LabTwin®

AI Use Case Catalog

Impact of AI on operational results
in bio-pharmaceutical industry

LabTwin AI Lab - Trusted Partner in Your AI Journey

Who We Are

LabTwin

LabTwin GmbH is a laboratory software company on a mission to create the next generation of integrated, connected smart digital lab tools. Their leading AI- and voice-powered digital lab assistant enables hands-free real-time data capture, structuring and exchange with informatics systems at the point of experimentation. Both user- and data-centered, LabTwin saves scientists time while increasing data quality and interoperability. LabTwin GmbH is an independent Germany-based company backed by biopharma supplier Sartorius and Boston Consulting Group Digital Ventures.

Sartorius

The Sartorius Group is a leading international partner of life science research and the biopharmaceutical industry. With innovative laboratory instruments and consumables, the Group's Lab Products & Services Division concentrates on serving the needs of laboratories performing research and quality control at pharma and biopharma companies and those of academic research institutes. The Group has been annually growing by double digits on average and has been regularly expanding its portfolio by acquisitions of complementary technologies.

Boston Consulting Group

Boston Consulting Group partners with leaders in business and society to tackle their most important challenges and capture their greatest opportunities. BCG was the pioneer in business strategy when it was founded in 1963. Today, they work closely with clients to embrace a transformational approach aimed at benefiting all stakeholders—empowering organizations to grow, build sustainable competitive advantage, and drive positive societal impact.

Table of Contents

Accelerate your organization's adoption of AI.

BOOK A CONSULTATION

Introduction

Industry 4.0 comprises advanced manufacturing technologies that capture, optimize, and deploy data. These advances will affect every manufacturing domain according to Boston Consulting Group[1]. By leveraging the power of artificial intelligence/machine learning (AI/ML) research, lab processing can become smarter and more efficient, enabling biotechnology and pharmaceutical organizations to create more value and improve efficiency. AI/ML infrastructure lowers the cost barriers for mass innovation between, across, and within business units. Resulting cost advantages, shorter innovation cycles, and new revenue sources will define the winners of tomorrow. We want you to be part of this future.
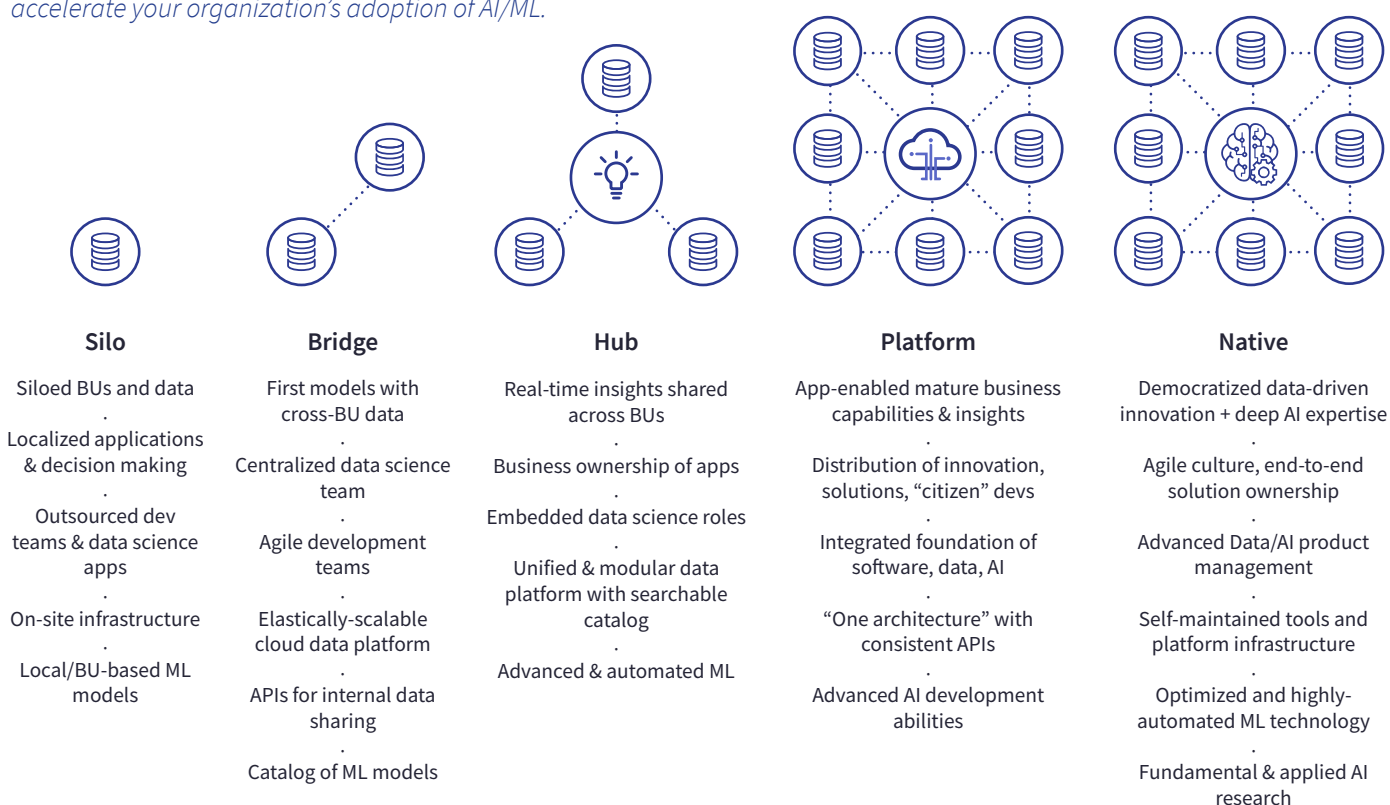
The current share of dedicated AI platforms represents a small percentage of R&D, split evenly between in-house and contract research and manufacturing. However, USD94 billion worth of investments, paired with 186 partnerships between pharmaceutical companies and AI technology firms are rapidly reshaping the rules of the game in the biotechnology and pharmaceutical industry and fueling three times faster growth. A number of companies have recognized the first mover advantage and are investing heavily to build a competitive edge. It will be impossible for latecomers to catch up to their exponential growth.

