

Student research group: how to organize the management of a distributed team?

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Abstract

Background: The increasing flow of information and the epidemiological situation of the last few years forces us to find tools for organizing a productive collaboration distributed team of a student research group.

Method: Comparative analysis of six instruments (Trello, Office365, Meister, Bitrix24, Asana, Google Workspace) for collaboration on 12 criteria.

Results and Discussion: A large selection of tools for managing a distributed team allows flexibly organizing a project of any complexity for a team of any size.

Conclusion: Using tools to collaborate with a distributed team allowed us to simplify the organization of the student research group's work and not stop working on projects under lockdown conditions.

Keywords: project management, research group, agile, kanban

Background

The student research group of the Department of Pathology conducts lectures, master classes, scientific projects, and joint meetings with other research groups. Work is organized by four people: two supervisors (directors of oncopathology and pediatrics) and the head and deputy head of the department.

We have been looking for tools for distributed work since 2017 due to the growing territorial disunity of the team. Classes for students of the first two courses are held in the main building of our university. Starting from the third year, students move to the university clinics, which, which may be located up to 30–40 km from the main building in a megalopolis. Supervisors maintain medical practices and scientific work in several clinics at different locations

within cities. Thus, gathering everyone in one place and at the same time became a non-trivial task. With the onset of the COVID19 pandemic, this became almost impossible.

The main objective in organizing the work of a distributed team is project management. Every tool we reviewed is based on modern productivity methodologies: kanban [1], agile [2], scrum [3], or waterfall [4]. These methodologies are widely used in various branches [5] and gradually integrated into medical education [6, 7].

There is a wide range of productivity tools to choose from. We were looking for maximum functionality from a simple tool from a single source to reduce cost of configuration and integration.

The main objectives that the tool should support:

- 1) Setting and controlling tasks: task/project manager
- 2) Graphic representation of ideas: mind map
- 3) Collaborate on documents

Choice criterion

Onboarding

Before starting tool selection, ask the team about the social media accounts they use. Creating additional registrations can be a small barrier. Systems that limit the choice of registration method include Asana (Google or email), Microsoft (email, phone or GitHub) and Google (email). The inconvenience of logging in to Microsoft and Google is offset by a wide range of ecosystem products. If you are using Windows 10, you can set up a sign-in with Hello [8], which significantly simplifies signing in to Windows 10 and Office365. Trello and Meister can be logged into through an account on many popular systems (Google, Apple, Facebook, etc.)

The main problem at the start is always the time required to get acquainted with tools. Trello, Meister and Asana have the most comprehensive overview and reference materials. Other tools may require searching for a solution in the reference center, and implementation may take time. Sometimes it is better to look for a solution in a search engine, where you can find video tutorials and non-standard solutions for using the tools. For example, some websites explain how to use Google Sheets as a project manager or OneNote as Customer Relationship Management (CRM) software.

Project manager

The easiest way to organize work is a list of tasks and a calendar. This method is more suitable for work on approved tasks than for project work. Microsoft ToDo and Google Tasks have very limited functionality. Specialized services allow creating task cards, moving them between projects, using lists in the card (subtasks), attaching files, assigning executors, and setting deadlines.

Kanban boards or a Gantt chart can be used to control the project. A Gantt chart is useful when dependencies are the main factor in the schedule, whereas kanban boards can be used for jobs that do not have dependencies among themselves. In addition, a Gantt chart is appropriate when there is a preliminary plan for the entire content of the project, whereas the kanban boards are more suitable for cases where the entire plan arises and is finalized as the project develops. Kanban boards are better suited for recurring tasks (work with similar steps), and Gantt chart is better for managing a combination of different types of work. Note that the studied tools have a function to link tasks, and the individual cards on a kanban board can be converted to a Gantt chart. Other tools that allow linking tasks are MeisterTask, which has a fee for business users, and Bitrix24, which has a restriction of three links between tasks on a free plan.

