**AGILE PROJECT MANAGEMENT; ENHANCING FLEXIBILITY AND EFFICIENCY THROUGH ARTIFICIAL INTELLIGENCE**

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**ABSTRACT**
Agile project management is an popular form of project management which sets an focus on adaptability, collaboration & continuous improvement that works effectively for software development tasks and also has various benefits such as the ability to adjust the changing requirements, utilize resources efficiently and create a continuous improvement culture. It can lead to a projects overall success, a faster time to market and more transparency & responsibility which also includes traditional project management techniques often suffer from being too rigid, having few stakeholder interactions, uncertain requirements, difficult change management, no flexibility when it comes to risks and insufficient resources. Every approach has benefits as well as disadvantages that are most appropriate for certain project objectives and businesses can create a project management plan that best match their unique needs by knowing the benefits and drawbacks of both agile & traditional project management methods. This paper examines the development of project management techniques, highlighting the limitations of conventional waterfall techniques as well as the emergence of agile techniques. The paper also covers a number of Agile techniques like Extreme Programming (XP), Kanban, Scrum,Scrumban & Crystal Techniques as every technique have benefits and drawbacks of its own, it is important to choose the best strategy to perform at challenge. In conclusion, in the fast paced and uncertain business setting, agile project management provides a more adaptable and effective method to project management in which agile project management gives businesses even more when integrated with data driven approaches.

**Keywords:** Agile project management, Artificial Intelligence, Data-driven, Flexibility, Efficiency, Continuous improvement, Risk management, Stakeholder satisfaction

**1.INTRODUCTION:**

 **1.1 Project**

Project is a temporary task undertaken of creating a unique product, service or result which has a Specified project beginning, end, scope and resources and projects are carried out with limited resources including cost, time and scope and also has a clearly defined start and finish as well as certain aims, objectives and limitations [(Bröchner 2022](https://www.sciencedirect.com/science/article/pii/S0263786322000540)) to ensure that resources are used effectively and that the expected results are obtained, projects are managed by the use of an organized methodology[(Pinto et al. 2022)and involves splitting the project into manageable tasks, allocating works to team members & monitoring advancement in relation to deadlines and benchmarks.](https://www.sciencedirect.com/science/article/abs/pii/S0263786322001156)

**1.2 Project Management**

The process of successfully and efficiently planning, executing and monitoring of projects is known as project management [(Herath & Chong 2021)](https://journal.oscm-forum.org/publication/article/key-components-and-critical-success-factors-for-project-management-success-a-literature-review) which includes managing each stage of a project from start to finish, maintaining that the project achieves its goals while keeping the limitations like time, cost, scope and quality [(Yao et al. 2023).](https://www.sciencedirect.com/science/article/abs/pii/S0263786323000297)and also during the entire project duration, resources and stakeholders are managed by a range of procedures, tools and approaches that are all included in project management

 **1.3 Challenges of Project management**

There are many challenges with project management such as scope creep, when a project scopes expands beyond what was originally planned, resource constraints are caused by a lack of time, budget, skilled labour, stakeholder management[(Malav et al. 2021),](https://www.sciencedirect.com/science/article/abs/pii/S0959652620332728)that involves managing the expectations and interests of multiple stakeholders, risk handling which is identifying, evaluating and reducing project risks [(Lavagnon 2022)](https://www.sciencedirect.com/science/article/abs/pii/S0263786322000771) and communication ,to ensure that team members as well as stakeholders are communicating effectively.

**1.4 Evolution of Project Management:**

Project management started off as an ordinary management approach, but it has developed into a complex which combines the field of psychology, technological advances and strategic planning and then from initial stage, unorganized approaches has evolved into organized systems like a waterfall, the Agile approach and Lean[( Vivek et al. 2021)](https://www.researchgate.net/publication/355651276_Evolution_from_operations_project_management_to_strategic_project_management_a_systematic_review/citation/download) each depending on the unique needs of the business and the complexity of the project. Technological advancements have also been important in enabling data driven decisions, predictive analytics and real time communication as soft skills are now recognized as essential as technical expertise in project management, the field has grown complex and focuses on stakeholder participation, communication and leadership[(Gibbin et al. 2023)](https://www.sciencedirect.com/science/article/abs/pii/S095965262301911X)which also constantly changing as organizations get an increasingly dynamic environment, accept innovation and adapt to the ever changing needs of modern projects.

**1.5 Drawbacks in existing project management approach:**

Current project management methodologies has a many challenges that might cause a project failure, even if they operate effectively and one major drawback of traditional methodologies like Waterfall is resistance to change, [(Alsharef et al. 2021)](https://www.mdpi.com/1660-4601/18/4/1559) where requirements change quickly, remains to a set strategy can result in delays, excess and ultimately project failure. Rigidity also causes particular problems in industries  [(Sanz Llopis & Ostermann 2020)](https://www.emerald.com/insight/content/doi/10.1108/IJMPB-08-2019-0210/full/html)where responsiveness and flexibility are crucial such as those characterized by ambiguity, risk, complexity and uncertainty.

