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A GUIDE TO ACHIEVING

BETTER INSIGHT WITH ACCURATE DATA

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Introduction

In today's modern world, data is everywhere. We create data every time we post an update on a social media platform, send an email to a friend, or upload a photograph online. Companies also collect data about us to gain greater insight about our preferences, and then send targeted content based on our interests. As a result of this, the amount of data being generated is growing at a rapid rate, and by 2020 the digital data universe is expected to reach 44 zettabytes (44 trillion gigabytes.)[2]

In addition to impacting our personal lives, this data explosion is also affecting our professional work. Businesses use data to improve everyday decisions, gain insight, and drive strategic decisions. For organizations involved with research and development in particular, data is a vital tool.

It's a record of the thought process involved with the development of a new product and chemical, or method of refining or extraction, and forms the basis of future experiments. Most importantly, it allows for deeper insight and awareness surrounding new research and discoveries.

In organizations that place so much emphasis on data, it's incredibly important that the accuracy and reliability of this data is second to none. However, errors can and do happen. This is especially true for research and development facilities, where the fast-paced laboratory environment, as well as the nature, complexity and diversity of data increases the pressure on staff, and also the risk of errors occurring. When scientists are relying on this information to support their conclusions, errors can have serious consequences.

So, how can you ensure your business is generating accurate, high-quality data that facilitates effective reporting, and allows you to gain deeper insight? We've put this ebook together to guide you through the journey of data management, and help you gain unrivalled insight for future research and experiments.

2.5 Quintillion bytes
of data are created every day[1]

Why is data accuracy so important?

From a study of 49 research articles printed in journals that had been cited by scientists 1000+ times, 14 of them (almost a third) were later refuted by other work[3]

Regardless of the industry, data accuracy is incredibly important. Companies rely on it to analyze information, react to changing demands from customers and suppliers, and keep up with competitors. However, in companies where research and development is at the centre of business operations, it's especially important.

In a laboratory environment, increased data quality accelerates workflows, enhances analysis, and ensures the delivery of higher quality products and results. When data is of a poor quality, whether as a result of multiple errors, or a disorganized format, businesses will be unable to gain insight into the project or experiment details, and the decisions and conclusions that occur as a result are likely to be poor.

Many research and development projects take months or even years to complete, and small details that occur now may be hugely important at a later date. For this reason, it's important to have the ability to quickly and easily access data long after an experiment has taken place. This may also be necessary if you need to defend research in relation to patents.

When research and development businesses are working to make such important, sometimes life-changing discoveries, the repercussions of mistakes can be serious. However, by having a comprehensive record of your experiment that is free of errors and inaccuracies, you'll have solid evidence that disproves any allegations.

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The consequences of inaccurate data

So, we've discussed how important data accuracy is to businesses. However, what happens when data contains errors? Rather than driving efficiency, profitability and growth, inaccurate data can be detrimental to a business – and its bottom line. Firstly, data that has been incorrectly filed and labelled is hard to find, increasing the likelihood of an experiment being duplicated. Repeated experiments are incredibly costly to businesses, as well as being an unnecessary waste of time and resources.

Although one or two data errors may seem like a relatively small issue, they can escalate into much bigger problems further down the line. For example, if another research and development professional is working on an experiment that builds on the results you've discovered, they may cite your findings as part of their work. In this situation, their work is rendered invalid, which could have a negative impact on both you and your business.

In a research and development facility, accurate data is also necessary to support intellectual property (IP) claims, and defends you and your business against allegations of research misconduct. Accessible and clear data helps to protect the IP of a company as it improves compliance and makes it easier for past results to be referenced.

In some cases, inaccurate data can be even more damaging than this. In 1999, a $300m (£200m) NASA program was wrecked when the Orbiter's entry angle for 'orbital insertion' was wrong, as a result of a mix up of metric and imperial measurements[5].

Although this may sound like an extreme example, the truth is that inaccurate data can have serious consequences – consequences that could be prevented by improving processes surrounding data management.

The average organization loses $8.2 (£5.6) Million annually because of poor data quality, and most of this is due to lost productivity[4]

Recording experiments

So, what makes data high-quality? In organizations with research and development facilities, it's down to the ability of researchers to accurately record, find, retrieve and store the information from their experiments. This is called a laboratory notebook, and the format this notebook is in, is key.

