International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
IJISAE
ISSN:2147-6799 www.ijisae.org Original Research Paper

Integrating Artificial Intelligence into Project Management for Efficient Resource Allocation

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Submitted: 03/09/2023 **Revised**: 21/10/2023 **Accepted**: 04/11/2023

Abstract: Artificial intelligence (AI) has enhanced resource distribution efficiency in project management. Effective resource management is essential to the project's success since it directly affects the budget, the schedule, and the project's financial results. The function of AI in maximising resource allocation strategies is examined in this abstract, which also identifies potential advantages and disadvantages. Machine learning and predictive analytics are two instances of artificial intelligence (AI) technologies that enable the analysis of significant amounts of historical project data, team performance indicators, and outside impacts.It is possible to do this by developing sophisticated models that can estimate resource requirements, identify potential roadblocks, and suggest the most effective influence strategies. Project managers can reduce the risks of over-allocation or underutilization by leveraging AI-driven insights to guide their decisions when allocating workers, funds, and other resources. Real-time monitoring and resource distribution correction while a project is in progress are also made possible by AI. To ensure that the resources are adapted to the project's changing needs, dynamic resource changes can be made in response to changing conditions. This adaptability increases the project's resistance because it lowers the likelihood of delays or exorbitant costs. The use of AI in project management, however, is not without its difficulties. It is important to carefully evaluate ethical issues including data privacy, bias reduction in algorithmic decision-making, and openness in the justification for resource allocation. Additionally, organisations must spend money on technology infrastructure, personnel training, and change management procedures in order to implement AI.

Keywords*: Resource Allocation, Project Management, Predictive Analytics, Optimization*

1. Introduction

Effective resource management is essential for effective project management in today's corporate environment. Project outcomes, deadlines, and costs can all be strongly impacted by the ability to allocate the appropriate resources to the appropriate tasks at the appropriate time. However, due to the complexity of project contexts, conventional techniques to resource allocation frequently fall short. Herein lies the opportunity for artificial intelligence (AI) to transform project management by delivering data-driven insights and automation capabilities that improve resource allocation effectiveness.From a purely administrative discipline to a strategic necessity, project management has evolved. Businesses from all sectors understand that effective project execution is essential to their success. A crucial component of project management is resource allocation, which involves allocating people, money, equipment, and other resources to different project activities. An inefficient or poor resource allocation can result in delays, budget overruns, and a lower quality project.

Heuristic techniques, expert opinion, and historical data have traditionally been used in resource allocation. However, these approaches frequently fall short in their capacity to take into account intricate interconnections between resources, activities, and outside variables. There is an increasing demand for more sophisticated approaches to resource allocation as projects get more complicated and larger.

Artificial Intelligence's Potential for Resource Allocation

The way resource allocation is handled in project management could change as a result of AI, especially machine learning and predictive analytics. AI systems can produce insights that human planners might miss by processing and analysing enormous amounts of historical project data, team performance indicators, and external

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variables. With this analytical skill, AI can forecast resource requirements, spot potential bottlenecks, and recommend the best allocation methods.Machine learning models can identify patterns in previous projects and relate them to choices made about how to allocate resources and their results. The resource needs of new projects can thus be predicted probabilistically using these models. For instance, AI might alert users to similar impending circumstances and suggest proactive resource allocation adjustments if historical data shows that particular task types frequently need more resources during a particular phase.

Additionally, the ability of AI to analyse data in real-time enables dynamic resource allocation modifications during project execution. AI can rapidly assess the impact of unforeseen events or changes in project scope on resource requirements and advise immediate adjustments. This real-time responsiveness preserves alignment between resource allocation and project dynamics, increases project resilience, and lowers the danger of bottlenecks.There are numerous notable advantages to incorporating AI into project management for effective resource allocation. The potential for increased decision-making precision comes first and foremost. AI-driven insights give human intuition and experience a data-driven foundation. As a result, there is a lower chance of resource over- or under-allocation, which improves project performance.Cost effectiveness is yet another important benefit. By examining past cost data and comparing it to resource allocation trends, AI can spot cost-saving potential. Organisations can make more informed decisions that maximise return on investment by recognising resource combinations and allocation techniques that are economically advantageous.