Furthermore, managing expectations from stakeholders and communicating effectively is a challenge for traditional project management in which Stakeholders are important to the success of a project [(Pargaonkar 2023).](https://d1wqtxts1xzle7.cloudfront.net/106763843/ijsrp_p14015-libre.pdf?1697745969=&response-content-disposition=inline%3B+filename%3DA_Comprehensive_Research_Analysis_of_Sof.pdf&Expires=1718470946&Signature=K7Y-UMt2EbjkHVOxCPHjl~rdLqjMKi0GttTMLtecJPPdX~-fCM3ng1EyiMWOykHLgdyNt9HIiH4YqrHt1byNaaR7K97Jcld1jvSsLI9k9Ge2MtK7HHQ9twhO4Y5tHVlQc~X0SxVYyqdayyh6CJdVX57ZX~JNkaLm~xkqiiN9uUBOJ1LXR0PT4j5qRxlU788P~F4Q3ICPuWMU40nLctxBsZSUgMeJLs6-G4Xdp7qjEDNGjyA54Lv3XADevOxYjwT7j1DfgIVyl9PnKP2fGNVe6Ec0GRdBhRFhorzgY6VwdEbbkKFZ7iIdmYh8ajpZlFE~0UthJaEPDmfJ477b0tKgug__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA) yet some times their demands and opinions are misinterpreted. Conflicts, scope creep and project failure can result from this misalignment, [(Masia & Poll 2021).](https://www.inderscienceonline.com/doi/abs/10.1504/JGBA.2021.114320)in addition to this, poor communication among team members, stakeholders & leaders can delay decision making, increase risks & decrease certainty , all of which may delay cooperation and creativity.

Another typical error in Agile Manifesto indicates that is the tendency to prioritize tools and processes over people and communication, when inflexible and rigid procedures are the standard, team members innovation and adaptability may be diminished which can lead to dissatisfaction and exhaustion. [(Carsten Kaufmann 2022)](https://www.sciencedirect.com/science/article/pii/S026378632200076X) moreover, an excessive focus on tools and technology may show the benefits of using human focused project management strategies like empathy, behavioural intelligence and effective leadership, even while these methods are helpful for organizing workflows and managing data.

Finally, a lot of project management approaches now in use find it difficult to handle the complexity of current projects, which involve different teams, groups and even organisations [(Giezen 2020)**.**](https://www.sciencedirect.com/science/article/abs/pii/S0263786312000129) therefore, even though conventional project management techniques have clearly been useful for planning & executing projects [(Clauss et al 2021)](https://www.sciencedirect.com/science/article/pii/S2444569X20300317), their drawbacks highlight the importance for continuing innovation & evolution in project management techniques to meet the changing demands of the modern business environment.

**STRUCTURE OF THE PAPER**

The papers chapters are structured as follows, the framework for agile project management is provided in first sectio  Introduction, which also defines key concepts like project management challenges and principles. In the second section, the Literature Review, various Agile methodologies are examined along with the development of Agile practices and a comparison of Agile vs traditional project management strategies is provided. In order to study the application of AI into Agile Project Management, appropriate resources have been identified, filtered and analyzed. The process is outlined in detail in section 3, Methodology. In section 4, Analysis, practical application of AI in agile project management are addressed. The advantages of data-driven approaches are highlighted and the challenges associated associated with traditional project management techniques are reviewed.

**2. LITERATURE REVIEW:**

**2.1.Agile project management:**

Agile project management is a highly adaptable and iterative process that prioritizes teamwork, quick delivery of functional advancements and continual improvement which prioritizes flexibility in response to change and consumer satisfaction by regular feedback and continuous teamwork, [(Manurung & Kurniawan 2021)](https://www.emerald.com/insight/content/doi/10.1108/IJMPB-10-2020-0310/full/www.frost.com/full/html) its efficiency in handling complex projects with dynamic needs has led to its widespread use in many industries [(Ivetic Pavle et al. 2020)](https://www.researchgate.net/publication/344752386_Reinventing_Universities_Agile_Project_Management_in_Higher_Education) where agile fundamental principles are found in the Agile methodology, which puts an focuses on resources & their communication over procedures & technologies, functional software over detailed documentation, customer participation over contract negotiations &  adapting to change over fixing to a schedule

It  is based on the continuous concept that work is broken down into small feasible units called sprint or iteration, in every iteration usually lasts for number of time, from 2-4 weeks, throughout which a cross functional teams works together to produce a product advancement [(Rahardja & Lutfiani 2020)](https://iopscience.iop.org/article/10.1088/1742-6596/1477/3/032023/meta) which could be transported and by delivering value to stakeholders early, this continuous approach provide them  opportunity to provide input and build the projects sequence across its entire duration[.](https://www.sciencedirect.com/science/article/abs/pii/S1472811721000689)

 Agile project management promotes cross functional, self organizing teams as well and  teams that use Agile have the scope to collaborate & adjust to developing conditions, as opposed to depending on high level decision making processes together [(Koch & Schermuly 2021) , team members from many area such as growth and development, design and evaluation to achieve common objectives by combining their different backgrounds and expertise to produce outputs which is the highest quality](https://onlinelibrary.wiley.com/doi/full/10.1111/1467-8551.12536) [(Felix et al. 2021)](https://www.sciencedirect.com/science/article/abs/pii/S1755581721000559?casa_token=Vm6xHxECnvQAAAAA:YLdqHp6YvBSeaKlSrm6jHLcgXyrBfb5ptZoeeggw-7PU5dJL2dUlOzMZGNq9xutjpx3hOJfefH-W). Furthermore, agile approaches such as Scrum and Kanban provide methods & frameworks to help agile teams to plan, execute and monitor their work efficiently in the fast moving and uncertain business world, (Rush & Connolly 2020) which provides a dynamic and adaptive method to project management, allowing teams to create quality rapidly and adjust to changing requirements.

