



WHAT PROJECT-MANAGEMENT SOFTWARE CAN DO FOR SCIENTISTS

Four tools that help researchers to see the big picture, especially when working in collaborative groups. **By Julian Nowogrodzki**

In January 2019, NASA announced that its Transiting Exoplanet Survey Satellite had discovered a planet about three times the diameter of Earth. The planet, orbiting a dwarf star 16 parsecs (53 light years) away, was found using sophisticated equipment including the satellite itself and the Magellan II telescope at Las Campanas Observatory in Chile. But its discovery also relied on a more prosaic tool, says astronomer Johanna Teske: the project-management software Trello.

The five-university consortium that oversees the telescope uses Trello to track and manage the queue of astronomical targets that different teams want to observe, says

Teske, who works at Carnegie Observatories in Pasadena, California. “The way that Trello organizes information seemed very much in line with the type of information we wanted to capture,” she says, and it’s worked well.

Popular project-management tools for research teams include Trello and Jira, both from the company Atlassian in Sydney, Australia, as well as Asana and GitHub project boards, both in San Francisco, California. These tools are more than simple to-do lists. They help teams to see the broad view of a project, allowing users to create and complete tasks, meet deadlines, capture detail-rich notes and provide templates for common

protocols. The tagging functions of these tools allow managers to assign tasks to team members. If used well, they can make teams more efficient and minimize frustrations such as forgotten tasks and duplicated work.

In short, project-management tools and the managers who use them “connect the details with the high-level goals”, says Tracy Teal. As the executive director of Dryad, a non-profit repository for open data in Durham, North Carolina, she uses several such tools.

Management experience

At the Broad Institute of Harvard and MIT in Cambridge, Massachusetts, computational

biologist Beth Cimini manages a small consultancy group within a larger team run by cell biologist Anne Carpenter, which focuses on automated image analysis. Carpenter's group uses project-management tools to handle tasks ranging from keeping track of the team's overall direction to experimental design, Cimini says – the latter thanks to a Trello template that automatically pre-populates notes with standard operating procedures so that laboratory members don't forget key steps. "It's definitely reduced the amount of time we spend reproducing what someone else has already done," Cimini explains. Her own team uses Trello and GitHub project boards to juggle their clients' needs. "It would be hard for each person in our group to have ten different projects a year" without them, she says.

Project-management tools tend to have a common visual style, called a Kanban board. This is divided into columns, called lists, with multiple cards pinned to them to represent different projects, protocols or topics. Users can make multiple lists (for example, 'To do', 'In progress' and 'Done'), create individual to-do items (either in the app or by sending an e-mail to a dedicated account), tag team-mates to assign tasks, and drag the cards from board to board as their status changes. Many tools can also display a timeline or calendar view, and provide apps for use on mobile devices.

But there are differences, and most tools offer both free and paid tiers, with different incentives for paid accounts. "It's worth exploring the different tools a bit and finding the right ones for you," recommends José Sánchez-Gallego, an astronomer at the University of Washington in Seattle. "Personally, I prefer tools that do one thing but do it well, rather than tools that allow you to do many things but become more cumbersome."

Sánchez-Gallego actually uses multiple tools for project management in his day-to-day work. These include ZenHub for managing GitHub issues for the Sloan Digital Sky Survey telescope in New Mexico; Jira for overarching project management, hardware issues and input from users; and OmniPlan for creating timelines and tracking time. "I like to look for simplicity and good overall design," Sánchez-Gallego says. "I also prefer apps that can work offline over web apps that only work when connected to the Internet. And I prefer tools that don't require me to share too much personal information."

With any project-management tool, the most difficult part is establishing a routine for using it, says Cimini. "It's easier to enforce doing that when it's collaborative," she says. "My collaborative Trello boards stay more up to date sometimes than my personal one."

