

Figure 1. OpenProject Timeline

(Source: <https://community.openproject.org/news/41-new-design-for-openproject>)

Consider that unlike most of the available project management tools, OpenProject is only available for Linux. However, one of the main aims of OpenProject is establishing active community that would help this tool improve ever more. Therefore, at the end of 2013, was created OpenProject Foundation (OPF), inspired by Ubuntu Foundation and Apache Software Foundation. The main goal of this foundation is to constantly improve OpenProject and ensure overall product quality.

3.2 ProjectLibre

ProjectLibre is open source project management software that provides management assistance during a project development. It was released in 2012 as multiplatform software developed in Java by Marc O'Brien and Laurent Chretienneau, under the company Projity, as a branch of already existent project management software – OpenProj. The development of OpenProj was discontinued and developers used this available tool as a base and added some new features and improvements. This tool is known as open source alternative for Microsoft Project (Kelly, 2012), (Hibbets, 2013), (Project Libre, 2015). Some of the available features are: Microsoft Project 2010 compatibility; Ribbon user interface; Earned value costing; Gantt and PERT charts; Resource breakdown structure (RBS) chart; and Work breakdown structure (WBS) chart.

ProjectLibre is a system that is mainly focused on longer phases and iterations, providing an overview of overall WBS and RBS during project lifecycle. In terms of installation, ProjectLibre can be easily installed on local system using MSI – engine used to install software on Windows. That means that a project is represented by a file that is stored in a disk system and may be saved and posteriorly loaded. This differs from most of project management tools that attempt to provide on-line collaborative environment that can be accessed and used from anywhere.

As presented on Figure 2, ProjectLibre has a Ribbon styled navigation menu, which is very similar to MS Software style. This GUI makes this tool more user-friendly while trying to compete with MS Open Project.

Figure 2. ProjectLibre Gantt Chart (Source: <http://sourceforge.net/projects/projectlibre/>)

3.3 Redmine

This open source project management tool was firstly released in 2006 while being developed in Ruby on Rails by JP Lang (Hartl, 2012). One of the advantages of this tool using Ruby is the use of “gems” which is an easy way of distributing and installing software. Redmine includes calendar and Gantt charts to aid visual representation of projects and their deadlines. It also features multi-project support, role based access control, a per-project wiki, and project forums. Some of the features provided by Redmine are, as follows (Ozio Media, 2012): Multiple projects support; Budgeting; Issue tracking system; Gantt chart and calendar; News, documents & files management; Feeds & email notifications; Per project wiki and forums; and Time tracking.

While being a popular tool, there is a variety of plugins that can be added to Redmine to somehow enhance it. This enhancement may be the installation process or management and visual customization to fit better accordingly to a specific company (Ozio Media, 2012), (Redmine, 2015). Differently from most Open Source tools, Redmine

has a large amount of plugins that are distributed by developers that are built on top of Redmine and are capable of somehow enhancing its capabilities.

Figures 3a) and 3b) show Redmine user interfaces. However, while Figure 3a) shows basic GUI, Figure 3b) presents a plugin that improves Redmine visual characteristics, making GUI more appealing.

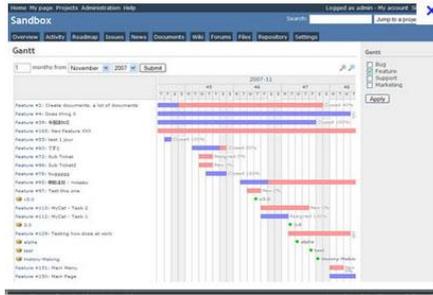


Figure 3. a) Redmine Interface

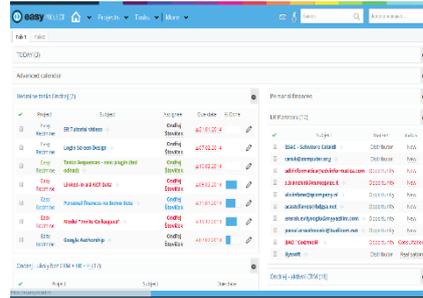


Figure 3. b) Easy Redmine Interface.