The easiest way to organize project work is Trello, MeisterTask and Asana because these services were created specifically for this kind of work. Unfortunately, Office365 plans do not include ready-to-use solutions for kanban boards and project management. Microsoft has separate Project and Planner applications, but they are not part of the basic package and require additional financial costs. To solve this problem, we recommend using the built-in MS Excel templates for project management and Gantt charts or a similar solution with Google Workspace. Bitrix24 has all the necessary components, but they have restrictions on the free plan, and the program requires time to master.

Our experience has shown that the maximum effect when using links between tasks can be achieved by integrating memory maps (mind maps) into the project.

Mind map

The methodology of memory maps [9-11] has proven itself well for visualizing ideas. The use of this method for medical education is reflected in positive [12, 13] and restrained [14, 15] opinions. Our goal is to capture ideas, but not mnemonics. Memory maps are great for creating study design templates, articles, and reports; they allow

saving units of information on one board for later restructuring. The maximum effect of memory cards is obtained if nodes can be assigned as tasks and, in the same place, assigned to a performer without switching between instruments. Complete integration between a mind map program and a task manager is ideal. An additional benefit from such a bundle is distributing access rights to information without switching to paid tariffs. Different people can access tasks and memory cards for the same project. Of the studied tools, only Meister products have full task integration and allow us to design our own memory cards.

Collaborative writing

Organizing convenient collaboration on documents is very important for successful scientific work [16]. All the presented tools allow writing simple notes directly in the task. MeisterNote has advanced note-editing features. Its functionality is close to OneNote, and it is not very suitable for writing scientific articles. We did not consider the option of working in LibreOffice or OpenOffice for ourselves because we have been using Microsoft products for a long time and have not found any reason to stop using them.

However, using free office software can be a good solution for minimizing costs. Complete tools for co-authoring articles, presentations and spreadsheets are only available from Microsoft and Google. Successful work requires creating storage space in the tool's cloud storage or in a cloud storage platform you are already using. The last option is preferable from our point of view. First, the Office365 document attached to the task can only be edited by downloading on the computer. After editing, you need to attach the document to the task again. In some cases, the names of the documents do not change, which then requires manual version control to avoid over-writing another author's work. Sending document copies to co-authors by email is worse. Second, the choice of third-party cloud storage allows you to flexibly configure access rights to documents. For example, a user can see a task but cannot edit it. Roles and administrator functions ensure access rights only on paid plans in Trello, Meister and Asana. Third, you should only use version-controlled services to avoid losing information.

Reference managers

Collaborative work on a scientific article is an essential part of the professional progress of students and residents. All products could share writing text, but only a few could work with a list of references. Automated bibliography compilation is an essential tool for a scientist's work. Unfortunately, only MS Word has quality integration with reference managers (Mendeley, Zotero, EndNote, etc.). We only found two products that integrate a reference

manager with Google Docs–Paperpile [17] and Zotero [18]. We have found the combination of Microsoft Word and Mendeley to be effective when working with scientific articles. Our experience showed that this combination works stably and requires minimal setup and financial costs. You can find a convenient solution for yourself by reading the key characteristics of reference managers [19].

Storage

The size of files for collaboration (text, spreadsheet, presentation) usually does not exceed 30–50 MB. Therefore, the file size limitations on Trello starter plans, Meister and Asana (see Table 1) have little impact on the choice of collaboration tool. If a file exceeds the size limit, it can be uploaded to another form of cloud storage. All services have integrations with the most popular cloud storage options.

Supported cloud storage:

- Trello: Trello, Google Drive, Dropbox, Box, OneDrive
- Office365: OneDrive
- Meister: MeisterTask, Google Drive, Dropbox, Box, MindMeister
- Bitrix24: Bitrix24, Google Drive, OneDrive
- Google Workspace: Google Drive
- Asana: Asana, Google Drive, Dropbox, OneDrive/SharePoint

We believe that Google Drive is a good solution for most users.

In our experience, it is better to collaborate on documents in standard formats. Microsoft Office is the most common format used for documents in the scientific community. In this situation, style formatting errors are eliminated and working with reference managers is simplified. In MeisterTask, OneDrive support is currently only available through Zapier.

