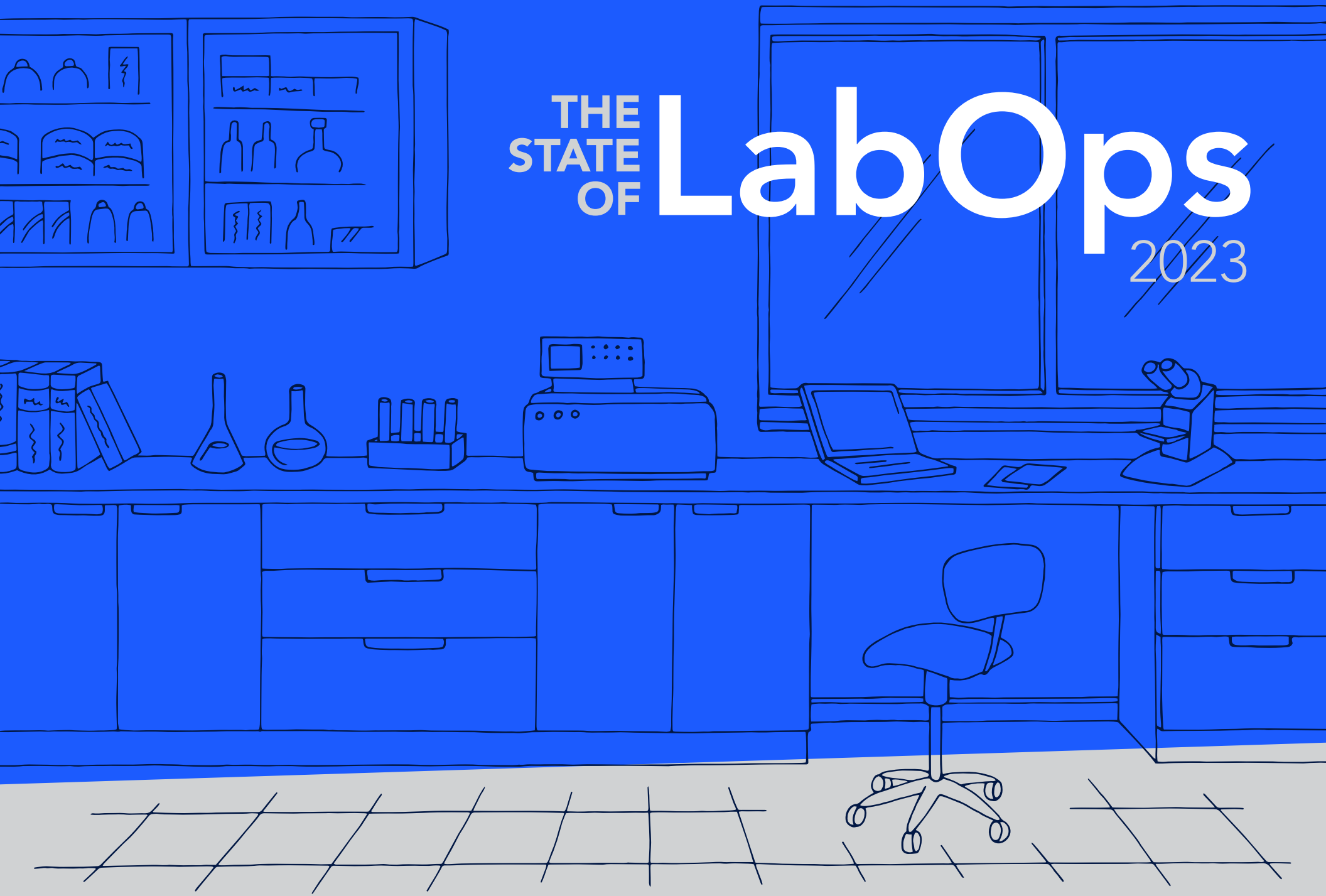
THE STATE OF LabOps 2023



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FORWARD

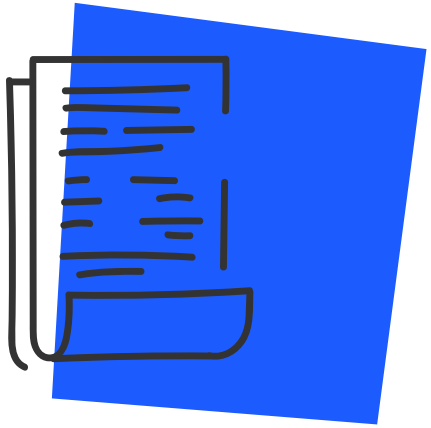
Over the past two years, scientific discovery has been thrust into the spotlight like never before. Facing an unprecedented global health crisis, researchers advanced life-saving treatments, once-ironclad timelines shrank, and the world observed and cheered developments long ignored by the masses.

Now, different headwinds are beginning to swirl. Talk of a global pandemic has given way to talk of a global recession. Lab directors are bracing for economic turbulence, budgets are being squeezed, and all involved are being tasked with a seemingly impossible assignment: do more with less.

Suddenly, the lever most responsible for the lab's efficiency and excellence – laboratory operations (aka LabOps) – is once again tasked with pulling a rabbit out of a hat.