Organizations that adopt and integrate AI technology are better positioned to double their cash flow by 2030. Interestingly, though, when looking at research and manufacturing organizations, many have significant room to grow when it comes to AI maturity. According to an ESI Thought Lab study and LabTwin's research, over half (65%) of surveyed biotechnology and pharmaceutical organizations have only just begun their journey to AI maturity[2]. These organizations categorized themselves as either "Silo" or "Bridge", meaning that they either use AI tools in isolated cases to solve specific bioinformatic problems or that they have only just begun pilot programs aimed at improving cross-department data exchange.

Figure 1: Stages of AI maturity [3]

The aim of this whitepaper is to help you think through various aspects and benefits of building in-house AI capabilities to unlock operational efficiency. It will delve into biotechnology- and pharmaceutical-specific use cases powering some of the aforementioned high-value results. It will also show how working with an experienced partner like LabTwin can help you accelerate your organization's adoption of AI/ML.

Silo	Bridge	Hub	Platform	Native
Siloed BUs and data	First models with cross-BU data	Real-time insights shared across BUs	App-enabled mature business capabilities & insights	Democratized data-driven innovation + deep AI expertise
Localized applications & decision making	Centralized data science team	Business ownership of apps	Distribution of innovation, solutions, "citizen" devs	Agile culture, end-to-end solution ownership
Outsourced dev teams & data science apps	Agile development teams	Embedded data science roles	Integrated foundation of software, data, AI	Advanced Data/AI product management
On-site infrastructure	Elastically-scalable cloud data platform	Unified & modular data platform with searchable catalog	"One architecture" with consistent APIs	Self-maintained tools and platform infrastructure
Local/BU-based ML models	APIs for internal data sharing	Advanced & automated ML	Advanced AI development abilities	Optimized and highly-automated ML technology
	Catalog of ML models			Fundamental & applied AI research

> **Organizations that adopt and integrate AI technology are better positioned to double their cash flow already by 2030.**

Demonstrating the Potential of AI With Use Cases

AI brings many benefits to the pharmaceutical research and manufacturing sector. When adopting AI, organizations often begin by exploring their existing data – typically using external tools. Encouraged by their results, an organization may then initiate their first in-house projects aiming for cross-department collaboration. However, sooner rather than later, they may learn that they lack the necessary data at the acceptable quality, as well as the processes and infrastructure to process these data and build meaningful and powerful AI applications. As a result, some organizations spend hundreds of millions of euros on acquiring biotech and technology companies to access high quality data. For others, the prohibitive cost and perceived risk of improving infrastructure leads to a dangerous slowdown of momentum. Moreover, the in silico applications of AI/ML get the most attention in the media, which often sends inexperienced organizations in search of the holy grail.

