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HYBRID PROJECT MANAGEMENT

BY

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ABSTRACT

The most basic agile development provides a feather weight framework that a provides team to concentrate on giving business value quickly in the form of ever-changing functional and technical contexts. Traditional project managements take precedence over individual planned sequential phases. Once the requirements are defined, no further changes or additions are expected. Not with the current situation, this is not true anymore, and improvement groups need to make changes at a later stage to stay competitive. Agile methods are superior to customary strategies around here. Coordinated can deal with projects that are more muddled and versatile.

On the other hand, organizations that rely heavily on legacy approaches such as waterfalls find it dangerous to fully embrace agile. Agile approaches can pose enormous potential dangers by Misleading and prominent information that poses financial risks to financially sensitive companies. As a result, many companies are hesitant to adopt Agile, as adopting this approach across the enterprise conflicts with the old waterfall approach. Hybrid agile strategies help organizations create a smooth transition to agile. In this article, by conducting interviews with various organisations, I investigated the implementation of hybrid methodology in various organisations. This included interviews with project managers, team leaders, and team associates. I have examined the use of hybrid methodology in projects in organizations, as well as benefits and drawbacks. This thesis wind up by evaluating the values of the hybrid approach based on the implementation of hybrid methodology. The advantages of a hybrid approach focused on business value, time, and costs. Rather than employing a single strategy, project management methodology should be tailored to the situation, and quality on complicated projects should be improved.

Acknowledgements

I would like to take this opportunity to thank everyone who cooperated in the preparation of the master's thesis. Thanks to all the professors who helped me gain the knowledge to work on this research. I would like to thank the readers and examiners of my subject who helped me reach all the milestones of my work to complete it with their constant support whenever needed.

I would also like to thank the interviewees for helping me with my dissertation by sharing their valuable knowledge in preparation for my dissertation.

Special thanks to my project supervisor Andrew Thorn, and the constant motivation and beliefs of all my family and friends.

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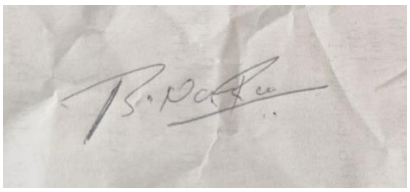
DECLARATION

This dissertation is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed: Boppana Narasimha Rao Date:09/02/2022



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INTRODUCTION

Today's world is characterized by continuous, non-linear transitions, increasing risk and increasing uncertainty. This inherent uncertainty make organizational overcome a specific challenges (Meredith et al., 2015). It seems that different organizations are trying to pursue this goal. Long-term strategic advantages and forms of continuous development They are exposed to the weather. Challenges to improve performance and profitability while remaining innovative. They offer a variety of techniques and tools to help them improve their performance. Organizations are adopting modern project management solutions because conventional undertaking the executives is at this point not powerful (Sohi et al., 2016). Some current undertaking the board approaches likewise appear to misjudge the effect on the climate. Some strategies are more effective for long-term and complex projects. Others are employed because it is essential to complete the project as soon as possible. Organizations can use hybrid management as one of the current techniques to improve performances and meeting their criteria.

Hybrid project management is defined

As a method of adapting Agile principles into the typical phased projects environment.

Of the many combined variants, this defines only one subdomain. Classical project management, Lean project management, and Agile project management are three types of management that cover many types of combinations. Each strategy has its own advantages and disadvantages. Organizations can organize a certain combination to create a project management system that is suitable and specific to the business.

The goal of creating more productive and efficient resources is a key driver for adopting or using integrated project management, but often established organizations find it difficult to adapt to the concept. this. Being an Agile organization or using a managed, phased approach are two different things. On top of that, multiple project cultures and characteristics must be compared to investigate possible combinations (IAPM, 2017).

The purpose of this study is to illustrate the challenges, advantages and disadvantages of using integrated project management methods, especially Lean Agile methods, in traditional companies. The following section provides detailed information on the project management approach. Research techniques are followed by a bibliographic study of Lean, Agile and Hybrid project management. Finally, conclusions and summaries are presented.

LITERATURE REVIEW

Bryde (2003) conducted an empirical assessment of project management practise and perceptions among project participants. He performed a poll survey based on six predetermined criteria: PM Applicability, PM Uses, Project Life Cycle Activities, Project Life Cycle Models, PM Procedures, and PM Success Measures. He came to a conclusion from the study after completing in-depth research and conducted a survey with employees. PM practises reflecting the program's expansion, as well as PM principles and techniques compatible with the new PM methodology, were at best ad hoc and unequal, with some organisations adopting them while others did not. However, even in firms where these procedures had been developed, their application was not always consistent. There are many techniques for such companies that can be classified as project-focused, in which projects account for the majority of the organization's outcome/earnings/expenses, and those that may be classified as not project-focused. Some companies, on the other hand, may be project-oriented, but they have no expertise with project management and are currently focusing on it. Despite the fact that some firms have a low project emphasis, they have a long history of employing project management in various parts of the business and are actively working on it. The study discovered more proof of new PM activities in organisations with a strong project emphasis / strong PM concentration. The PM group faces a problem in redefining current information boundaries and developing a new PM approach that is acknowledged as applicable and advantageous to all of the aforementioned organisational situations. The disparity between theory and practise suggests that theoretical advancement lags behind practise; nevertheless, another interpretation is that, if established theories are accepted, practise lags behind theory. If this alternative viewpoint is to prevail, more study is needed to develop a systematic collection of project management conceptual theories with practical value and recognition in a range of organisational settings. The hypotheses would need to be demonstrated to be valid and useful in order to gain credibility and adoption. To demonstrate the validity and value of such PM approaches, it would be necessary to link theoretical advances with work that shows the project's achievements will be achieved in terms of achieving the performance requirement if such PM methods are used. A crucial need for achieving this would be the establishment of an uniform set of project performance requirements, as well as assessment tools that would allow for obvious comparisons between old and modern project management practises. It would be impossible to influence changes in PM activities in all organisational environments without this quantitative data.

