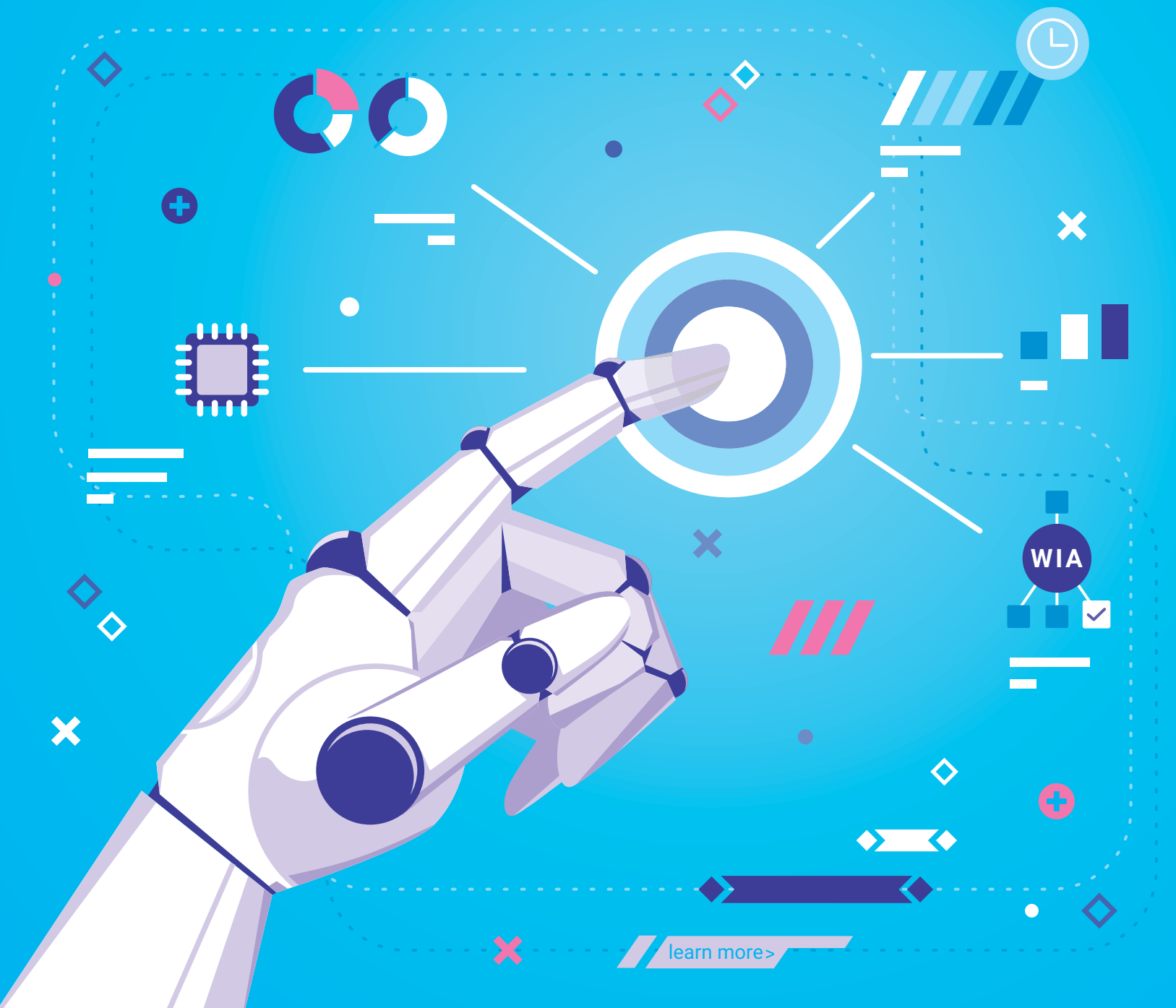# ARTIFICIAL INTELLIGENCE
in Multi-Project Management

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ARTIFICIAL INTELLIGENCE
in Multi-Project Management

CONTENTS

1.THE ROLE OF AI IN MULTI-PROJECT MANAGEMENT

Artificial intelligence in project management is an integrated system that assists in administering projects. The power of AI in PM is all-encompassing, ranging from automating repetitive tasks to assisting in making project decisions.

The importance of AI is especially critical in a multi-project environment, where more than two projects run in parallel. Apart from the traditional way of treating projects separately regardless of their relations, AI makes it possible to analyze inter-project relations and build another approach to multi-project management. This allows cross-functional teams to work on several projects at the same time, just moving from project to project based on project and task priorities. As long as these priorities can't be calculated by the human brain due to the extra-large amount of data, the need for AI in a multi-project environment becomes crucial.

HOW EXACTLY DOES AI ASSIST IN MANAGING PROJECTS?

AI Saves Project & Resource Managers' and Team Members' Time

AI-based tools can take over functions like meeting planning, reminders, day-to-day updates, and other administrative tasks [1]. The simplest form of AI - machine learning - is capable of automating most monotonous tasks and is being successfully applied in most project and resource management tools. This saves project managers' and resource managers' time that they can spend on other important activities that require human intelligence and active involvement. Besides, by freeing PMs and RMs from such repetitive tasks that don't require human intelligence, AI contributes to project success by letting them be close to their team members and creating a comfortable team environment where everyone feels supported and valued [2].

AI Can Prevent Issues in the Workplace

AI's analyzing capabilities can detect mistakes and roadblocks that the human eye can't notice and therefore prevent bigger issues that may happen in the workflow.

AI Ensures Flawless Performance

Artificial intelligence can reduce the number of human errors as it can't be distracted by external stimuli, bad mood, private issues, or illness. Also, AI can't be interrupted by other tasks as it works according to the strictly defined algorithms as distinct from an employee who can be disturbed by other team members or management. This, in turn, reduces negative risks and improves outcomes.