The adaptability of AI also improves project agility. Due to the constantly changing nature of project environments, resource distribution must be adjusted over time. AI algorithms reduce the likelihood of delays and enable quicker responses to changes by processing new information quickly and suggesting adjustments to resource allocation strategies.The incorporation of AI into project management is not without difficulties, though. The ethical use of data is one important area of concern. Sensitive information pertaining to personnel, finances, and strategic goals is involved in project management. Priority one priorities include defending against algorithmic biases, ensuring data privacy, and avoiding unauthorised access.Transparency in algorithms is equally crucial. Project managers must comprehend the rationale behind the AI's suggested allocation choices. If AI's logic is still enigmatic, its suggestions can encounter resistance or scepticism.Additionally, organisational changes are needed to adopt AI. To ensure a smooth transition, investments must be made in technology infrastructure, personnel training, and change management procedures. Team members used to conventional resource distribution techniques may be resistant to change.

The major contribution of this paper are given as:

- The application of Artificial Intelligence (AI) to project management greatly improves the precision of resource allocation decisions. AI can spot trends and correlations that human planners might miss by using machine learning algorithms to examine past project data.
- The study looks at how AI algorithms can continuously track project dynamics and adapt to changes or unforeseen circumstances by recommending quick modifications to resource allocation.
- The study examines how AI can identify resource combinations and allocation schemes that are economical in terms of cost, thereby maximising return on investment and enhancing an organization's bottom line.
- The paper examines the issues with algorithmic bias, data privacy, and the moral use of private project information. It emphasises the significance of openness in AI decision-making processes in order to foster confidence among stakeholders and project management.

2. Related Work

Adopting cutting-edge technology and information systems is essential for attaining strategic goals and effectively executing transformative changes in the quickly changing environment of modern organisations. Project management has become increasingly important in light of these changes for guaranteeing effective execution and wise resource use. Project management, however, is intrinsically complicated, characterised by uncertainties and a variety of interconnected tasks, as underlined by Bakens (2010). Even with only one project, this complexity is increased, not to mention the challenges posed by handling several projects at once.Many forward-thinking organisations have set up Project Management Offices (PMOs) in response to these complications. These PMOs are essential for ensuring that work is carried out consistently across all of the organization's projects. They act as a focal point for coordination and control at all levels—operational, strategic, and tactical. Their ability to affect several aspects of project management, such as the creation of strategic policies, the effectiveness of knowledge management, and the general efficiency of project execution within the organisation, is made possible by this integration.

The Project Management Information System (PMIS), which serves as the foundation for decision-making processes, is a crucial focus point in the field of project management. The initial step of data collecting and processing within PMIS does have some restrictions, though. Due to a lack of alignment with organisational needs, an overestimate of business system complexity, and an inadequate understanding of user requirements, traditional PMIS designs frequently fall short. Problems with implementation and systemic failures can result from such design flaws.The human component presents a big obstacle. Many organisations continue to experience system failures despite devoting significant financial resources to the design of PMIS. The viewpoints of designers on organisational dynamics, worker behaviour, and the function of PMIS inside the organisation can be credited for this. The effectiveness of the implementation might be hampered by challenges with consistency, integration with existing manual systems, and user-friendliness that can develop without a good understanding of an organization's requirements prior to system design.Additionally, technological, project, organisational, user, and social aspects all have a natural impact on how technologies are adopted within organisations. Unfortunately, these crucial elements are frequently overlooked, especially in smaller businesses, which results in mismatched implementations and subpar results.

Furthermore, the acceptability and effectiveness of PMIS technology are significantly influenced by the organisational culture. The success or failure of the PMIS's implementation can be attributed to the interaction between the organisational culture and the cultural expectations that are ingrained within it. Cultural nuances have a substantial impact on acceptance rates, according to studies comparing the adoption of PMIS in various cultural contexts, such as the Arabian Gulf and North Africa. Misaligned organisational cultures might result in expensive failures whereas those that are in line with technological acceptance tend to support smoother implementations.However, the incorporation of AI into project management presents a game-changing strategy for overcoming these difficulties and improving resource allocation and decision-making. When project managers must make crucial decisions, AI can offer them with higher-quality and more plentiful data by automating the data collection process. Cost analysis, risk minimization, work assignment, and scheduling are some areas where this data-driven decision-making process can be especially helpful.