According to **J. Fernandez and D. Fernandez (2008),** Agile approaches, including project management, sprang from a desire to manage projects marked by complexity and risk with flexibility and adaptation. Alternative project management approaches are required when objectives and

methodologies are uncertain and there is a high level of variability. Learning about different project management strategies can help project managers choose the one that best fits the project's needs. The effort to include agile project management approaches and know-how to be scalable and adaptive may be worthwhile for many project managers. This flexibility may be especially useful when dealing with other sorts of projects and project settings. The importance of properly coordinating the project management methodology with the project is critical to project success. Making a one-time decision to be "agile" may be insufficient for the organisation, or even for the duration of a single project. Instead, a desire to change, adapt, and be attentive of how to effectively handle a given project predicament in a specific environment and society is required. A hybrid approach to project management that incorporates both traditional and agile approaches could be the most viable option.

According to **Salah** and **Ramadan** (2017), many tasks are nevertheless in the back of schedule, over budget and now no longer assembly the wishes of users. One of the principle motives for those disasters is loss of challenge control. With the developing fashion of adopting agile methods, there are opposites: agile and conventional challenge control methods. It is suggested to apply each tactics or integrate them in a software program editor. This may be beneficial for software program providers running extraordinary tasks the usage of extraordinary challenge control methodologies. So, the query is a way to combine the 2 tactics right into a single challenge control framework. In this paper, researchers recommend a brand new technique that mixes extraordinary challenge control methodologies primarily based totally at the alignment in their ontological models. Two challenge control tactics are considered: Scrum and PMBOK constitute agile and conventional tactics, respectively. This technique additionally makes it viable to introduce new gear or combine current gear to guide this integration.

Frank (2011) defined agile project management as a technique for more successful project collaboration and implementation utilising the Scrum framework. He offered a comprehensive overview of agile project management methodologies, focusing on scrum, and discovered that: Agile project management using the Scrum model allows the project team to handle digital library projects more efficiently while also lowering project management time. Using an iterative process of constant analysis and short design timescales, the project team is best able to adapt projects efficiently to increasingly changing scenarios in which technologies are to be deployed. The fundamental benefit of agile project management, particularly scrum, is its simplicity. Within an agile project, roles are clearly defined and do not cross the line. Within short iteration cycles, features can be thoroughly built and tested. Project ownership is more loosely focused since each team member bears a large amount of

responsibility for their phase of the project. Agile project management uses a coordinated approach to big advances, allowing teams to interact more effectively. This will eventually lead to increased efficiency for those involved. There are a few precautions to be aware of before commencing on an agile project. Frequent communication does not imply that no documentation is required, and if the documentation is not retained, the project could devolve into "undisciplined hacking." Some of the most important components of agile methodology, such as no changes during a sprint, can be difficult for new agile project managers to accomplish. To successfully implement an agile approach, all involved parties, including upper management, must agree to the process. To successfully implement an agile approach, all stakeholders, including higher management, must agree on the process. Nonetheless, agile project management is still one of the most effective techniques to speed up project production. The technique helps both stakeholders remove functional tasks and actually execute effective work by focusing on removing excessive complexity, operation, and process of project management.

According to the survey, **Zahid Ali Masood** and **Samia** Farooq (2017) describe the benefits and challenges of agile project management in recent research opportunities. The agile approach differs from the traditional approach in that the project team prepares the entire project and implements the strategy while managing changes. Agile approaches are usually focused on developing rigorous project specifications and timelines, as they recognize that transformation is an integral part of the project. This approach emphasizes project execution and project specification rewriting after each iteration. It also emphasizes the importance of collaboration between the project team and specific stakeholders in the project design and implementation process. The agile approach aims to make the project implementation more adaptable to changing project conditions. The agile approach has several benefits for companies, project teams, customers, and stakeholders. Reducing redo costs, delivering orders on time, improving customer retention, growing employees and teams, increasing visibility of results, and increased imagination and innovation are several benefits. Despite these benefits, APM is not considered a fail-safe solution for project management. This approach has its own problems, including: B. Difficulty in organizing tasks, quality assurance, information management, managing large projects, managing diverse teams, and dealing with individual issues. To overcome these challenges, project teams and organizations need to experiment with a combination of traditional project management elements such as: B. Documenting project events and creating a structured layout of the project organization. Enhanced APM documentation makes it easy for project organizations to monitor deliverables, information, and schedules. The formal framework of the organization improves teamwork, especially for large, multi-site projects.