AI Contributes to Efficient Resource Management

Artificial intelligence helps resource managers allocate resources and balance their workload by:

◇ Matching the resource and the task based on availability, capacity, experience, and skills.

◇ Automatically reduce idleness while preventing bad multitasking. This only requires a project manager to input all the necessary data into the system, and then the AI-driven tool will perform all the necessary operations. At the same time, any PM tool can be integrated with a human resource management system, which will eliminate the necessity of manually adding availability and skill set data into the software solution.

◇ AI can predict demand levels. This helps optimize resourcing costs and staff projects with required resources.

AI Helps Reach Business Goals

Predictive analytics helps make project decisions

AI can process huge amounts of data and make complex analytics, which makes it valuable for any business thanks to its ability to predict a project's success or failure. The biggest advantage of artificial intelligence as compared to the human brain is that it analyzes every item of the dataset in the system thoroughly and without any distraction as distinct from a person, whose attention can be easily caught by any other event at work. Besides, a project manager can predict some shifts in the further project flow only based on his or her own insights, intuition or experience, while AI algorithms make predictions relying on regularities and patterns discovered as a result of the data analysis. AI warns managers before things go wrong so that they have enough time to take measures.

AI is capable of reducing costs and time

As mentioned above, artificial intelligence automates most repetitive tasks and lets team members, project and resource managers perform more complex assignments that require human intelligence. In such a way, AI improves the quality of work while reducing the cost of labor and speeds up many operations.

AI helps manage risks

Predictive analytics can foresee the emergence of threats to the project flow. Its data collecting, analyzing, and structuring capabilities create all necessary conditions for project transparency that contributes to early detection of risks and their further mitigation.

AI makes it possible to reduce lead time

It's possible by means of prioritizing tasks in such a way as to make the project flow as smooth as possible and eliminate resource conflicts. This is especially relevant for a multi-project environment with a shared pool of resources when they're needed at different stages of various projects. The number of tasks within the portfolio of projects covers such a huge amount of data that it's impossible for a human brain to analyze it and create an ideal schedule without any resource conflicts. With the help of AI, this becomes possible, and even if some project changes occur, a project or resource manager doesn't have to reschedule anything, as the AI algorithms just change the priorities according to newly appeared circumstances.

2. BENEFITS AI BRINGS TO PROJECT MANAGEMENT

The fact that artificial intelligence increases chances for project success and that the project managers armed with AI-driven tools deliver more projects on time is proven by the PMI survey "AI Innovators: Cracking the Code On Project Performance" involving 551 project management professionals across a range of industries and from around the globe. According to the results, artificial intelligence provides the following benefits to the companies that have adopted it:

◇ Better on-time delivery: 61% of projects have been completed on time and within budget thanks to AI.
◇ Superior benefits realization: 69% of their projects realized 95% of their business goals.
◇ Higher ROI: 64% of their projects met or exceeded their original ROI estimates [3].

To sum up, we distinguish the following benefits that AI brings to project management from the planning stage up to the project completion:

**RISK AND UNCERTAINTY MANAGEMENT,
COST REDUCTION, FAILURE PREVENTION, FASTER DELIVERY**

Business Insights   Risk Management   Human Capital Optimisation   Action taker   Active Assistance

◇ With AI tools, project goals are more likely achievable thanks to a much better planning and project strategy as well as appropriate risk management that allows them to avoid and mitigate risks along the way.

◇ It can prevent failure by providing project managers with a high probability of winning throughout the project life cycle. Apart from analyzing project success, AI is capable of figuring out the causes of failures. The AI tools provide information about the true level of resources required and any other considerations such as training or availability.

◇ AI mechanisms make it possible to track the interdependencies between projects and provide early warning of both potential and real problems.

◇ Machine learning algorithms support the optimization of project schedules to minimize the total cost based on resource constraints. For example, predictive forecasting can be used to identify potential excess or shortage in resources at certain points during the project lifecycle.

In such a way, the role of a project manager shifts from a 'manager' to a 'leader' able to integrate AI capabilities into new practices and procedures, allowing for a greater focus on activities requiring soft skills such as ideation, communication, listening, problem-solving, and emotional intelligence.

3. MODERN AI-POWERED SOFTWARE SOLUTIONS FOR PROJECT MANAGEMENT: AVAILABLE AI-DRIVEN FEATURES

Regardless of the diversity of PM and RM software solutions in the market that claim they are fully AI-driven, we as software developers with more than 20 years of experience and being subsidized by the Dutch government to research AI in project management, have to admit that we can speak only about narrow AI in this field.

Machine learning algorithms at the heart of such products are capable of collecting, analyzing, and structuring large amounts of data that can't be processed by the human brain, which is a great assistance for program, project, and resource managers. These tools improve their efficacy and help achieve better results faster. We've collected the most widely used AI-powered features that the most popular AI-driven solutions have, and you can check them in the table below:

Feature	Description
Resource load balancing	The system shows idle and overloaded resources and suggests changes to balance the workload
Risk management	The software solution suggests the ways to mitigate risks
Demand forecasting	The tool analyzes data and predicts the demand, which lets a company reduce costs
Success prediction	The system processes all available data and makes predictions regarding the success of the project
Resource allocation	Machine learning analyzes all available data about resources and offers the best options for allocation

We'd like to show you how the AI-driven features described above run through the example of our product. We've been working on the Epicflow solution for more than 17 years and within the last 7 years we've been fully focused on researching AI capabilities in project and resource management and the ways they can be adopted in our tool. Let's consider our developments in more detail.