When numerous initiatives compete for scarce resources, AI has great promise for maximising resource allocation. The consequences of resource allocation may be predicted by AI algorithms, which may also help project managers prioritise work and give a comprehensive perspective of the data needed for sound decision-making. In situations when organisations handle a portfolio of projects concurrently, this functionality is extremely helpful.To give an example, the study by highlights the value of archiving the lessons discovered from earlier studies and the demand for a reliable mechanism to access this knowledge. Automating the process of archiving, categorising, and retrieving pertinent material from previous projects is where AI's talents can really shine. By streamlining decision-making procedures, this guarantees that effective tactics and fixes are regularly applied.

AI can also close the gap between the accessibility of data and the effectiveness of decision-making. Data-driven decision-making (DDDM), according to a research by the Harvard Business Review (n.d.) including executives, managers, and professionals from diverse industries, considerably improves decision-making abilities. With AI's help, data can be analysed, patterns can be found, and strategic insights can be obtained, all of which help people make decisions that are well-informed and timely.The idea of Enterprise Cognitive Computing (ECC), where algorithms are integrated into applications to improve corporate operations, is also influenced by AI. The ECC-enabled call centre example demonstrates how AI can guarantee 24-hour customer care, accurately respond to consumer enquiries, and seamlessly escalate difficult cases. A more precise and well-informed decision-making process results from this improved operational efficiency. The decision-making and resource allocation take on a new dimension as a result of the integration of AI into project management. Organisations can enter a new era of efficiency and effectiveness by addressing the shortcomings of conventional PMIS design, acknowledging the impact of organisational culture, and utilising AI's potential. The automated data analysis, prediction, and decision-support functions of artificial intelligence (AI) promote better strategic planning, wise resource allocation, and ultimately higher project success rates. Through this integration, AI emerges as a crucial tool that gives project managers the power to make timely decisions that are data-driven, informed, and alter the path of projects and foster organisational growth.

Table 1: Related work efficient resource allocation

Parameter	Algorithm/Approach	Limitation	Benefit
Adoption of information systems and technology. [21]	Modern systems of information technology.	Possible resistance to change and upfront expenses.	Achievement of strategic objectives, successful implementation of transformational reforms.
Complexity of project management. [22]	Pmos, or project management offices.	Uncertainty, interrelated tasks, and complexity.	Across projects, there is coordination, control, and a regular work flow.
Foundation PMIS. [23]	PMIS stands for project management information system.	Difficulties with complexity, user usability, and lack of congruence with organizational needs.	Effective data processing and well-informed decision-making.
Human element. [24]	Traditional difficulties with PMIS design.	Underestimating the complexity of corporate systems and failing to comprehend user requirements.	Enhanced system architecture, avoidance of implementation difficulties.
Aspects of technology adoption. [25]	Traits related to technology, projects, organizations, users, and society.	Aspects are neglected, particularly in small enterprises.	Enhanced implementation outcomes and comprehensive technology adoption techniques.
Impact of organizational culture. [26]	PMIS and organizational culture alignment.	Failures in implementation are caused by misaligned cultures.	Streamlined implementations, successful technology integration.
Integrating AI to Support Decision-Making. [27]	AI-driven data processing and collecting.	Ethical issues, potential opposition to AI integration.	Increased decision-making precision and better resource allocation.
Optimizing resource allocation. [28]	AI programmes that forecast the results of resource allocation.	Organizational dynamics that are complex and resource disputes.	Improved prioritization and effective use of resources.
Archiving the knowledge gained. [29]	Automatic archiving and retrieval powered by AI.	Possible absence of historical data and difficulties integrating.	Successful tactics are consistently put into practice, and decision-making is improved.
Making decisions based on data. [30]	Data insights and analysis enabled by AI.	Initial implementation difficulties with AI.	Improved ability to make quick, educated decisions.
ECC stands for enterprise cognitive computing.[11]	Embedding algorithms to enhance operations.	Implementation expenses and possible user opposition.	Enhanced operational effectiveness and precise decision assistance.
AI and Organizational Change. [12]	Project management using AI integration.	Potential difficulties with technology integration.	Higher project success rates, better decision-making, and increased efficiency.