As a practice, lab management is as old as research itself. But, as technology has advanced, so too has lab management evolved and transformed into LabOps. Here, we attempt to encapsulate the current state of LabOps, define its key players, and forecast its ever-evolving trajectory amidst a murky future.

Sridhar Iyengar, PhD
CEO and founder, Elemental Machines
November 2022



DO MORE WITH LESS

Today's charge could be just what LabOps needed

A persistent number has snuck its way into business headlines for months: twenty percent.

"Cerebral to Cut 20% of Staff as Operations Shrink"
"Intel Layoffs: 20% Staff Reduction in Some Divisions"
"Snap Lays Off 20% of Its Staff"

Perhaps the enduring number is a carefully calculated one, widely mimicked only by chance. Or perhaps, the thinking is simpler: surely we can make do with 20% less. After all, everyone else is doing it.

Hot and cold

In the not-too-distant past, when interest rates were at historic lows, throwing debt at endeavors, equipment, and employees with the hope of stimulating growth was, if not prudent, widely tolerated.

Today, with interest rates reaching their highest levels in more than twenty years, investors are reconsidering their moves, companies are revising their projections, and leaders across regions and throughout industries are revising their plans – abruptly.

In the world of scientific research, the mandates are daunting and occasionally contradictory:

- More data-driven certainty
- Less time for new technology
- More efficient equipment usage
- Less wasted space
- More safeguards against spoilage
- Less red tape impeding discovery
- More promising candidates
- Less time to market

Adding insult to injury is the fact that, thanks to record inflation, a 20% year-over-year cut to a given budget would actually require a 30% reduction in resources. To do more with less in the coming months and years will require not just new levels of urgency or determination, but new systems that reduce waste and increase productivity with a vengeance.

Evolution and innovation on the horizon

The good news? Boundaries have a way of forcing ingenuity; restrictions, promoting efficiency. Throughout history, such moments are when persistent inefficiencies are finally shed. Obstacles tolerated for too long are finally released.

The next 12-24 months could well become the span that forces

LabOps to evolve – the push scientific organizations need to:

- Reduce OpEx and CapEx by eliminating unnecessary equipment, service plans, and warranties based on actual usage data

- Automate the collection of operational data with lab-wide alerting & monitoring

- Make better use of equipment on hand to improve team productivity by deploying dependable equipment reservation systems

LabOps tech companies like Elemental Machines are setting their sites squarely on helping labs conquer those three goals for the next 12-24 months.

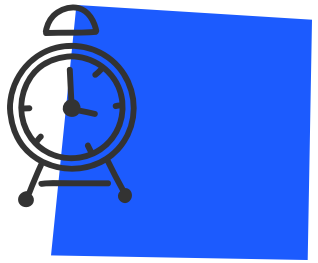
Lab-wide usage data can offer detailed insights regarding which assets gain favor, and which gather dust, both in real time and over time. Proprietary software, hardware, and data science can now work in tandem to draw usage data from virtually any object with a power cord.

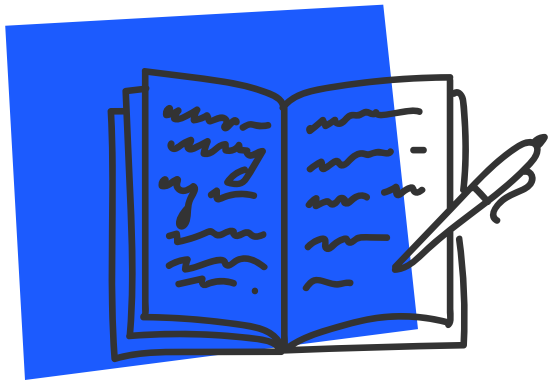
The resulting intel can shape future budgeting or capex decisions, empowering you with data-driven answers to financial questions like “do you really need this equipment?” or “Why are we paying so much for that service contract?” By identifying underutilized equipment, labs gain significant savings from unnecessary warranties, service plans, and square footage.

Connected alerting and monitoring ecosystems empower LabOps pros to gather data and gain alerts from any kind of equipment, anytime, anywhere. Internet of things (IoT) sensors can measure temperature, humidity, light, pressure, ambient conditions, and more, while smart integrations with existing machinery can digitize other operational data like air flow rate, air quality, gas flow rate, leak alarms, salinity, RPMs, and water quality.

Finally, equipment booking software can empower scientists to reserve assets and tag protocols for any tool in the lab. From microscopes to fume hoods and centrifuges, scientists can reserve equipment when they need it, ensuring their scientific workflows are completed efficiently. And behind the scenes, LabOps teams can create reports and pull data from any reservable equipment to inform future growth plans or shape preventative maintenance with vendors. In aggregate, these three solutions represent timely tools in the toolbelt of the recession-bracing LabOps leader.

As teams are tasked with doing more with less in the coming months and years, adopting technologies focused on increasing efficiency could be the essential move that enables them to meet the moment.





DEFINING LABOPS

A new label for an old practice encapsulates the vital work of a widening field

As a practice, lab management is nothing new. But LabOps is fresh, and it's being defined in this very moment.