Lozo and Jovanovic (2012) make a strong case for using a flexible – hybrid strategy rather than a standard one. It also discusses how an organisation can make this change. They emphasise the need for organisational adjustments prior to implementing the hybrid strategy. In the IT business, the landscape of project management (PM) is always changing. Working with small teams and often restricted resources, project managers are constantly under pressure to achieve quick turnarounds while dealing with frequent changes in business requirements. Leaders in this field are optimising and adopting distinct and new more effective styles and techniques in response to the demands of IT project management. This article presents a novel hybrid approach to managing IT projects that combines the traditional and Agile methodologies in a flexible fashion. It also looks into the organisational changes that must be made in an IT company before switching from the traditional to the proposed new hybrid way.

Griffiths (2004) presents the results of The Shine Technologies Agile survey, which offer a convincing case for businesses to adopt agile approaches. 93 percent of the 131 participating firms reported an increase in production. While 88 percent reported an increase in the quality of their applications, and 83 percent reported increased business satisfaction. I absolutely agree with Griffiths (2004) that agile approaches should be utilised alongside appropriate traditional project management techniques to offer execution and control mechanisms when handling projects with significant execution risks.

According to **Afshin Jalali Sohi et al. (2016)**, growing project complexity necessitates a tailored project management methodology to support the efficient execution of complex projects. Combining lean and agile project management as a potential solution to this problem. As previously noted, the lean strategy has limitations in construction projects, but the combination of lean and agile was deemed to offer a solution. At the moment, agile project management is extensively employed in construction projects, and the goal of their research was to look into how lean and agile approaches could be used in this sort of project to improve efficiency by dealing with uncertainty. Based on the outcomes of the correlation analysis, it was concluded that the implicit usage of lean and agile components would aid in coping with the project's difficulty.

PROJECT MANAGEMENT CONCEPTS

Project

Any temporary effort to complete a new assignment that meets consumer requests that occurs in all types of human organisations is referred to as a project.

These are unique, fast-paced projects that produce new commodities, equipment, programmes, and activities that result in considerable operational and other benefits. Because all initiatives, big or small, will have an official start and end date, it is referred to as a transitory activity. Projects have a specific goal that must be met before the project is completed. The project's goal is sometimes specific, and sometimes it isn't. Typically, projects are one-of-a-kind in that the business has a clear need for something that isn't already offered.

Projects can be internal or external, but they must match the clients' expectations. On account of outside projects, the client is typically the individual or organization who employed the task group. The client for interior activities could be a director, another group, or significant others inside the firm. In certain conditions, individuals will likewise be clients or potential accomplices, conditions that will be investigated in additional detail later (Masood and Farooqi, 2017).

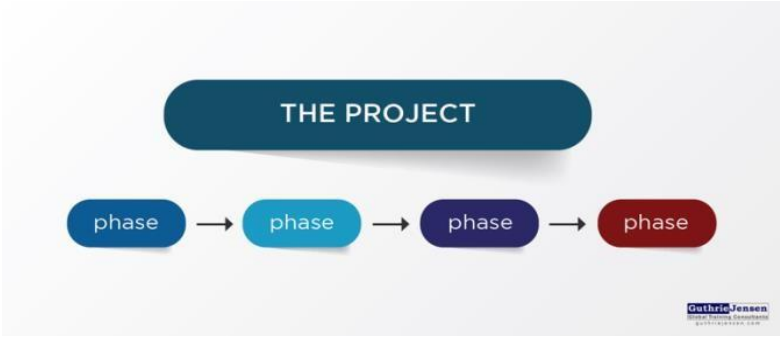

Fig:1 The Project :(guthriejensen.com)

Project Characteristics

The project will normally be distinguished by the following:

• The necessitates the achievement of a definite, specified objective, result, or conclusion.

• It usually has a set of constraints or objectives in terms of cost, schedule, and performance standards.

• It draws on knowledge and skills from a variety of sectors and organisations.

Many projects necessitate advanced technologies and an emphasis on task interdependencies, which might present new and uncommon challenges. The tasks and talents required vary from project to project.

Unique: A project is usually a one-time procedure that does not have to be repeated. Typically, each item of impact exposure should be distinct.

Somewhat unfamiliar: It may entail cutting-edge technology, which adds to the level of complexity and danger. The failure of the initiative could jeopardise the company's goals.

Temporary Activity: This is done to meet a deadline and complete an aim; if the deadline is fulfilled, the project may be completed**.**

Goal achieving process: All through the cycle, the task go through different unmistakable stages, with jobs, work force, the board design, and assets advancing as the undertaking moves starting with one phase then onto the next. The start and end of a venture are generally characterized. Assessment, evaluation, approach, execution, finish, and testing should be generally done on account of airplane fix

Part of an interlinked process: Projects are rarely completed in isolation. There is usually some interconnection between the numerous projects carried out by any given business.

Relatively complex : Project involve a cooperative methodology among groups with clear-cut objectives and goals. Therefore, they are more intricate as far as hierarchical design than standard inner techniques.

The venture's quirks uncover that the undertakings require a unique style of the board. Accordingly, the idea of venture the board has developed to incorporate planning, coordinating, and controlling the different dynamic and much of the time variable errands that are engaged with projects.

