

Expanding Collaboration and Innovation in R&D: Leveraging the Power of Open-Source Tools

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ABSTRACT

Departmental silos and disjointed communication channels often impede effective collaboration, decelerate decision-making processes, and hinder innovation. In this presentation, I explore the transformative potential of open-source tools in fostering seamless communication, empowering end users across teams, and promoting cross-functional collaboration. By delving into the inherent flexibility, scalability, and adaptability of open-source platforms, we will demonstrate how organizations can harness and build upon these tools to automate processes, enhance interdepartmental communication, and facilitate knowledge sharing. Furthermore, we will discuss the role of open source in driving innovation by enabling rapid prototyping, iterative development, and the integration of cutting-edge technologies. Discover how the strategic implementation of open-source tools can dismantle silos and supercharge your organization.

INTRODUCTION

Open nearly any application on your phone, go to the “About” section, and under “licenses” there is a non-zero chance that it relies on a multitude of open-source projects. Even the operating system on your phone incorporates open-source technology, a testament to the efficiency and interoperability achieved through community-driven solutions [1].

In the ever-evolving landscape of the pharmaceutical industry, open source is emerging as a transformative force, mirroring the collaborative ethos that has proven successful in the tech domain. We will examine how open source fosters interdepartmental collaboration and synergy, how strategic application of open source can enhance overall operational efficiency, and how it positions organizations for accelerated innovation and preparing for the future.

Collaboration

As seen in the open-source community, the most impactful software is developed openly, where communication and collaboration are done where all can see. Often this happens in forums such as GitHub, Gitlab, or other similar open-source repositories using issues, pull requests, or even community boards. Throughout development, multiple approaches may be attempted, where differing positions, benefits, and costs are weighed, and ultimately solutions emerge that are greater and more valuable than the original project intent and goals [2]. These same benefits found in the larger open-source community can also be realized within organizations implementing open source and an open-source mindset.

When an organizations projects use open-source technology, we can increase involvement from the development and user sides. This is due to both the availability of the software and a shift in mindset. As open-source software is usually freely available to all users [2], any user can install and use the tools on their computers if the IT infrastructure is not there to support it or work with technology teams to make it centrally available. As open source proliferates, so can the ethos and mindset that comes with open source of anyone can use and contribute also shifts the narrative.

By getting individuals at the organization to start or contribute to various initiatives across the organization, more perspectives are introduced, and feature priorities can be discussed less about feeling and more about value across the organization. Additionally, bringing together developers across the organization leads to creative applications of previous solutions which can improve the code base. On the other hand, by using an open-source solution, the user base at the organization can be wider, meaning more feedback on improvements or new features. Developers can even quickly mockup solutions, rapidly prototyping use cases of open tools before investigating into specific use cases.

This cycle of creating value leading to more involvement from the user base, leading to more input and value is a model many open-source projects use. From the likes of Linux for operating systems, R and Python for data science languages, this cycle has demonstrated success. Even projects within the pharma world are seeing improved collaboration, like the Pharmaverse [3], by using open-source technology that anyone can contribute to. Specifically, looking at the creation of the {admiral} R package, and its value to the community, to even growing to a collection of packages where different pharma companies have come together and created a suite of packages to solve common problems.

From an internal perspective, teams experiencing tangible benefits from a project are more likely to collaborate and share resources. Increased engagement and connection enhance the likelihood of project success by addressing organizational challenges. This leads to greater efficiency over time.

Operational Efficiency

Open-source tools offer organizations a transformative opportunity to enhance operational efficiency through the sharing of previous work, the distribution of ongoing efforts, and the multiplication effect gained from internal and external solutions. As highlighted in the introduction, much of today's software relies, at least in part, on open-source tools. This strategic integration spares organizations the effort of reinventing the wheel, allowing development teams to focus on specific project and organizational needs.

One such example where open source is currently improving efficiency is for biostatisticians. By leveraging open-source tools that implement robust statistical capabilities and cutting-edge techniques for data analysis, they don't have to re-create algorithms and can take advantage of software that has been reviewed by the community. Similarly, clinical programmers are starting to take advantage of tools created for data engineering and even some pharma-specific software (Pharmaverse [3]). By using these existing tools, they can focus on delivering top quality analysis and datasets. Rather than having to spend the time to create or maintain tools internally, using "off the shelf" solutions that are vetted by the community means they can focus on delivering value.

Early-phase researchers also benefit from the flexibility and adaptability of open-source solutions. As more data are collected, novel techniques of data processing to handle larger and varied data sets are often available in existing open-source tools. Streamlining this crucial step of the analysis workflow allows researchers to focus on their specific research needs instead of having to learn how to manage incredibly strange data types or structures.

Even teams where programming is not part of the role can benefit from the increased efficiency from the use of open source. While these teams may not directly engage with open-source code, the ease with which solutions can be developed for use by staff using open-source tools is powerful. The creation of web applications (E.g., Shiny or HTML Dashboards in R, and Shiny or Flask in Python), APIs, or the ability to provide standardized scripts that can be embedded in proprietary data systems (such as Tableau [4], Power BI[5], etc.) to standardize analysis and previewing outputs can save weeks of effort.

The widespread application of open-source tools can streamline operations, re-focus effort, and pave the way for sustained efficiency gains. By leveraging existing solutions and minimizing redundant efforts, organizations can significantly enhance their operational effectiveness, positioning themselves for greater time to innovate and impact.

To Innovation and Beyond

Open-source tools and libraries are known for solving difficult or common problems openly and allowing the community to review, adopt, and improve the solutions over time as well as cutting edge techniques in a fast-moving world. By taking advantage of existing tools, users can focus on novel applications and solving different, bigger problems as opposed to re-implementing the same technical solution. Focusing on the bigger problems allows for projects to drive impact, add value, and potentially cause pan-industry change.

From data collection, processing, analysis, and reporting, the pharma workflow is rife with opportunity to create novel solutions to reduce efforts and save time. For processes that have been done a certain way for a long time, re-investigating them through the lens of open source will allow teams and individuals to trial innovative ideas quickly and efficiently. The ability to rapidly prototype and combine open-source solutions together may lead to new avenues or automatability that were not seen before [3].

On top of the ability to improve current processes, there are opportunities to adapt and integrate industry shifts without having to create completely bespoke solutions by integrating open-source solutions. Now teams can take advantage of the latest 'omics, analysis tools, and collaboration engines with less time than what might normally be required to find a vendor or wait for the solution to be produced by commercial providers.

Finally, the benefit of open source is that it is available to all. What this means is the pool of qualified people to perform tasks is large, since people can learn it in university or in their free time for curiosity and work learning. As the number of people that are entering the workforce now are comfortable using open-source tools and can find training easily online, it is a massive benefit to be able to recruit around the use of open source at your organizations.

CONCLUSION

In the dynamic landscape of the pharmaceutical industry, where change is inevitable, organizations face a pressing need to enhance collaboration, streamline operational efficiency, and foster a culture of continuous innovation. The strategic adoption of open-source tools emerges as a linchpin in achieving these objectives.

By facilitating the sharing of ideas and streamlining workflows, open source becomes a catalyst for organizational transformation. Its impact extends beyond mere technical needs; it nurtures a culture of innovation, allowing teams to explore new possibilities, adapt swiftly to industry shifts, and remain at the forefront of advancements.

Embracing open source is not just a technological choice but a strategic imperative that will propel organizations into the future.

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