Just a generation ago, the concept of a laboratory was linked to scientific and university endeavors alone. But today, the lab is the braintrust of activity in innovative organizations across science, industry, manufacturing, food production, and more. Pharmaceutical labs, biotech labs, clinical labs, QC labs, and materials science labs are shaping our world with novel treatments, sustainable materials, and renewable energy sources.

Arising on the heels of industry 4.0 and artificial intelligence-powered discovery, LabOps is a set of practices that combines laboratory management (Lab) and operations management (Ops). LabOps professionals aim to drive technological and scientific innovation through the implementation of standard operating procedures, thereby supporting data-driven decision-making within research, development, and clinical organizations.

Lab *management* involves getting lab personnel to satisfy duties within the limits of time and resources. Personnel, equipment, workflows, daily operations, and training all fall under the purview of a lab manager. Associated responsibilities typically include maintaining instruments, restocking consumables, scheduling, providing technical expertise, and keeping records of certain lab activities or incidents in the lab.

Lab*Ops* aims to optimize these tasks and responsibilities by incorporating IT and management principles into the standard operating procedures for each functional area. While the procedures underpinning lab management and LabOps are aligned, the overarching business objectives are unique.

Operations management entails designing and controlling the process of production and redesigning business operations in the production of goods or services. LabOps is aligned with operations management in that they are both concerned with managing an entire production or service system.

At their core, LabOps professionals provide functional support by overseeing lab infrastructure including people, processes, and assets. Furthermore, these team members often serve as liaisons between information technology (IT), management, and facilities to drive strategic initiatives that increase quality and operational efficiency in the lab. In recent years, LabOps professionals have increasingly had overlapping responsibilities in all of these areas.

As LabOps is defined, so are its owners

LabOps encompasses a much wider strategic scope that drives efficiency, data provenance, lean operations, and budgets — but who will manage all of this?

At the helm of each task is a lab operations manager tasked with keeping discovery unobstructed and colleagues unhindered. They are the frontmen of LabOps — the oil that's long lubricated the machine of laboratory activity. They are the essential workers who support researchers with high-functioning spaces, well-stocked supply rooms, and precise and accessible data.

Yet for many, the role's challenges make it a far cry from the visions they once held.

If you're a lab manager, see if this sounds familiar: As a kindergartener, your dream job was as clear as day. While other five-year-olds traversed the halloween parade in firefighter costumes and ballerina regalia, you made the rounds in a white lab coat and safety goggles. As your peers spent weekend afternoons immersed in virtual worlds, you explored natural ones. At the time, your future profession was as certain as it was simple: scientist.

Years later, you channeled your chemistry with chemistry into something more specific, albeit slightly less familiar to the kindergarten crowd: lab operations.

While the role you play in the lab is undoubtedly consequential, the tasks that fill your day are a far cry from the experimentation five-year-old you had in mind.

More often than not, the discrepancy isn't for lack of opportunity, but lack of time. Rather than maintaining a well-deserved place at the strategic table, a lab operations manager is dealt much of the urgency and little of the glory.

Compliance, troubleshooting, and paperwork consume both time and talent, leaving little capacity for proactive planning, much less discovery. And all too often, the response to a job perfectly executed is silence. Those who benefit from a lab in perfect order tend to notice only if something goes awry.

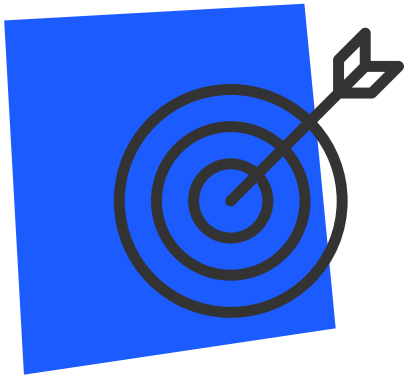
The proficiencies of most LabOps professionals are taken for granted until a refrigerator goes kaput or record goes missing.

Clearly, these are not facets of a five-year-old's idealistic aspirations. Yet, help is on the horizon.

Today's connected lab platforms ease many of the burdens wrought by today's LabOps reality, including remote monitoring that reduces error and expands visibility, turnkey reporting that makes regulatory compliance a snap, and AI-driven insights that harness real-time data for forward-looking planning. In other words, IoT technology empowers LabOps pros with the tools they need to claim the seat at the strategic table they've always deserved.

In the modern lab, LabOps professionals are more than managers; they're masterminds.

Your five-year-old self would be proud.



LABOPS EXCELLENCE

What does it look like to master a practice that's only just being defined?

The basic principle of LabOps is to push the boundaries of scientific discovery and technology to drive innovation and the lab of the future. But how can LabOps specifically support the lab of the future?

This is essential information that organizations can use to benchmark their operations and measure operational success and efficiency. However, until now, there has been significant gaps and misalignment on the foundational pillars of LabOps and consensus for each. The industry is in dire need of standards and roadmaps for how to achieve excellence in LabOps.