[Moreover, Agile project management supports a values of constant growth and research which provides the teams to examine their processes, highlight areas for development and assess innovative ideas to increase their efficiency through frequent evaluations or review sessions and teams are able to adjust and develop over time, continually improving their methods to provide better results, due to this constant feedback loop](https://onlinelibrary.wiley.com/doi/full/10.1111/1467-8551.12536) [(Bogdanova et al. 2020)](http://ijasos.ocerintjournals.org/en/pub/ijasos/article/786345) and moreover, it encourages visibility and openness by tracking progress and updating stakeholders on status by the use of visual tools such as activity boards, burndown visualizations & Kanban boards[(Ebirim et al. 2024).](https://fepbl.com/index.php/estj/article/view/864) [and this transparency allows stakeholders to be update on project status in real time and encourages dependability and teamwork within groups.](https://onlinelibrary.wiley.com/doi/full/10.1111/1467-8551.12536)

**2.2. Evolution of Agile project Management:**

Agile project management has developed through continuous improvement and adjustment  in response to dynamic environment of software development and other fields in which limits of traditional waterfall systems gave rise to the emergence of Agile methodology such as Kanban, Scrum and Extreme Programming (XP), starting with Agile Manifesto, which was released in 2001 ([Balaban Suzana et al. 2021)](https://www.researchgate.net/publication/351858054_Agile_Project_Management_as_an_Answer_to_Changing_Environment). These approaches revolutionized the approach projects were managed by supporting adaptability, quick feedback loops, an focus on additional value delivery and also implemented continuous improvement, prioritized customer participation and created self organizing, cross functional teams.

When Agile technique developed popular, flexibility became a requirement  especially in software development [( Omonije 2024).](https://www.researchgate.net/publication/377979833_Agile_Methodology_A_Comprehensive_Impact_on_Modern_Business_Operations)as a result, scaled Agile frameworks were created, such as SAFe (Scaled Agile Framework) methodologies, LeSS(Large-Scale Scrum**)** & DAD (Disciplined Agile Delivery)**,** that offer guidance on implementing Agile concepts in more complicated projects and larger companies[(Saqqa et al. 2020).](https://www.semanticscholar.org/paper/Agile-Software-Development%3A-Methodologies-and-Al-Saqqa-Sawalha/53436eeef7672a4b982ba8872491635cbf211f1a?p2df) through the implementation of new levels of cooperation, management and alignment, these frameworks allowed businesses to efficiently use Agile technique at scope without  compromising flexibility or responsiveness.

Moreover, another important critical point in its development was the combination of Agile & Devops methodology to improve the software delivery process, Devops focus on automation and cooperation between the operation & development teams (whiteley et al. 2021). By means of continuous enhancement, delivery and feedback, organizations may obtain faster time to market, increased reliability, higher customer satisfaction by integrating Agile concepts into the Devops [( Habermann & Schmidt 2020).](https://www.inderscienceonline.com/doi/abs/10.1504/IJMP.2020.105674) and reduces the limits between operation and development and drives the advancement of Agile methodology project management into different areas of effectiveness and innovation.

**2.3.Difference between agile project management and traditional project management:**

Some of the key differences between agile project management & conventional project management are applicable, where traditional project management like Waterfall remain to be a more rigorous, sequential procedure, Agile focus on flexibility and adaptation[(](https://journals.sagepub.com/doi/abs/10.1177/8756972820973082)[Gemino](https://journals.sagepub.com/doi/abs/10.1177/8756972820973082#con1) [et al. 2021)](https://journals.sagepub.com/doi/abs/10.1177/8756972820973082) which divides projects into brief, time limited iteration called sprints and this structure enables teams to modify requirements and priorities at any point during the project duration according to input from customers or shifting market conditions [(Jafari et al. 2024)](https://www.worldscientific.com/doi/abs/10.1142/S0219649223500600). On the other side, traditional project management requires a great deal of planning clear and a straight path through the project stages, with few opportunities for modification after the plan is established.

Second during the project, rigid cooperation between cross functional teams, clients & stakeholders is supported by agile project management and agile focus on teamwork and communication [(Gaborov et al.2021)](http://81.2.247.240/index.php/jatespath/article/view/279),with regular meetings and feedback systems to guarantee knowledge and alignment[(Zavyalova Elena et al. 2020).](https://www.researchgate.net/publication/339510213_Agile_vs_traditional_project_management_approaches_Comparing_human_resource_management_architectures#:~:text=The%20traditional%20management%20approach%20is,traditional)%20methods.%20...)Conventional project management may attribute more hierarchical organizational structures, fewer channels for communication and ability for project leaders or senior leaders to make decisions without seeking much feedback from the team as a whole.

| **Features** | **Agile Project Management** | **Traditional Project Management** | **Literature Review** |
| --- | --- | --- | --- |
| Method of Planning | Iterative and adaptable, with regular modifications made in response to input & evolving needs. | Sequentially and rigorous, with a thorough strategy made from the start and implemented all the way through. | [Ciric et al 2021](https://apem-journal.org/Archives/2021/APEM16-1_099-111.pdf) |
| Managing Change | Recognizes change as a necessary element of the process & views it as a chance to get better. | Usually uncertain to change requiring formal change management procedures and frequently leading to extra expenses and delays. | [Gaborov et al. 2021](http://81.2.247.240/index.php/jatespath/article/view/279) |
| Team Arrangement | Cross functional in nature, self organizing groups that work closely together and adjust to changing demands. | A hierarchical allowing team members less freedom to adjust to changing circumstances and clearly defined positions and tasks up front. | [Koch et al. 2023](https://bpspsychub.onlinelibrary.wiley.com/doi/full/10.1111/joop.12429) |
| Interactions and Feedback | Focuses as huge value on regular feedback loops, stakeholder involvement and frequent and transparent communication. | Depends on official reporting and documentation systems and communication channels are frequently less flexible and more rigorous. | [Gemino et al. 2021](https://journals.sagepub.com/doi/abs/10.1177/8756972820973082) |
| Project Delivery | To deliver value in small steps, with regular releases and chances for adjustments. | Planned to complete the project scope in a single, fixed end delivery, sometimes led to longer lead times until stakeholders could observe any real progress. | [Aleinikova et al. 2020](https://elibrary.kubg.edu.ua/id/eprint/41314/) |

