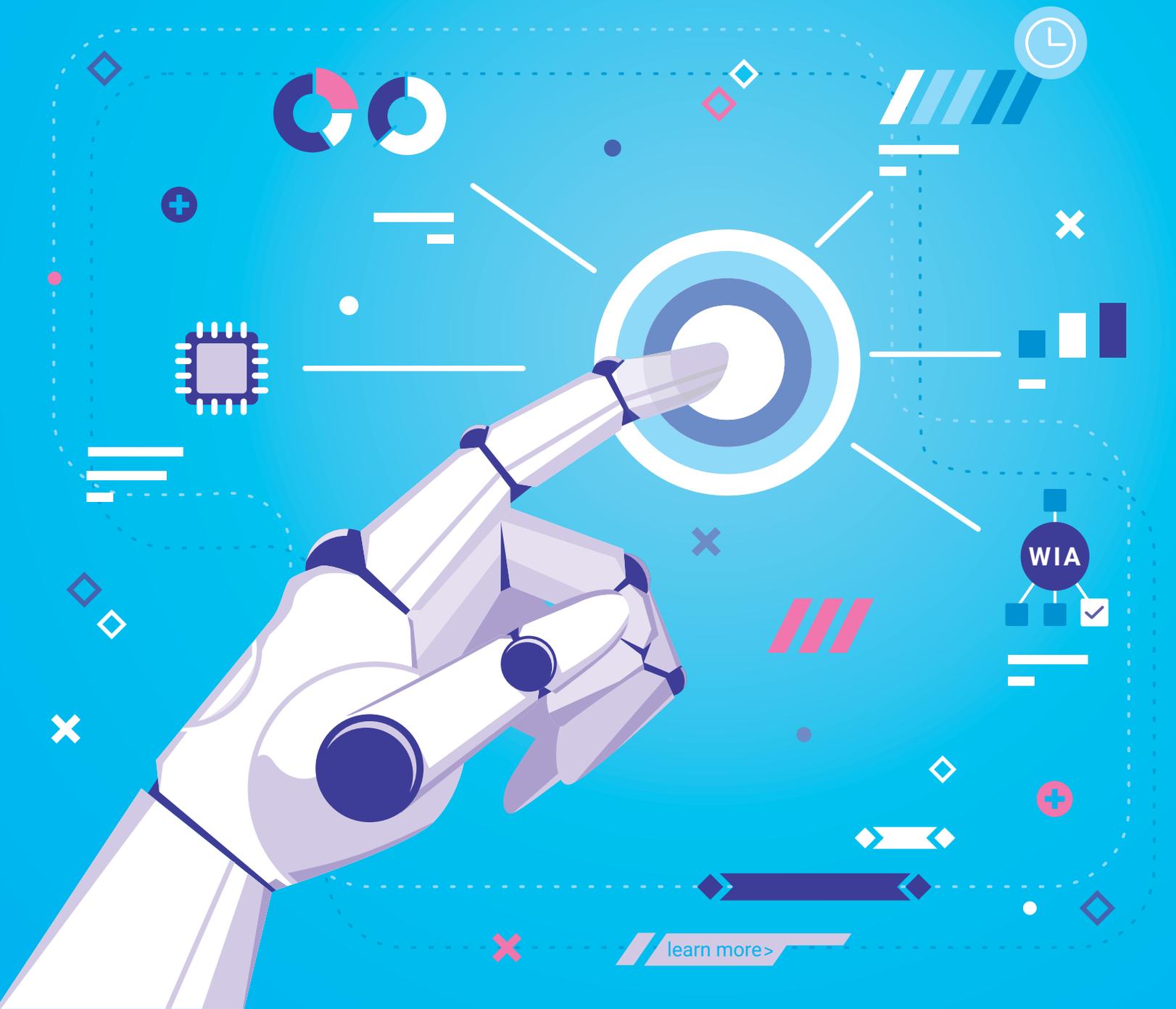


# ARTIFICIAL INTELLIGENCE in Multi-Project Management

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# ARTIFICIAL INTELLIGENCE in Multi-Project Management

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# 1. THE STATE OF ARTIFICIAL INTELLIGENCE IN PROJECT MANAGEMENT

## 1.1. ARTIFICIAL INTELLIGENCE AND ITS TYPES

Artificial intelligence (AI) is the ability of computer systems to interpret and learn from data. The term is most commonly applied to describe systems built using machine learning or deep learning models. AI techniques can be used to enable computers to solve a wide range of problems that were previously considered intractable [5].

People started talking about the superpower of artificial intelligence far in the 80s. Since then, a lot of studies have been carried out in different areas of human activity and business. Today, there are enough developments in the field that make it possible to classify AI based on certain parameters.

There are several types of AI depending on the complexity of operations:

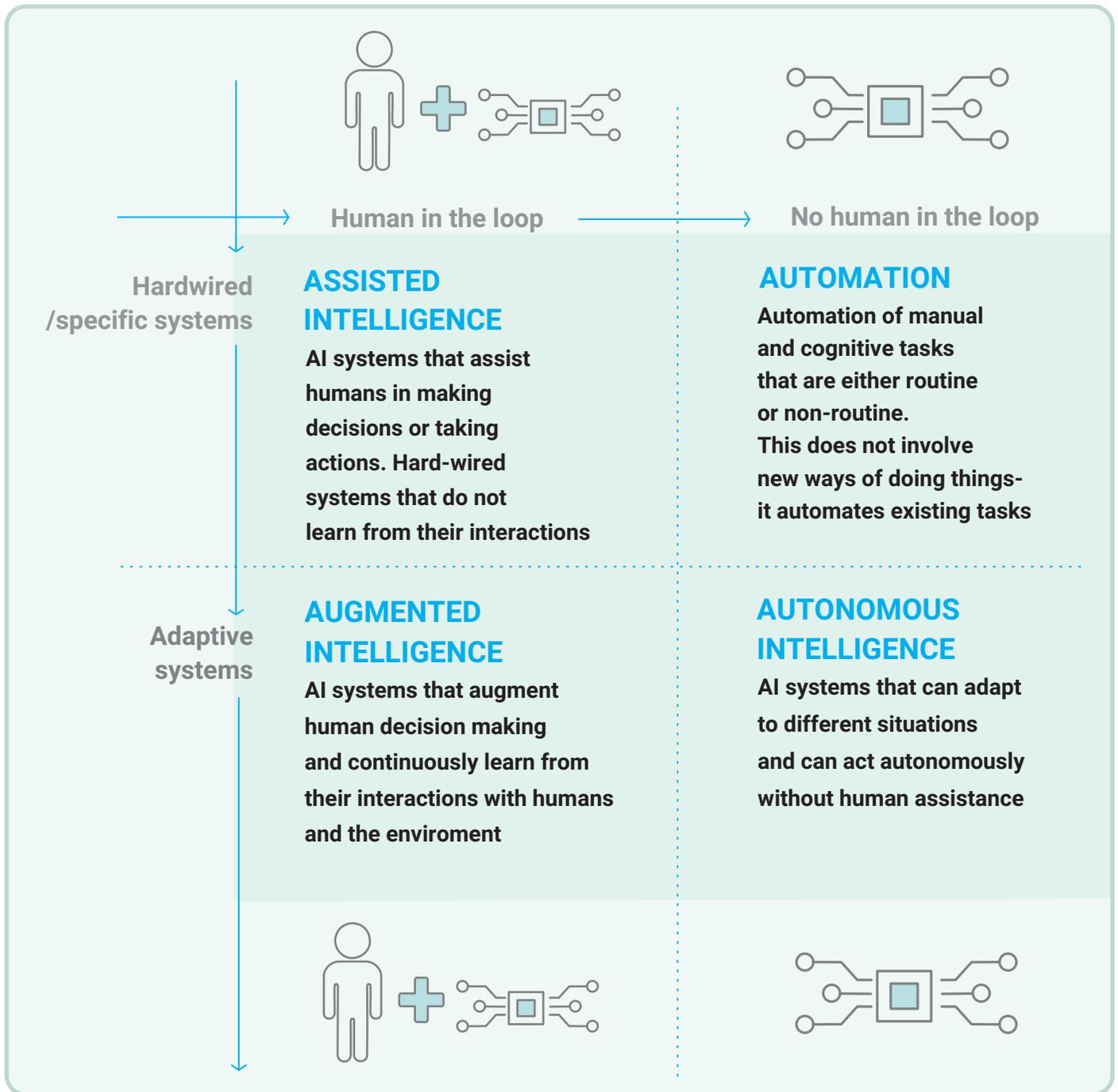
- ◇ **Artificial Narrow Intelligence (ANI, or narrow AI)** is the most common type of AI capable of performing a single task at a time. Technology like speech recognition, voice assistants, chatbots, facial recognition are the examples of narrow AI. It can't replace human intelligence, it can only simulate it when performing a task based on the programmed conditions. Machine learning is a subgroup of ANI aimed at learning from human behavior and drawing relevant conclusions.
- ◇ **Artificial General Intelligence (AGI, or deep AI)** is the type of AI that can be utilized to perform various tasks and improve itself based on received experience. It can simulate human intelligence but due to the lack of study on how the human brain functions, this area of AI is still under development and is not fully utilized.
- ◇ **Artificial Super Intelligence (ASI)** is the most powerful kind of AI but still understudied as the technology is far from superseding the human brain.

IBM experts suggest similar classification though with other names for the types of AI: weak AI for ANI and strong AI for AGI and ASI [4].

Another classification distinguishes among several types of AI depending on the degree of human involvement in the process:

- ◇ Automated intelligence: automation of manual/cognitive and routine/non-routine tasks.
- ◇ Assisted intelligence: helping people to perform tasks faster and better.
- ◇ Augmented intelligence: helping people to make better decisions.
- ◇ Autonomous intelligence: automating decision-making processes without human intervention [11].





## 1.2. MACHINE LEARNING, DEEP LEARNING, AND PREDICTIVE ANALYTICS:

### How Do They Differ from AI?

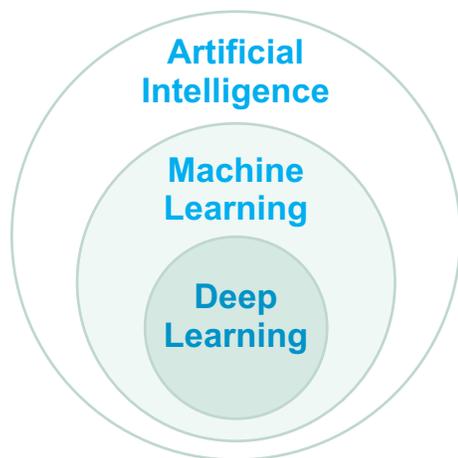
People often get these concepts confused, being sure they're the same. Let's dive deeper into the difference between them.

Artificial intelligence is the broadest term that is applied to classify machines simulating human intelligence. It is used to predict, automate, and optimize human tasks, such as speech and facial recognition, decision-making, and translation.



Machine learning is a branch of artificial intelligence (AI) focused on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

It's heavily dependent on human intervention to learn [6]. Graphically, the relationship between AI and machine learning can be shown like this:



Deep learning being a subset of machine learning is always considered closely with machine learning in the context of artificial intelligence. Let's see how IBM experts interpret these concepts to understand the meaning of each:

- ◇ Machine learning uses statistical techniques to derive sophisticated predictive models and algorithms from large data sets, without requiring explicit programming.
- ◇ Deep learning is a branch of machine learning that uses neural networks with large numbers of hidden layers. These highly sophisticated networks are used in cutting-edge fields of deep learning such as computer vision, machine translation and speech recognition [5].

### So how is predictive analytics associated with machine learning?

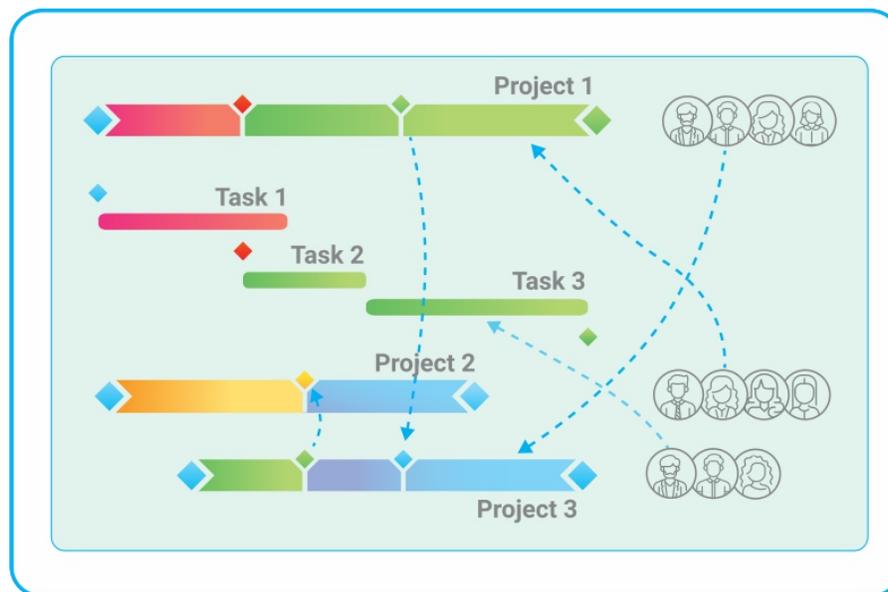
Predictive analytics is not a new concept. Statisticians have been using decision trees and linear and logistic regression for years to help businesses correlate and classify their data and make predictions. What's new is that the scope of predictive analytics has broadened. Breakthroughs in machine learning and deep learning have opened up a lot of new opportunities to use predictive models in areas that have been impractical for most business investments earlier. Predictive analytics uses historical data to model a specific domain or problem and isolate the key factors that have driven specific outcomes in the past. Models built using this process predict likely future outcomes from new data [5].



