# Optimize your laboratory operations:
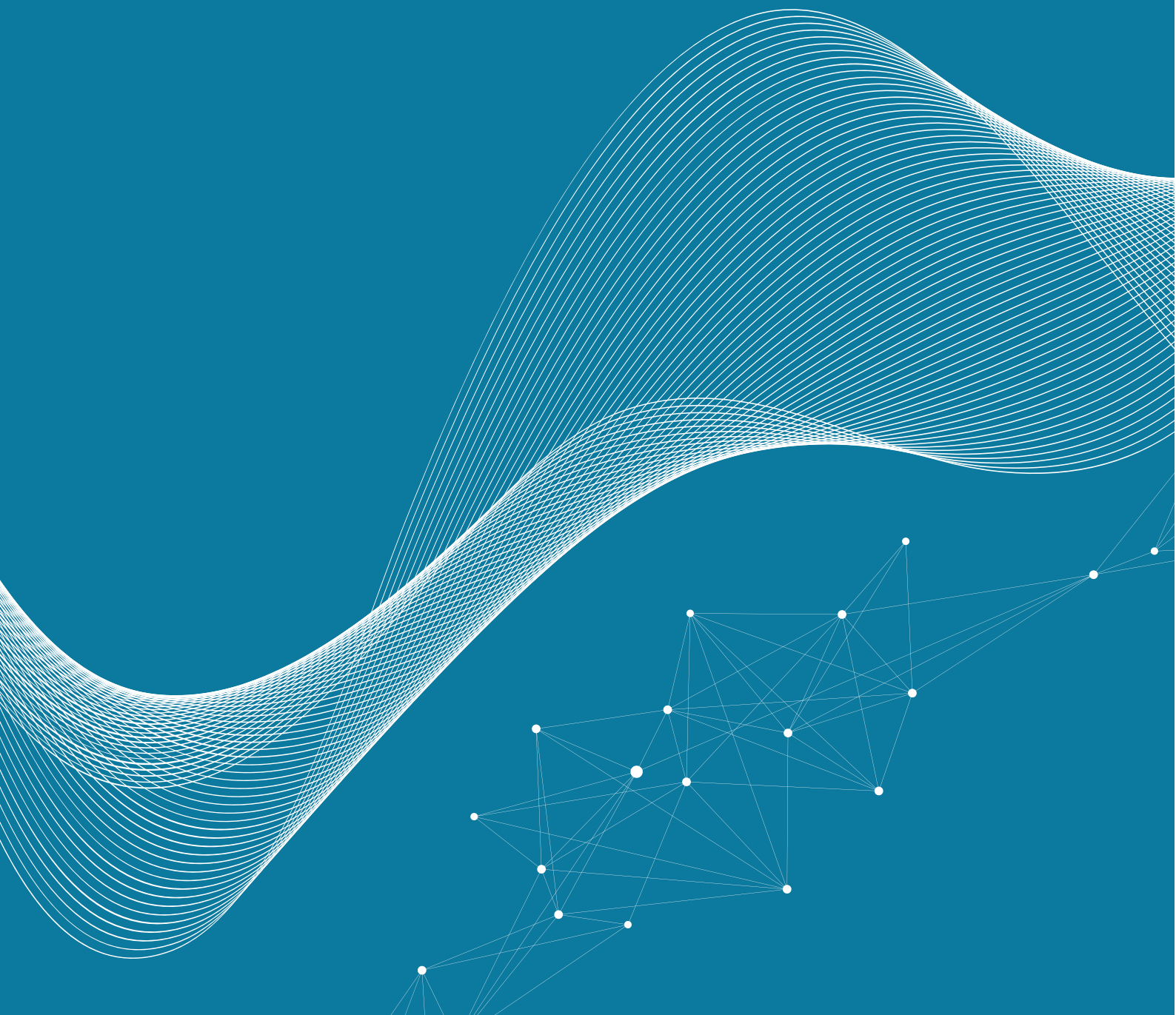
## a 2022 guide to digital workflows
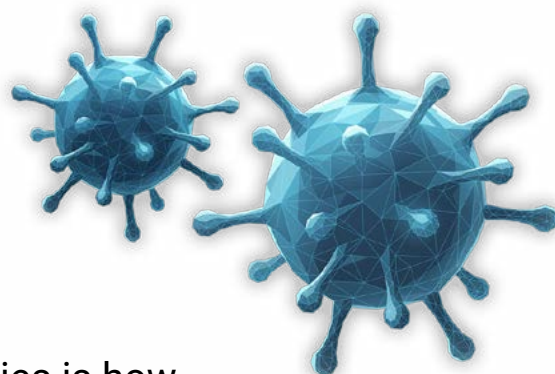
scifeon

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# 1.