**Table 2.1:  Difference between agile project management & traditional project management**

**2.4.Similarities between agile & traditional project management:**

Despite using different methodology, agile & traditional project management have a number of similarities.

**Goal Oriented:** Within limitations like time, cost and scope, the both agile and conventional project management (Teichert et al. 2024) look for achieve certain project goals and the main goal is to provide benefit to stakeholders or consumers, regardless of the approach used[.](https://ijol.cikd.ca/article_60735.html)

**Resource Management:** To guarantee that project goals are effectively achieved, both agile and conventional project management require effective resource management, including resources, time and cost [(Gomes et al. 2022)](https://onlinelibrary.wiley.com/doi/abs/10.1002/csr.2287) which is essential for all techniques for managing budget, giving work to team members or monitoring progress.

**Risk management:** In both traditional and agile project management, minimizing risks is essential and both approaches divide the common practice of identifying possible risks, evaluating their effect [(Zahidul Islam et al. 2020)](https://gjcst.com/index.php/gjcst/article/view/360) and setting strategies to reduce them in order to maximize the project's outcome and minimize delays .

Agile and conventional project management distribute a number of plans and practices, despite their different methods and these similarities make it possible to guarantee that projects are planned, executed & managed in a technique that aims to produce positive results, irrespective of the technique used.

**2.5. Types of agile project management:**

Agile project management has a number of approaches, each with unique advantages, the most popular Agile methodology types are:

**2.5.1.Scrum**:

**Agile Approach:** Scrum is a widely used Agile methodology that is significant by its continuous method, in order to produce deliverable elements of work, [( Munteanu et al. 2021)](https://ejbmr.org/index.php/ejbmr/article/view/741)cross functional teams divide project tasks into brief iterations called sprints, which usually run 1-4 weeks.

**Comparing Scrum with Traditional Project Management:** Traditional project management is more hierarchical and plan driven,(Papadakis & Tsironis 2020) whereas Scrum focus on self organized teams, continuous collaboration & adaptation to change and also it encourages adaptability and responsiveness to client data, enabling changes to be done.

**2.5.2.Kanban:**

**Agile Approach:** Kanban is a graphical management technique focusing on efficiency maximization, work in progress (WIP) limitation [(Alaidaros et al. 2021)](http://paulorodrigues.pro.br/ojs/ijmp/index.php/ijmp/article/view/1482) and continuous flow which  involves utilizing visual signals to indicate when work may be brought into the next step and displaying tasks for the project on a board the called Kanban board with rows representing various process stages.

**Comparing Kanban with conventional Project Management:** Kanban promotes more adaptable and flexible planning than conventional project management,(Zielske & Held 2021)which frequently depends on setting timeframes and timetables and  instead of following a predetermined plan, it promotes a continual flow of tasks and enables teams to prioritize activities depending on current requirements and limits[.](https://www.sciencedirect.com/science/article/abs/pii/S0164121221000479)

 **2.5.3.Scrumban:**

**Agile Approach:** Scrumban combines the ideas of the Kanban as well as Scrum technique & the iterative methodology and roles of the Scrum Master, Product Owner, Development Team remains same, [(Zayat & Senvar 2020)](https://www.worldscientific.com/doi/full/10.1142/S0219877020300025) while Kanban's continuous flow & visual management are integrated and it combines the flexibility and continual improvement of Kanban with the structured planning and review process of scrum.

**Comparing Scrumban to Traditional Project Management:** Scrumban combines the continuous flow and adaptability of Kanban with the planning of Scrum [( Shker  & Saoud 2023)](https://www.researchgate.net/profile/Lama-Saoud/publication/377213650_The_Integration_between_Building_Information_Modelling_and_Scrumban_Case_Study_FD3_Commercial_Building_in_Damascus/links/65e57e6fadc608480af9b926/The-Integration-between-Building-Information-Modelling-and-Scrumban-Case-Study-FD3-Commercial-Building-in-Damascus.pdf). Scrumban is suited for situations where needs are flexible or uncertain because it gives teams greater flexibility to adjust to shifting priorities and requirements than traditional project management, which frequently takes an orderly and plan driven technique.