4. AI-DRIVEN FUNCTIONALITIES THROUGH THE EXAMPLE OF EPICFLOW

Epicflow is an AI-driven solution that has been designed specifically for multi-project environments. This next-gen software ideally suits mid to large-sized enterprises that run many complex projects with a shared resource pool.

Inspired by CCPM ideas, Epicflow implements a completely different approach to orchestrating projects. One of the main goals of the Epicflow approach is to prevent teams from overload and avoid bottlenecks. Here's what Paul Boudreau, a highly respected project management professional with over thirty-five years of experience, the author of bestsellers about AI in PM, writes in his recent book "The Self-Driven Project: Using Artificial Intelligence to Deliver Project Success." [4]: Epicflow uses AI to optimize resource utilization across multiple projects in a portfolio". This is possible thanks to:

◇   setting clear priorities;
◇   adding buffers to protect major milestones and the due date
      instead of hiding buffers in task estimations;
◇   real-time control of the workflow;
◇   powerful resource allocation that contributes to team members' efficiency;
◇   preventing imbalance workload;
◇   predicting possible threats (bottleneck resources)
      based on historical and real-time data and suggesting ways to eliminate them;
◇   making data-driven decisions.

Key AI-Driven Features

◇   Automatic prioritization of projects and tasks based on predictive analytics.
◇   Real-time bottleneck detection and ongoing workflow control
      with immediate project change effect.
◇   AI-empowered resource allocation based on team members' availability,
      capacity, demand, and skill levels.
◇   Predictive analytics mechanisms allowing to simulate the workflow far in the future
      based on historical and real-time data.

Let's review Epicflow's AI-based functionalities in detail and how exactly they help at each project lifecycle stage.

Any project starts with planning. Having a realistic project plan with a high probability of accomplishment is a great recipe for success and a means to make stakeholders tolerate bumps along the way if they can see the project will be successful. Based on the project planning in Epicflow, a prediction of a positive outcome is made before the project starts.

Epicflow's predictive analytics mechanisms make it possible to foresee resource contention between projects and guide resource allocation, unlike conventional tools which treat projects in isolation.