LabOps Excellence Maturity Model

The LabOps Excellence Maturity Model is a framework designed to help LabOps professionals improve proficiency within each of the six pillars of LabOps. A lower maturity level equates to a low proficiency level in that pillar, with an ascending scale toward higher maturity and optimal proficiency. The six pillars of LabOps are:

Asset Management - A systematic approach to the governance and realization of value from the lab equipment that LabOps teams are responsible for, over their whole life cycles

Safety & Compliance - Adherence to and training on the numerous local, state, and federal regulations specific to laboratories including, biological safety, hazardous materials, etc.

Operational Data Management - Management of all lab-related data (outside of experimental data) from creation, storage, security, and integration with other systems

Logistics & Procurement - Sourcing and management of materials needed to run lab experiments

Team Management - An organization's ability to lead a group of people in accomplishing a task or common goal (at the single lab, department, and organizational level)

Sustainability - Best practices to reduce energy consumption and waste in the laboratory environment

The maturity model details 5 stages of LabOps Excellence and encompasses the teams and processes that govern LabOps. These range from the initial stages that are irregular, inconsistent, and chaotic to the optimized stage where teams and processes are continually improving and adapting.

THE STATE OF THE LAB - THE RISE OF BIOTECH

Today, the lab's actions have the world's attention

Twenty years ago, if a scientist sat down for dinner with his future in-laws and described his profession, the reaction would likely include some combination of financial concern and practical uncertainty.

> *Academia, eh? I hear there's not much money in research. It's a shame. Are you sure that will provide enough for a family?*

What a difference a few years make.

It seems like it was just yesterday that apps alone were minting new billionaires and social networks were driving Bay Area housing prices sky-high. As for the scientists, they were relegated to whatever financial, residential, and social scraps remained.

Few could have imagined then that in November of 2020, a San Francisco Chronicle headline would pronounce biotech the "bright spot in the Bay Area's battered economy."

As COVID-19 caused Big Tech's office buildings to be emptied of their software developers, labs went into overdrive.

Simultaneously, the public's understanding of and value for lab technology skyrocketed. Seemingly overnight, the world came to understand the importance of scientific research and how every scientific discovery in the world starts in a lab.

Post-COVID-19, the masses now understand some of the intricacies of lab operations, speak the language of clinical trials, and grasp the peculiarities of scientific timelines. No longer are a lab's goings-on the concern of academics alone. The discoveries of dedicated researchers have moved from the unread pages of scientific journals to the front pages of Pulitzer Prize-winning newspapers.

The discoveries once made in a vacuum were suddenly being watched—and cheered—by every country, industry, and neighborhood on the planet. Society's value for science surged – and funding followed.

The first three quarters of 2020 saw a whopping $19.5 billion flow into biotech and pharma. Biopharmaceutical disruptor Resilience secured $800 million in backing for its crusade to upend the drug manufacturing process. Meanwhile, Boston's Ginkgo Bioworks retooled its DNA analysis machines to test for COVID-19. Scientific advancement accelerated as the lines

between research and manufacturing began to blur. “It's laboratory as factory. That trend is just starting, and it is going to drive biotechnology for the next 50 years,” explained Gingko CEO, Jason Kelley.

But what was this $800 million spent on? While the obvious answer is creating life-saving medicines and vaccines, the not so obvious answer is the running of labs - around the clock - which enabled the fastest scientific developments known to date. This includes the essential supplies and materials required for experiments, new machines and equipment, and of course personnel to do manage the projects and run the experiments.

Laboratory vacancies dipped to commercial real estate’s lowest, while competition for scientific talent skyrocketed to the job market’s highest. Developers, educators, employers, and investors all began to take note.

Central to the biotech buzz left in the wake of COVID-19 is the promise of the modern, digital, connected lab. New challenges associated with remote work, a meteoric surge in demand for cold storage, and the increased relevance of research have created both challenges and opportunities for stakeholders.

Gone are visions of labs as windowless, underground bunkers to which academics flee for lonesome deliberation. Instead, the world has awakened to the reality of the modern lab as a place of progress, discovery, and hope.

For all its misery and destruction, 2020-2021 will likely go down in the history books as a watershed era for science.

A year has since past, and the fundamental changes that COVID-19 created are still felt by many.

In the wake COVID-19, investment in biotech has slowed. Moving forward, it will be a question of maintaining momentum to advance scientific innovation whilst balancing spend and insulating against short-term economics.

3,100

Biotech Investments

By Venture Capital Firms Through 2021

$34 Billion

Raised by Biotech Companies in 2021

(2X Compared to 2020)

Source: Crunchbase

LABOPS TECHNOLOGY

With less firefighting and more strategy shaping, LabOps pros are no longer forgotten

Amidst a record heatwave in Britain a few summers ago, the Queen's Guards offered a friendly reminder of their humanity. Cloaked in thick traditional garb, some of the Royal family's faithful protectors took to fainting — and the world took notice. Their perfection punctured, the world was suddenly reminded of the expectation of perfection that rests on their tasseled shoulders.

Such has long been the life of a lab manager. Seen as the obvious point of contact for seemingly any lab question, supply request, maintenance issue, audit report, data access kerfuffle, or logistical snafu, yesterday's lab manager extinguished hazards with the frequency and urgency of a big city fire chief, leaving little time for their proactive strategic insights to be heard or heeded.