3.4 LibrePlan

Developed by Igalia, private company based in Spain, LibrePlan is an open source web-based project management tool. This software started being developed in April 2009 in Galicia (Spain) with the aim to build a planning tool for the Galician regional naval auxiliary sector. Project was originally named by NavalPlan and posteriorly, past 1.2 version, renamed to LibrePlan (Libreplan, 2016). Some of the feature categories are as follows: resource management, planning, control and monitor, data tracking, and connection. Resource management represents both human and material resources that are necessary during entire project lifecycle. While focusing on the human resource it is possible to easily manage team members by configuring their personal pages that contain not only basic information but also assigned tasks, calendars, working time, expenses, available time and more. Project planning represents one of the base pillars for any project management tool. LibrePlan provides time estimation and deadline tracking, GANTT charts, resource allocation, activities and Monte Carlo simulation. Monte Carlo simulation is a computerized mathematical technique that provides necessary data for risk in quantitative analysis and decision making (Palisade, 2015). In this tool, it provides the probability density function of the project duration using the PERT optimistic, most likely and pessimistic times of the tasks belonging to the critical path. Also, it is possible to overview the entire company dashboard. This dashboard contains the information of all the existent projects and allows to compare their progress as well as associated costs. Finally, it is possible to manage subcontractors. Many of the enterprise highly invest into outsourcing and LibrePlan allows to easy track contracted entities and track their scheduling and costs. Figure 4 presents an example of resource overview.

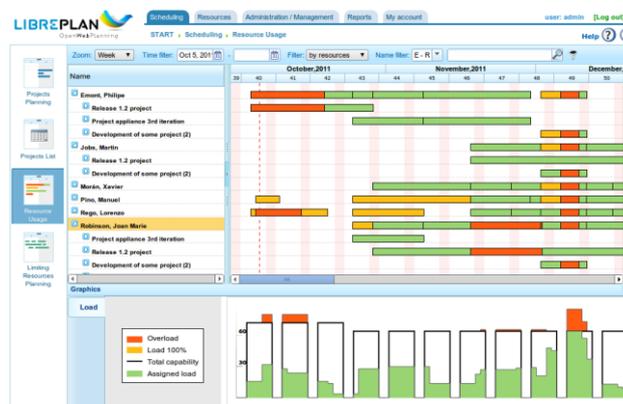


Figure 4. LibrePlan resource load (Source: <http://www.libreplan.com/features/monitor-and-control/>)

3.5 Open Source Features Comparison

In the previous sections we described some of the most popular open source project management alternatives. In Table 1 we present the comparison list of features. This side-by-side comparison will let us understand better which offers more functionalities. Note that we considered some of the main possibilities that are more important during project lifecycle.

Table 1 - Open Source Tools Features

	<i>OpenProject</i>	<i>ProjectLibre</i>	<i>Redmine</i>	<i>LibrePlan</i>
<i>Language</i>	Ruby	Java	Ruby	Java
<i>Multiplatform</i>	Linux Only	Yes	Yes	Yes
<i>Web-based</i>	Yes	No	Yes	Yes
<i>Issue tracking</i>	Yes	No	Yes	Yes
<i>Scheduling</i>	Yes	No	Yes	Yes
<i>Resource management</i>	No	Yes	No	Yes
<i>Document management</i>	Yes	No	Yes	Yes
<i>Reporting</i>	No	No	No	Yes
<i>Portfolio Management</i>	Yes	No	Yes	No
<i>Forum</i>	Yes	No	Yes	No
<i>Email Support / Integration</i>	Yes	No	Yes	No
<i>Resource management</i>	No	Yes	No	Yes
<i>Repository integration</i>	Yes	No	Yes	No
<i>Task management</i>	Yes	Yes	Yes	Yes
<i>Budget management</i>	Yes	Yes	Yes ¹	Yes
<i>Time tracking</i>	Yes	Yes	Yes	Yes
<i>CRM</i>	No	No	Yes ¹	
<i>Charts</i>	Yes	Yes	Yes	Yes
<i>Simulation Scenarios</i>	No	Yes	Yes ¹	Yes
<i>Import/Export data</i>	Yes	Yes	Yes	Yes

¹ Available using plugin.