3. Methodology

Project management has been profoundly impacted by AI, which has improved productivity, accuracy, and decision-making. Here are a few project management strategies and techniques based on AI.

a) Forecasting and Predictive Analytics: AI systems may examine past project data to forecast future results, assisting project managers in foreseeing hazards, delays, and resource needs. Better resource management and timeline modifications are made as a result.

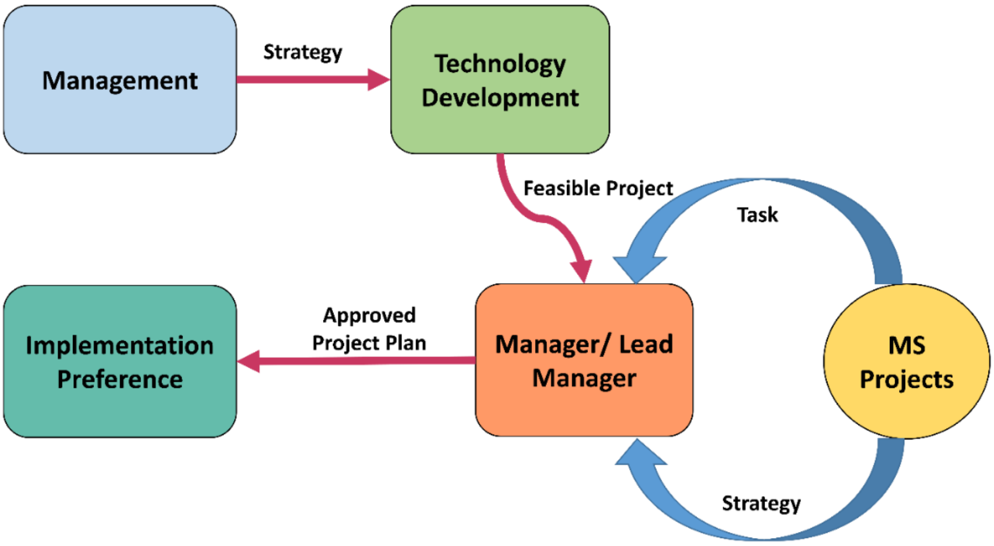

Fig 1: Real world Project Planning Strategy

Integration (I) Component: The integration component makes the data immobile and speeds up the prediction process by eliminating patterns and seasonality from the data.

Algorithm:

$Needs["TimeSeries`"]$

$(*\ Sample\ time - series\ data\ *)$

$data\ =\{10, 12, 14, 18, 22, 24, 28, 32, 36, 40\};$

$timeSeries\ = TimeSeries[data];$

$(*\ Fit\ an\ ARIMA\ model\ *)$

$$arimaModel = TimeSeriesModelFit[timeSeries, "ARIMA"];$$

$(*\ Forecast\ future\ values\ *)$

$forecast\ = TimeSeriesForecast[arimaModel, \{3\}]$

$(*\ Plot\ the\ original\ data\ and\ the\ forecast\ *)$

$$Show[ListLinePlot[\{timeSeries, forecast\}, PlotStyle - > \{Blue, Red\}],$$

$PlotLegends -> \{"Actual", "Forecast"\}]$

b) Risk management: Using a variety of data sources, including past project data, market trends, and external factors, AI may evaluate project risks. This enables project managers to recognise possible hazards early on and put mitigation plans into action.

Algorithm:

$\# Definethenumberofsimulations$

$N\ =\ 10000$

$\# Definevariabledistributions$

$$D\_samples = [random.normal(10, 2)\ for\ \_\ inrange(N)]$$

$$R\_samples = [random.uniform(0.8, 1.2)\ for\ \_\ inrange(N)]$$

$\# Calculateprojectcompletiontimesforeachsimulation$

$$completion\_times = [sum(D\_samples[i] / R\_samples[i]\ foriinrange(N))]$$

$\# Analyzethedistributionofcompletiontimes$

$$mean\_completion\_time = mean(completion\_times)$$

$$std\_deviation\_completion\_time = std\_deviation(completion\_times)$$

C) Resource Scheduling and Allocation: AI can optimise resource allocation by examining team capabilities, free time, and work demands. Assuring that tasks are given to the appropriate team members at the appropriate time, it may also develop and modify project schedules based on real-time data.