PROJECT EXECUTION STAGE

AI-Calculated Project and Task Priorities
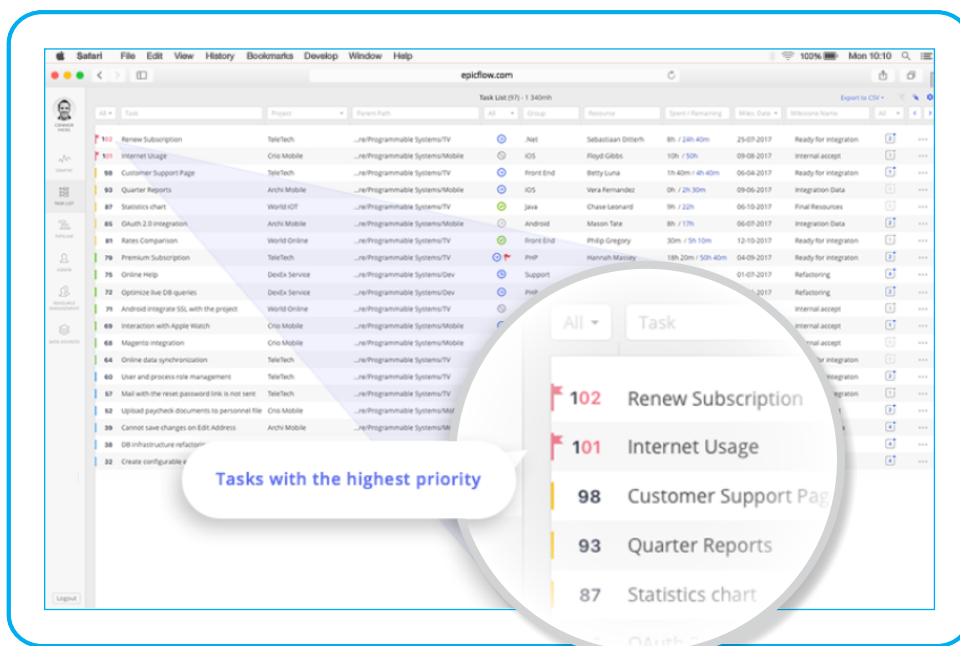
Task priorities are automatically calculated based on the project portfolio data.
If any changes in a project occur, the priorities are recalculated right away. So the project manager doesn't have to reschedule anything - priorities are updated automatically.
This also simplifies the work of the whole team as nobody has to think and argue about the urgency and importance of tasks. Everyone knows what goes first and what follows then. In such a way, Epicflow eliminates bad multi-tasking and "management by decibels".
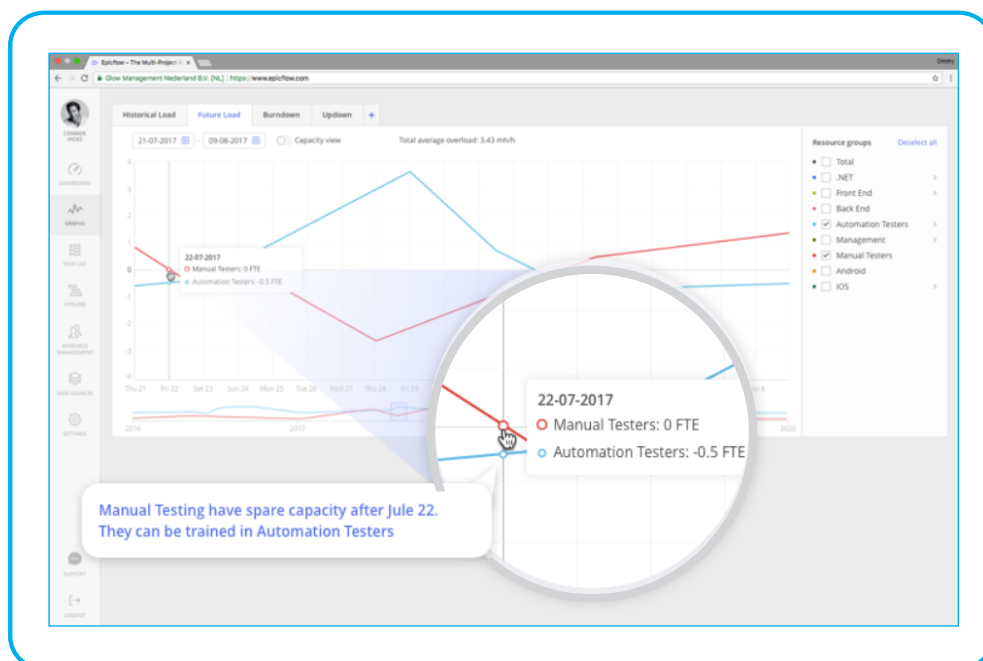
Bad Planning Detection Capabilities
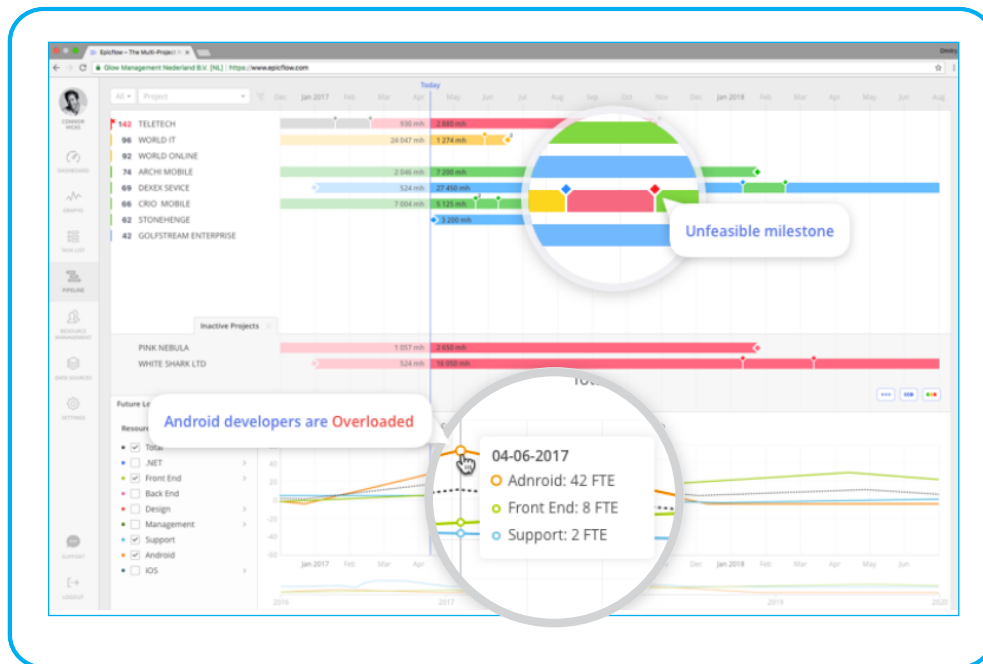
The tool is capable of identifying and predicting:
a) overload,
b) tasks without milestones or deliverables,
c) tasks without resources assigned,
d) tasks without estimates,
e) loops.

AI-Calculated Demand Levels

The tool automatically predicts the demand levels of employees based on past and current project-related data (displayed on the Historical Load Graph and Pipeline).
The Future Load Graph shows the probability of resource overload that can create bottlenecks which are dangerous for other resources and even resource groups.