Project the board is basically the organization's overall administration. To accomplish the necessary results, solid undertaking the board requires the effective execution of a wide scope of general administration skill. Monetary mindfulness, showcasing appreciation, specialized agreement, arranging abilities, key mindfulness, and quality administration are only a couple of the methodologies that senior organization leaders use consistently to work huge undertakings.

Project management encompasses a wide range of project types. In many of these regions, skills are also required to improve the project's outcome. Across functional, regional, and product lines,. Top-down authority and well-organized correspondence are in place. Departments seek to be highly skilled and function independently. With what they are doing, traditional businesses are becoming more productive and more adaptable to a safe world. Because they are largely static, they are less suited to the chaotic and complicated conditions that characterise project situations

Project Management

This is the use of functions, techniques, tools, skill, and knowledge to meet the demands and expectations of customers. In contrast to the past, where project data and metrics were collected and analysed, this is becoming a significant notion. Changes are done to improve the project's efficiency and productivity. Project managers were in charge of the entire project's operating budget.

Project management usually starts with a vision or an idea that aids the organisation in producing something and achieving the project's objectives. Though we have a lofty goal in mind, the early stages of a project are usually perplexing in terms of where to start and what the end result will look like. The project must be monitored from start to finish in order to compare the action's outcomes to the desired outcomes. As a result, a project plan with all relevant tasks and outcomes is required. To create such a strategy, you'll need information on the project's goal as well as expectations or specifications for the expected project outcomes.

The Project Management principle is to reduce our vision to a single goal, then break it down into sub-goals before stating the requirements or criteria that our desired outcome must meet. We must follow certain criteria for creating targets, requirements, or specifications to stimulate the phase of determining specific project characteristics: we must identify SMART objectives, requirements, and specifications.

Projects can be found in a wide range of human endeavours. They are unique, dynamic endeavours that develop new items, facilities, programmes, and events that result in major organisational and other desired changes or disaster recovery following natural or man-made disasters. Projects have beginning and ending dates, and they progress through several stages of the life cycle.

Because the more traditional, well-established principles and tactics of managing our classical functional organisations do not perform well in organising, overseeing, and managing projects, initiatives, or portfolios of projects, project management practise has arisen. Projects are made up of several tasks that necessitate a variety of specialised abilities and are consequently divided along traditional organisational functional divisions. They are limited activities with a finite lifespan, and so do not provide reliable organisational homes for those involved. The problem is to complete the right projects at the right time while also providing safe housing for all project contributors

Project Management Characteristics

The following are the primary distinguishing elements of PM in relation to organisational functional management:

• Each programme, project, and project initiative has its own set of responsibilities.

• Development and efficient utilisation of information through the application of interrogative and predictive processes, procedures, and strategies.

• Organizing and leading each project team, which consists of multi-disciplinary managers and professionals who are responsible for completing the project assignment.

• The expansion of Project management disciplines always results in a project matrix of duties ranging from weak to robust in terms of the project manager's authority to deliver project directions to team members.

Project Management phases

The following are two critical phases in project management:

The Project Life cycle

The difference between a project and ongoing activity as a need for management is that a project has a life cycle from planning to implementation to completion. Currently, the concept stage and project risk management are included in the PM to gives the necessary link difference between the organization growth management and the PM, but initially focus only on project planning and management. Was guessed. By extending the life cycle of the project, certain professionals can achieve the desired results.

Achieving the Project Results

The Project Management discipline is responsible for achieving the benefits of completing the project after it has been completed. To achieve the optimum results, the project must be modified on a regular basis in the organisation. Project management also encompasses any organisational changes that occur as a result of the project's completion. Project outcome integration or benefits realisation is the term for this post-completion phase. expertise is obtained in order to obtain fresh future projects from other customers. The customer will require a new information system or office as a result of the project's integration. The project is divided into five phases that must be completed in order to be completed effectively.

• **Initiation**: This is the starting stage of the project.

• **Planning**: A plan ought to be created as soon as the venture has begun. It is the maximum vital degree of the venture control process. A well-thought-out method ends in achievement and decreases waste.

• **Execution**: Once the strategy is implemented, the team needs to implement the strategy to achieve the project goals.

• **Control**: The project should be controlled at a specific level throughout its execution to handle problems and track progress.

• **Closure**: This is the point at which the customer or sponsor officially closes the project.

Fig:2 Project Management Method (Source: https://www.replicon.com)

Project the executives decides numerous achievement and disappointment models for a task, structures them, and runs them as one unit to meet all achievement rules. This cycle includes framing and coaching an undertaking group of individuals with various abilities. The venture administrator needs to coordinate individuals in the group prior to having the group total the undertaking. Like the drive, groups exist temporarily.

When a project is complete, the project team may be disbanded or reassigned to another project. To be successful, the project manager needs to master nine areas of knowledge and five phases. These categories of knowledge show the skills that leaders need to succeed. Scope the board, using time productively, cost administration, quality control, HR the executives, correspondence the board, mix the board, acquisition the executives, and hazard the executives are unique types of management (Masood and Farooqi, 2017).