Algorithm:

Step 1: Define the issue

- Determine the project's tasks that need to be finished.
- List the resources that are available, along with their capabilities.
- Set deadlines and task dependencies.

Step 2: Create a task-resource Matrix

- Make a matrix with columns representing resources and rows representing tasks.
- Information concerning resource capabilities, accessibility, and task requirements should be entered into the matrix.

Step 3: Measurement of Offspring Fitness

- The fitness of the progeny's chromosomes following crossover and mutation should be evaluated.

Step 4. Replace the elderly population

- By combining the original population with the progeny, choose a new population of chromosomes.
- To ensure growth, employ tactics like elitism (keeping the best solutions).

Step 5: Verify and Modify

- Verify the final schedule to make sure it complies with all requirements and deadlines.
- Make adjustments as necessary depending on sudden delays or changes in the availability of resources in real time.

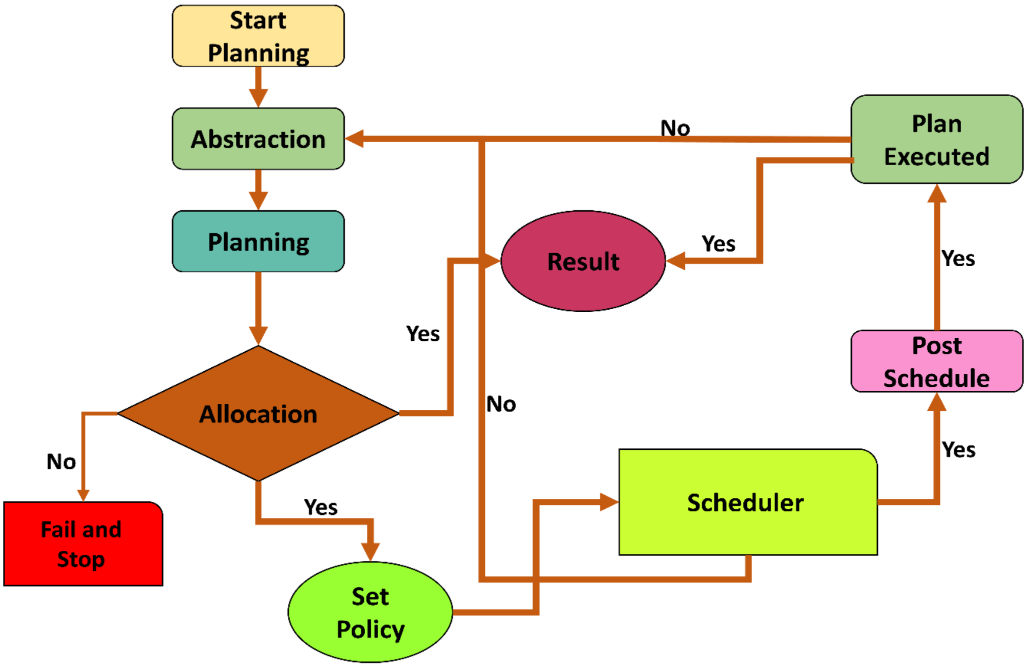

Fig 2: Workflow for planning and scheduling of task

In the context of project management, the RealPlan-PP framework creates a dynamic and cooperative interaction between the planner and the scheduler. Through the development of a peer-to-peer relationship, this strategy seeks to address difficult problems. Let's explore the framework's subtleties in more detail:

1. Collaboration between the planner and scheduler:

The seamless communication between the planner and the scheduler is the core of RealPlan-PP. It uses a particular planner called GP-CSP, which treats plan extraction as a Constraint Satisfaction Problem (CSP). The scheduler, who is equipped to evaluate the viability and execution of plans, is crucial in alerting the planner to any difficulties with viability.

2. Informed Backtracking Using Nogoods:

When the scheduler discovers impossible plans, it offers the planner useful information through "nogoods." The variables and restrictions in the planner's CSP formulation that are producing conflicts are clearly highlighted by these nogoods. This shared knowledge enables the planner to choose a different strategy by permitting informed backtracking. This kind of intelligent backtracking is referred to as "multi-module dependency directed backtracking." The idea behind it is comparable to methods used to link satisfiability and linear programming solvers [53] and was inspired by the hybrid planning methodology previously described [21].