After evaluating the results, we concluded that although Redmine is one of the most popular open source alternatives and while it provides all the core features, most of those are additional modules and add-ons that mostly are not open source. That means that while the core system is open source additional features may have to be bought from the providers. When it comes to Open Project, this tool is limited to the Linux operating system. This may be a limitation for some of the development teams. Overall, ProjectLibre may be the best alternative since this software provides most of the important features. One of the drawbacks is it not being web-based and, as previously stated, differently from other tools, requires local installation and created a project file on the local disk system. LibrePlan is a tool with similar features to ProjectLibre. However, this software provides a feature that others do not: Monte Carlo Simulation. This data may be useful to predict project evolution and be prepared for some of the scheduling challenges.

4. Proprietary Tools

In the second part of our evaluation we describe proprietary tools. Similarly, to the previous section, that presents open source alternatives, we choose four popular proprietary project management tools: Bitrix24, JIRA, Microsoft Project and Asana. After a brief description we present a feature comparison table that allows an easier comparison of the possibilities of those tools.

4.1 Bitrix24

Bitrix24 is a proprietary project management tool (Bitrix24, 2015). This is a web-hosted software which means that there is a possibility of using this tool without any installation. However, there is also a possibility of using a

self-hosted version that would require an internal configuration, per company. This is one of the most popular proprietary tools for project management. It allows not only scheduling and task management but also to allocate all the necessary resources, those being physical, human or even monetary. Differently from some of the available solutions, when creating a Bitrix24 environment, there is a possibility of internally manage all the company employees as well as clients. It is also possible to recreate organizational chart that would represent existing departments and assign each of employees to their working space.

This tool looks professional and organized but may be complex when logging since all the latest announcements, for example daily/weekly assignments, private messages, forum updates, tasks and groups will pop to notify all the changes that have been made since last login.



Figure 5. Bitrix24 Interface (Source <https://www.getapp.com/>)

Figure 5 shows Bitrix24 user interface. Just by its visual aspect we can easily difference this tool from previously described. Some of the main features are (Bitrix24, 2015): Task and schedule management; Employee management; CRM; Reporting; Online Document management; and Charts. It is important to consider that staff, client and enterprise management are some of the most important features of this tool. There is a possibility of assigning responsible employees to projects, clients as well as teams. Also, a full client sheet provides all the necessary information that may be useful for the future projects or as evaluation of already completed ones, for example, locations, previous projects, previous responsible, contacts, etc.

4.2 JIRA

JIRA Software is a proprietary issue tracking tool, which is developed and managed by Atlassian (Atlassian, 2015). Differently from previously described project management tools, main focus of Jira consists of feature and issue tracking. The name of this software comes from the widely known movie Godzilla. Originally, in Japanese, it is pronounced as “gojira”, posteriorly “go” was dropped and JIRA became the software name. This project management tool, similarly to Bitrix24, may be used as either a self-hosted or cloud-hosted. When is chosen self-hosting, this tool supports multiple platforms which may be usefully accordingly to the enterprise architecture. As previously stated, this tool not only allows task management but focuses mainly on issue tracking and agile development. It works well with the agile development methods such as of SCRUM (Mishra & Mishra, 2013). One of the main characteristics of this tool is a large amount of available features. Although the main focus of JIRA is agile issue tracking, it provides a core set of any project management tool. Some of the available features are: Issue and task tracking; Bug reports; Feature requests; Reporting; and Notifications.

Figure 6 presents JIRA interface. On this figure we can see that any team member can keep track not only of all the tasks, but other team members’ tasks and progress. Pie chart acts as additional comparison, providing easy visual understanding of how many issues have been addresses by whom.



Figure 6. JIRA Dashboard (Source: <http://blog.tempio.io/2012/lean-customer-development-delivering-solutions-to-your-customers-on-time-and-on-budget/>)

Currently there are a lot of plugins that are added accordingly to the enterprise needs. However, it is important to notice that most of those add-ons are enterprise and have to be bought from the distributors. That means that core JIRA distribution only provides main features.