Automating

Productivity tools should always have built-in mechanisms for the automation of routine actions. Examples of tasks that can be automated are deferred posting to social networks, creating repetitive tasks, and assigning responsibility depending on the status of the task. Basic automation tools are available for all tools other than Google Workspace. In Office365, automation can be implemented through macros or Power Automate [20]. Despite the user-friendly interface and templates, customizing processes could take time. If the built-in automation tools in Trello, Meister and Asana are not sufficient, additional automation services such as Zapier and IFTTT (If This Then That) can be used.

Integrations

All products reviewed have an impressive list of integrations and tasks that could be solved within the product ecosystem. The tool pages provide a list of supported integrations with third-party services [21-25]. In our situation, the most useful integrations were available through the Zapier service [26], which allows automating most routine processes. For example, a task in Taskmanager about the upcoming meeting of the research group could be created. Then, creating a meeting in Zoom, posting meeting information on social media, adding a meeting to a calendar, and sending an automated email happens without additional intervention according to the configured processes.

Integration with the calendar allows adding tasks to each participant's schedule. Duplication of email and push notifications helps users not miss a task in the case of technical problems.

We also recommend considering application programming interface (API) tools to integrate tools with software with no ready-made templates.

Settings complexity

Integrations in Trello, Meister and Asana do not require any special computer knowledge. The settings in Zapier and IFTTT are intuitive and provided with step-by-step prompts according to the "if-then-else" algorithm.

Microsoft has its own process automation product, Power Automate, with many templates [20]. This tool could be used both in the desktop version and browser extension. Google Workspace has Apps Script [27], which requires programming knowledge and is more like Microsoft's VBA macros. Automation for Google Workspace is best configured with tools like Zapier and IFTTT.

Despite the many modules and extensions for configuring Bitrix24, it may require paid plans or programming skills. This tool is more focused on large business projects.

Communication

A unified communication environment is an important part of the organization of collaboration. Integrated means of communication (messenger, calls, video chats) are only available from Microsoft, Bitrix24 and Google. Communication in other tools could be organized by a large set of third-party services, or you may limit yourself to comments on the task card. Usually, there are enough notifications for mail in the mobile application. A group could be created in any messenger application used by all team members for quick communication.

Platforms

Some tools allow work on a smartphone, tablet, laptop or desktop without an Internet connection. In most cases, a web or cloud platform is sufficient for most work, using mobile messaging for quick replies or notes. Note that the desktop version of MeisterTask does not work without the Internet. Google has add-ons for the Chrome browser for offline work with documents, spreadsheets and presentations [28].

Pricing and Discount

Cost is a key factor in choosing a tool. Comparing direct prices is difficult due to options in tariff plans. Some will be interested in a monthly subscription; others will price based on the number of participants in the tariff plan. Additional fees may apply for extensions. All tested tools have free starter plans with sufficient functionality to get started. During use, the tariff plan could be changed by the use of extensions. We recommend paying attention to discounts available for educational and non-commercial projects. Most plans offer an average discount of about 50%. If your organization uses Office365 for Education, that's good news — basic Office365 applications and services are free.

Results and Discussion

Every instrument was tested for 4 to 6 months. We do not summarize the points for each instrument in Table 1 because there is no universal solution for organizing remote teamwork. We considered only the functions that we need at the moment.




















	Trello	Microsoft Office365	Meister	Bitrix24	Asana	Google Workspace
Onboarding	+++	++	+++	+	+++	++
Project manager	+++	Project+ Planner or ToDo+ Outlook+ Excel	MeisterTask	+++	+++	Sheets+ Gmail+ Tasks+ Calendar
Mind map	Add-on	Visio	MindMeister	Add-on	Add-on	Add-on
Collaborative writing	Add-on	+++	Meisternote	Add-on	Add-on	+++
Reference managers	+	+++	+	+	+	++
Storage	∞*	1 Tb per user	∞*	from 5 Gb	∞*	from 30 Gb
Automation	+++	++	+++	+	+++	++
Settings complexity	+	++	+	+++	+	+
Integrations	+++	+++	+++	++	+++	+++
Communication	+	+++	+	+++	+	+++
Platforms **	  	  	  	  	 	 
Pricing & Discount	++	++	+++	+	++	++

Table 1. Key features that influence the choice of collaboration tool for a distributed team.