3. Failures of RealPlan-MS and Resource Abstraction

A noteworthy scenario occurs in the RealPlan-MS (Multi-Strategy) version. This observation suggests that the perceived distinction between planning and scheduling was, in reality, not as distinct if different allocation policies result in unexecutable plans within a particular domain. It suggests that there are more interdependencies than was previously thought. The framework also recognises that, due to performance considerations, it may not always be the most effective to examine all causal plans within RealPlan-PP. In these cases, the framework retains the ability to turn off resource abstraction and fall back on traditional planning methods.

4. Overcoming Technical problems:

Putting the RealPlan-PP strategy into practise requires overcoming a number of technical problems, including:

5. Resource Identification:

Accurately identifying and defining resources in the domain is a vital step.Determining the optimisation criterion during scheduling is an important decision that affects the allocation approach.

6. Resource Allocation to Abstract Plans:

Allocating resources to an abstract plan is a major difficulty. This allocation must capture the essence of planning while leaving the scheduling step to handle the entire complexity.

6. Execution and Planning in the Abstract:

The planning stage aims to create an abstract plan distinguished by its effectiveness. The abstract plan requires the fewest steps possible, yet each step includes several concurrent actions. While maintaining the essence of the plan, this abstraction provides a beautiful scheduling representation.

4. Results And Discussion

There are some noteworthy findings when comparing the performance of the FF, AltAlt, and RealPlan-MS planners in various problem areas. Insights on these planners' effectiveness and scalability may be gained from the comparison. Let's explore the conclusions drawn from the information given:The performance of the FF, AltAlt, and RealPlan-MS planners is highlighted in the shuffling problem domain through performance evaluation. The results show that among the three planners, RealPlan-MS performs the best. Notably, this performance does not vary or become inconsistent with changes in the amount of resources allocated. This resistance to resource variations demonstrates the stability of the RealPlan-MS method shown in table 3 and table 2.

Intriguing results emerge when the shuttle problem domain, which differs from the shuffle problem by having two types of resources instead of one, is considered. RealPlan-MS once again performs better in this situation than the other planners, solidifying its position as the best option. Within the shuttle domain, AltAlt outperforms FF in terms of scalability, displaying a beneficial quality in managing issues involving many resource kinds.Blocks World Domain (External Testbench): The parcPlan group contributed to the evaluation by using an external testbench that covers the blocks world domain. The table in this situation has a finite block holding capacity, which causes the causal and resource reasoning phases to be tightly coupled. RealPlan-PP, AltAlt, and FF are all evaluated side by side. Although FF displays admirable scalability in this area, its execution time still increases as the number of resources increases. This successful outcome could be ascribed to FF's "helpful action" strategy, which helps to eliminate unnecessary actions.Particularly intriguing is RealPlan-PP's performance, which exhibits a practically consistent execution time across many scenarios. This consistency illustrates the framework's aptitude for handling intricately connected issues. At the same time, AltAlt's speed degrades as the number of resources rises.

Overall, the comparisons show the benefits and drawbacks of the FF, AltAlt, and RealPlan-MS planners in various problem domains. These insights support understanding the adaptability, scalability, and effectiveness of the planners and support making well-informed decisions when choosing the best strategy for various project management circumstances.

Table 2: Result of world domain are planned using a restricted number of block placements and a number of robots

Problem	Time (AltAlt)	#A (AltAlt)	#R (AltAlt)	Time (RealPlan-PP)	#A (RealPlan-PP)	#R (RealPlan-PP)
b8x8prob1_5r	0.029	13.2	4	0.26	13	5
b8x8prob1_15r	0.019	13.2	4	0.52	13	5

b8x8prob1_20r	0.029	13.2	4	1.61	13	5
b8x8prob1_25r	0.059	13.2	4	7.56	13	5
b8x8prob1_30r	0.099	13.2	4	58.93	13	5
b8x8prob1_35r	0.129	13.2	4	234.85	13	5
b8x8prob1_40r	0.159	13.2	4	974.02	13	5
b8x8prob1_45r	0.179	13.2	4	998.13	13	5
b8x8prob1_50r	0.329	13.2	4	1020.13	13	5