So, when we're talking about machine learning, deep learning, and predictive analytics we mean artificial intelligence, namely ANI. And when speaking of AI in terms of project management, we mean the above-mentioned phenomena, because deep artificial intelligence is still underdeveloped in this domain and still requires human assistance: data input and check, making assumptions and testing with further analysis of the outcomes.

Let's see what advantages machine learning and predictive analytics mechanisms give to project managers.

## 2. AREAS OF APPLICATION OF ARTIFICIAL INTELLIGENCE IN PROJECT MANAGEMENT



### 2.1. THE ROLE OF AI IN MULTI-PROJECT MANAGEMENT

Artificial intelligence in project management is an integrated system capable of administering projects with minimal human input. 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 to treat 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 for 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.



## So how exactly does AI assist in managing projects?

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

Studies have shown that project managers spend more than half of their time on administrative tasks such as dealing with check-ins and managing updates [3].

AI-based tools can take over functions like meeting planning, reminders, day-to-day updates and other administrative tasks [13]. 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 [12].

### AI Can Prevent Accidents at the Workplace

AI's analyzing capabilities can detect errors that the human's eye can't notice and therefore prevent the accidents that may happen at the workplace under changing conditions [8].

### 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 make all necessary operations. At the same time, any PM tool can be integrated with a human resource management system, which will eliminate the necessity of adding availability and skillset data manually into the software solution.
- ◇ AI can predict demand levels.  
This helps to create an ideal working environment and reduce resourcing costs.
- ◇ Another unique ability of AI in RM is monitoring human behaviour and distinguishing patterns to make corresponding predictions including foreseeing errors.



Thus, the tool can track employees' behavioural patterns and then react if any changes occur. This helps predict and avoid mistakes or resource conflicts. Besides, this ability also serves as a means to manage employees' skills: the tool will let a PM and RM know if anyone in the project team requires upskilling [12].

## 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 labour 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.



## 2.2. 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” (2019) 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 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 [1].

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



- ◇ 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.



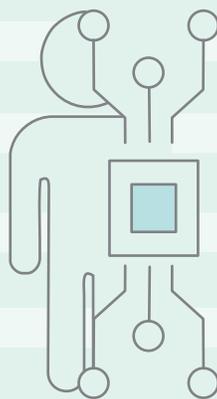
- ◇ AI mechanisms make it possible to track the interdependencies between projects and provide early warning of both potential and real problems.
- ◇ Machine learning algorithms support the optimization of project schedules to minimize the total cost based on resource constraints. For example, predictive 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.

### 2.3. WILL AI REPLACE PROJECT AND RESOURCE MANAGERS?

According to Gartner's recent report, by 2030, 80% of today's project management tasks will be eliminated, as AI will perform basic PM functions [2]. AI-driven software provides great assistance to project managers, especially for a multi-project environment: starting from storing and collecting information and performing routine and repetitive tasks to selecting the right resources to assign to the tasks, predicting possible outcomes and assessing the risks. But the process of managing projects also requires human interaction: communication, negotiation, problem-solving, which in turn requires corresponding qualities and skills that are only peculiar to a living person now (e.g. communication skills, emotional intelligence, empathy, leadership skills, etc.). Therefore, AI is not expected to replace the job of a project manager, and the use of technology can significantly improve their performance.

PROJECT MANAGERS	AI
<b>21ST CENTURY SKILLS</b>	<b>VIRTUAL PARTNER</b>
Data science	Identifying relationships & trends
Complex problem solving	Intelligent real-time analysis
Ability to make data-driven decisions	Optimising schedules
Collaborative leadership	Enhanced data and improved portfolios
Stakeholder management	Providing business insights
Emotional intelligence	Human capital optimization
Communication	Status report
Legal & regulatory knowledge	Risk management sup
Negotiation	Active assistance
Security & privacy knowledge	Researching new trend and experts



So as long as there will be people working, there will be the need for someone who will be responsible for resource allocation, dealing with employees' professional development and training, managing interpersonal conflicts, and so on. Such a job requires skills (communication, reasoning, negotiation, emotional intelligence, etc.) that cannot be replicated by artificial intelligence, at least in the near future. To prove it, let's examine the level of automation in 49 PM processes (based on PMBOK) throughout the whole project life cycle, from the initiation stage to the closing one (see the Table below).

PHASE PROCESS FAMILY	ARTIFICIAL INTELLIGENCE LEVEL		
	By Human	Basic Automation	Semi Automated
Initiating	2	-	-
Planning	10	12	2
Executing	4	6	-
Monitoring and Controlling	4	8	-
Closing	1	-	-

Source: [7].

The biggest number of the tasks that can be performed by a machine refer to the planning stage. This includes scope, budget and schedule definition, where developing schedule and defining budget are considered to be semi-automated. 10 types of activities that refer to gathering project requirements, identifying stakeholders, determining scope and tasks, considering risks, and more are still executed by a human.

At the same time, AI-driven tools are capable of predicting the project's success even before the execution stage, which is why these activities can be reconsidered in terms of automation vs human performance.

PM and RM tools are actively used in the execution and monitoring phases, where 'project health' must be under strict control to detect probable threats early on.

As we can see from the table, some activities that require human interaction and communication cannot be replaced by the machine yet. The main conclusion we can draw is that to ensure project success, there must be synergy between artificial and human intelligence anyway.



### 3.PROBLEMS ON THE WAY TO ADOPTING AI IN PM

#### Lack of Studies in the Field

Regardless of the number of existing studies in the field and the latest developments on the way to making project management tools perform complex operations and ensure project success, we can't speak about artificial general intelligence in this area yet. Narrow AI has been used within a few recent decades in a form of machine learning, but still there are a lot of things to be done to make the PM tool 'compete' with the power of human intelligence.