* - The lower-price plans limit the size of downloadable files (up to 10 Mb - Trello, up to 20 Mb - MeisterTask, up to 100 Mb - Asana).

** - legend: platforms -  web/cloud, -  desktop, -  mobile

The choice between Trello and Asana is based on subjective design preferences. The functionality and integrations of these tools are very similar. Meister products offer a good ecosystem with easy customization. The disadvantage to us is a lack of native support for OneDrive (at the time of this article). This annoying flaw is fixed by the integration through Zapier.

The main advantage of Bitrix24 is a huge number of built-in modules for business (CRM, various analytics options, website creation, IP-telephony, etc.). Such a comprehensive solution is more suitable for the organization of a scientific society or university management. We found that the complexity of configuring this software was not

repaid in benefits, even though it offers a “Project +” tariff plan for project activities. This tool makes sense if a very large project is planned, but some functions may remain unused even then.

If your university uses Office365 for Education, most of the tools could be obtained immediately and for free. It only remains to choose the method of project management. We currently use Office365 Family, MeisterTask and MindMeister, which required the minimum time for setup. We do not actively use MeisterNote because it is not very suitable for writing a scientific article. We do not analyze the cost of the instruments in detail because the pricing policy may differ depending on the region and other conditions.

Conclusion

Using tools for collaborative work of a distributed team allowed us to not stop work on projects through a lockdown. The solutions we considered are far from the only ones. Solving the challenge of joint remote work on projects now is no longer a problem. Many tools on the market support productive work. A solution could be found without financial costs. The major problem is that it may be necessary to use several services for complex solutions.

Declaration of interest section: The authors declare no conflicts of interest.

References

1. Lage Junior M, Godinho Filho M. Variations of the kanban system: Literature review and classification. *Int J Prod Econ* 2010;125:13–21. <https://doi.org/10.1016/j.ijpe.2010.01.009>.
2. Ramesh G, Devadasan SR. Literature review on the agile manufacturing criteria. *J Manuf Technol Manag* 2007;18:182–201. <https://doi.org/10.1108/17410380710722890>.
3. Al Qurashi S, Qureshi MRJ. Scrum of scrums solution for large size teams using scrum methodology. *Life Sci J* 2014;11:443–9.
4. George JF. From waterfall to agile: A review of approaches to systems analysis and design. In: Topi H, Tucker A, editors. *Comput. Handbook, Third Ed. Inf. Syst. Inf. Technol.*, Chapman and Hall/CRC; 2014, p. 28-1-28–16. <https://doi.org/10.1201/b16768>.
5. How to create an agile organization | McKinsey n.d. <https://www.mckinsey.com/business-functions/organization/our-insights/how-to-create-an-agile-organization> (accessed July 4, 2021).
6. Stojanovic V. Trello (product review). *J Can Heal Libr Assoc* 2021;42:94–7. <https://doi.org/10.29173/jchla29545>.
7. Goldman S. The educational kanban: Promoting effective self-directed adult learning in medical education. *Acad Med* 2009;84:927–34. <https://doi.org/10.1097/ACM.0b013e3181a8177b>.