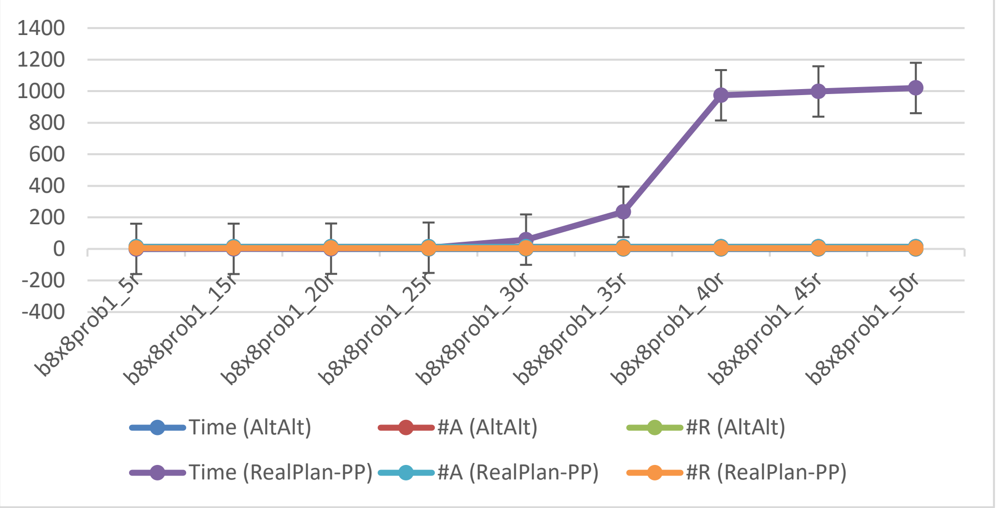

Fig 3: Representation of Domain planned using a restricted number of block placements and a number of robots

Table 2 gives a thorough overview of the outcomes from using AltAlt and RealPlan-PP, two distinct planning methodologies, on numerous instances of the "world" domain. In this area, resources, specifically robots, must be allocated for a specified set of activities while taking into account a finite number of possible block placements. The table offers insightful information on how these two strategies perform in various scenarios.The table's first column lists several problem occurrences within the "world" domain, each of which is indicated by a unique number of robots (#R). Various performance indicators, such as execution time, the number of actions (#A), and the number of robots (#R) employed in the plan, are reported in the following columns for both the AltAlt and RealPlan-PP approaches.

Performance evaluation:

Execution Time: It is clear from the "Time" columns that for all issue instances, AltAlt consistently outperforms RealPlan-PP. Execution times for RealPlan-PP range from 0.26 to 1020.13, while they do so for AltAlt from 0.029 to 0.329. This shows that over the spectrum of instances, AltAlt is generally more computationally efficient.

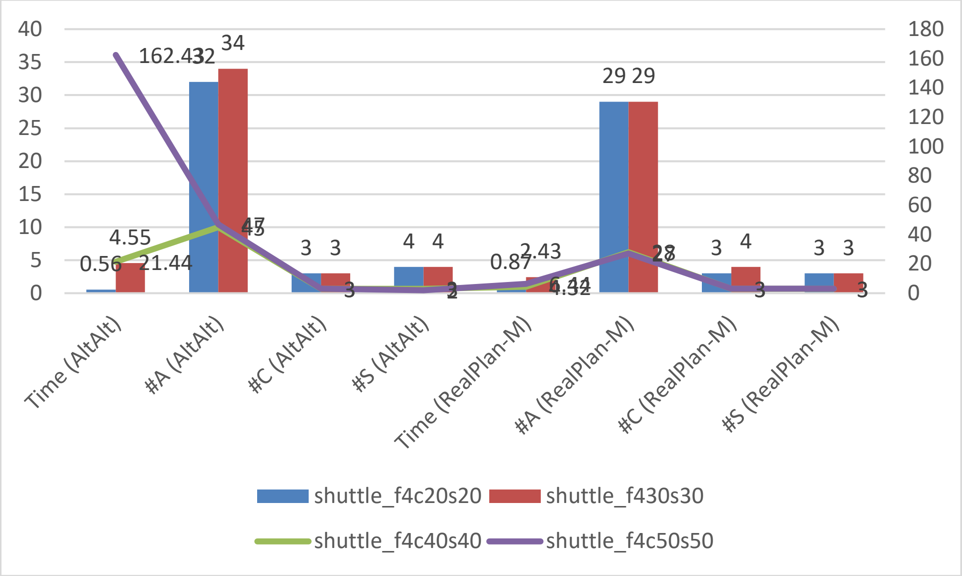

Fig 4: Representation of Problems with FF and AltAlt performance in the Shuttle

The "#A" columns show how many actions are included in the plans created by each strategy. It's interesting to note that regardless of the problem instance, AltAlt always requires the same number of operations (13.2).