## Becoming a better lab

The ever-present question in laboratories is how to optimize the use of time and resources, getting the most out of the work being done without compromising quality. Digitalization of the laboratory is the perfect strategy for optimizing workflows in the organization and increasing capacity in the laboratory.

However, most laboratories are built on scattered digital and analog solutions that aren't aligned with the actual workflow. Many essential laboratory activities, such as tracking data or keeping records, aren't always supported in the best way. While some solutions are adequate for one person working, they might hinder collaboration or lack standards that make data-sharing easy and effortless.

It's not uncommon to find multiple solutions working alongside each other, such as Electronic Laboratory Notebooks (ELNs) combined with Excel or paper and whiteboard. This leads to wasting valuable time, as scientists keep retyping the same manual data entries that have to be repeated across platforms. Data is inaccessible and takes time to track down.

When done right, a digital transformation of the lab can improve workflows and ensure the quality and validity of data. Furthermore, digitalization supports increased collaboration and ease of data-sharing.

However, it can be difficult to assess the criteria for choosing a new system that can support and supplement workflows. This paper details ways to improve and enhance the information management of the modern laboratory. It's about going digital the right way.
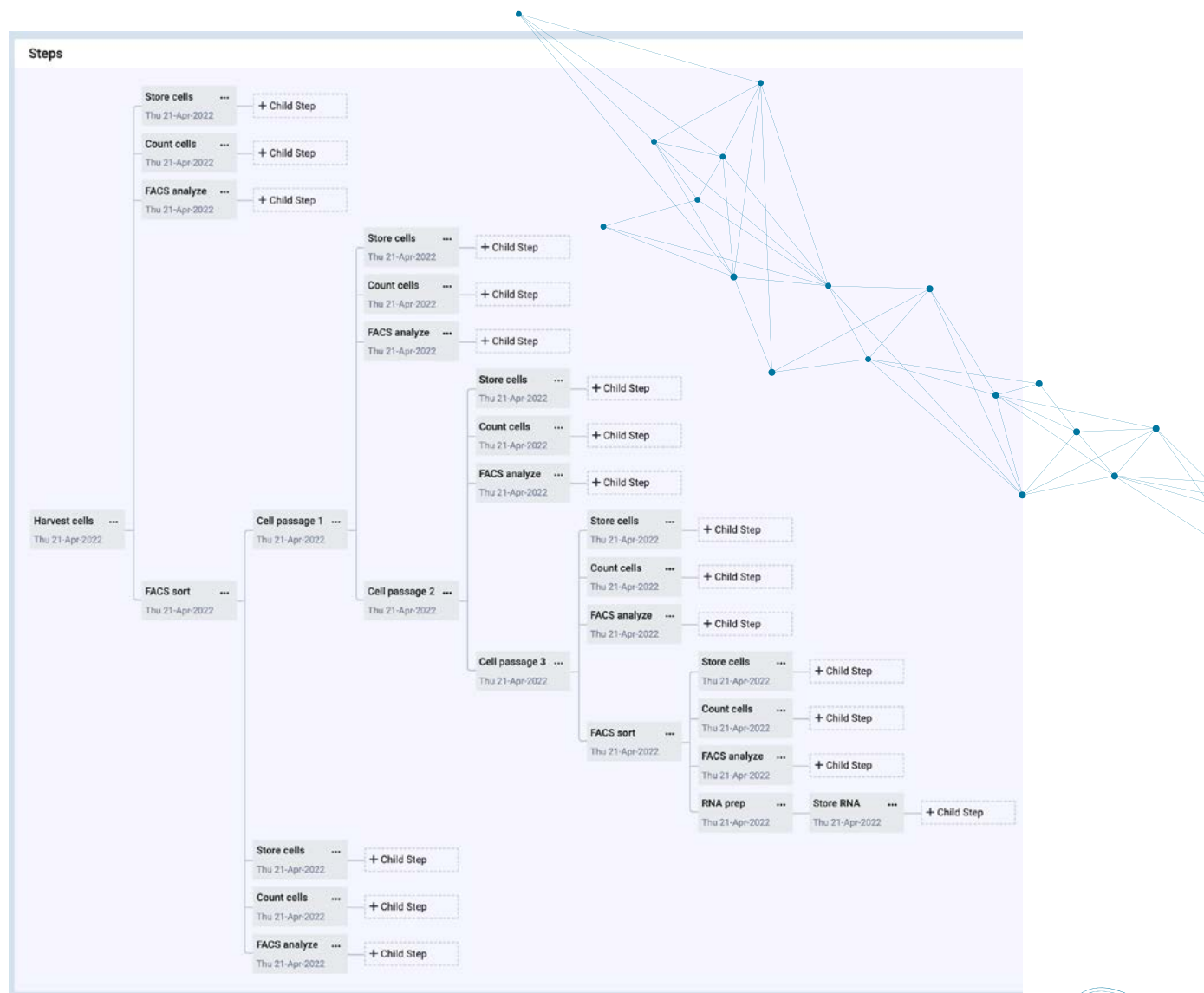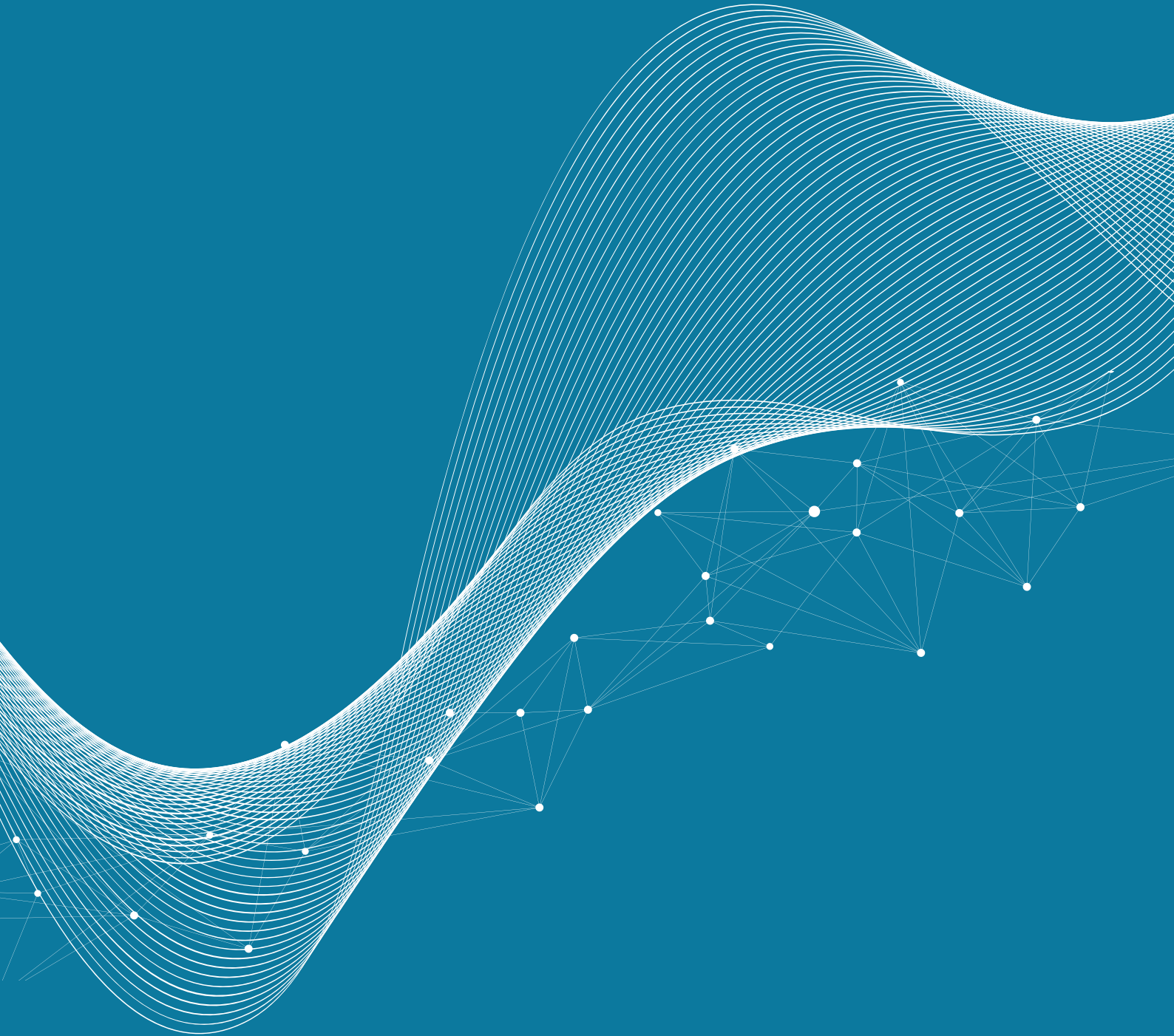
# 2.