#### Human Assistance

One more thing that hinders the development of fully automated AI in project management tools is the need for preparing and entering project-related data to be processed by a machine. To make the software solution prioritize tasks, mitigate risks, and provide insights regarding project decisions, it must have a sufficient amount of data to structure and analyze it, generate patterns, and produce the desired outcome.

The biggest challenges in this domain are as follows:

- ◇ Team members must timely enter necessary information.
- ◇ They must timely update and edit the information if some changes occur.
- ◇ The data must be valid, relevant, and correct.

Though AI-driven software is smart enough to fill in some gaps by making assumptions about the missing data and sending notifications to team members to enter the required information, there are still a lot of challenges these tools can't address.

#### Dependence on the Data Correctness

When working with AI-driven resource management solutions, you should be guided by the rule "garbage in, garbage out". This means that to receive the correct and reliable outcomes, you should input the correct and clear data.

Data correctness challenges include

- ◇ typos,
- ◇ capitalized letters,
- ◇ figures mixed with letters,
- ◇ improper signs,
- ◇ different date fields,
- ◇ blank fields,
- ◇ incorrect spelling.

Despite the fact that machines perform a wide range of important functions in project management, the adequacy of their work can be hindered by some data inconsistencies. And one more problem when dealing with improper data is that the errors can be noticed not right away. They can be caught when transferring it from one database to another.



Apart from typos and other mistakes at the symbol level, document format is another challenge. Projects should be categorized to be easily processed by a machine learning tool because they will be perceived as a dataset that is easier to process. Storing documents in different formats complicates the task and the outcome can be unpredictable [9].

#### 4. 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 20-year 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:

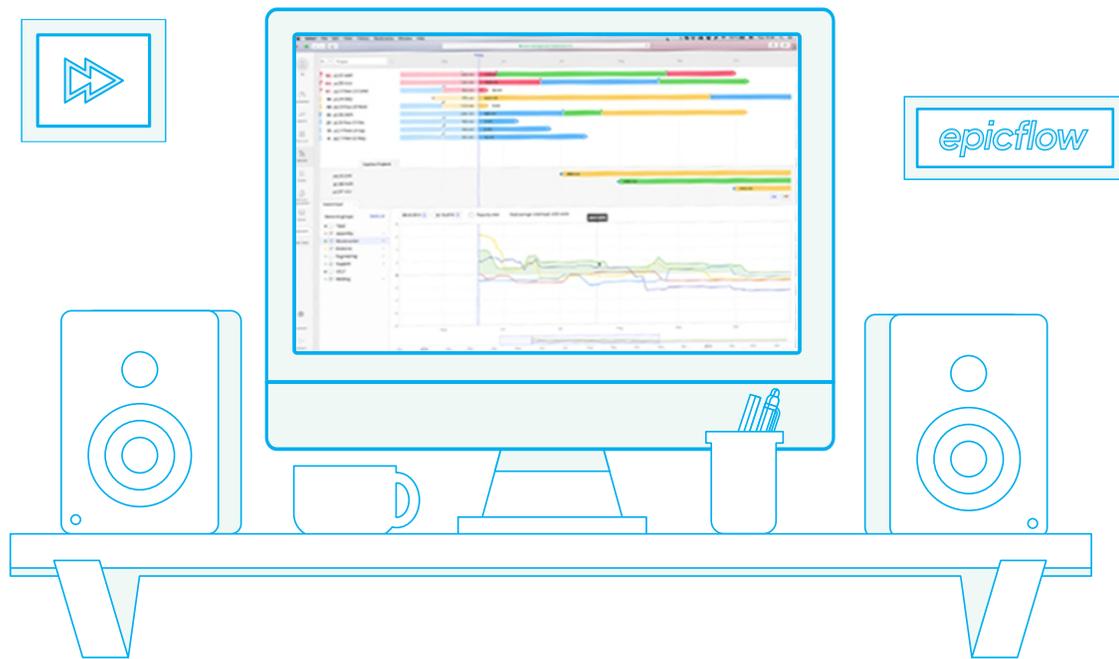
Resource load balancing	→	The system shows idle and overloaded resources and suggests changes to balance the workload
Risk management	→	The software solution suggests the ways to mitigate risks
Demand forecasting	→	The tool analyzes data and predicts the demand, which lets a company reduce costs
Success 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

As we stated above, artificial intelligence in project management isn't mature enough to speak about the unimpaired operation, but our researchers have gained ground in this direction.

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 15 years and within the last 5 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.



## 5. 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 Beaudreau, a highly respected project management professional with over thirty-five years 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." [10]: Epicflow uses AI to optimize resource utilization across multiple projects in a portfolio". And 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;
- ◇ predicting possible threats based on historical and real-time data.

### 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.

## Project Initiation Stage

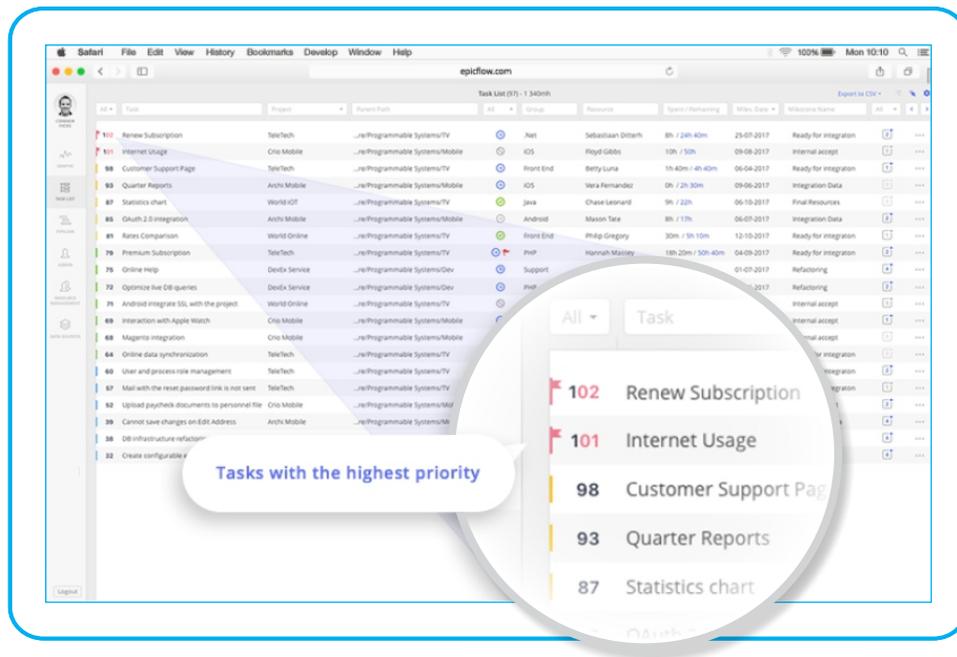
Any project starts with planning. Having a realistic project plan with a high probability of accomplishment is a great recipe for success and a means to make stakeholders tolerate bumps along the way if they can see the project will be successful.