Project Management Methodology

A project management methodology is defined as a set of actions, methods, standards, and processes that disciplinary staff uses to manage a project. These approaches help project managers complete tasks and maximize resource and time utilization. If a problem arises during the implementation of a project, different approaches will seek different solutions. The methodology depends on the type and scope of the project. The important methods are:

Waterfall Method

The Waterfall approach, which is a sequential, linear process, is one of the oldest traditional project management methodologies. The flow is one way downwards and very requirements oriented. It is divided into various steps that include gathering and analysing data, designing a solution, implementing the solution, and resolving challenges.

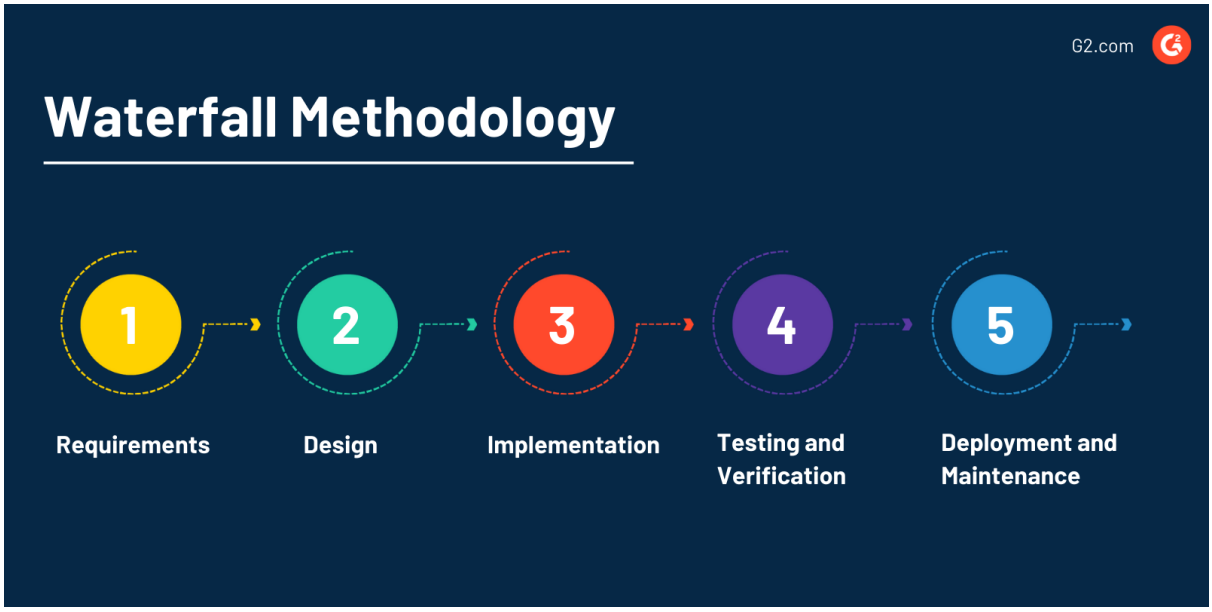

Fig:3 The Waterfall Method (source: https://www.g2.com/articles/waterfall-methodology)

Because the system's history dictated it, waterfall methodology sounded difficult. It is widely used in areas other than software, including as manufacturing and construction. Because strategies cannot be changed after the project is underway, they should be planned before the new phase begins. Every individual from the group ought to know about their undertaking's errand and what it involves. The significance of recording in each period of the venture is accentuated by the Waterfall strategy. This archive, which contains all data on the advancement, is conveyed to colleagues to guarantee that everybody is in total agreement. A few stages vary contingent upon the venture, but they all follow a comparative example.

• **Requirement**: This is the stage wherein you assemble explicit insights about the undertaking's necessities. Data can be accumulated in an assortment of ways, including subjective exploration like meetings and overviews. Before the finish of this stage, the undertaking necessities ought to be self-evident, and you ought to have an archive of prerequisites that has been given to your group.

• **Design**: The system is designed using the requirements defined in the previous step. The team members define programming languages and hardware requirements.

• **Implementation**: Utilizing the data assembled in the former stage, developers code a functioning item. They make programming in little pieces that are coordinated toward the finish of this stage or the start of the following.

• **Product test:** It can begin after all of the coding has been done. Any flaws are carefully considered by the testers, who meticulously record them. If major issues arise, the project may need to return to step one of the reassessment processes.

• **Deployment**: After the project is completely completed, the product is ready to be deployed.

• **Maintenance:** If an issue emerges after the product has been delivered to the client, the team must create patches and updates to address it. Returning to phase one may be necessary if the problem is severe.

The Waterfall approach is simple to comprehend and apply. It's set up in a way that allows people to organise and split their tasks. Perfecting each phase aids us in achieving better results. When fresh resources are needed, the documentation in the waterfall makes it easier for them to participate in and work on projects. In waterfall, a thorough understanding of the project is required, as well as the analysis of requirements. If some changes are required, the project must be resumed from the beginning, which raises the danger of failure. This strategy is better suited to small, straightforward projects with well-defined needs, as it is less flexible for large, complex projects (Mohrman and Worley, 2010).

Six Sigma Method

Six Sigma is a project management technique that includes a variety of methodologies and instruments for improving performance. By removing the sources of errors and lowering the variability of impacts in production activities and business tasks, Six Sigma methodologies increase the overall quality of process output. With the help of specialists, Six Sigma employs quality control methods such as analytical and quantitative tests.