# Support collaboration in the laboratory

# We already know that collaboration is key.

Supporting collaboration is essential in assuring quality in output and products. Good collaborative practices increase the speed of creating valid results. However, a lack of infrastructure and standardized procedures hinders the process and wastes valuable time. This chapter outlines the best ways to become more collaborative in your laboratory.
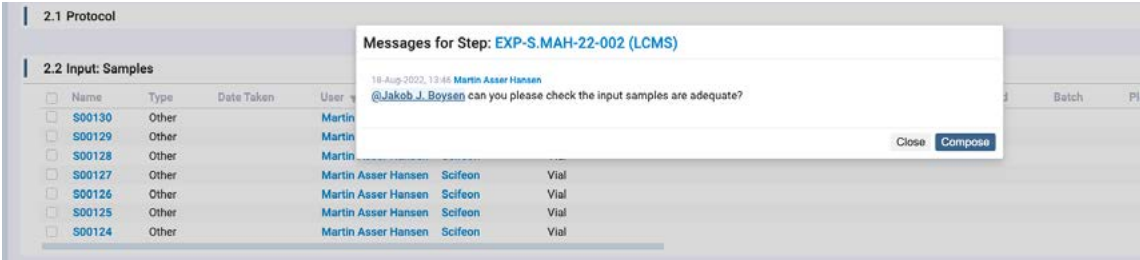
## Make data accessible

Inaccessible data is one of the biggest obstacles to efficient collaboration. New technologies bring new opportunities for producing more data than we have before. But this only exacerbates the issue. There is plenty of data, but a lack of access.

A common practice in laboratories is for each scientist to keep track of their own data, performing tests and measurements, and typing the results into Excel or something similar.
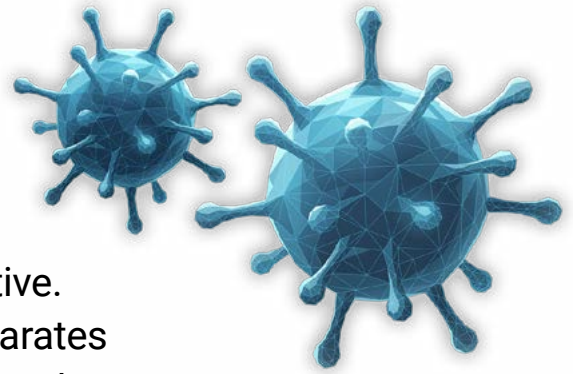While this is an excellent way to analyze data, it is less than optimal when coworkers or other departments need to access the data.
This creates unnecessary time delays as coworkers are forced to chase down data without any clear indication of where it could be or who might be responsible for it.

Some labs try to get around this, by supplementing a system with other systems that are more open and collaborative. However, this creates a new issue as it separates data handling from data sharing. This means that scientists are typing the same data into multiple systems, wasting time, and increasing the risk of errors.

The path to minimizing errors and optimizing data sharing is to choose software that can handle multiple functions, keeping data entry and data analysis on an accessible platform. This means that data is only typed into the system once, but is available to multiple teams or departments - thereby eliminating the issues in data sharing and improving the collaboration.

## Enhance data

Data isn't just data. What one department focuses on, might not be interesting to another.  Therefore, an immediate way to make the data beneficial to each department is to invest in systems that can handle and track large amounts of metadata. This improves the collaboration and avoids duplication of tasks.

Metadata ensures that tests are easily tracked, and mistakes or missing calibrations are easier to spot. The goal is to get as much knowledge out of the data, with as little effort as possible. Systems that automatically include metadata, enrich your data and give a better starting point for questions and follow-ups. Choose software that can help bring relevant data to the right people. This accelerates the information exchange between departments, making it effortless.

# The same processes

Better collaboration saves time. Defining the information that needs to be tracked and shared keeps processes clear and streamlined across organizations. This becomes a lot easier with software where the data is integrated directly into the system.

