or reworking outputs to fit the business need.

Analytics engineers or translators build and maintain robust information pipelines to produce high-quality datasets for downstream users, such as analysts and business stakeholders. As data proliferates, this has grown steadily more complicated, especially given the variety of data sources, structures, and origins. Because the original purpose or intent of the source data is often wildly different than that of the analytical function that a data ingestion pipeline is trying to fulfill, a simple business question can require a complex pipeline, and that pipeline gets more complex when you do not understand the intricacies of the source data system.[14] Without understanding these complexities, particularly in a GenAI-enabled system, a range of additional governance and privacy risks can present themselves.

"Data and the design of a company's technology and analytic architectures must be understood to be key competitive assets, rather than simple infrastructure."

The frustrations expressed by executives about the disappointing returns from their substantial investments in enterprise technology and workflow automation platforms reflect the lack of sufficient attention to driving fundamental business process changes. Investing in a best-in-class CRM system and then not mandating its use means far too little data is entered, undermining the ability to surface insights with which to boost agility and precision. Similarly, the explosion of use cases that has accompanied GenAI's emergence is not a substitute for reexamining core processes or reimagining end-to-end domains. One recent study estimated the failure rate of projects deploying AI to be close to 80% and noted that in many cases these failures occurred despite technical success.[15] Technology is rarely a panacea and is even less so when realizing its full potential necessitates foundational architectural changes and profound changes in ways of working.

In this new life sciences market, in which the need for speed, agility, and precision — amplified by the proliferation of data and the democratization of its use — are critical, data and the design of a company's technology architecture must be understood to be key competitive assets, rather than simple infrastructure. Deriving the full benefit from these assets, in turn, necessitates a strong and consistent commitment to transformation. Just as data and architecture must be seen as assets, so must digital transformation be understood to be a core process, rather than a project. The speed at which the biopharma market is evolving requires steady and sustained focus if companies are to adapt to what customers and patients need next. With such focus and commitment, physicians like Dr. Pereira da Silva can get access to the information they need, through the channels they prefer, in time to ensure that their patients benefit from the best available, evidence-based care.

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Acknowledgments

The author wishes to thank several colleagues for their generous and thoughtful contributions through the thought process, as well as comments on earlier versions of this paper. Charles Rink, Emiliano Gummati, Pieter Lommelen, and Souvik Sengupta provided invaluable ideas and critical feedback along the way.

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