LabTwin's team recommends a pragmatic focus on "boring" operational/logistics optimization, which made companies like Amazon, Tesla, or Moderna into efficient supply chain machines. Our pragmatic DNA is rooted in the longstanding traditions of our investors, Sartorius, and Boston Consulting Group.

At LabTwin, we enables organizations to break their stalemate by identifying inefficiencies and optimizing processes to improve business results. We help organizations analyze their processes and build solutions to remove inefficiencies. Mathematical models enable us to measure the expected benefits of each solution in real-life scenarios, uncover bottlenecks, and carefully estimate the costs and options, unlocking the most economical path forward.

Sample Use Cases

This section contains a selection of sample use cases to illustrate possible "gateway" projects that can help you to obtain early internal funding for infrastructure changes. Please treat them as examples, because in our experience, the use cases that are generated internally and that focus on unique problems and opportunities within your company are the most powerful. At LabTwin, we are aware of each client's individual goals and it is always at the center of our collaboration.

25% of scientists' time can be recaptured and spent on the R&D tasks[4], given efficient allocation of lab resources.

Use Case 1: Converting protocols

One of the most common and time-consuming problems we have seen at many labs are moving protocols/SOPs from the old platform to the new one. When a new software is added to the lab tech stack it also means that over thousands of those files must be migrated and adapted to the new software. For each protocol this task can take between 15 min to 3 hours.

As one valuable feature of LabTwin is to walk the scientists through their protocol and simultaneous data capture while working at the bench, we are aware of the time spent to translate existing protocols into a voice-friendly actionable flow which can be read by LabTwin. One of our goal being to save time, we are commited to leverage the recent advances in AI to automatize this task. Thanks to the GPT4 integration, our Protocol Ingestion feature is enabling the scientists to load any protocol from a Word format or their ELN and instantaneously convert it into a voice-friendly actionable format which can be opened and read out in LabTwin. This leads to tremendous time savings when done on a grand scale of files and allow non-LabTwin experts to generate protocols optimized for voice.

Use Case 2: Querying information at the bench

Scientist often find themselves in the lab looking for crucial information to continue their experiments. More than often, this means they need to deglove and search through files, internal systems, or the internet to find the information they needed.

By being the digital lab assistant of the scientist at the bench, it is an obvious task for LabTwin to be able to answer any queries and save the trouble of searching for the information. This is why we are building the Scientific Inquiries feature and providing LabTwin users with the possibility of querying their enterprise databases or

scientific ones. Scientists can now perform hands-free scientific calculations such as diluations, without having to remember how to use the formula. They can also query some standard scientific knowledge, such as the molecular weight of a molecule they are working on and leverage it for future calculations. By connecting to internal databases or instrument manuals repositories, LabTwin can as well provide scientists with live support for troubleshooting their instruments.

Use Case 3: Automatic data structuring

Collecting process data while performing successful, sometimes time-sensitive, experiments is a clear challenge for the scientists. Despite the IT team providing dedicated tools for entering this data in the computer, such as ELN or LIMS systems, scientists still prefer to collect dirty notes on paper or Word documents while working at the bench, and then spend extra time later on to clean, organize and upload their data. This represents a huge amount of time spent in data wrangling and cleansing and is often postponed to weeks after the experiment, creating delays in data sharing and prone to transcription errors.

At LabTwin, we believe that the secret to efficient data capture is the user-friendliness of the user interface and are resolved to offer scientists with the most natural voice input technically possible and automatize the rest. Thanks to the recent progress in Natural Language Processing and Large Language Models, an intelligent system is now able to recognize the different entities present in a text (such a reagent, a value, …) and attribute them to some standard categories. With LabTwin, as we are already processing the voice-to-text through our scientifically trained models, we have the perfect opportunity to process this data, label it, interlink it and classify it before automatically sending it to the correct repository. Our feature FlashFill, to start with, enables the scientists to automatically fill up data in a table format without following a precise order or remember exact nominations. This is particularly useful for any description of characteristics of a series of items (animals health check, cell cultures review, imaging slides description…).

All the scientist has to do is to verbally describe the status and LabTwin automatically organizes the different parameters or values in a table template. This automatic data capture mode has proved more than 20% time savings in an internal test compared to inflexible non-intelligence data capture modes.

Our workshop helps your team to identify and qualify the most impactful applications of AI in your company. We apply proven innovation methods to develop strong use-cases supported by a business case and implement the best candidate in your company.

Use Case 4: Anomaly detection

Experiment execution is frequently impeded due to failing machines or sub-optimal protocol configurations, which in turn leads to delayed projects, higher resource use, and longer development cycles. Unfortunately, experimental process data and analysis is often missing, leaving companies blind to these inefficiencies.