But reliable and intuitive technology is finally removing many of the repetitive, urgent, and thankless tasks from the lab manager's to-do list, freeing them to bring their knowledge to the strategic table. With the addition of technology, lab managers are transformed into LabOps professionals.

Coincidentally, the very technology enabling such a dramatic shift in the LabOps professional's role are connected operations platforms that take note of the asset behaviors that would otherwise go similarly unnoticed.

For instance, a freezer's 17 years of continuous chill receive little attention until an overnight outage puts trays of precious tissue samples in jeopardy. An incubator is unlikely to earn a researcher's attention until it malfunctions over a holiday weekend.

This is the thankless world for which smart sensors were built. Connected operations systems give scientific equipment the spotlight they deserve, pulling data while monitoring temperature, light, usage, and more.

Some sensors report on the temperature inside of a liquid nitrogen tank, while others record the temperature, humidity, light and air pressure inside a lab or vivarium. Others still connect original equipment manufacturer (OEM) instruments to the cloud, automating the collection and analysis of scientific data from legacy equipment.

When equipment is performing flawlessly, IoT sensors give our thankless scientific instruments the credit they deserve. And when an instrument falls short, comprehensive systems

deliver real-time alerts, then connect the dots to determine the malfunction's root cause and empower users to take corrective action.

But how? Two little words built on major infrastructure: artificial intelligence (AI). Much of the effort associated with data science is required upfront – constructing the infrastructure that makes processing and using the data sustainable and meaningful. Enter Elemental Machines' groundwork building IoT sensor technology.

Without careful groundwork, "little things" quickly become big impediments, such as battery life or inconsistent timestamping. When a sensor's battery needs to be replaced in a regulated environment, the seemingly routine task could require donning full PPE, entering a controlled space, and interrupting an otherwise validated process. And if the times maintained by a lab's sensors vary by even a minute or two, insightful correlations could be muddied by imperfect metadata.

The lengthy battery life and universal timestamping built into Elemental Machines' sensors are just two examples of the meticulous groundwork that preceded the more straightforward model-making one might view as the true work of AI. Elemental Machines' sensors are but a means to an end, an essential foundation laid to enable the automatic and frequent collection of data throughout the lab, and populate a robust cloud-based database.

Whether flawless or defective, never again will an instrument's operations fail to be seen. And thanks to the time they reclaim, neither will the strategic insights of the LabOps professional.

Reliable and intuitive technology is **finally removing many of the repetitive, urgent, and thankless tasks** from the Lab Manager's to-do list, freeing her to bring her knowledge to the strategic table.

LabOps productivity is the path toward the lab of the future

Amidst a scientific organization's modern hiring and training procedures, an archaic task often slips through. After completing a high-tech safety course, many new hires are presented with an aged binder in which to place an inky signature signifying their compliance. The surprising step is a tangible reminder that in many labs, paper still endures.

The paper lab notebook has adorned the benches of research and clinical laboratories for decades – and for good reason. It doesn't suffer from power outages, it never requires an IT trouble ticket, and the only barrier it presents to data access is the occasional paper cut. Yet, the familiar drawbacks of paper lab notebooks have been the motivation behind the continuous evolution of laboratory data collection over the last thirty years.

The evolution of data collection tools has repeatedly taken two steps forward and one step back for some time. Many tried-and-true benefits of paper notebooks gave way to tech-enabled efficiencies (and deficiencies) via Electronic Lab Notebooks (ELNs) in the 1990's, then cumbersome hardwired sensors in the 2000's, before combining the best of all advancements in the wireless IoT platforms.

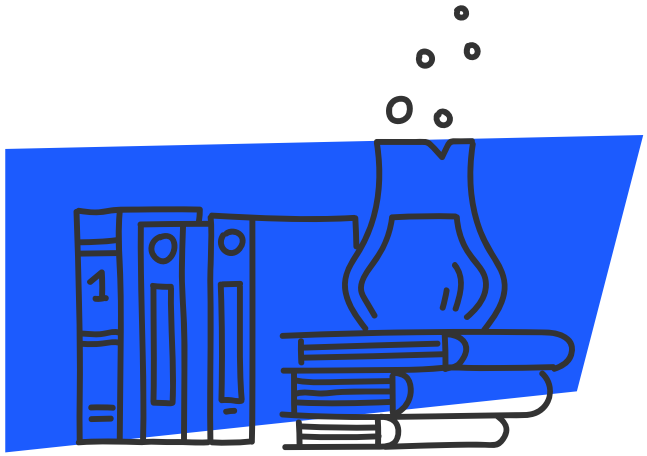
Today, thirty years of technological advancements have finally converged to empower LabOps professionals with reliable automatic operational data collection and unified management.

On leading connected lab operations platforms, turnkey IoT sensors unify nearly any metric, from any asset in the lab onto a single cloud-based dashboard. Data collection is automatic, as sensors track and transmit data 24/7, freeing researchers and LabOps teams to focus on the science and leave routine tasks to the technology best suited to conquer them. Data reporting is a breeze, as 24/7 monitoring doubles as a historical record and dashboards generate turnkey reports for regulatory compliance.