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

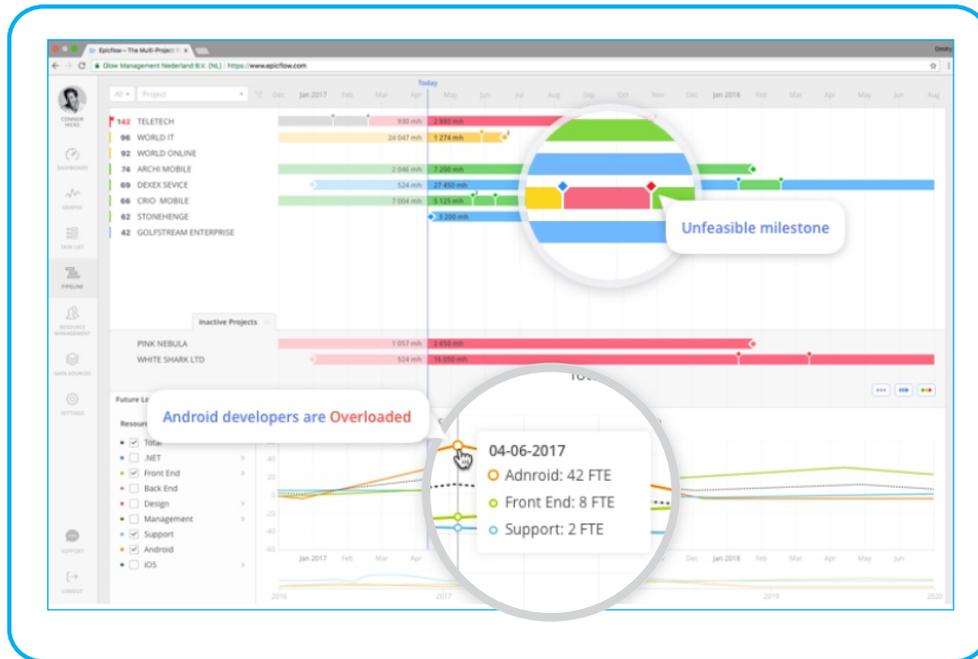


Task priorities are automatically calculated based on the project portfolio data. If any changes in a project occur, the priorities are recalculated right away. So the project manager doesn't have to reschedule anything - priorities are updated automatically.



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”.

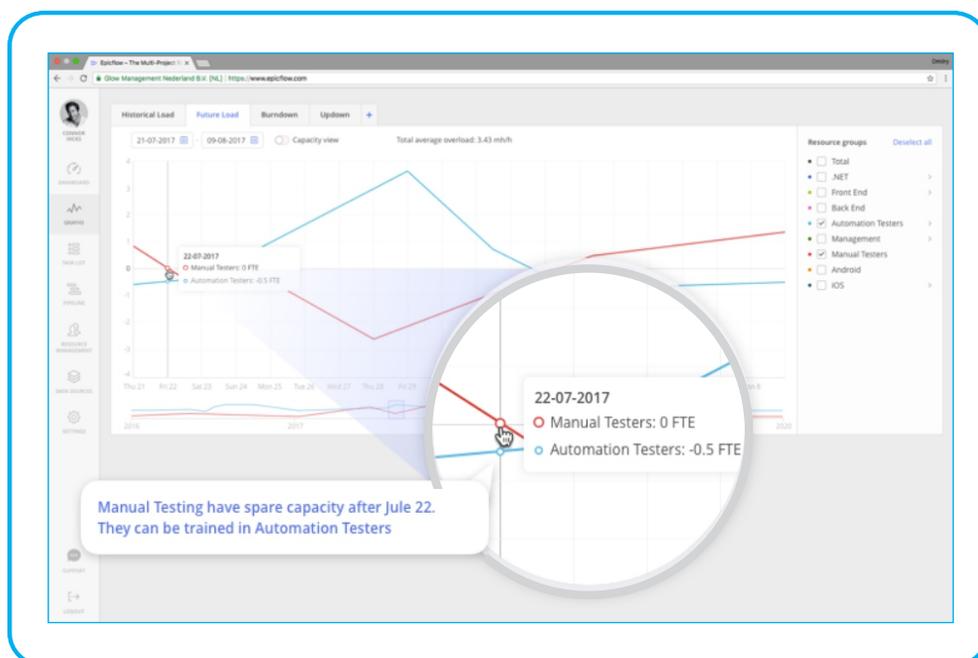
### ◆ Bad Planning Detection Capabilities



The tool is capable of identifying and predicting:

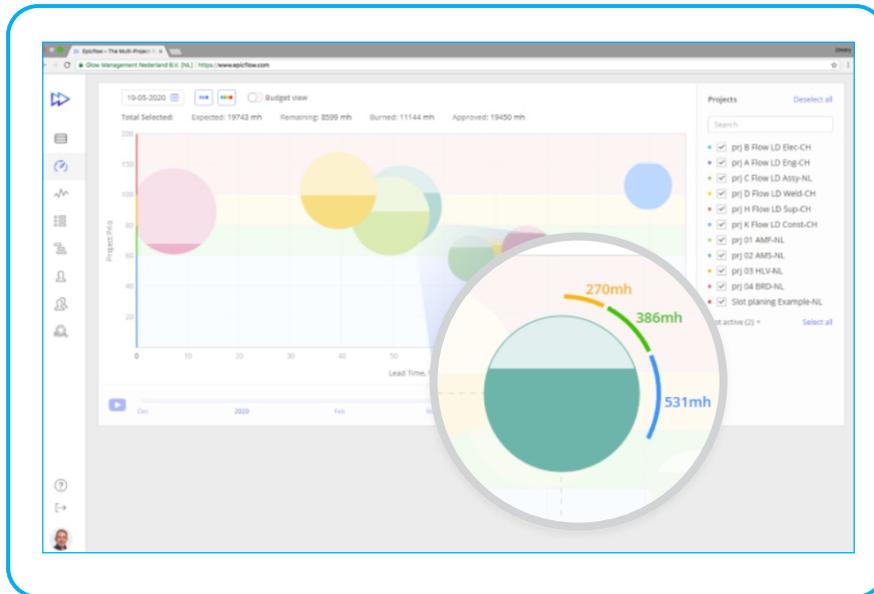
- a overload,
- b tasks without milestones or deliverables,
- c tasks without resources assigned,
- d tasks without estimates,
- e loops.