By being able to capture and structure data live at the bench, a digital lab assistant can also provide a quick analysis of the entered data and check its validity compared to standard values or previous work. The rapid feedback to the scientist would allow for an immediate correction of the out-of-range value or recording a justification. On a second step, deviations and anomalies can then be automatically highlighted on the report and enable fast identification of issues.

We recently developed a solution for a client from the chemical industry that identified the root cause for a high experiment failure rate. We implemented a structured and semi-automated process to collect data about the core events and parameters of experiment execution. This dataset enabled our client to quickly identify the root cause of the high failure rate, resulting in 57% fewer errors after just 6 months (see below the success story).

LabTwin AI Lab Success Story: Experiment Execution Optimization

Business Problem

One of our clients, a Swiss chemical company, wanted to structure group data to address errors that had appeared throughout their long-term experiments. Experiments had failed previously because data was not centralized making information unavailable, and samples were lost. Historically, almost 1 in 3 experiments failed due to lack of access to information. Due to a fragmented IT infrastructure data was captured and stored in various platforms.

Pretotype

We started to map out the data input and output with the client. As a first step, users captured and shared data with our team, from which we were generating a manual output. This data outcome definition phase took 2–3 iterations until we understood how the data should be structured and what patterns occurred during data capture. We helped the users optimize their data capture to ensure that a highly informative output could then be delivered.

Prototype

Based on this research, we built a prototype of an automated reporting system in 2 days. This system considered metadata and complex rules from the customer and was able to automatically generate structured and labeled reports.

Value

Operations analytics enabled the client to investigate and analyze the experiments and decide on optimization steps based on their expertise and actual performance to date. The group implemented numerous optimizations of their processes based on the provided analytics data, which led to 57% less errors over time.

This shows the value of an ML prototype based on a real-life client business problem. We believe that anyone could achieve such ROI, despite a fragmented IT infrastructure.

Use case workshop → **Pretotype: human outlines data model** → **Feedback loops to settle on data output** → **Prototype: build an automated solution** → **Launch prototype to client**

Figure 2: Process flow from use case definition to prototype launch to a client.

Once the Snowball is Rolling: Microservices for AI

Microservices are incredibly useful tools to ease AI implementation in an organization. They are comparable to applications running on your mobile phone's operating system. Most users do not need to know the technical details of an application in order to use it, which makes applications easy to adopt. At the same time, only one infrastructure is needed to leverage an entire ecosystem of microservices performing specialized functions.

Each microservice can operate in its own container and there is no need to fully connect all microservices architecturally. Only one data platform is needed to facilitate independent use of microservices by teams from different departments, countries, and organizational levels. This approach enables the cost of developing each new microservice to drop by many orders of magnitude, when compared with developing traditional monolithic software solutions. The low cost of developing new microservices is a sound investment in future competitive advantage, as it enables organizations to innovate in parallel rather than

in the project-based linear way characteristic of traditional software projects.

LabTwin GmbH has expertise in accelerating this process – from the first "killer microservice" to helping you build a platform that enables your teams to develop their own solutions in the future. We call it an "AI Snowball Effect".