AI-Based Risk Management
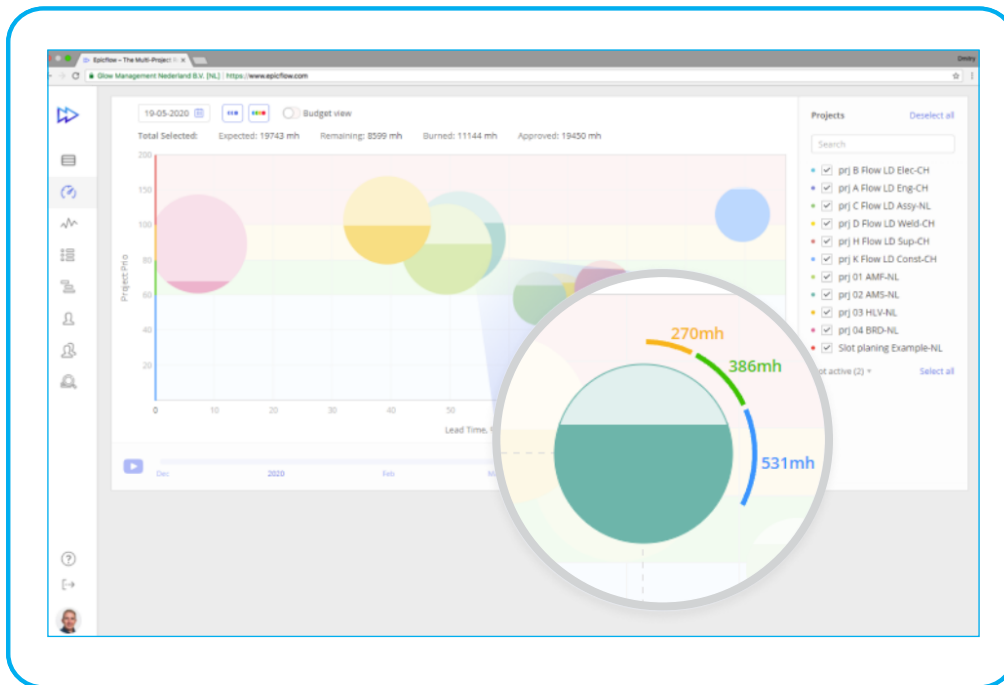
The project execution stage is supported by tools that constantly reevaluate risks. Epicflow provides all the necessary means to cope with uncertainty and make a project plan flexible to achieve better outcomes. AI assesses the ability of a project to stay on track as it determines whether the probability of success is increasing or decreasing. Epicflow tracks the interdependencies among projects and provides early warning of both potential and real problems.
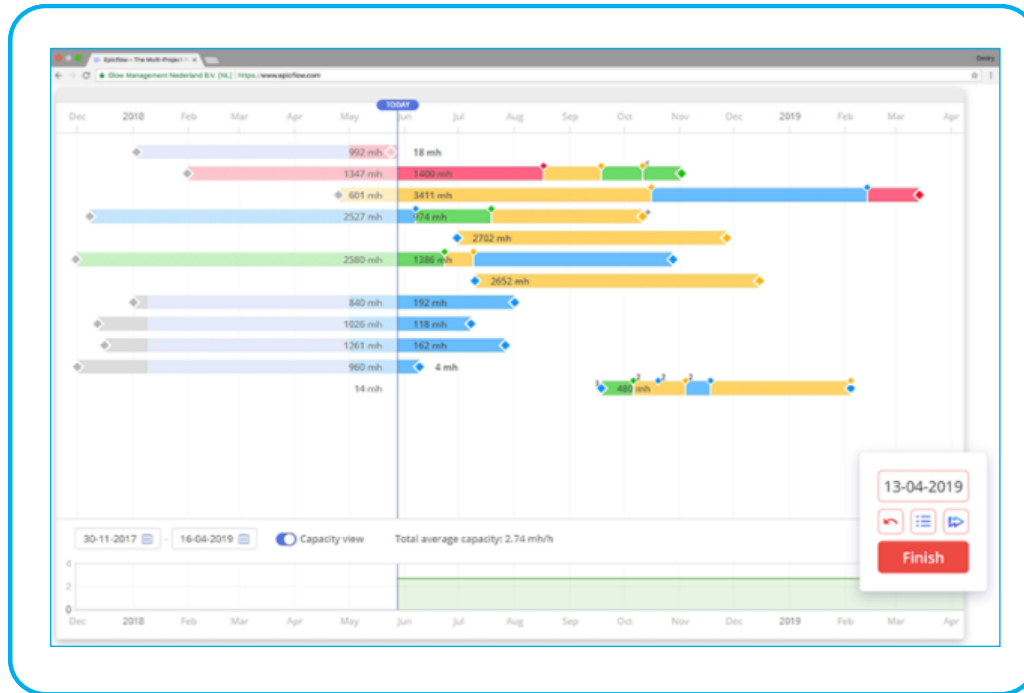
AI-Powered Resource Allocation
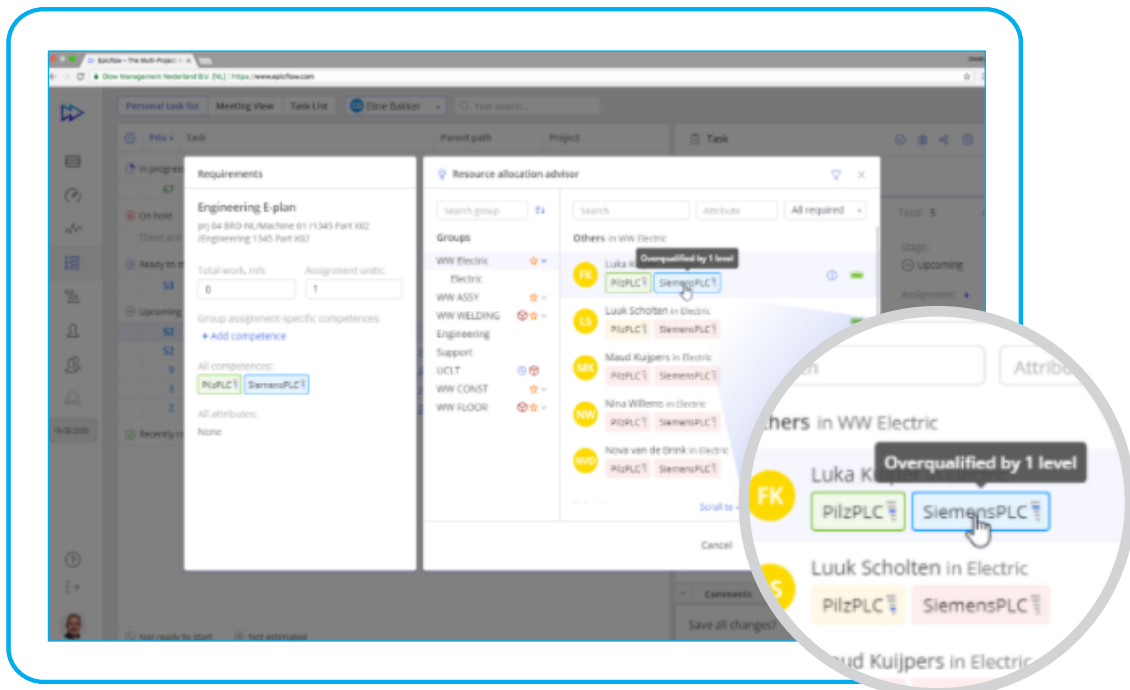
Epicflow supports smart resource allocation based on employees' availability, capacity, skills, and experience. The system suggests the best option for resource allocation to let the task be done by the most expedient team member.