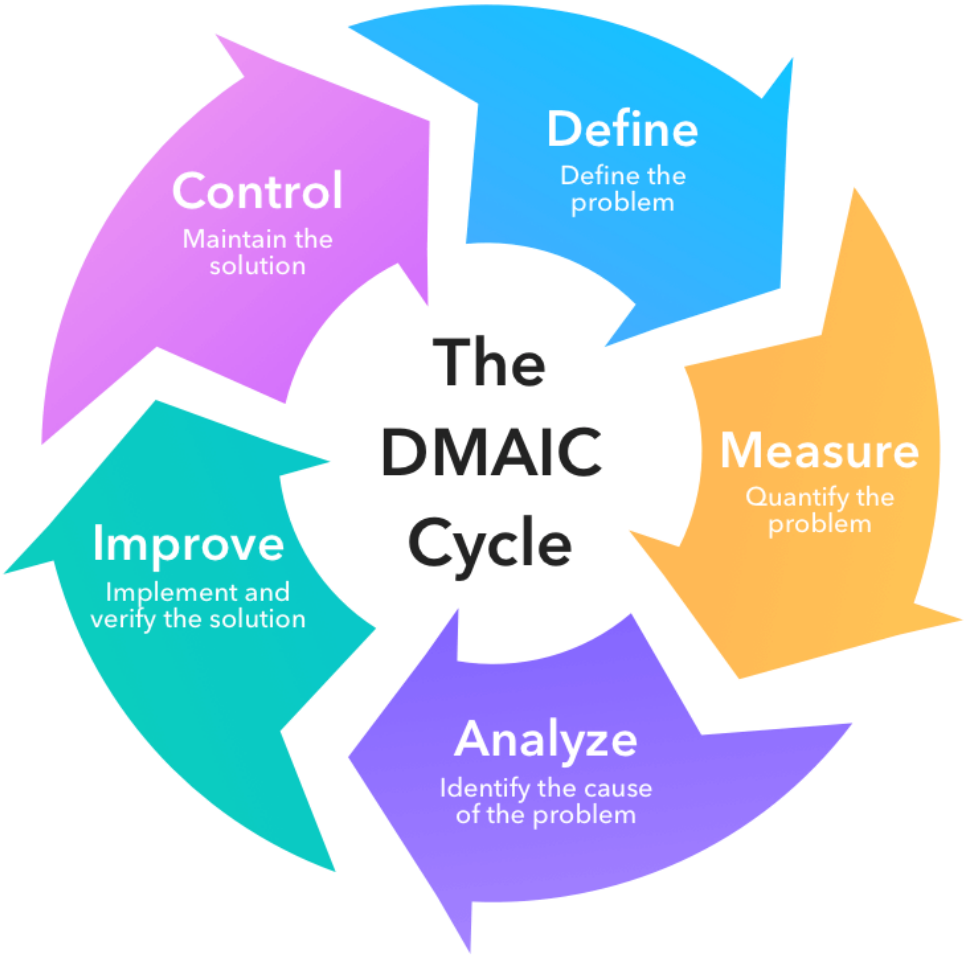

Fig:4 six sigma (Source: https://startinfinity.com/project-management-methodologies/six-sigma)

Six Sigma Green Belts and Six Sigma Black Belts use DMAIC and DMADV as main methodologies, which are organised by Six Sigma Master Black Belts. DMAIC is a problem-solving method for constantly improving an existing process. It's an acronym for

• Define the perspectives, expectations and goals of the client project.

• Measure different focuses in the current technique in more detail.

• Analise the information to recognize significant blunders in the system.

• Improve develop an information-driven way to deal with work on existing techniques.

• control potential state systems and guarantee that all deviations from targets are settled prior to making surrenders.

DMADV approach is utilized to fabricate imaginative frameworks and new labor and products. It represents

• Characterize item needs in accordance with buyer assumptions and client strategy

• Measure basic cycle and item qualities

• Examination of elective developments and constructions

• Plan and foster procedural data

• Actually take a look at determinations, set up tests, send off creation and boat to clients

These Six Sigma approaches aid in increasing production while reducing defects. Although the methodology and technologies used in Six Sigma and Lean Management are comparable, the two programmes are not the same. Six sigma focuses on eliminating faults and limiting deviation, whereas lean management focuses on waste disposal through the use of a set of validated standardised tools and processes. These Six Sigma methods and approaches are primarily utilised for one purpose: to increase production while minimising defects

Critical Path

The Critical Path Approach (CPM) is a technique for non-programming projects in which you arrange every one of the assignments expected to finish the work inside the errand breakdown structure. Then draw a diagram of the expected duration of each procedure as well as the links between them. This makes it easier to plan out which jobs can be completed concurrently and which tasks must be completed first. The advantages of adopting critical path approaches are as follows: Improved Scheduling: You'll be able to appropriately manage your assignments if you concentrate on arranging the length of the operations and their interdependencies. CPM can assist you in defining and planning the goal if task X is dependent on task Y being completed first. Prioritization: The CPM approach's effectiveness is subject to the recognition and investigation of basic and non-touchy tasks. After you've arranged out these obligations, you can give assets a higher need. The disadvantages of this strategy include: Scheduling necessitates experience: Everything often takes longer than you expect, as any experienced project manager will tell you. You're more likely to estimate the erroneous duration for each work if you don't have real-world scheduling experience. No room for manoeuvre: The Waterfall approach, like CPM, is front-heavy. You must plan things out from the beginning. If any changes are made, the overall programme loses its significance. As a result, this method is unsuitable for projects with changing requirements (Mohrman and Worley, 2010).