**2.5.4.Extreme Programming(XP):**

**Agile Approach:** To produce high quality software, extreme programming is an Agile technique which focuses on engineering techniques and ( Shrivastava et al. 2021) also it focus an extreme value on techniques like collaborative programming, continuous enhancement, frequent redesigning and testing driven development (TDD[).](https://iopscience.iop.org/article/10.1088/1742-6596/1969/1/012046/meta)

 **Comparing XP to Traditional Project Management:** XP focus on teamwork and technical proficiency more than traditional project management techniques, early and frequent delivery of functional software is the top priority [(Saqqa Samar et al. 2020),with an focus on consumer fulfillment and adaptability to changing needs](https://www.researchgate.net/publication/342848746_Agile_Software_Development_Methodologies_and_Trends)

[**2.5.5.Crystal Techniques:**](https://www.researchgate.net/publication/342848746_Agile_Software_Development_Methodologies_and_Trends)

[**Agile Approach:** Alistair Cockburn created the Crystal family of Agile projects in which Simplicity, personal connection and communication are prioritized and there are three varieties of Crystal Methods such as Crystals Clear, Crystals Orange and Crystals Yellow](https://www.researchgate.net/publication/342848746_Agile_Software_Development_Methodologies_and_Trends) [(Ikram & Dev 2020).](https://d1wqtxts1xzle7.cloudfront.net/79025273/Paper191-libre.pdf?1642510358=&response-content-disposition=inline%3B+filename%3DXCRUMBAN_A_Proposed_Agile_Methodology.pdf&Expires=1718468955&Signature=PR6b3z4G8zsfAVc0Ra7xKdzCdVQuFwwfEeFo2PyQu7v1r8YEzCO1e-Epufqa8JVL4tCmm1dkJJdiLDVfS155wQcAXIuGjvP-OpskCRq7HDn3YdrUrZCwzVxFJC0SOfM5Bqq988~z1g2SBCYK6mVt-KPJfQcEDXi1WcXG9BSEfnj8PaNYIArt6jokVY9YqGP0PuOVvebb2uuxcfc2HwyGirV9~hWpYGdadb5j-nGIYRZbjNt~-sJmDLWxBkkW0QtcNMR2fNcJugJxvOWQn7JQb9vQ6xdXXIC8E5Ds-sR6FtCMEAkzfwlmFFSPmlA~BINkkgsPcoQZJY1~BiQiQlSPfA__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA) [and each designed focus on certain project qualities and team dynamics and the Crystal Techniques tries to achieve a balance between adaptability and structure, prioritizing resources before procedures.](https://www.researchgate.net/publication/342848746_Agile_Software_Development_Methodologies_and_Trends)

[**Comparing Crystal to Traditional Project Management:** Crystal Techniques focus on teamwork, flexibility and interpersonal interactions more than they do, in order to promote an agreement for the project goals and priorities, Crystal supports minimal processes and regular communication, (Tetteh 2024) in contrast to traditional approaches that may primarily depend on documentation and processes and Projects with irregular needs or where team interaction are important to project success are especially well suited for Crystal Techniques](https://www.researchgate.net/publication/342848746_Agile_Software_Development_Methodologies_and_Trends)

**2.7. Artificial Intelligence into Agile Project Management:**

Agile project management is extremely improved by AI, which improves repetitive operations, generates data driven vision and enables better decision making and by examining past project data and observing trends, AI powered solutions can forecast project risks, maximize resource allocation and simplify workflows[(Josyula et al. 2023).](https://www.emerald.com/insight/content/doi/10.1108/IJOA-05-2021-2749/full/html) For example, the processing of natural languages (NLP) can perform the sorting and prioritizing of customer stories and feedback and machine learning techniques can estimate sprint speed and assist with clear workload adjustments[(Amani et al. 2022).](https://journals.iau.ir/article_698174_6ba724282489287ae939ea60bd8d507c.pdf) AI chatbots save time on administrative duties by enabling immediate communication and support [(Lee 2020).](https://koreascience.kr/article/JAKO202009759220194.page) additionally, AI driven analytics provide real time vision to project strength and team work, enabling agile teams to make wise decisions, adjust quickly to changes and continually enhance their procedures which result in more effective and successful project results.

**3.METHODOLOGY:**

A systematic research technique will be implemented to collect, assess & synthesize data through the identification, screening & evaluation of relevant papers and the framework for this study was created using the PRISMA standard.

**3.1 Identification**

For this review process, Scopus is the main source and a wide choice of conference papers and peer reviewed publications found in the databases and the search string contained terms like “Artificial Intelligence”, “AI”, “Agile”, “Flexibility”, “Efficiency”, “scrum” and “Agile Project Management” then search was combined using boolean operators like AND, OR to obtain the detailed list of articles in the search topic.

**3.2 Criteria for Inclusion & Exclusion**
In order to ensure identification of relevant as well as superior research articles, the following measures for inclusion & exclusion were created:

* **Access:** Paid papers were not included, only open access articles included.
* **Article Types:** Included were research and review articles and Book chapters. Encyclopedias, mini reviews, news items and video articles were some the other publications that were not included.
* **Language:** To prevent misunderstandings caused by language, only articles available in English were taken into consideration.
* **Time Period:** To ensure that the information is current and relevant, only articles which were published in previous four years (2020–2024) were included because of technological advancements, more relevance to Current practices and to avoid redundancy.

**3.3 Eligibility Criteria**

Articles that met the qualifying requirements were chosen for qualitative analysis. Among the requirements for qualifying were:

* **Title:** In the beginning, the title of the articles were used to filter articles.
* **Abstract:** To filter out research that weren't relevant, abstracts of the papers were reviewed.
* **Content Analysis:** The entire texts of articles that could be relevant were examined to see if they met the parameters and requirements of the research and eliminated articles that did not clearly address AI, Agile Project Management, adaptability or efficiency.

**3.4 Results and Discussion**

Meta analyses and systematic review findings are reported using the PRISMA standards. This flow chart shows the steps involved in the research selection process, which includes:

* Number of articles acquired by database searches.
* Number of articles were filtered.
* Number of articles were evaluated for eligibility.
* Number of papers that were part of the final review.