AI-Driven Decision-Making

Epicflow's What-If Analysis is a tool that helps predict potential bottlenecks and shows the way the workflow will distribute over time. It analyzes the projects in terms of milestones' feasibility which helps the project or portfolio manager make decisions about the reasonableness of project changes. With this tool, when any change requests occur, a project manager and project team members can consider their impact on both the budget, resources, and schedule and be in time to take actions that will save the project. A project manager and project team can easily check the impact of any changes on both the budget and schedule in Epicflow. These predictions will help the team members decide on the reasonableness of any transformations in the project scope or plan.

PROJECT COMPLETION STAGE

The completion stage is the final in the project lifecycle. At this stage, project teams analyze the outcomes, mistakes, reevaluate risks, and report to stakeholders.
The tool lets managers learn variability from the past and mitigate risks. The analysis of the changes in resource capacity, availability, and demand levels is helpful for the lessons learned analysis and, as a result, avoiding similar mistakes when orchestrating projects in the future. Machine learning mechanisms collect this information, examine it, and use this knowledge for future projects

Predictive analytics goes hand in hand with virtual assistance which is a means to deliver information to a user. The information is gathered and analyzed with the help of predictive analytics.

Epica is Epicflow's AI-powered virtual assistant that interacts with users in the following ways.
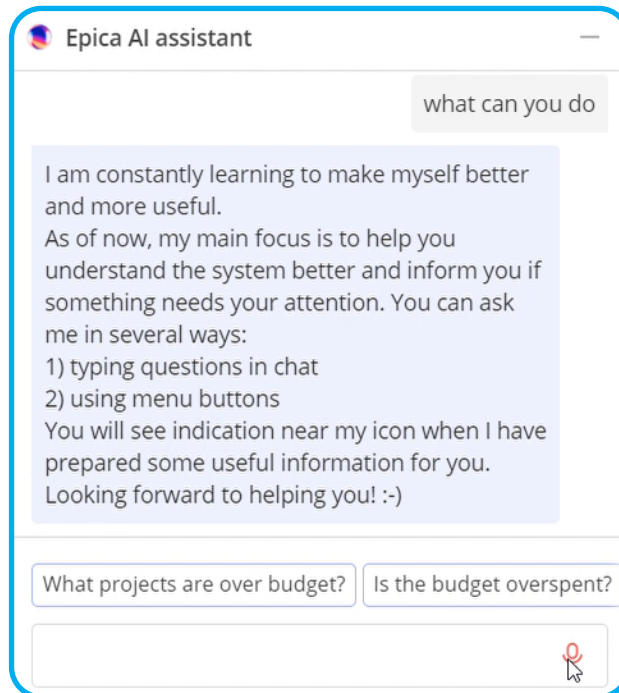
Management level

Epica sends real-time notifications to keep project and resource managers up to date.

◇ The assistant notifies a project/resource manager that some resources haven't logged their work hours and suggests sending reminders to these users with just one click.

◇ Epica informs about overload in resource groups. Then, it suggests considering corresponding graphs and checking the workload to improve it.

◇ The virtual assistant warns you if there are some changes or threats in a project environment, e.g., some peaks on the graphs arise, signaling a bottleneck or cost overruns.
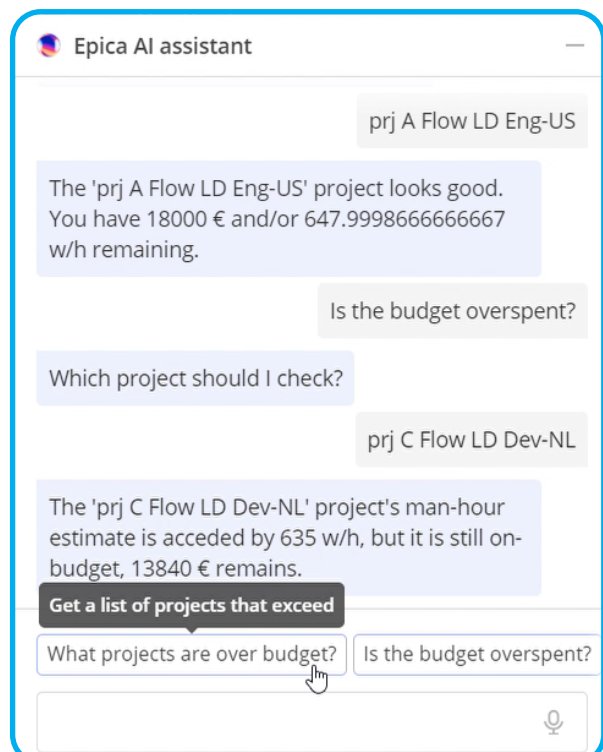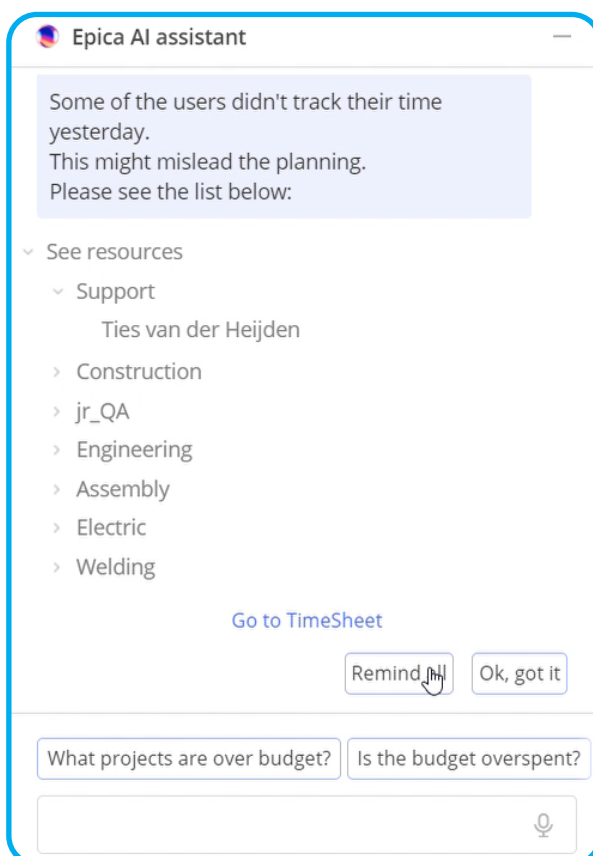
Epica provides detailed data about all projects and any resource-related data upon request