Software that can be set up according to organizational practices integrates the information exchange and is easily updated. Whenever a new need arises or new data changes the process, information can be disseminated and standardized: the process is in the software rather than distributed across journals, Excel sheets, or databases.

This makes collaboration an ongoing process that incorporates information from every scientist and department. Doubt is eliminated and errors are reduced.

# 3.

## Choosing Scientist-friendly Software

When adapting software for better workflows, the biggest barrier is that the existing methods work adequately. Implementing new software will, inevitably, slow down work. However, solutions that are "scientist-friendly" do exist, as they consider existing workflows and experience.

The most common digital solutions are Electronic Laboratory Notebooks (ELNs) and Laboratory Information Management Systems (LIMS). There is also a new option on the market that combines the flexibility of ELN with the data capabilities of LIMS.

## The Electronic Laboratory Notebook

Classic ELNs are essentially just a digital version of paper notebooks. While it is an open-ended entry system, it is not a big improvement on regular pen and paper. Content is a mix of prose, calculations, or images from results. This gives great flexibility in terms of documentation, but can have severe drawbacks when actually using the data. Often ELNs are combined with more data-oriented software. While both systems do what they are designed to do, working in this way is often very  time consuming to scientists as they are forced to repeat the same data across different systems.

## Laboratory Information Management Systems

LIMS are database solutions that record information and data in laboratories. The main benefit is that the data is stored in a traceable way according to a common standard. However, they often lack the flexibility of the lab notes or metadata sets. Working with LIMS can sometimes be a cumbersome process as it isn't set up according to common lab procedures and the user interface can be difficult to parse. There is a need for cross-referencing with a more flexible system. This creates a risk of data that is unbound to metadata and relevant notes, making it difficult to comprehend the context.

## The best of both worlds: combining ELNs and LIMS

The best solution doesn't just consider the existing workflow. Actually, it should be deeply ingrained in its user experience. A laboratory's expertise is inseparable from its workflows. Therefore, a platform that can integrate and share information based on the existing processes can be a perfect solution for laboratories looking to upgrade software.

Systems that use workflows as a baseline can combine the capabilities of ELNs and LIMS. Each department can set up different workflows for samples and testing while simultaneously recording their results and notes in the system, along with any potential metadata. Data is easy to analyze, but it is still paired with notes and metadata, such as who is updating and performing these tests, which instruments were used, or other relevant notes. A lot of know-how is built into setting up correct and precise processes. Workflow-based software increases transparency throughout the process. The workflow is built into the
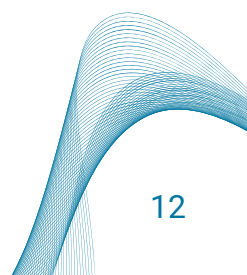
platform, providing records of the state of each step; planned, in progress, or completed. This also promotes registration during execution, as workflow and data entry become entwined.



## Usability matters

While many factors come into play in choosing laboratory software, the most essential is choosing a platform that scientists are comfortable working with. While usability is often overlooked in favor of features, it is imperative that people actually want to use the system.

Resistance to change is the main impediment to a digital transformation of laboratory workflows. New systems can seem time consuming and difficult to learn which increases resistance to change. This makes it less likely to see successful adoption, as scientists are

reluctant to use it. Instead, they prefer to spend time doing their actual work, performing experiments and producing results.

A system with all the features, but no data is a wasted investment. Customization is the best way of ensuring not just top great features, but great usability. For this to happen, you need all the input and feedback you can get from the scientists.

**The risk of Off-the-shelf**

Off-the-shelf software is standard software that can be purchased and implemented directly.
It might seem like it is quicker and easier to implement than custom-made solutions.
But there is a catch.

Often the implementation process is less smooth and once the software is installed, there will be places where the workflow and the system aren't properly matched, e.g. omitting important things in the experiments that must then be included in other ways.

Worst case scenario: scientists abandon the system and return to their previous methods, as they can't fit their processes into rigid structures.

This can make it expensive in the long run, as it takes up valuable time. While it is sometimes possible to purchase or invest in changes or upgrades, these are usually expensive and negate the financial advantages that off-the-shelf solutions had in the beginning.

## The advantages of customization

Customization is a process where the software vendor, consultants, or internal developers spend time and resources analyzing and defining work processes and requirements for a system before delivering a solution. This ensures that no knowledge is lost when moving from previous methods to a digital solution.