Today, the routine data collection tasks that once hoarded researchers' time have been delegated. The outages that once ruined research projects are being mitigated. And the silos that once complicated sensor-gathered data have been eliminated. In order to reach the lab of the future we still need to overcome significant barriers that are bogging down operations teams. In the future, all equipment in the lab will connect to a single dashboard, unite with a lab's favored software systems, and advance untapped intel for unlimited impact.

"Prevention is frequently the **best solution** to a problem."

LILY HUANG
ASSOCIATE SCIENTIST
PLIANT THERAPEUTICS



Continuous monitoring is making compliance painless

"Of course it wouldn't specify, because that's an area of federal law where we'd want to have as much ambiguity as possible."
~ The West Wing

If you'd mistaken the preceding line of fiction for the chatter of a laboratory compliance specialist, you'd be forgiven. Regulatory compliance is one of the great necessary evils in science. Yet without it, research methods and practices would be inconsistent; their results, less reliable. Alas, the scientific community is beholden with regulatory burden for the unforeseeable future.

And yet the powers that be leave much about compliance to the researcher's imagination. For example, ISO 9001:2015 orders that an organization "maintain a quality management system," while the FDA requires a "risk-based approach." As for how, both leave much up to the interpretation – and implementation – of the reader.

In the US, much of the FDA's regulations come from Title 21 of the Code of Federal Regulations (CFR). Today, the CFR has over 100 million words and would take over 3 years to read!

It's no surprise that designing a quality system that is compliant with such verbose regulations is one of the most pressing challenges in LabOps circles.

The ambiguous mandates are costly ones. The total cost of compliance spans budgetary categories and org charts, tacking on costs to everything from staffing and development to scientific instrumentation and even printer toner.

Pharmaceutical companies devote an average of $18.2 million to compliance each year, while the industrial sector averages $29.4 million. Perhaps the only thing more costly than compliance is non-compliance, which can result in criminal charges, forfeitures, and civil claims.

Much of the energy devoted to compliance comes down to monitoring and surveillance. Satisfying the FDA's risk-based requirement is a matter of somehow setting a risk score, then monitoring to determine if your wild guess initial estimates had any basis in reality.

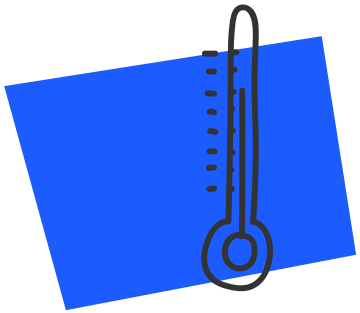
Herein lies the considerable advantage of intelligent connected operations platforms. Smart sensors replace yesterday's archaic paper records with always-on, never-distracting sensors that turn a lab's existing equipment into internet-connected devices in as little as 60 seconds.

A reputable connected operations platform will ensure the authenticity, integrity, and confidentiality of electronic records, satisfying a wide range of GxP requirements, including:

- Electronic Record Authenticity (21 CFR Part 11)
- Electronic Record Integrity & Confidentiality (21 CFR Part 11B)
- Alerts & Monitoring (21 CFR Part 1271)
- System for User-Generated Records (21 CFR Part 1271)
- Customer Data Protection (GDPR)
- Lab Equipment Protocols (21 CFR Part 58D)

The mandates set forth by regulatory bodies may be ambiguous at times (and they're certainly costly to implement), but this same ambiguity is what actually gives companies the latitude to create systems that suit their specific needs. When an entire industry has flexibility to craft their own types of compliance guidelines, any supporting technology must be equally (if not more) adaptable.

The advances brought forth by connected lab operations platforms make compliance easier than ever before. Better yet, strategic implementation of such a system can deliver much more value than any red tape might consume.



EQUIPPING LABOPS

Furthering the optimization of LabOps depends on ease and access

For years, technological capability alone was the reason LabOps managers found themselves recording routine data with pen and paper, fielding weekend calls about faulty freezers, and satisfying audit requests manually and arduously. Sensor technology simply didn't exist. There was no other way.

Today, the hurdles to technological optimization are different. No longer are manual tasks the lone way of satisfying a lab manager's duties. Today, the hurdles to operations optimization are twofold: ease and access.

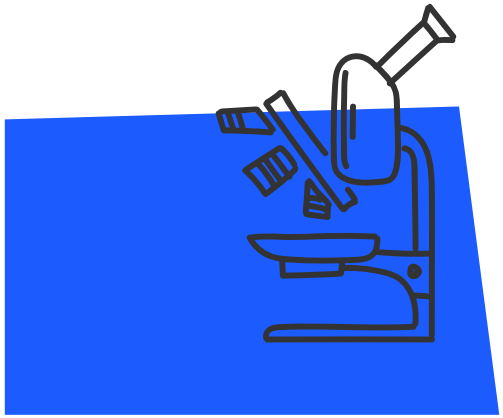
In order for lab technology to be effective, it must be useful. And in order for data to be useful, it must be accessible.

By now, most LabOps professionals have heard the same conversation a dozen times: "there's this new technology we want to try..." And for too long, the results have been underwhelming.