### ◆ AI-Calculated Demand Levels



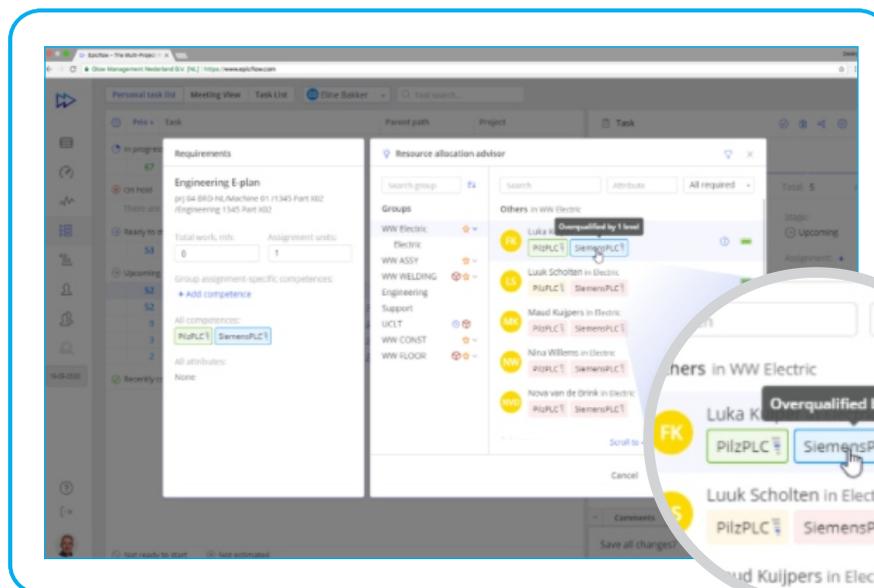
The tool automatically predicts the demand levels of employees based on past and current project-related data (displayed on Historical Load Graph and Pipeline). The Future Load Graph shows the probability of resource overload that can create bottlenecks which are dangerous for other resources and even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

### ◆ AI-Based Risk Management



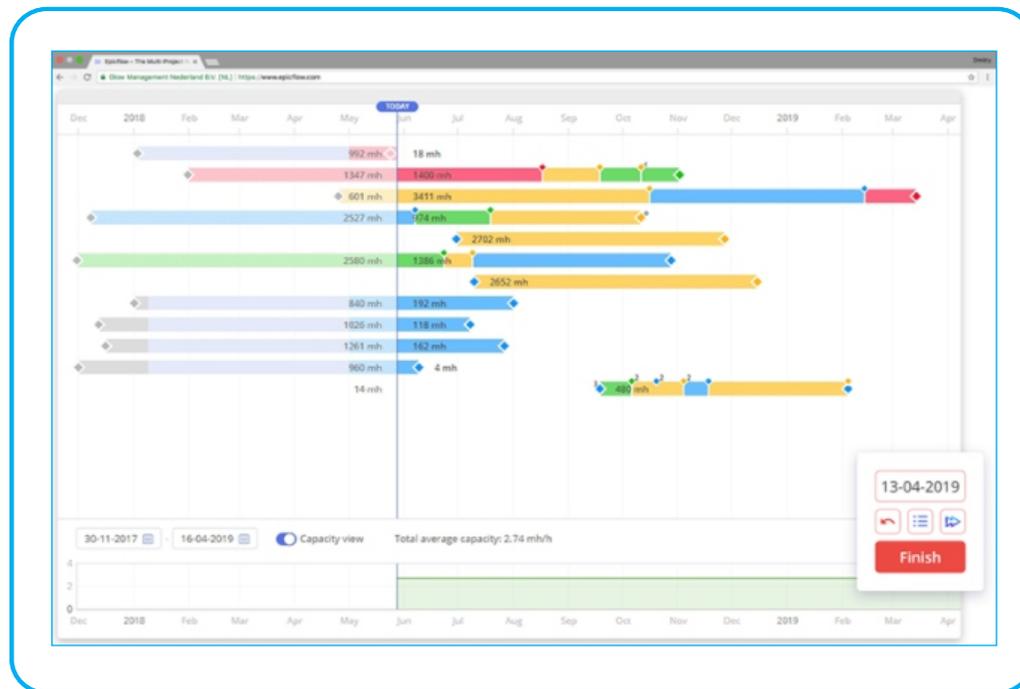
The project execution stage is supported by tools that optimize resources and constantly reevaluate risks. Epicflow provides all the necessary means to cope with uncertainty and make a project plan flexible to achieve better outcomes. AI assesses the ability of a project to stay on track as it determines 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-Empowered Resource Allocation



Epicflow supports smart resource allocation based on employees' availability, capacity, skills, and experience. The system suggests you the best option for resource allocation to let the task be done by the most expedient team member.