8. Learn about Windows Hello and set it up n.d. <https://support.microsoft.com/en-us/windows/learn-about-windows-hello-and-set-it-up-dae28983-8242-bb2a-d3d1-87c9d265a5f0> (accessed July 4, 2021).
9. Eppler MJ. A comparison between concept maps, mind maps, conceptual diagrams, and visual metaphors as complementary tools for knowledge construction and sharing. *Inf Vis* 2006;5:202–10. <https://doi.org/10.1057/palgrave.ivs.9500131>.
10. Budd JW. Mind maps as classroom exercises. *J Econ Educ* 2004;35:35–46. <https://doi.org/10.3200/JECE.35.1.35-46>.
11. Farrand P, Hussain F, Hennessy E. The efficacy of the “mind map” study technique. *Med Educ* 2002;36:426–31. <https://doi.org/10.1046/j.1365-2923.2002.01205.x>.
12. Baliga S, Walvekar P, Mahantshetti G. Concept map as a teaching and learning tool for medical students. *J Educ Health Promot* 2021;10:35. https://doi.org/10.4103/jehp.jehp_146_20.
13. Choudhari SG, Gaidhane AM, Desai P, Srivastava T, Mishra V, Zahiruddin SQ. Applying visual mapping techniques to promote learning in community-based medical education activities. *BMC Med Educ* 2021;21:210. <https://doi.org/10.1186/s12909-021-02646-3>.
14. D’Antoni A V, Zipp GP, Olson VG, Cahill TF. Does the mind map learning strategy facilitate information retrieval and critical thinking in medical students? *BMC Med Educ* 2010;10:61. <https://doi.org/10.1186/1472-6920-10-61>.
15. Pudelko B, Young M, Vincent-Lamarre P, Charlin B. Mapping as a learning strategy in health professions education: A critical analysis. *Med Educ* 2012;46:1215–25. <https://doi.org/10.1111/medu.12032>.
16. Lingard L. Collaborative writing: Strategies and activities for writing productively together. *Perspect Med Educ* 2021;10:163–6. <https://doi.org/10.1007/s40037-021-00668-7>.
17. Paperpile: Modern reference and PDF management | Paperpile n.d. <https://paperpile.com/> (accessed June 30, 2021).
18. Google docs Zotero Documentation. n.d. https://www.zotero.org/support/google_docs (accessed June 30, 2021).
19. Comparison of reference management software | Wikipedia n.d. https://en.wikipedia.org/wiki/Comparison_of_reference_management_software (accessed June 30, 2021).
20. Process Automation with Power Automate | Microsoft Power Apps n.d. <https://powerapps.microsoft.com/en-us/automate-processes/> (accessed July 4, 2021).
21. Integrations available for Bitrix24 n.d. <https://www.bitrix24.com/integrations/> (accessed June 30, 2021).
22. Asana Apps and Integrations | Asana n.d. <https://asana.com/apps> (accessed June 30, 2021).
23. Trello Integrations n.d. <https://trello.com/en/integrations> (accessed June 30, 2021).
24. Integrations | MeisterTask n.d. <https://www.meistertask.com/pages/integrations> (accessed June 30, 2021).
25. Microsoft 365 Products, Apps, and Services | Microsoft 365 n.d. <https://www.microsoft.com/en-us/microsoft-365/products-apps-services> (accessed June 30, 2021).
26. Zapier | The easiest way to automate your work n.d. <https://zapier.com/> (accessed June 30, 2021).
27. Google Apps Script: Automate, integrate with, and extend Google Workspace. n.d.

<https://workspace.google.com/intl/en/products/apps-script/> (accessed July 4, 2021).

28. Work on Google Docs, Sheets, & Slides offline - Computer - Docs Editors Help n.d.
<https://support.google.com/docs/answer/6388102?co=GENIE.Platform%3DDesktop&hl=en&oco=1>
(accessed July 5, 2021).

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Funding or grant support: nil

Conflicts of interest/Competing interests: nil

Availability of data and material: Not applicable

Code availability: Not applicable

Authors' contributions: All authors contributed to the study conception and design. Concept and design were performed by Zhakota Dmitrii Anatol'evich. Material preparation, data collection and analysis were performed by Kushch Darya Sergeevna, Malyugin Nikita Georgievich and Donchenko Nikolai Sergeevich. The first draft of the manuscript was written by Zhakota Dmitrii Anatol'evich and Mnichovich Maxim Valer'evich and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethics approval: Not applicable

Consent to participate: Not applicable

Consent for publication: All the authors have agreed to the publication.