Lean Method

Lean is a business idea originating from the Toyota Production System, not a tool or strategy. The goal is to minimise waste in all corporate operations while increasing value. The three lean (3M) wastes are as follows:

- **Muda**: An extra resource that adds little value.
- **Muri**: Excessive use of a resource.
- **Mura:** Inconsistent operational performance that decreases efficiency and productivity.

The application of lean concepts to the field of project management is known as lean project management. Lean project management aims to reduce the three Ms within the project phase while also improving client satisfaction. Shorter lead times, lower manufacturing costs, lower operational expenses, increased profitability and performance, better output, and high consumer satisfaction are all benefits of lean project management.

Lean principle Lean thinking is a means of looking at an operation and identifying waste that is created unnecessarily due to the way the process is set up. The following are the guidelines:

Identify Value: Value must be defined by the buyer in terms of the right product with the right features at the right price. The word customer is used to denote cost. The idea is to rely on whether the customer is willing to pay.

Map the Value Streams: The worth stream is recognized by the chief. Movements of every kind expect you to carry items from natural substances to your clients. Intensive plan, designing, creation, orders, creation arranging, and conveyance make a worth stream map. Then, check out the guide for squander and corporate worth with regards to the current circumstance. Exercises fall into three classifications: esteem added customization of items and administrations, esteem added changes that can be dispensed with later on, and non-esteem added changes that can be immediately disposed of.

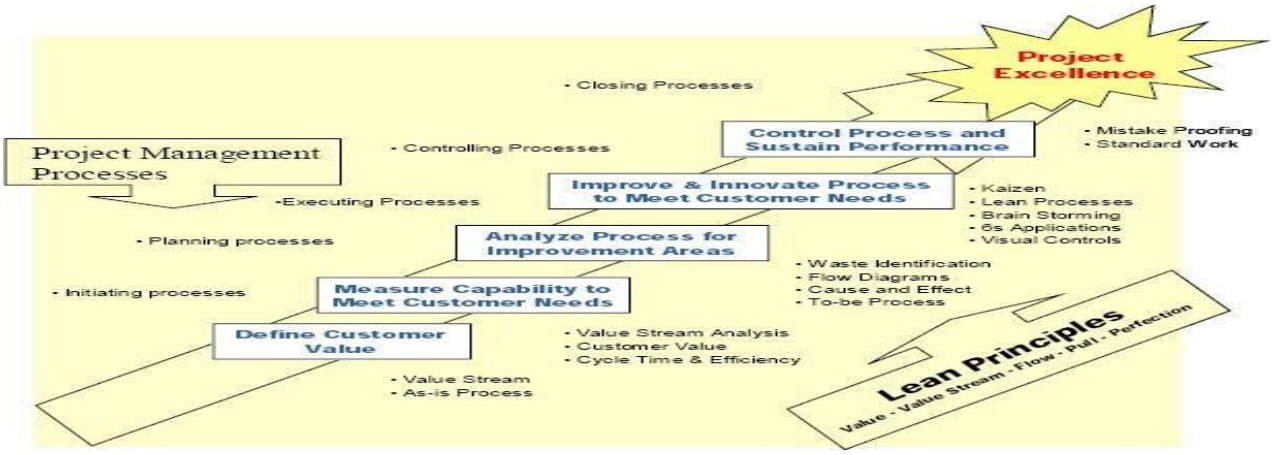

Fig:5 lean method Source: (pmi.org)

Make Value Flow: Value streams are accomplished by eliminating waste from the worth stream. It directs the task to progress and furthermore shows the current status of the undertaking**.**

Establish Pull: A stream is created and the client can get the stream. Don't give value before the customer asks for it, and don't give more than the amount initially agreed upon. We help keep inventory levels low by taking additional actions based on customer demand.

Seek Perfection: Perfection is the last principle of Lean Thinking. The pursuit of excellence will lead to a lean manufacturing culture and a cycle of continuous process improvement. The constant doubt about the merits of every action allows us to approach perfection even if we do not.

Respect People: The effectiveness of all Lean programs is based on the Lean concept of respect for people. We make decisions with our customers in mind, allowing them to get the most value with the least amount of waste. We respect our employees and provide working conditions that allow them to do their jobs effectively. We strive to improve our processes regularly, with the respect of our colleagues, to ensure that everyone gets the greatest benefit

Lean practices

In the Lean tradition, students must learn without waiting for the teacher to explain. On the other hand, some of Toyota's learning curve methods have been used to create an ideal environment for learning about the legacy of lean manufacturing

Kaizen: Kaizen activity is a planned time in which all functions are continuously improved and all employees participate in standardized programs and processes. The goal is to improve the everyday, not the tasks to be completed. Managers follow Dr. Deming's PlanDoCheckAct methodology.

