SMART LABS

The right space for **the future of research**

SIEMENS

Table of contents

Solving complex problems in complex environments

In the past few years, many life science organizations have witnessed a scientific breakthrough, thanks to shifts in more data-driven approaches across the value chain, greater collaborations, digital transformations and advancing CEO priorities.[1] A new bar has been set, and companies are now willing to move beyond convention to solve the toughest challenges and reap the biggest rewards.

But staying competitive in this new paradigm requires the right spaces and environments where scientific research can thrive – where researchers can work across disciplines, domains and borders with technologies like automation, artificial intelligence (AI), cloud computing and web-based platforms. Where they can collaborate in real time, in safe comfortable spaces, to expedite discovery, improve time to market and increase competitiveness.

Working against tough challenges

Today's scientific spaces need to address the most pressing challenges facing the industry. Whether you're an accredited university, an established global pharmaceutical company or a start-up looking to disrupt your own field of expertise, the pace of work and the pace of change may be giving you unique challenges. Here are a few of the most common challenges facing life science organizations around the world.

The time-to-market squeeze

Because of vast disruptions in human health and global supply chains, time to market has never needed to be faster. "With universities playing a bigger role in economic development and private enterprise investing heavily in R&D, competition is tougher than ever, and costs are growing significantly," explains Jens Feddern, Head of Life Science, Siemens Switzerland.

Navigating research and development, multiple clinical trial stages and regulatory approval often takes global firms up to 15 years, with price tags in excess of $1 billion. And start-ups need to develop and get their products to market fast to attract investment. The race to discover solutions, receive certification, scale production and launch products is a defining competitive factor.

Research and development is changing

The problems that today's scientists are working to solve are increasingly complex, requiring researchers to work across multiple disciplines, with an integrated approach, to deliver breakthroughs.

At the same time, the nature of scientific work and the ways researchers collaborate is changing rapidly. Advances in technologies like automation, AI and data processing are reducing the number of hours scientists spend in the lab physically working on experiments, freeing them up to focus on analysis, synthesis and ideation.

Spaces are changing

Driven in part by the automation and digitalization of science and in part by generational and cultural shifts, the spaces where science happens are changing. "Researchers are spending less time in traditional lab environments and more time in desk-based and collaborative spaces," says Jens.

Open-source tools are enabling better access to scientific knowledge and data, and new kinds of research spaces such as co-working spaces, incubator hubs and DIY labs are providing spaces for research entirely outside the lab. There is also a growing focus on energy efficiency and reducing the climate footprint of R&D.

What does the lab of the future look like?

With such an array of changes and challenges happening in life sciences, a new approach to how research spaces are designed and built, both physically and digitally, is required. A recent report from design, engineering and architecture firm Arup Group states, "Science and research have been seminal in creating today's world, and their role in the future development of mankind will most likely be even greater. Creating excellent spaces and environments for scientific research and researchers to thrive will, as a result, become even more important."[2]

At Siemens, we see the lab of the future having these four fundamental characteristics:

1. People-focused
Traditionally, the research facility has been built to provide the required functionality for a specific type of science or research. While functionality will continue to be important, the future research lab will have a greater focus on user needs, experience, comfort and wellbeing.

2. Flexible spaces
Along with demand for highly specialized spaces, the design of research facilities will become more generic. New highly flexible spaces will focus on technology and tools rather than custom designs for a particular branch of science.

3. Digitalization and automation
Powerful new tools will help collect, analyze and share data, and experiments can be monitored remotely for collaboration, regulatory and safety purposes. People and product safety will remain top priority while intelligent, automated tools will make it easier and more cost-effective to achieve.

4. Remote collaboration
Driven by increasing connectivity, future labs will have a cloud-based component to aid multi-national, real-time co-working. Labs could be a cluster of likeminded organizations and spaces rather than a single building and provide researchers with access to equipment and a community outside the institutional framework.

Solving tomorrow's challenges with today's technology

At our headquarters in Zug, Switzerland, we've created the lab of the future with technologies available today. Our smart pilot lab is a "room in a room" solution that demonstrates what's possible in terms of state-of-the-art technology, smart building controls, safety, flexibility, user satisfaction, remote collaboration and more.

Created together with our partners at H. Lüdi, the lab showcases our automated building technologies and controls, human-centric lighting, as well as the electrical infrastructure and the lab-space setup and expertise.

A modular, fully integrated smart lab
The lab is fully modular and equipped with the integrated smart technologies needed to provide real-time collaboration and utmost safety and energy efficiency. A complete life-science ecosystem of technologies and controls is running seamlessly in the background.

Components of the smart lab:

- Three state-of-the-art fume hoods featuring tailor-made laboratory ventilation
- Specialized modular ceiling components designed to reduce air velocity
- Fully integrated automated controls for HVAC, ventilation, temperature, humidity, fire detection, access control and more
- Lighting based on human biorhythms, indicating dangerous situations
- Video surveillance
- Digital twin for virtual observation and collaboration capabilities

H. Lüdi provides the ceiling components, media carrier, air treatment, exhaust and lighting. All Siemens automated control system components are standardized and pre-engineered to work seamlessly with these components and meet global standards and modular design principles.