The low cost of developing new microservices enables organizations to innovate in parallel rather than in a project-based linear way characteristic of traditional software projects.
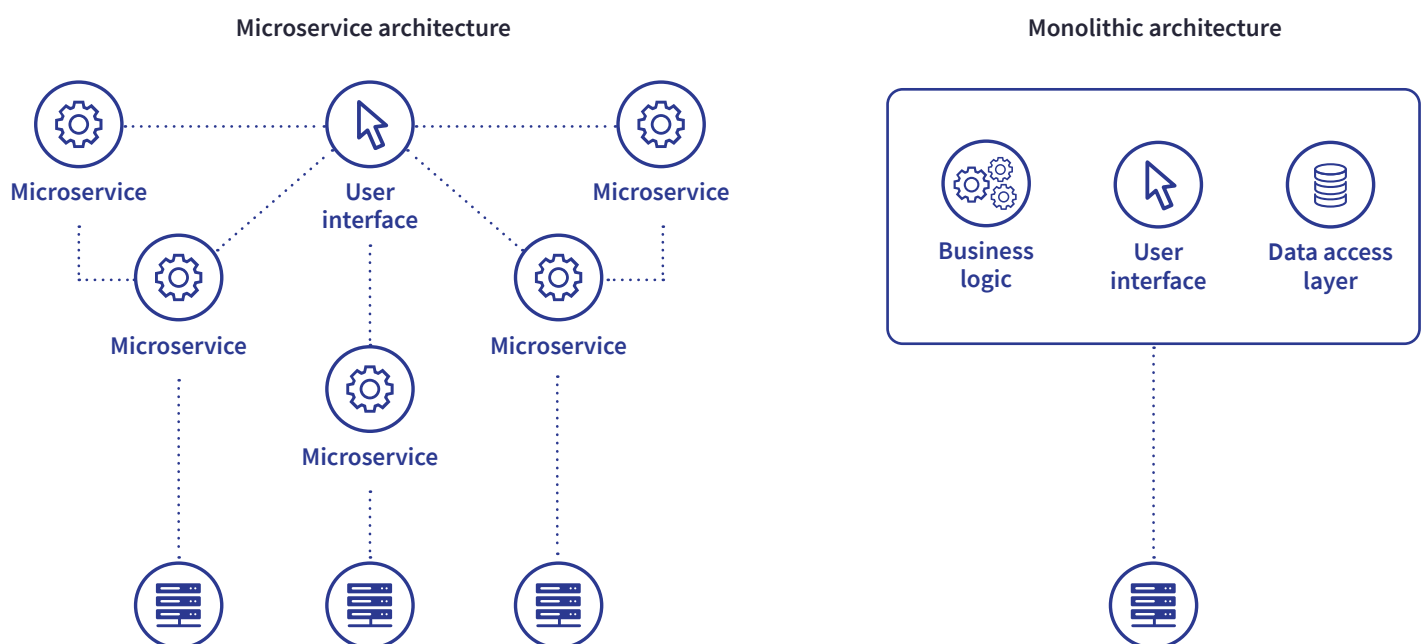
Microservice architecture

Microservice   User interface   Microservice

Microservice   Microservice

Microservice

Monolithic architecture

Business logic   User interface   Data access layer

Figure 3: Microservices units act as independent units to execute a task whereas in monolithic service approaches everything is combined in one[11].

Successful Development of In-House AI Capabilities

AI will create up to $2 trillion of value in supply chain management and manufacturing, according to Mckinsey[12]. Applying data science, machine learning, and AI is expected to augment all aspects of the manufacturing process (from process optimization to production to supply chain logistics).

LabTwin GmbH helps ambitious emerging data leaders turn this statistic into reality by streamlining decision-making throughout the organization, reducing disruptions, and ultimately maximizing profit, quality, and service. By generating broader, deeper, and faster insights from structured and unstructured data, leveraging proprietary AI/ML and advanced analytics technologies, and offering access to effective AGILE teams experienced in delivering fast results, we help organizations transform into enterprises able to make continuous decisions within an empowered, inspired, and faster continuum.

Feel free to explore more of our resources by visiting www. labtwin.com or book a call with one of our digital experts.

Discuss how AI can support your goals?

BOOK A CONSULTATION

Resources

1. https://www.bcg.com/en-us/capabilities/operations/embracing-industry-4.0-rediscovering-growth
2. https://econsultsolutions.com/roi-ai/
3. Harvard Business School course materials for Competing in the Age of AI.
4. https://resources.perkinelmer.com/corporate/pdfs/downloads/bro_the-true-cost-of-lab-inefficiencies.pdf
5. https://www.benchling.com/customer-stories/bolt-threads-optimizing-biomaterials-with-data-driven-insights
6. https://www.benchling.com/customer-stories/anagenex-teaming-up-with-a-trailblazer-to-develop-next-gen-drugdiscovery
7. https://www.benchling.com/customer-stories/enveda-building-a-backbone-for-machine-learning-in-life-sciences
8. https://www.benchling.com/customer-stories/syngenta-driving-faster-seed-and-agricultural-development-at-a-globalscale
9. https://www.beckmancoulter.com/de/blog/diagnostics/consequences-of-unplanned-downtime-in-the-laboratory
10. https://www.agilent.com/en/promotions/prevent-lab-downtime-a
11. https://docs.oracle.com/de/solutions/learn-architect-microservice/index.html#GUID-1A9ECC2B-F7E6-430F-8EDA-9 12
12. https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-ofai-on-the-world-economy

LabTwin AI Lab offers expert advice and solutions to help your operations reach peak efficiency.

> Identify and qualify the most impactful applications of AI in your company

> Gather a multi-disciplinary team in your organization

> Apply proven innovation methods

> Develop strong use-cases supported by a business case

> Implement the best candidate in your company