### ◆ AI-Calculated Capacity Utilization Rate



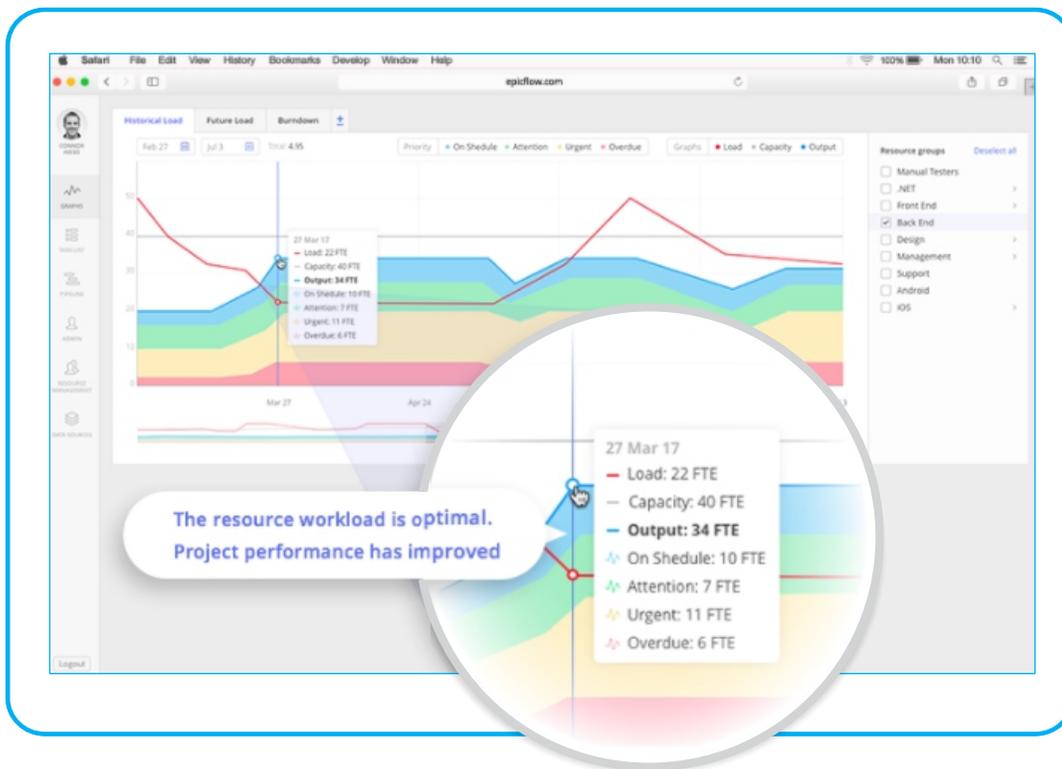
Epicflow's capacity utilization opportunities are ensured by an AI-calculated What-If Analysis - a tool that helps predict potential bottlenecks and shows the way the workflow will distribute in the course of time. It analyzes the projects in terms of milestones' feasibility which helps the project or portfolio manager make decisions about the reasonableness of project changes. With this tool, when any change requests occur, a project manager and project team can consider their impact on both the budget 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 project team to decide on the reasonableness of any transformations in the project scope or plan.

### Project Completion Stage

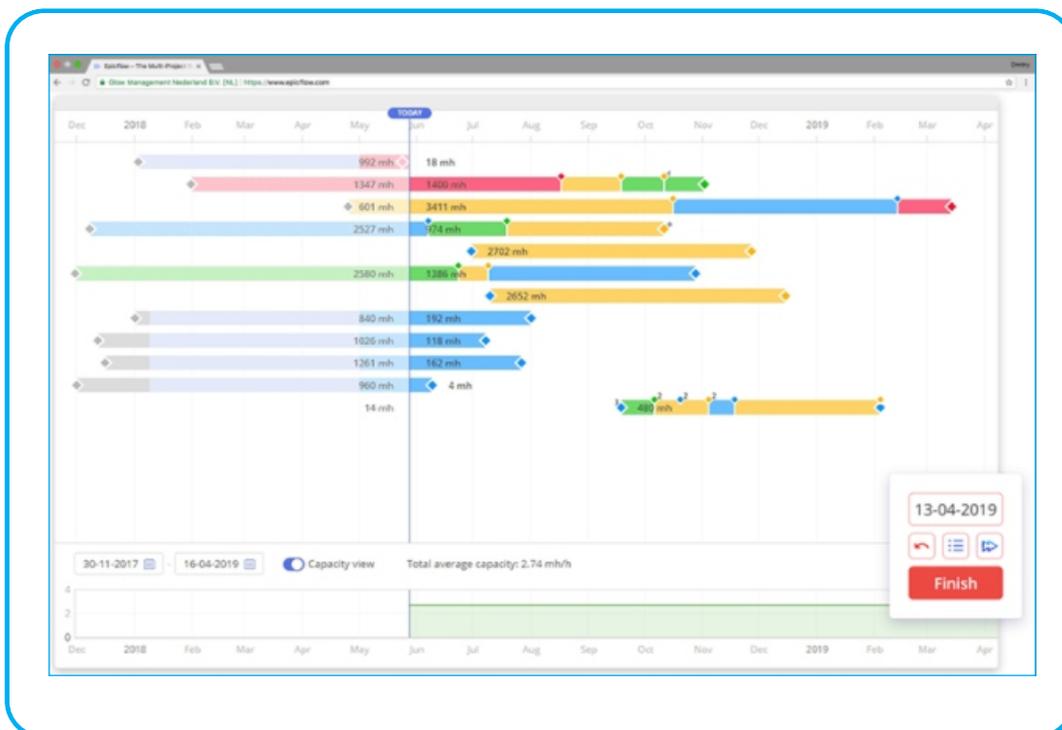
The completion stage is final in the project lifecycle. At this stage, project teams analyze the outcomes, mistakes, reevaluate risks, and report to stakeholders.





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.

## Project management decisions



As the project is in progress, Epicflow's AI tools help guide and direct a project and portfolio manager towards the best decisions possible whatever a situation is. Before making a decision, a project manager can test its consequences in a simulated environment with the before-mentioned AI-driven What-If Analysis. If the results aren't satisfying, he/she can try other approaches to improve the state of things until the best possible solution is found. What's also important is that it's possible to make ad-hoc decisions if needed, and a PM doesn't have to change the schedule: Epicflow tools will change priorities throughout the portfolio right away.

## 6. THE FUTURE OF ARTIFICIAL INTELLIGENCE IN PROJECT MANAGEMENT

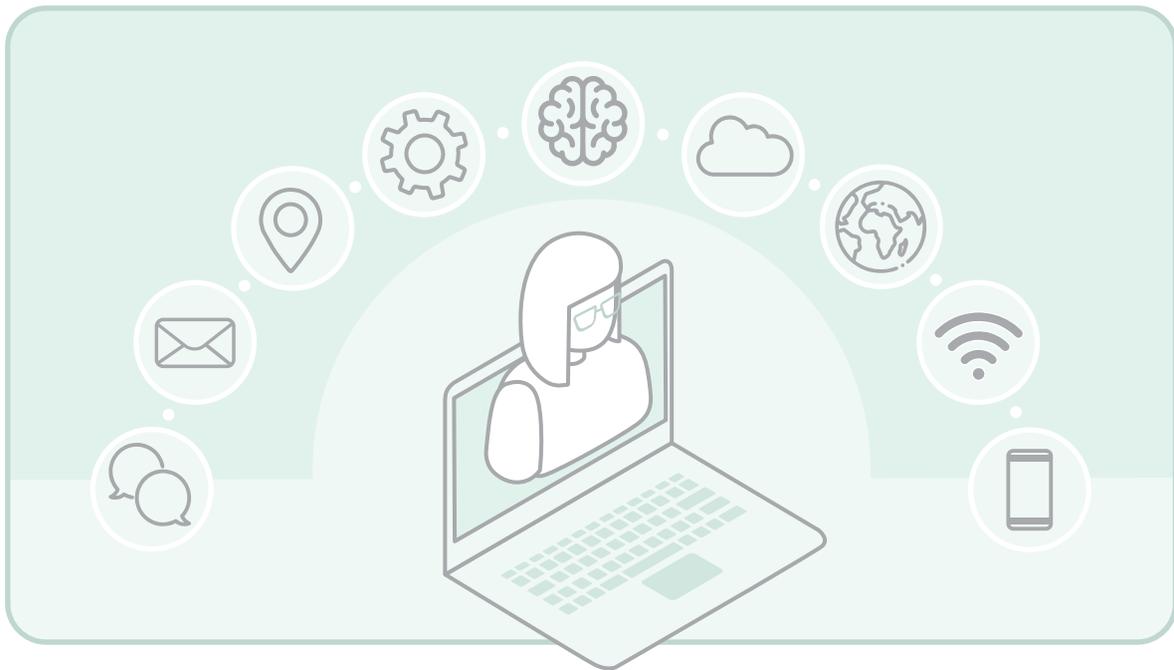
### 6.1. PROMISING DIRECTIONS OF AI RESEARCH IN PM