Many promising lab technologies create more tasks than they eliminate. Too often, data is siloed, associated with just one asset, or relegated to its own platform. When such is the case, each additional asset requires a new process and creates a new chore.

Worse still, equipment- or manufacturer-specific sensors leave out many of a lab's most trusted assets: those purchased long ago.

In order for lab technology to be **effective**, it must be **useful**. And in order for data to be useful, it must be **accessible**.



Turnkey sensor technology endows dated equipment with modern superpowers

Despite his title as the "Oracle of Omaha," Warren Buffett has been known to pull up to his favorite Dairy Queen drive-thru in a 2006 Cadillac. For Mark Zuckerberg's daily commutes, an Acura TSX will do. And Alice Walton, one of the wealthiest women in the world, happily drives a 2006 Ford pickup.

The message from Billionaire Row is clear: sometimes, the best tool for the job is a familiar one.

Such is also true behind the doors of the modern lab. Perhaps it's a balance so familiar that using it feels like using nothing at all. Or a barometer as heavy as an elephant but as dependable as the morning sun.

To replace it would be akin to replacing one's own appendage. And yet in the R&D world, favoring an old piece of equipment is a trade-off. To retain a dated instrument is to forgo the bells and whistles of a modern replacement. As the modern lab migrates to the cloud, the biggest consequence of retaining an "oldie but a goodie" is eliminating IoT connectivity.

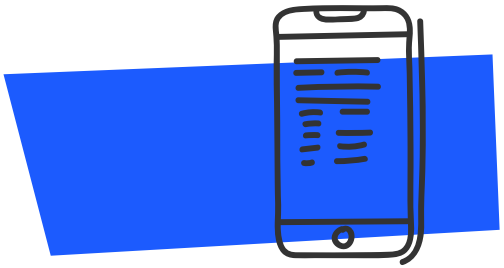
Or so it was. Today's IoT sensors can transform legacy equipment into data-collecting devices in a flash. One such company, Elemental Machines, manufactures a number of sensors designed to connect legacy equipment in as few as 60 seconds.

For instance, the company's Element-D features a standard digital data output that connects to the data port of OEM instruments, collecting key data from incubators, bioreactors, pH meters, and more. Its Element-C uses four current loop receivers to connect legacy equipment without any data port at all. And the Element-T turns existing freezers, refrigerators, and ovens into data-reporting equipment just 60 seconds after unboxing. This wireless, battery-powered sensor requires no outlet and mounts via magnet for simple installation.

Despite their significance, such sensors don't actually solve the most pressing hurdles of ease and access. They're merely a prerequisite for universal lab connectivity.

Their true value is made clear once they're connected, when disparate assets are connected, operations platforms gather and interpret data throughout the lab, offering real-time insights and alerts on a cloud-based dashboard.

Best of all, today's lab technologies are actually enjoyable to use. Why the change? Commercial manufacturers are beginning to learn from their consumer counterparts.



Lab technology is finally fleeing the B2B design hall of shame.

Long before HGTV turned the masses into armchair renovators, a runaway hit was helping Americans wade into the waters of interior design: Trading Spaces.

Over the course of three days, a pair of gutsy neighbors would swap houses and redecorate a room in each other's homes on a $3,000 budget. Free of input from the room's ultimate sofa-dweller, the results were subpar. Some even brought unamused homeowners to tears – sad ones.

The problem was as acute as it was intentional: the decision maker and the end user lived separate lives, embodied different values, and possessed different tastes. Sound familiar?

Such is the conundrum of industrial design. More often than not, the purchaser and end-user are anything but one. To win a buyer's order, companies design and market B2B products focused on the purchaser. As for the end user, they can deal with it. The result is precisely what you'd expect – and what we've all experienced.

Purchase a laptop for home use, and you'll enjoy sleek lines, glistening surfaces, and intuitive UI. Procure a laptop for work use, and you may encounter a facade as uninspired as they come and a form boxier than a 1973 Volvo.

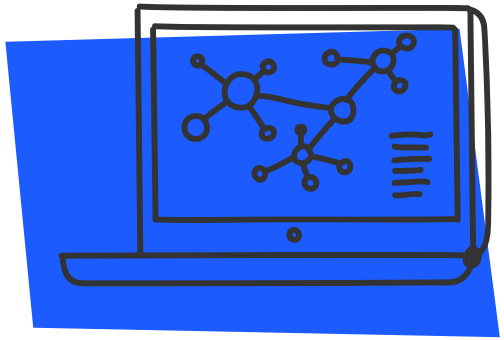
From employee expense portals to desk phones and office copy machines, B2B design could fill a hall of shame. An avoidable shame, it is.

Not so in the halls of today's leading lab technology platforms.

At Elemental Machines, the prioritization of consumer-centric design is inscribed in its mission statement. The company's first industrial designer arrived following tenures at both Lego and Bose, and its current roster of designers have earned the acclaim of household brands and product design houses. It's also why the company has designed universally compatible and future-proof products. The company cites user-centric design as the reason its sensors begin transmitting data 60 seconds after unboxing, and why they insisted that the Elemental Machines platform be both universally compatible and future-proof. As CEO Sridhar Iyengar once explained, "We're building the products that I wish I had myself a few years ago."