Finding a software provider that understands laboratory workflows is essential. The best solution takes the knowledge from the existing workflows and builds it in ways that improve and enhance the process.

Customization, as a process, also minimizes the risks of digital transformation in the lab, as it takes the specific standards into account and is adjusted to the processes of the lab. The initial assessment is a solid investment, as the system supports the workflows already in place. This means that the focus is not just on eliminating mistakes and increasing capacity. A custom solution for a digital transformation in the lab can actually enhance workflows, by including things such as automated data capture and data processing.

With a system that scientists see the benefit of, the gain is not only less time wasted and higher quality data. It makes it easier for employees to get used to the system, as they don't have to change their workflows. The aim is to clear away impediments to digitalization and work with scientists to support their current processes and workflows.
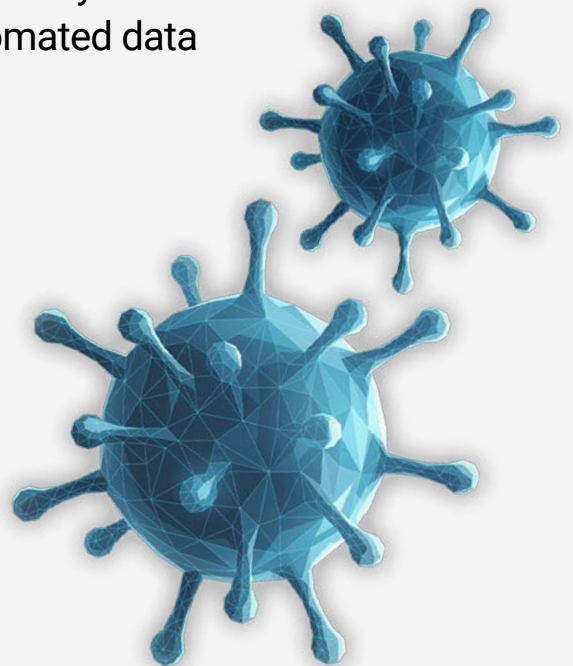
# 4.

# How AGC improved their lab workflows

AGC Biologics is a leading global Contract Development and Manufacturing Organization (CDMO), providing the development and manufacture of mammalian and microbial-based therapeutic proteins, plasmid DNA, viral vectors, and genetically engineered cells. When looking over their processes, the organization saw an opportunity to increase efficiency and improve data integrity by implementing an ELN/LIMS solution.

> **"Our process characterization generates lots of data that we used to keep track of and handle using pen and paper before entering it manually into Excel, and then copying it, manually, into other programs for further analysis. It was just endless revisions and very repetitive work, and of course, it introduced the risk of human error."**
>
> *Lars Schrøder, principal scientist at AGC.*

AGC reached out to Scifeon to collaborate on developing a software solution that could transform their digital data handling. Scifeon has developed a complete digital solution for the lab. It is a workflow management system that uses an ELN as the interface to a data management system.

## Scientific thinking – built-in

An essential part of the process was the customization that was based on existing knowledge within AGC. Time was dedicated to understand the experience that was ingrained in the processes.

From the very beginning, the scientists who would be using the system were brought on board to share knowledge and needs for a new software solution.

Scifeon then used their own knowledge in life science to design a system that fit the needs and requirements of AGC.

To further ensure that the implementation ran as smoothly as possible, Scifeon implemented the solution in increments. They built a small project with a limited scope in one department. This meant that there was time dedicated to learning and testing with the scientists. Anything that didn't work was easily changed.

After the initial trials, the system was approved by the scientists who would be working on it. Only then was it scaled up and adapted to other departments.

Having the scientists involved throughout the entire process was key in creating software that assisted the existing workflows, so that they will be used. But the knowledge of Scifeon also played an essential role.

> **"There's a lot of life science thinking built into the Scifeon platform. We don't have to adapt our workflows to the system. We can adapt the system to our workflows."**
>
> *Frederik Nilsson, vice president of Manufacturing Science And Technology, states.*

## Benefits now and in the future

AGC are happy with their decision, both in terms of immediate benefits and long-term potential.

They highlight the reduced time as a major benefit,

# saving up to 30% on every project.

Furthermore, AGC' ability to make full use of data has improved.

"Automatically collecting and storing our data makes it more accessible, more processable, and more easily available for further analyses. It will make us able to start asking questions we didn't know before, which will increase the value of our data."