◇ You can get details on the workload of your resources and groups.

◇ You can learn about the projects' progress and check if they're within time and budget constraints.

◇ You can receive information about the tasks and performance of your resources. In fact, Epica has access to all project data and can help you with any project and resource management processes.
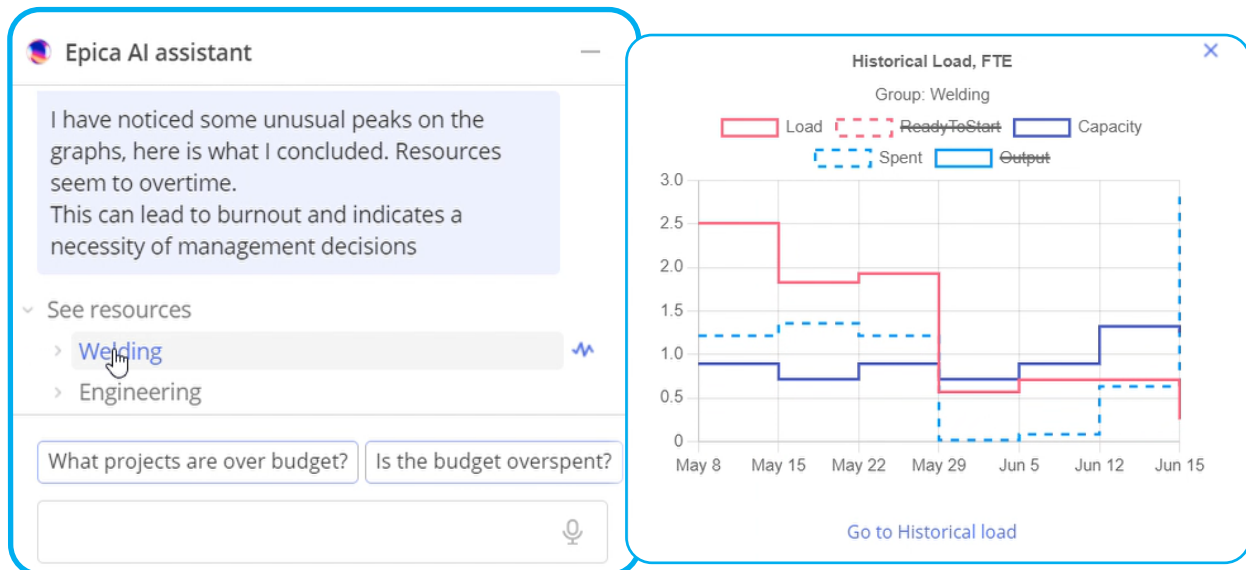
Epica helps assign the right resources to the right tasks

Our virtual assistant facilitates effective resource allocation across multiple projects running in a company. Epica uses natural language processing to find the most appropriate resource for the tasks based on historical data and predetermined models, e.g., experience with a certain client or equipment. This is one of the resource allocation models Epicflow has, and a resource manager can choose any option depending on the current needs and requirements.

Team Level

Epica sends notifications to project team members in the following cases:

◇ If they forget to log their hours (upon the project manager's request),

◇ If they deviate from the established task priorities,

◇ If they have several personal tasks in progress; then Epica reminds them that they should work only on one task at a time to be efficient and asks to put one of the assignments on hold.

Epica shows the highest priority tasks

An employee can ask Epica about their daily tasks, and Epica will display the user's task list with the tasks sorted by priority.
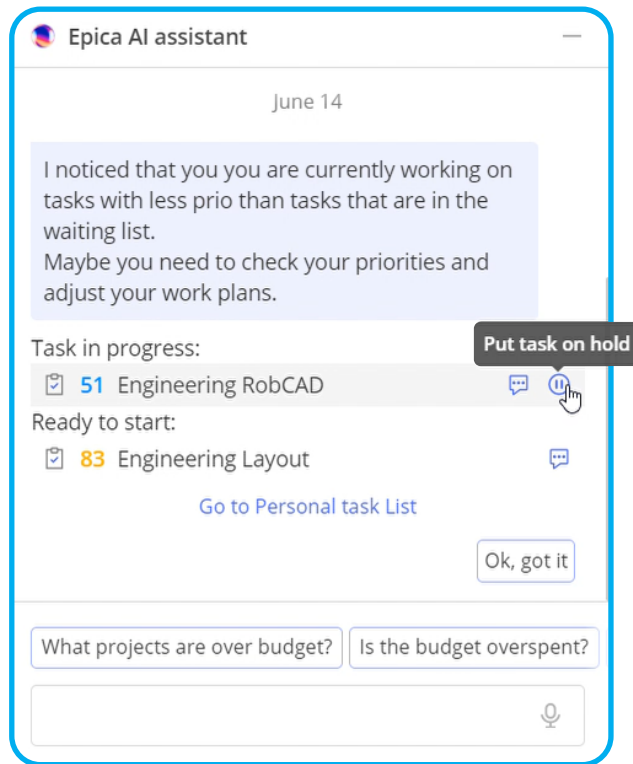

Epica calculates the best dates for a day off or a vacation for any project team member without harming the project flow

Any user can ask Epica whether a certain date or dates are suitable for having a rest or ask the assistant to define the best dates for a holiday. In response to this question, Epica shows a calendar with the dates marked with different colors.