It's why today's solutions add insights while reducing siloes, and why lab managers rightly insist that even in a category as intentionally obtrusive as alerts and monitoring, quality design should disappear and relieve, not obstruct and demand.

As manufacturers work to shape the lab of the future, they are finally doing so on a less-traveled path: designing products with the end user in mind. Go figure.



Improved compatibility with ELN and LIMS and turnkey software integration means labs can keep what they love.

Behind many innovative technologies is a shameful concept known as planned obsolescence. New gadgets are marketed to entice consumers to toss their 12-month-old versions, banishing once-praised contraptions of glass and plastic to a junk drawer.

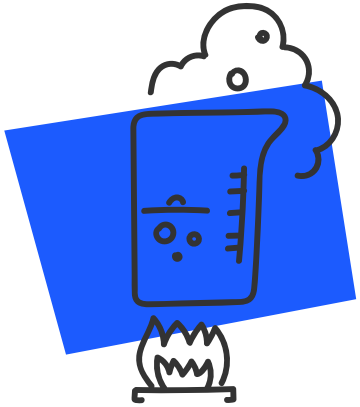
But in the lab setting, where some assets are as pricey as entire American homes, and new tools often warrant IT trouble tickets and retraining, new systems aren't always welcomed with open arms.

Today's lab technology manufacturers seem to have gotten the message. Leading connected operations platforms promote the retention of legacy equipment and favored platforms.

On Elemental Machines' leading connected operations platform, an application programming interface (API) allows users to seamlessly integrate with existing ELN, laboratory information management systems (LIMS), quality management systems (QMS), building management systems (BMS), and computerized maintenance management systems (CMMS), offering LabOps professionals new data points using familiar platforms. Meanwhile, turnkey sensors turn legacy tools from nearly any era or manufacturer into connected equipment in as little as a minute.

As new technologies enable new connections and capabilities, they do so with a welcome caveat: you can keep what you love.

Today's lab technology manufacturers seem to have gotten the message. Leading universal lab platforms **promote the retention** of legacy equipment and favored platforms.



CHAMPIONING LABOPS

A charge from Sridhar Iyengar, PhD, CEO and founder of Elemental Machines

Throughout scientific history, the lab manager has been handed extensive duties, little praise, and few words to describe the discovery-shaping responsibilities they carry.

After all, theirs are the hands tasked with restocking supplies, the eyes responsible for identifying maintenance needs, and the shoulders on which a lab's continuous and flawless operations must rest in order for live-saving, mission-critical research to progress unimpeded.

Yet for too long, their contributions have been given little of the spotlight and no "home." Allow me to explain.

For years, I attended conferences and trade shows, inspired by the future-focused researchers, chemists, and automation engineers I encountered, yet puzzled by the glaring lack of a home base for the team running the show: the lab managers, LabOps professionals, IT staff, and facilities managers who support the scientific organizations behind the scenes. I couldn't find a single conference that catered to this community.

So a few years ago, we spearheaded a conference of our own called the Elemental Summit Series. The enthusiastic response made it clear that demand for collaboration among lab operations professionals was extensive.

That conference birthed an online community called LabOps Unite, a digital watercooler that established a sounding board for operations professionals that was free to join and free from vendors. The group grew to over 500 operations professionals and continues to grow today.

With each endeavor, our collective instinct grew more acute: these essential workers known as lab managers, IT managers, and facilities managers needed a home — and a name befitting all they do.

Last year, we put a stake in the ground, christening a longstanding practice under a long-overdue banner: LabOps.

This year, alongside investment in the LabOps Unite community, we also filtered resources into the development of the LabOps Excellence Maturity Model and self-assessment tool. Bolstered by industry experts, we are helping to define, validate, and share LabOps standards and best practices. Our commitment to this effort will continue into 2023 and beyond, as the industry matures and technological innovations become more accessible and relevant.

The lab managers of yesterday are running the LabOps of tomorrow. It's the role once regarded as a cost center but today understood as a strategic driver and data epicenter. In addition to the countless operational tasks long asked of it, today it's the trade responsible for data's storage, connectivity, security, quality, and compliance — the one that enables data-driven decisions company-wide.

LabOps professionals are the colleagues (heroes) no scientist can do without. They're the former firefighters finally freed from robotic tasks and empowered as strategy-shapers. And they are who Elemental Machines exists to serve.

The indispensable contributions of lab operations professionals are as old as scientific discovery itself. But their reign under a banner befitting of their contributions to the infrastructure of science begins today.

We look forward to working together to build a more connected and intelligent future for scientific discovery.

Here's to LabOps.

The State of LabOps was produced by Elemental Machines, a global leader in smart lab technology.

ABOUT ELEMENTAL MACHINES

The Elemental Machines platform elevates LabOps teams to lead data-driven discovery, development, and delivery by simplifying the connection between physical and digital worlds. The result is a lab united by a universal cloud-connected dashboard and operations, informed by monitoring of every asset and environment, both in real-time and over time. Why? The standards established by operations determine the pace of output and discovery organization-wide.

www.elementalmachines.com