4.3 Microsoft Project

Microsoft Project is a management tool with the right blend of usability, power, and flexibility all of which help to manage projects more efficiently and effectively. It allows project managers to stay informed and be able to control project work, schedules, and finances, keeping project teams aligned, and creating more productivity through integration with familiar Microsoft Office system programs (Carter & Lippert, 2006).

It is a proprietary software tool for project management designed to assist the project managers in developing a plan, assigning resources to tasks, tracking progress, managing a budget, and analyzing workloads. Some of the available features are: Timeline; Integration with another Microsoft Tools; Scheduling and Task management; Reporting; and Task path tracking.

Microsoft Project provides a standard MS Office-like interface and a set of project and time management functionalities. Figure 7 shows a basic MS Project interface. Ribbon menus provide easier usability since these days most of software users are familiar with other MS tools, like Office, that this interface becomes more friendly and easier to understand even if used by an inexperienced user.

One of the important features of this tool is the user management based on the access levels. That means that there are different classes of users that can have differing access levels to projects, views and other project-related data. This type of access restrictions increases project security level and provide a higher control over project tracking.

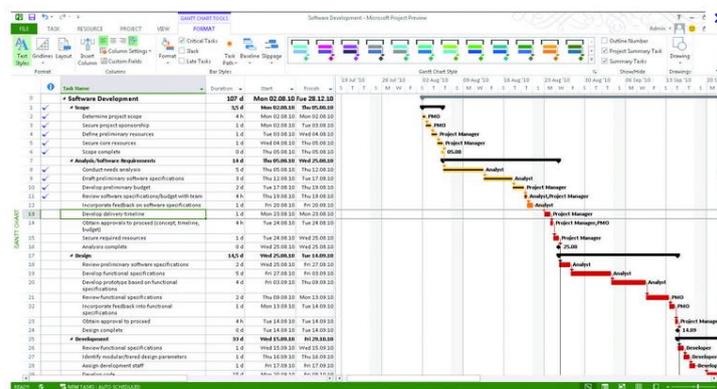


Figure 7. MS Project interface (Source: <https://www.getapp.com/project-management-planning-software/a/microsoft-project/>)

4.4 Asana

Asana is a web-based project planning tool focused on team communication and collaboration. It was created in 2008 by the co-founder of Facebook, Dustin Moskovitz. This tool provides a full messaging system in order to reduce the use of email and attempting to combine all the necessary features in one software. Project team may create their workspace. This workspace is used to englobe similar projects into one main group. In order to track a project different tasks are created that may contain attachments, comments and tags. If a team member is in this project and subscribed to notifications, any changes to those tasks will be sent to user's inbox as notifications. For easier task scheduling tracking, Asana provides a calendar-like notification system where each task has a priority and a due date. Team members assigned to this task will be automatically notified about due date approach. Besides basic project management features, Asana provides integration with another available software tools, for example, Dropbox. These days many people opt for cloud stored data and Dropbox is one of the most used tools for file storage. Therefore, it is possible to attach files to tasks directly from Dropbox. Some of the other integrations are: HipChat, Slack, Google Chrome, Google Drive, Zapier, Okta, etc (Asana, 2016).

While being a web-based tool in desktop environment, Asana is also available as application for iOS and Android. Those apps allow team members and project managers to be constantly updated about overall project status as well as tasks due dates and notifications. Figure 8 presents an example of the mobile and web interfaces.



Figure 8. Asana web and mobile interface (Source: <http://www.hifluence.eu/hi-people/top-10-must-have-business-apps-of-2015/>)

4.5 Proprietary Features Comparison

In Table 2 we present some of the main features of the four proprietary popular tools: Bitrix24, JIRA, MS Project and Asana. Although all of those tools require payment, we did not consider licensing and pricing on this comparison. Our main goal is present their features in a most comparable way to features available in open source tools.