◇ The blue and green colors mean that these days are suitable for a vacation.
◇ The yellow and red colors mean that the absence of the resource will harm the project flow and cause delays.

Based on this information, a resource can decide whether it's reasonable to be absent on a certain day or if it's better to postpone the vacation to avoid bottlenecks in the project flow.
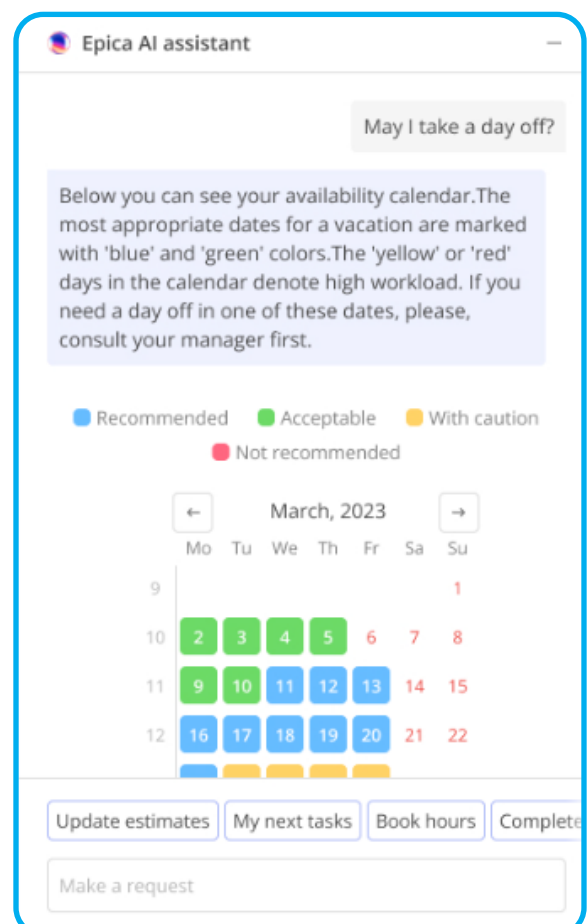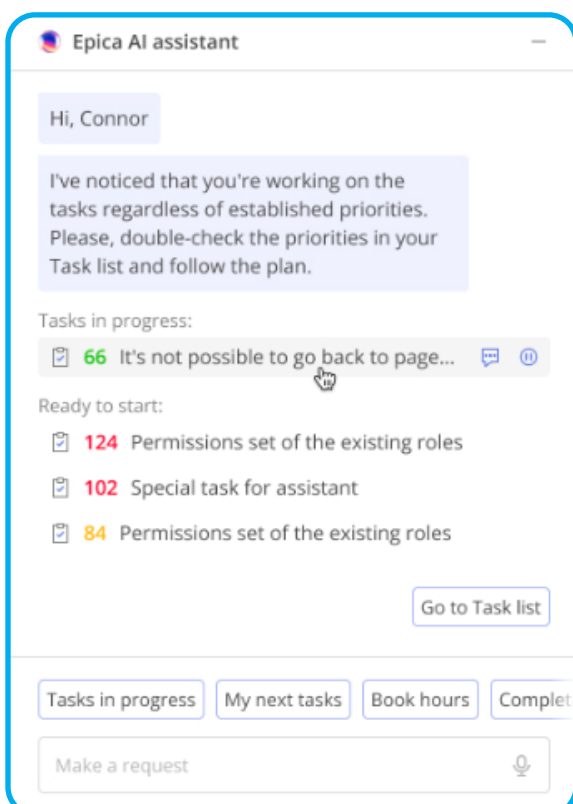
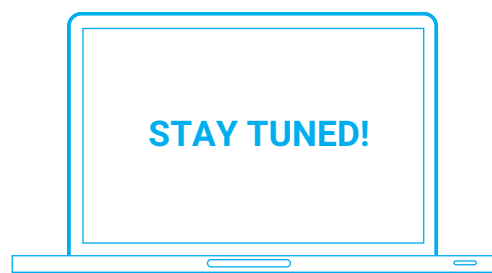**Epica knows everything about Epicflow and how to use it efficiently**

◇ Get descriptions of all Epicflow's features and instructions on using them to deliver the best output possible.

◇ Get answers to project and resource management questions.

◇ Ask Epica anything, and it will provide you with detailed replies by analyzing information from the chosen sources.

CONCLUSION

◇ Artificial intelligence has great potential in the field of project and resource management but at the moment it's still understudied and a lot of research and developments have to be done before we can speak about unimpaired operation.

◇ AI in PM and RM can simplify and improve the work of project teams by performing repetitive tasks and predicting potential threats, but only in close collaboration with a human being positive outcomes are possible.

◇ Epicflow is a great example of AI-powered software, which not only can perform monotonous tasks but also mitigate risks, warn about time and budget constraints, contribute to efficient resource allocation, and improve decision-making by simulating a project environment where a PM or RM can test project changes before implementing them.

◇ In the near future, the project management domain will be more and more disrupted by AI, and a lot of unique functionalities will appear to help businesses deliver more in half the time and budget.

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