This systematic methodology ensures a complete and objective analysis of the available literature, offering insightful information the way AI might be integrated into Agile Project Management techniques

































**Figure 3.1 PRISMA Framework**

**4.OBJECTIVES:**

**1.** To identify the application of AI in Agile Project Management

**2.**  To evaluate the benefits of the agile project management: enhancing flexibility and efficiency through data driven approaches

**3.** To determine the Challenges in the traditional project management through data-driven approaches

**5. ANALYSIS:**

A keyword analysis of the papers identified resulted in the below Figure no 1 which highlights the various areas of focus namely Agile, flexibility, Kanban, Scrum, Efficiency iterative and much more.



**5.1.** **Application of AI in Agile Project Management:**

AI is being used in Agile project management in many ways to improve decision making and efficiency where the  AI programs have the ability to create and evaluate user stories according to past data and input from users[(Khatib & Falasi 2021)](https://www.scirp.org/journal/paperinformation?paperid=107733). Sentiment analysis may be used to prioritize the highest value elements by identifying the most important user demands from user comments and those helps to coordinate development efforts with customer needs and market demands while also enabling the story creation process.

AI has the potential to greatly enhance and increase sprint planning and backlog management processes and teams concentrate on the most significant task with the support of automated backlog prioritization, which uses predictive analytics to evaluate the possible effect and importance of backlog items. By evaluating team members prior performance, present workloads and skill sets, AI help with job distribution during sprint planning, balancing workloads and increasing efficiency [(Suwarno & Jaya 2022).](https://ojs.uma.ac.id/index.php/jite/article/view/6412) which helps avoid bottlenecks and overloading and ensures that sprint are well planned with work assigned to the appropriate team members.

| **S.No** | **Agile Element** | **AI Applications** | **Literature Support** |
| --- | --- | --- | --- |
| 1 | User Stories | AI driven user story generation and prioritization, sentiment analysis on user feedback | Oyekunle et al. 2024[Mehta & Pandya 2020](https://www.researchgate.net/profile/Pooja-Mehta-26/publication/344487215_A_Review_On_Sentiment_Analysis_Methodologies_Practices_And_Applications/links/5f7bfb2992851c14bcb16528/A-Review-On-Sentiment-Analysis-Methodologies-Practices-And-Applications.pdf) |
| 2 | Backlog Management | Automated backlog prioritization, predictive analysis for backlog refinement | [Ozdenizci Kose 2021](https://onlinelibrary.wiley.com/doi/abs/10.1002/smr.2331)[Bahi et al. 2024](https://openurl.ebsco.com/EPDB%3Agcd%3A15%3A29402159/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A176379003&crl=c) |
| 3 | Sprint Planning | AI assisted sprint planning and task allocation, workload balancing | [Brüggen&Holland 2022](https://www.ceeol.com/search/article-detail?id=1055961)[Bhavsar et al. 2019](https://d1wqtxts1xzle7.cloudfront.net/64695480/Bussiness_process_reeingnering_journal_KrunalBhavsar.pdf?1602852142=&response-content-disposition=inline%3B+filename%3DBussiness_process_reeingnering_journal_K.pdf&Expires=1718466526&Signature=CEFQGsmYGbOX6l3Gzagd3GAzPp2YLOHVYu3sJ03H4x7Sqxtrv6htoFhsa8vXqY7BldPjtkxWir9YZVha5fjC1ppgiaHGqjGJ4UfrIyWzGO8naKHa~y~DBgdXrEw0q7VQmE6h1L7wteO0yQ1S7BmcpFg0bmQiHmI79lfNGrLEX4K7AMVVB0bzQwN6o2dPEKRGt1qj-f8DD4iZlZQurm3B0jeQnfGk8PyZWL7x8X2I5rGls17j2TLJnSURFTEZgDQw7xomTzOg2CrEtIkjTG2PioCPrTsxa7ffB2xfdmmP9xwBDZXWZa2gE6vFWAZKA0J-I7iPTTrWsNnm9ukEUryQ9Q__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA) |
| 4 | Daily Stand-ups | Automated summarization of daily stand up reports, sentiment analysis on team morale | [Xander & Andres 2024](https://jest.com.pk/index.php/jest/article/view/130)[Shamim 2024](https://globalmainstreamjournal.com/index.php/IJMISDS/article/view/107#google_vignette) |
| 5 | Continuous Integration (CI) | Automated code integration and testing, AI for error detection and resolution suggestions | [Gupta 2020](https://www.ingentaconnect.com/contentone/asp/jctn/2020/00000017/f0020009/art00144)[Özpolat et al. 2023](https://dergipark.org.tr/en/pub/ejt/article/1330631) |
| 6 | Continuous Delivery (CD) | Predictive deployment analysis, automated rollback planning | [Steidl et al. 2023](https://www.sciencedirect.com/science/article/pii/S0164121223000109)[Cunningham 2021](https://www.ceeol.com/search/article-detail?id=939806) |
| 7 | Retrospectives | Text mining and sentiment analysis of retrospective meeting notes, automated action item tracking |  [Migid et al. 2022](https://www.sciencedirect.com/science/article/abs/pii/S016412122100279X)[Joshi 2021](https://www.researchgate.net/profile/P-L-Joshi/publication/350579236_A_Review_of_Agile_Internal_Auditing_Retrospective_and_Prospective_International_Journal_of_Smart_Business_and_Technology_IJSBT_Australia_Volume_9_No_2_2021/links/61cc1298d450060816750567/A-Review-of-Agile-Internal-Auditing-Retrospective-and-Prospective-International-Journal-of-Smart-Business-and-Technology-IJSBT-Australia-Volume-9-No-2-2021.pdf) |
| 8 | Test-Driven Development (TDD) | AI driven test case generation, automated test execution and result analysis | [Vial et al. 2023](https://onlinelibrary.wiley.com/doi/full/10.1111/isj.12420) |
| 9 | Pair Programming | AI assisted coding suggestions and error prevention, automated code review and feedback |  [Liu & Li 2024](https://journals.sagepub.com/doi/abs/10.1177/07356331241240460)[Sudarmaningtyas & Mohamed 2021](https://repository.dinamika.ac.id/id/eprint/6854/) |
| 10 | Release Planning | Predictive analytics for release scheduling, AI driven risk assessment for release management | [Odejide&Edunjobi 2024)](https://www.fepbl.com/index.php/estj/article/view/959)[Bento et al. 2022](https://www.inderscienceonline.com/doi/abs/10.1504/IJTIP.2022.126841) |