*Fredrik Nilsson from AGC.*

Further down the road, there is an opportunity of integrating AI and automatic readings into the system. All of this is only possible because Scifeon has developed a system that scientists will actually use.

# 5.

## Level-up your data

Laboratories have the ability to create large quantities of data. However, poor IT systems or multiple entry points often mean that the full potential of all the data is not reached.

Often the storing and handling of data across multiple platforms creates a multitude of issues, as the need to manually aggregate data before analysis is very time consuming. Relying heavily on manually inputting data can mean missing out on value in data, as scientists balance where to dedicate their time. As more data is generated, the issue will only expand.

Good software can alleviate these issues ensuring valid, easily accessible data. Combining research practices with large data and metadata sets is key to improving the understanding and validity of results.

## Here are 7 key practices to ensure the best data and knowledge sharing across departments:

### 1. Avoid data loss

Collating data in a centralized, digital system ensures against data loss. When data is easily accessible to the entire laboratory there is no danger of data being hidden in an Excel file on someone's computer, accidental deletions, or system crashes. A reliable system secures against data loss, and everything is in the cloud.

### 2. Include all types of data

Some systems are great for one type of data, but struggle with annotations or other data types. This creates issues as scientists are forced to juggle multiple windows for data entry or accept that not everything is captured. The best systems can handle multiple data types simultaneously.
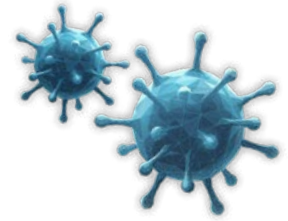
### 3. Automatic calculations

Great software will not only be able to handle large amounts of data. They are also able to generate more by performing automatic calculations or looking for links in data points. Often data is entered and then subsequently analyzed. This means that anomalies or potential errors are only spotted after the tests have been run.

Automatic calculations can be set up and defined beforehand. This streamlines the process across the organization, reducing time spent on calculations. Furthermore, it has the further benefit of reducing human errors.

### 4. Data integrity

Data integrity is about ensuring that the right measurement is assigned to the right test.

The same data is often collected, stored, and analyzed before being put into reports.
Every time data is moved manually there is a risk of loss of data integrity. Storing the data in a centralized location that can be accessed from multiple systems ensures data integrity and saves time, as the need to countersign data entries evaporates.

### 5. Employ metadata

Without metadata, it's impossible to make sense of and keep track of your data.
Metadata gives context to your results and can give valuable insights when tracking down errors or anomalies. Collecting metadata is easier in software, as it can be automated. This

means that it's possible to collect more data than if scientists had to collect and type it into various systems.

It is even possible to automate a lot of metadata compilation. The right software automatically tracks and adds metadata from files and instruments. Furthermore, metadata stays attached to the relevant data which increases the traceability of your data. This makes it easier to share data or reuse the same data later in new contexts.

## 6. Keep your data in one place

Data is everything in laboratories. However, it is often spread across platforms in different formats, making it hard to track down data. Much time is spent on locating data or parsing it through various Excel sheets looking for mistakes or anomalies. This makes ensuring the validity of data a laborious task. However, it is essential as mistakes can have fatal consequences. Congregating data minimizes this process and eliminates time typing in the same data multiple times.

## 7. Future-proofing your lab

Structuring and enriching data is key to useful digitalization. An added benefit is that it is a way to futureproof the laboratory. It provides insight into current processes and allows scientists to evaluate and develop the processes to ensure higher standards in less time. Digitally transforming the laboratory opens the possibility for further automatization by including automatic readings from instruments, tracing patterns, and enhancing collaboration in the lab and across the organization.

## Get in touch

At Scifeon our mission is to create software that supports scientists through all phases of research projects. By automatically collecting, organizing, and storing research data in a cloud database, Scifeon enables easier data processing and better collaboration. We have more than 20 years of experience in life science labs. Our solutions are made by scientists for scientists.
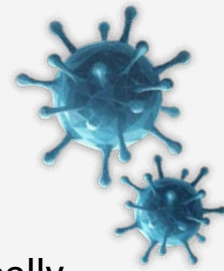
We know that your expertise is the foundation of everything you do. That's why we work closely with the scientists to ensure a full digital transformation based on the actual processes in the specific laboratory.

Are you ready to unlock your full potential and optimize your lab? Get in touch with Thomas Boesen, founder and CEO of Scifeon

**Contact Thomas**

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