According to the survey results "AI Innovators: Cracking the Code On Project Performance" (2019), PMI experts distinguish the following six areas of AI that they consider to be promising and actively developing in the near future:

- ◆ **Knowledge-based systems** currently impact 37% of organizations while they're expected to disrupt 71% of companies in the future. The technology is capable of comprehending the context of the processed data and supporting making decisions by a human.
- ◆ **Machine learning** is currently impacting 31% of companies while 69% of organizations expect to experience its effect on their own example. The technology, as mentioned above, collects and analyzes data, detects patterns and builds models and, therefore improves decision-making.
- ◆ **Decision management** technology is now used by 29% of companies while 68% expect to start applying it in the nearest future. It's the main means of automating decision-making by a computer instead of a human being.
- ◆ **Expert systems** are the technology that aim to simulate human behaviour in a certain field under certain conditions. It's currently disrupting 21% of organizations, while 64% expect to experience its impact in the future.
- ◆ **Deep learning** builds, trains and tests neural networks that predict outcomes and/or classify unstructured data based on probabilities. According to the survey, 21% of companies are currently impacted by the technology, while 63% only expect this in the future.
- ◆ **Robotic process automation** imitates and automates human tasks to support corporate processes. 21% of companies report they're currently impacted by the technology and 62% of organizations are expecting this.



## 6.2. EPICFLOW TEAM'S DEVELOPMENTS: MAKING PREDICTIVE ANALYTICS MORE EFFICIENT WITH VIRTUAL ASSISTANTS



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

### How does this work?

All project management plan documents are loaded to a voice-enabled agent that contains project management logical connections and interpretation. We distinguish between proactive and interactive assistance. Let's consider some examples to see the way they will work.

### Proactive

Today, proactive assistance is available in terms of estimate updates:

- ◇ The virtual assistant informs resources about the need to update a personal or group task status if this negatively affects the project, resource/resource group, or skill load. All team members get a reminder as soon as they go online upon their project manager's request.

The following options are in development at the moment:

- 1 The virtual assistant warns if a random task has been taken regardless of the established priorities and asks to name the reason.
- 2 The assistant informs that a piece of training is necessary for a certain resource based on the skill levels required for a certain task.
- 3 Proactive status reporting based on thresholds for Project, RG load, and Skill load.
- 4 Written language formal status for projects
  - a The person is overloaded, but the group is not.
  - b Resource group or Skill progressing on projects unbalanced (one project has a positive trend and another one has a negative trend).



## Interactive

At the moment, Epicflow users can ask Bella the following questions:

### What is my next task? What should I work on next?

- ◇ In response, the virtual assistant shows a user Task List with all the tasks ordered according to their priorities.

### May I take a day off?

- ◇ Epicflow calculates the demand, availability, and capacity in the corresponding resource groups and availability changes. A user gets a positive answer if his/her absence doesn't do any harm to the project, and a negative reply if his or her absence negatively affects the workflow. Knowledge base queries: what does {term} mean?

### Knowledge base queries: what does {term} mean?

- ◇ Users get a definition of the term and/or the link to the Wiki knowledge base with the corresponding article.

The following requests are planned to be implemented in the system:

### How is the portfolio doing?

- ◇ The system will provide Bubble chart data to show, for instance, if a negative trend occurred in case the remaining time wasn't updated, display the projects with missed milestones, resource group status (date ranges with overload).

### Why is my project late?

- ◇ Epicflow will provide all necessary information about the project failure, name the cause, and use this data to avoid similar mistakes in the future.

### When will my project / MS be completed?

- ◇ What-if analysis will suggest the most probable scenario of the project delivery.

### Will the project end date be on schedule?

- ◇ What-if analysis will analyze the project flow and show whether the project will be delivered on the schedule or not. It can also show if the project is on or under the budget, which can be very different from the current status.



### **Is the project on schedule?**

- ◇ A user will see Pipeline with all current project data. It will clearly show if there are any constraints at the moment.

### **Is the budget overspent?**

- ◇ Epicflow will suggest all necessary data in terms of budget on the Bubble graph (budget view) and Burnup chart.

### **May I move the current task (that is due this week) to the next week?**

- ◇ The agent will give a positive reply if the task isn't on the critical path. It will also notify about the risk and warn that this action will increase the risk probability from 20% to 30%.

### **Which skill level has a rising trend in demand and needs more supply?**

#### **What employees fit this extra supply?**

- ◇ Epicflow will analyze all tasks within projects based on the skills and their levels and provide the analysis results that can be further used by project managers in their resource management activities.

Besides, some other AI interactive solutions are on the roadmap:

### **What-if plus virtual assistant with pointers towards possible solutions.**

- ◇ Apart from predicting project workflow in the future, a What-if virtual assistant will provide suggestions on how to avoid or resolve potential issues.

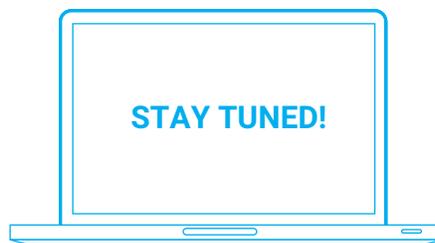
### **Encouraging notifications when goals are achieved.**

- ◇ When a resource completes the task, he or she will get an encouraging notification that the job is done perfectly.



## 7. 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.
- ◇ Artificial intelligence cannot replace project and resource managers because it's still far from simulating human behaviour and skills.
- ◇ 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.
- ◇ AI-driven functionalities are heavily dependent on a human being for some reasons: data must be correct and timely updated, which requires employees to input the information to the system.
- ◇ 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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