AI improves daily stand ups & continuous integration during the execution stage and can execute sentiment analysis to measure team spirit and summarize reports for daily stand ups, identifying any problems priorly. AI reduces human labour and improves code quality in continuous integration by automating code integrating and testing, identifying issues and recommending fixes [(Kaushik et al. 2020).](https://link.springer.com/article/10.1007/s13369-019-04250-6) where AI is used in continuous delivery to provide dependable and seamless software releases by doing automatic rollback planning and predictive deployment analysis [(Myllynen et al. 2021).](https://asmedigitalcollection.asme.org/nuclearengineering/article-abstract/7/4/041201/1096362/Developing-and-Implementing-Artificial)Using text mining & sentiment analysis, AI driven insights throughout retrospectives which help teams understand the details of their performance and automated action item monitoring makes sure that retrospective decisions are efficiently implemented and also agile teams may increase productivity, provide higher quality results and meet user expectations by implementing AI into these areas.

**5.2 Benefits of the agile project management**

Advantages of using agile project management, which focus on improving flexibility and efficiency using data driven strategies:

**5.2.1.** **Flexibility in Response to Changing Needs:**

Agile approaches focus on frequent feedback processes & rapid development, promote flexibility and when paired with data driven methodologies , teams can rapidly examine changing demands, client data and industry patterns [(Jafa et al. 2021)](https://real.mtak.hu/197151/) and  makes it possible to decide with knowledge and modify project objectives and deliverables appropriately, leading to a more adaptable and client focused method to development.

**5.2.2. Effective Resource Use:** Performance indicators, project dependence and resource usage trends are revealed by Teams which will be used to detect and reduce bottlenecks, enhance resource allocation and simplify procedures by implementing these findings into Agile project management [(Carl Marnewick et al. 2022)](https://www.sciencedirect.com/science/article/pii/S0263786322000606?casa_token=fzFjtAHb27AAAAAA:h3hHIU1rtc5HMPMSJhRTYtC8Ev8oT6fmIys-a_GzDuqo2iDE1XU5YArK-zoqOTItTKMyOcf9QvA) which results in decreased waste, increased resource usage efficiency and improved project overall outcomes.

**5.2.3.Culture of Continuous Improvement:** Through continual enhancement cycles and evaluations, agile technique promotes an approach of continuous enhancement and  Teams use data driven initiatives to analyse success over time, identify areas of advancement and analyse new strategies, [(Ali et al. 2021)](https://ojs.unito.it/index.php/ejsice/article/view/5158) as a result, teams are enabled to constantly improve their procedures and provide stakeholders with greater value, improving a culture of growth and creativity.

**5.2.4. Improved Decision-Making:** Agile teams make decisions based on actual facts rather than random judgments or assumptions when they use data driven decision making and  teams make better judgments on product priority, [( Dursun et al. 2020)](https://content.iospress.com/articles/journal-of-intelligent-and-fuzzy-systems/ifs189125) managing risks and project direction by examining relevant information including consumer behaviour, market developments and project parameters from which better results, less uncertainty and more dependence in decision making follows.

**5.2.5.Enhanced Risk Management:** By examining past data, detecting trends and forecasting possible problems, teams assist in detecting and evaluating project risks and take steps to prevent risks by monitoring important data, seeing warning signals early and setting reduction plans into place when they are linked with Agile project management [(carl & Annlizé  2022)..](https://www.sciencedirect.com/science/article/abs/pii/S0263786322000606) and by taking preventive measures, risk of project delays or breakdowns decreased, increasing the projects overall durability.

**5.2.6. Enhanced Stakeholder Satisfaction:** Agile approaches focus on high value on stakeholder interaction & customer cooperation through the development process and  teams measure customer satisfaction indicators, assess stakeholders needs and preferences and customize deliverables by using data driven techniques,[( Marnewick et al. 2022)](https://www.sciencedirect.com/science/article/pii/S0263786322000606?casa_token=0WMb_z6iqOAAAAAA:Ij1PAV5_u3aUacMw23Fm302p-TI-6F0qUwTpTAnvfNfjM0fxxk1M4WelypQhT7QmtgfjIj7qv1s) as a result, there is increase in satisfaction from stakeholders, greater consistency with business objectives and belief in the project team.