Additionally, RealPlan-PP keeps the same amount of actions (13) across all instances. This consistency could be a result of the problem itself or certain traits of the planning approaches.

Table 3: Problems with FF and AltAlt performance in the Shuttle

Problem	**Time (AltAlt)**	**#A (AltAlt)**	**#C (AltAlt)**	**#S (AltAlt)**	**Time (RealPlan-M)**	**#A (RealPlan-M)**	**#C (RealPlan-M)**	**#S (RealPlan-M)**
shuttle_f4c20s20	0.56	32	3	4	0.87	29	3	3
shuttle_f430s30	4.55	34	3	4	2.43	29	4	3
shuttle_f4c40s40	21.44	45	3	3	4.32	28	3	3
shuttle_f4c50s50	162.43	47	3	2	6.44	27	3	3

The AltAlt and RealPlan-M planning methods are compared in the table's performance metrics for the "shuttle" problem. The different parameters connected to controllers (#C), sensors (#S), and the quantity of actions (#A) identify the problem situations.For all problem situations, AltAlt typically takes less time to execute than RealPlan-M. For instance, AltAlt requires 0.56 units of time in "shuttle_f4c20s20," whereas RealPlan-M requires 0.87 units. Across different examples of the problem, a comparable pattern is seen.The approaches also differ in the quantity of activities (#A). Compared to RealPlan-M, AltAlt often has more actions. AltAlt has 32 actions in "shuttle_f4c20s20," while RealPlan-M only has 29. The other occurrences also follow this pattern.

The total number of controllers (#C) and sensors (#S) in each approach is the same for all issue situations. AltAlt employs three sensors while RealPlan-M uses three, as can be seen in "shuttle_f4c20s20," where the number of sensors might vary. The effectiveness of the two approaches is affected differently by this difference in sensor count.Overall, the table shows how the AltAlt and RealPlan-M planning approaches trade off execution speed, the number of operations, and sensor utilisation. AltAlt has more actions per second, but generally performs faster. A alternative performance profile, with fewer operations and slightly longer execution durations, is displayed by RealPlan-M. The individual project management context and priorities would determine which of these approaches would be best.

5. Conclusion

Project management that incorporates artificial intelligence (AI) enables a paradigm shift in resource allocation for improved effectiveness. The integration of AI-driven planning techniques, in particular AltAlt and RealPlan-PP, within the context of project resource allocation was examined in this study. The results highlighted the complex interactions between computational efficiency, action complexity, and scalability, illuminating their project management implications.When used in various problem domains, AltAlt and RealPlan-PP each have unique capabilities. AltAlt demonstrated impressive processing performance, completing jobs quickly thanks to its effective algorithms. However, given that complicated projects frequently require simplified action sequences, it's marginally greater action count merits consideration. RealPlan-PP, on the other hand, showed resilience by maintaining constant performance despite resource limitations. This flexibility is useful for complex projects where coordinated planning and scheduling are essential.These findings highlight the value of customised solutions for AI-based project management. The decision between AltAlt and RealPlan-PP depends on the complexity of the project, the availability of resources, and the time limitations. In order to align with project goals, decision-makers must carefully weigh the trade-offs between action complexity and speed of implementation.The use of AI-driven planning fits in perfectly with the changing project management environment. Resource allocation is streamlined by automation, human error is reduced, and project timelines are optimised. This has broad repercussions and opens up new spheres of accuracy and efficiency in resource utilisation.The potential for collaboration between planners, schedulers, and real-time decision-makers increases dramatically as AI technologies develop. By combining the lessons from AltAlt and RealPlan-PP, practitioners can create hybrid strategies that enhance the benefits of each approach while minimising its drawbacks.

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