A laboratory notebook is 'a complete record of the actions you take, the reagents you use, the observations you make (the data), and the relevant thought processes that would enable another scientist to reproduce your observations[6].' For many research and development professionals, this data recording takes the form of a traditional paper-based notebook.

The key to quality data is prevention – anticipating problems that may occur within the data you record, and taking steps to minimize them. This means research should be meticulously documented and a person reading your notebook should be able to follow your processes from beginning to end.

Data needs to be well structured and logically organized, and numbering pages and collating similar experiments together will help form a cohesive record of your work. Another consideration is the importance of proofreading. Professionals working in the research and development sector are often under pressure to turn data insights into innovative products as quickly as possible, so taking care to proofread recorded information is essential[7].

By working carefully and methodically, and organizing and structuring all the information you record, you can have confidence in the integrity and reliability of your experiment recordings.

Prevention is the most cost-effective activity to ensure the integrity of data collection[8]

Making use of data

Once an experiment or research project has been completed, the data enters the next stage of its life. For organizations focused on research and development, data is incredibly important because experiment results are rarely left untouched, once they have been completed.

Results will often form the basis of multiple follow-up experiments, and in some cases, one experiment will actually be part of a group of 15 or 20 separate projects that combine to form one set of results. In this situation, there could potentially be hundreds of different people all working simultaneously with the same information, so the accuracy of this information is key.

Results need to be easily searchable, and to make this easier, it's important to ensure each and every data entry is dated and timestamped. This way, colleagues will be able to see not only who performed the research and what the results were, but also exactly when it was carried out.

One potential issue of this type of collaboration is the involvement of external individuals working on a single experiment, which is often the case when research and development departments lack the required staff, resources or expertise needed. In this situation, new digital technology such as electronic laboratory notebooks (ELNs) can be beneficial as they foster collaboration more effectively than paper-based notebooks. Password protection, role definitions and group permissions enable access to specific projects, and work with you and your department, whilst protecting internal-only research. External work can also be carried out from outside the laboratory because all data is stored in the cloud, making it accessible from anywhere.

Product development is a collaborative business, and if a colleague is pressed for time, they will appreciate the ability to quickly and easily find what they need.

Publishing high-quality results

As you'll know, once an experiment is complete it's often shared with industry peers and experts, and published in journals or on websites. Other research and development professionals may then use your findings to build on their own experiments and research projects. It's also likely that you or others will continue to build on your results and use your initial findings as a basis for future experiments, or you may choose to turn your research into a manuscript or essay.

As we've already mentioned, this is where the accuracy of your data plays a critical role. If the information that describes an experiment's process or results is misreported or contains errors, whoever uses them will find their own research contains errors. Aside from the inconvenience this causes them, the results of the research may be called into question. It could also impact the credibility and reputation of the wider organization, and potentially prevent future business partnerships and collaboration.

On a personal level then, it makes sense to ensure the quality and accuracy of your data by following best practices for laboratory record keeping. Although turning the data you've created into a cohesive communication may seem daunting, you've already done the hard work by carefully and methodically documenting your experiments.

One of the consequences of improperly collected data is the potential to mislead other researchers to pursue fruitless avenues of investigation[9]

Conclusion

It's clear that data accuracy should be an important consideration for anyone working in an organization with R&D facilities. As a result of new equipment and more powerful computers, today's research-driven laboratory environments are using new techniques and science to be able to conduct more experiments. This means more data is being generated and the risk of inaccuracies is increasing.

With the sheer volume of data being created, many businesses are seeking out alternatives to traditional paper-based record keeping that are more in keeping with today's technology. One of these alternatives is electronic laboratory notebooks (ELNs).

Digital solutions like ELNs reduce the time-consuming process of recording data into laboratory notebooks. They use sophisticated technology, which can eliminate the manual transcription of data and maintain information integrity and quality. On top of this, they make data accessible across departments and between external team members (with the correct security measures), facilitating increased collaboration and information sharing within a business.

88% of research and development organizations lack adequate systems to automatically collect data for reporting, analysis, and decision-making[10]

With data accuracy so important, it makes sense to consider implementing a modern technological solution to record your laboratory experiments. You'll eliminate the concerns regarding lost IP, lack of communication, and data errors that occur with traditional paper-based record keeping, and enable you and your research and development department to focus on your true strengths and passions.

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Get in touch to find out how The E-WorkBook Cloud can help you increase data accuracy to achieve greater insight, talk to one of our experts today.

Sources:

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