**5.2.7. Faster Time to Market:** Teams provide value to clients more quickly and effectively when they mix agile project management with data driven techniques and teams reduce time to marketplace for new products by segmenting projects into more manageable segments and prioritising elements based on observations derived from data [(Cooper 2021)..](https://onlinelibrary.wiley.com/doi/abs/10.1111/jpim.12565) and as a result, businesses may better understand new possibilities and maintain their competitiveness in quick marketplaces.

**5.2.8.Increased Accountability and Transparency:** Teams gives ideas to the projects, performance indicators & results and transparency between stakeholders and team members is supported when transparency is implemented into Agile project management and teams make themselves responsible for keeping their word, taking immediate action when problems arise and providing value to clients by monitoring and exchanging relevant data[(Ozorhon et al. 2022)](https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29ME.1943-5479.0001052) and supports a culture of cooperation and trust.

Organizations may increase flexibility, efficiency, manage risks and develop stakeholder cooperation by implementing data driven techniques to the agile project management, and also agile teams can adapt to changing business demands more quickly, generate value more successfully and complete projects with higher success because to these advantages.



**Figure 5.1 Benefits of the agile project management**.

**5.3.Challenges in the** **traditional project management**

There are a number of challenges that traditional methods of project management, like waterfall overcome in order to be flexible and effective.

**5.3.1. Rigid Structure:**

The traditional methods of project management attach to an ordered framework in which projects are divided into phases that must be finished in order to advance and it may be challenging to allow modifications or adjust to changing requirements in middle of the project due to its inflexible structure [(Picciotto 2020)](https://www.sciencedirect.com/science/article/abs/pii/S0263786318311141). and as an example, it may be costly as well as time consuming to make significant modifications to the projects scope or objectives after it enters the execution phase of the project from the planning phase.

**5.3.2.Limited Stakeholder participation:**

Throughout the project lifetime, stakeholder participation may not be given priority by traditional project management approaches[(Orieno et al. 2024)](https://wjarr.com/content/sustainability-project-management-comprehensive-review)wheremisunderstandings, unfulfilled expectations and disappointment with the final deliverables can result from this lack of continuous involvement as well as interaction with stakeholders.

**5.3.3.Uncertain Requirements:**

Conventional project management techniques require definition of entire project requirements and needs may not always be clear or evolve throughout the duration of a project[(Bertello et al. 2021),](https://link.springer.com/article/10.1007/s11365-020-00727-1) which is complicated or innovative and due to this ambiguity, it is difficult to precisely plan and execute the project, which result in delays and additional effort.

**5.3.4.Inflexible Change Management:**

 It is difficult to handle changes in traditional methods for project management and sometimes change control procedures are rigorous and established, requiring significant records and approval for modifications and cause [(Ciric Lalic et al. 2022) the project to lag and make it more difficult to respond to new problems or possibilities.](https://www.emerald.com/insight/content/doi/10.1108/IJMPB-04-2021-0108/full/html)

 **5.3.5.Limited Flexibility to Risk:**

Throughout the duration of a project, risk management cannot be sufficiently resolved by traditional project management approaches in which Identifying, evaluating and mitigating risks are handled as independent, different tasks rather than being implemented into the overall project management process [(Robert Picciotto 2020)](https://www.sciencedirect.com/science/article/abs/pii/S0263786318311141?casa_token=Zdkn0kv_czUAAAAA:0BqfDdiYNVMPxNY8VwRAwVMBjTMWMD7OKrg3qO8luB_0P0dqgy0atMOm0vs_IMzhAWOJM4J62Tw) and unexpected risks might appear and cause delays or even project collapse.

**5.3.6.Resource Restrictions:**

In traditional project management, resource restrictions such as tight budgets or lack of resources can provide serious difficulties [(Garritty et al. 2021)](https://www.sciencedirect.com/science/article/pii/S089543562031146X)and insufficient resources can cause projects to run behind schedule, lose quality of their goals

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**Figure 5.2 Challenges in the traditional project management**

With regard to meet these difficulties, these techniques must change to become more adaptable as an example, agile methods focus a strong focus on iterative development, successful stakeholder involvement & change responsiveness. Organizations improve adaptability, productivity and project success by adopting Agile concepts and implementing data driven decisions into project management procedures.

**6. CONCLUSION:**

Although they have been around for a long, traditional techniques could result from being rigid & unresponsive to change and these paper involves the power of Agile where it gives teams to provides value more quickly & efficiently by placing a high priority on adaptability, collaboration and continuous improvement. Flexibility and efficiency are the two main components that make successful and teams can adapt to shifting demands, client feedback and industry trends helps to agile iterative methodology where flexibility is improved by data driven initiatives. Teams adopt a more client centric approach by making well informed decisions on project goals and deliverables through the analysis of relevant data, such as consumer behaviour and project standards. Increased efficiency is another characteristic of agile which can identify bottlenecks, allocating resources effectively and streamlining procedures, teams can reduce wastage effort, where agile promotes a continuous improvement by conducting regular reviews and retrospectives and based on data observations, teams may examine past performance, identify areas for development and try new tactics. This data driven strategy results in greater efficiency and also the efficiency and adaptability have several advantages of decision making by agile teams result in better risk management and higher project success. Agile focus on teamwork and data driven insight into consumer demands also increases stakeholder satisfaction where additional benefits include shorter time to market, more openness and responsibility and a continuous learning. Agile project management is clearly advantageous in uncertain and fast paced environment where agile helps teams to create quality fast, adjust to change efficiently and produce better project results by doing away with the constraints of traditional approaches and agile focus on adaptability, speed and data-driven decision making will surely pursue to be a key part of success as project management changes.

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