Leveraging the digital twin
As a virtual representation of a product, process, or performance, the digital twin enables the individual process stages to be seamlessly linked. This creates a consistent improvement in efficiency, minimizes failure rates, shortens development cycles, and opens new business opportunities: In other words, it creates a lasting competitive edge.

"

The lab functions as a sandbox to test our smart infrastructure solutions and concepts under realistic and replicable life science conditions.

Gregor Jetzer, Global Product Manager for Life Science at Siemens.

The benefits of standardization and integration

Combining standardized agnostic lab components with pre-engineered control systems and modular design results in flexible labs that can easily integrate with building management systems. Integrated automated control systems greatly speed up facility build and verification, as designs, processes and documentation already exist.

- Quick commissioning
- Quicker, easier verification
- Easy to replicate
- Cost-efficient maintenance

Siemens uses the pilot lab to train its life science technicians, help make commissioning even easier and ensure efficient implementation and replication.

What does the smart lab deliver?

- Maximum safety and security of people and assets
- A better, more comfortable user experience
- Easy remote collaboration and troubleshooting
- Opportunities for co-development, testing and training
- Complete flexibility and replicability
- Extreme energy efficiency

"

As an integrated part of the lab, the digital twin enables researchers to interact with experiments virtually in real time, enhancing collaboration and workflow efficiency.

Gregor Jetzer, Global Product Manager for Life Science at Siemens.

A space to meet your specific life science objectives

Explore our smart lab use cases:

Enhance collaboration
As scientific work becomes more collaborative, interdisciplinary, and technologically enabled, labs will need to accommodate new ways of working. They will need to include both physical and virtual collaborative spaces and be supported by excellent cloud infrastructure and connectivity.

The smart lab's building controls, such as HVAC, lighting, ventilation, security, and fire detection are strategically positioned to avoid locking in a particular configuration. "Its robust IT infrastructure supports growing data storage, processing and virtual collaboration," says Tim Walsh, Global Portfolio Manager for Life Science at Siemens, "and its connected equipment, sensors and devices allow researchers to monitor, adjust and analyze experiments remotely, further enhancing collaboration."

Optimize energy efficiency
Energy consumption in laboratories is typically five to ten times higher than in office buildings. This is primarily due to ventilation requirements for worker safety and research integrity: two thirds of the energy used in a life science laboratory is associated with meeting air change requirements and comfort control.

"The smart lab offers a range of products, solutions and services that improve performance and make the lab more efficient," says Ivo Boruta, Global Marketing Manager for Life Science. "The integrated smart components offer a range of usage data t hat lets building operators cut consumption of heating, cooling or power when the lab is not in use. This minimizes the lab's climate footprint and can help organizations meet their sustainability objectives."

Ensure prompt, accurate emergency response
Whatever is being tested or developed in a lab, from explosives to live viruses, safety of people and assets is the highest priority. That's why the control systems in our smart lab are designed to react quickly to health and safety triggers.

"Integration is the key enabler to safety," says Tim. "When temperature, humidity, ventilation, particle measurement and fire detection are integrated, it's possible to monitor and analyze conditions in the lab in real time. If smoke is detected under a fume hood, a series of other safety alerts and protocols will be activated, along with guided operation and evacuation in hazardous situations."

> We're welcoming life science customers and partners from around the world to our smart pilot lab in Zug – so they can experience first-hand the smart lab technologies of tomorrow that are already available today.

Tim Walsh, Global Portfolio Manager for Life Science at Siemens.

Visit the smart lab of the future

And start your journey to more efficient and sustainable research and development

Come and see our global head office where we've implemented all our latest and greatest smart building technologies, including our smart lab for life science.

- Get a demonstration – see, feel and experience the technologies in the lab to determine if a modular, integrated smart solution is right for you
- Conduct a real-world test – bring a challenge from your own lab into ours to see how it fares under flexible smart lab conditions
- Co-develop your own smart lab – starting with our plug 'n' play components, let's co-develop your future smart lab

[1] 2022 Global Life Sciences Outlook, Digitalization at scale: Delivering on the promise of science
[2] "Future of Labs", Arup Group, 2018

Can we support you?

Get in touch here

Smart Infrastructure combines the real and digital worlds across energy systems, buildings and industries, enhancing the way people live and work and significantly improving efficiency and sustainability.

We work together with customers and partners to create an ecosystem that both intuitively responds to the needs of people and helps customers achieve their business goals.

It helps our customers to thrive, communities to progress and supports sustainable development to protect our planet for the next generation.

usa.siemens.com/lifescience

Siemens Industry, Inc.
3617 Parkway Ln.
Peachtree Corners, GA 30092
United States of America

Telephone: +1 (800) 333-7421
info.us@siemens.com

Status 07/2022