Appoint a manager to run the tool at a team level, Teal advises. The Data Curation Network, of which Dryad is a partner, has

a project manager who goes through the team's Jira to-do items and pings a message to people if tasks aren't done, Teal notes. "The social connection between the tool and the team is a person who consistently makes that connection," she says.

"If used well, these tools can make teams more efficient and minimize frustrations."

Whichever project-management tool you use, ease your team into it to avoid overwhelming them, says Rafael Carazo Salas, who began using Trello after coronavirus-related shutdowns to aid communication and assign tasks in his stem-cell differentiation lab at the University of Bristol, UK. And don't feel you must restrict yourself to tasks, he adds. Salas has started using Trello to share literature with his team, tagging members on articles that are especially relevant to them. The literature keeps Trello interesting, and the tags alert people until checking the tool becomes a habit, he says. "Make it reach out to them," says Salas, "instead of making it a static board that they need to actively go and check."

Project toolbox

For the Magellan II telescope collaboration, Teske says, it is Trello's nested structure that allows the team to manage its users' needs. There's a board for each of the five institutions, which is visible only to that institution, and a separate board for the administrative team that is filled with astronomical targets for each slot of observing time. When a scientist wants telescope time, they create a card on their institution's board, which the administration team then moves to the observation board. Cards can include notes, PDFs and data files, and any other useful information. An archive board serves as a record of everything that has been done. "I think people find it intuitive," Teske says.

But small teams can also benefit from such tools. For Cimini's five-member team, Trello's integration with Tick, its time-tracking and billing software, has proved particularly useful to automatically track the amount of time they've spent working on projects that are billed separately, or to allocate how much time to spend on specific tasks. (Asana also integrates with Tick.)

Pre-formatted boards called templates are also useful, because they provide a starting place for common tasks. In Cimini's group, every time a team member kicks off one of their standard experiments, they use a template so they can be sure of completing every step in the protocol, she says. Cimini has also created a template for travel, which

includes standard tasks such as booking flights and hotels, and preparing presentations. This feature is particularly useful, she says, because the travel card stays on her Trello board until she remembers to file for reimbursements.

In her previous position at The Carpentries in Oakland, California, an organization that teaches coding and data workshops, Teal and her co-workers used Asana templates to ensure that they would remember to add essential components such as context, recurring tasks and milestones to every project. And they had a standard template to ensure that they completed all the tasks in the right order to be able to launch their workshops.

Project-management tools typically support plug-ins to enhance functionality. Trello, Jira and Asana can all integrate with the code-sharing site GitHub, for instance. But for developers and scientists who already spend a lot of time on the site, GitHub project boards are particularly appealing, say Teal and Cimini, whose teams both use this tool.

GitHub is a collaborative platform for people who develop software. Project boards organize GitHub's social elements – issue trackers, comments and code updates called pull requests – into a Kanban-like board. "It's this quick graphical way to understand how behind I am," says Clair Sullivan, a machine-learning engineer at GitHub, who is based in Breckenridge, Colorado. Whenever a programmer flags an issue (such as a bug report or a request for a new feature in the software), the software automatically slots it into the board's to-do column. As the team addresses these requests with finalized code fixes, GitHub's built-in Actions tool automatically marks the issues as done.

Sánchez-Gallego spends a lot of time using GitHub when he works with the team that maintains Marvin, an open-source data-visualization tool. But for his work managing the Sloan Digital Sky Survey helpdesk, he favours Jira, which his team has found to be more accessible for people who do not have experience in developing software. Observers and technicians at the two observatories his team supports use Jira to log tickets when something goes wrong. "What I find most useful is the ability to create personal filters," he says. This lets him see only the tickets that are most relevant to him.

No matter which management tool you choose, engage your team early in the decision-making process, Teal advises. Think about their needs and how they spend their time – for example, on GitHub or in their e-mail inboxes. Otherwise, your project-management tool risks becoming "sort of like another inbox", she says – just another thing that's hard to remember to check.

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