Table 2 - Proprietary Tools Features

	<i>Bitrix24</i>	<i>JIRA</i>	<i>MS Project</i>	<i>Asana</i>
<i>Development Language</i>	PHP	Java	.NET	Luna
<i>Multiplatform</i>	Yes	Yes	No	Yes
<i>Web-based</i>	Yes	Yes	No	Yes
<i>Issue tracking</i>	No	Yes	No	
<i>Scheduling</i>	Yes	No	Yes	Yes
<i>Document management</i>	Yes	No	No	Yes
<i>Reporting</i>	Yes	Yes	Yes	Yes
<i>Portfolio Management</i>	No	No	No	No
<i>Monitoring</i>	Yes	Yes ¹	Yes	Yes
<i>Forum / Wiki</i>	Yes	Yes ¹	No	No
<i>Email Support / Integration</i>	Yes	Yes ¹	Yes	No
<i>Resource management</i>	Yes	Yes ¹	Yes	Yes
<i>Repository integration</i>	Yes	Yes ¹	Yes	Yes
<i>Task management</i>	Yes	Yes	Yes	Yes
<i>Budget management</i>	No	Yes ¹	Yes	No
<i>Time tracking</i>	Yes	Yes	Yes	Yes
<i>CRM</i>	Yes	Yes ¹	Yes ¹	Yes
<i>Simulation Scenarios</i>	No	Yes	Yes	No
<i>Import/Export data</i>	Yes	Yes	Yes	Yes
<i>Custom Integrations</i>	No	Yes	Yes	Yes

<i>API</i>	Yes	Yes	Yes	Yes
<i>SSL Security</i>	Yes	Yes	Yes	
<i>Mobile Version</i>	Yes	Yes	Yes	Yes

¹ Available using plugin.

Accordingly to Table 2, JIRA may be compared to Redmine, where there is a core package with the main functionalities and additional features are add-ons. Bitrix24 is the tool that provides more options to its users and since it is web-based it does not require any installation. Finally, Microsoft Project, as previously stated, is known as proprietary version of open-source ProjectLibre and, therefore, it not only has similar available features but same type of local install since both of those tools are not web-based. Asana is a good alternative for more agile and task-based teams. It is important to notice that this tool provides a lot of integration with another software.

5. Discussion: Open Source vs Proprietary Tools

In the previous sections we described some of the most popular open source and proprietary tools while considering some of the main available features. We described four open-source project management tools: OpenProject, ProjectLibre, Redmine, LibrePlan and four proprietary tools: Bitrix24, JIRA, MS Project and Asana. All of those tools provide a large amount of available features, besides core project management functions. But which ones are most suited for an SME? There are different aspects that should be considered while choosing a tool for a company environment. Some of the most important are: security, quality, flexibility, support and cost. All of those qualities may be discussed into favor of proprietary tools as most of the users would expect higher quality for the enterprise options. However, if we think about it, does paying for something always translates into much better quality? Big companies that create software have limited resources not only to develop but also to solve any posterior tool software problems. If we look closer, most of the bug fixes and corrections always take some time to be released. On the other hand, there are always a lot of people working on the open source tools. Those are constantly being improved and due to the large amount of developers, there is a higher chance of detecting any failure on the early stages and correcting it as soon as possible. And what about support? Customers that spend their money on services are expecting some big quality support systems where their problems are solved on-demand. But does that happen? Is it faster to solve any problem by contacting software provider support that will be handled by someone or having a large community available? In some cases, enterprise support may be able to provide a solution considerably fast but same may be said about community and developers, who's availability is almost 24/7, considering that there are users from everywhere on the globe. Considering all that, is it actually for a smaller company to invest in proprietary software?

6. Conclusions and Future Work

While comparing available features, we concluded that proprietary and open source do not differ much. We believe that open source tools are capable, to some level, to keep up with proprietary tools and offer some of the basic necessary functionalities. However, after comparing some of those tools in terms of use, we defend that proprietary tools offer a more user friendly and intuitive interface.

As future work we intend to install and evaluate these tools by comparing user interface and overall ease of use of those alternatives in an enterprise, and understand the applicability and maturity level of project management tools in support of Projects for Big Data, Cloud, Mobile, Social Networking and Industrial Internet of Things (IIoT) environments.

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