Kanban: Kanban is the framework for Agile task control and the essential precept of lean thinking, and it became in the beginning named after Toyota`s production machine. Kanban permits Just-in-Moment shipping of an appropriate object to the proper place on the proper time. In task control, it reasons segments to be in advance of schedule, segments to be at the back of schedule, and end-of-task panic. The Kanban machine in manufacturing strives to lessen stock in any respect times. To get rid of inefficiencies, the objects ready withinside the deliver place are scheduled and removed as needed. One of the cues used to view the manufacturing manner is the Kanban board.

A sign card is a key component of a sign and provides information about the current location of the material. Signage cards help ensure that your employees get the right amount of work and don't over-produce items that remain in stock for long periods of time. Signage cards help develop demand-driven systems. Kanban lanes give you a clearer picture of your workflow, making it easier to

categorize and isolate your activities. Kanban is one of the most important strategies to teach lean thinking by giving examples of market behavior.

Autonomation: It is the process of gradually injecting human intuition into a machine, such as warning a virus when a computer is threatened, to monitor, stop and call a person if it thinks something is wrong. This type of automation does not produce but does some control function. Autonomy is needed to differentiate between humans and machines. Humans are not permitted to perform mechanical work and vice versa. Autonomy promotes lean thinking by providing a new approach to improving manufacturing efficiencies by building lighter, smarter machines at lower cost.

Andon: Andon refers to a programme that allows management, maintenance, and other employees to submit product or process faults. Lean thinking emphasises collaborative issue solving rather than entrusting the solution to a single employee. Employees are well educated about their jobs using the Andon system. Andon assists lean thinking in identifying the obstacles to the project's zero defect goal.

SMED (Single Minute Change of Die): SMED stands for Single Minute Change of Die, and it emphasises on flexibility. Flexibility refers to the ability to easily transfer from one task to another, not to constantly changing things. It's crucial to the flow of things and it's always a problem. SMED aids lean thinking in the development of flexibility until real single-piece flow is achieved in the proper order to respond to client demand.

Standardize work : Lean believing is tied in with finding the smoothest way to each occupation job, seeing disconnected issues and settling them autonomously, working on both advancement and individual self-administration. A normalized task is a graphical portrayal of the progression of work underway and the plan of the means and all the other things. Since significant focuses are featured, an individual can envision and feature the work as indicated by the client's necessities. It likewise gives you the certainty to make the following stride. Normalized work advances lean thinking by featuring the hindrances to smooth work looked by laborers and underscoring the topic of kaizen.

Visualization: Lean outlook is to introduce changed frameworks to see, insight and fill together toward this path. Visual administration is the essential strategy for creative critical thinking since everybody can see the contrast between what is generally anticipated and what is really occurring, and can observe prompt countermeasures and underlying drivers. Representation advances Lean Thinking by empowering individuals to work together on issues and improve their commitments without overburdening their objectives.

Lean thinking always focuses on people, not systems. Lean thinking simply seeks to cut costs and clearly states that it wants to identify and eliminate unnecessary costs in the first place, rather than

cutting costs and forcing workers to work with them. Individual customers are considered more important than market segments, and each customer's complaints and opinions about the product are taken into account. It also encourages employees to learn how to learn without telling them what to do. The purpose of Lean Thinking is to help people increase their problem-solving flexibility through quality improvement initiatives. Lean thinking offers a whole new perspective on the development of existing products and services, allowing us to understand how to achieve the same benefits, both from an environmental and financial perspective, at a much lower cost (Soltan and Mostafa, 2015).

Agile Method

Agile project management is a popular project management methodology inspired by agile software development that emphasizes collaboration, adaptability, development, and high-quality solutions. The term "flexible" was coined because it better reflects the flexibility of the system and its responsiveness to necessary process adjustments. A system in which needs and methodologies emerge from the collaborative efforts of self-organizing project teams and clients. It was created to develop software in response to the shortcomings of the Waterfall method, including methods that do not meet the demands of an increasingly competitive and sustainable movement in the software industry. Developing unique products, technologies, and business models typically requires a new approach to project management. Agile project management aims to:

1.Constant Innovation: To meet the needs of today's customers.

2. Product Flexibility: To meet the needs of future customers.

3. Improved market: To address the market window and increase return on investment (ROI).

4. Individual and Procedure Flexibility: To respond quickly to changes in product and service.

5. Best Results: To encourage business growth and profitability.

There are numerous approaches to implementing agile project management, but at the heart of all agile endeavours are basic values and principles known together as the Agile Manifesto. The Agile Manifesto, which contains four basic beliefs and twelve principles, benefits agile project management.

a) values:

• Interactions take precedence over procedures.

• Software trumps documentation.

• Customer collaboration trumps negotiation.

• Plan reversal over Following.

b) Principles:

• The fundamental goal is to provide customer satisfaction through timely and consistent delivery of usable applications.

• Adapt to expanding project development demands.

• Consistently delivering job applications

• Project stakeholders and developers must collaborate throughout the project.

• Build projects around motivated people by trusting them and providing them with the necessary assistance.

• Up close and personal cooperation.

• Work programming is the vital method for estimating progress.

• Nimble cultivates consistent turn of events, which helps with the support of a consistent stage endlessly.

• The determined quest for mechanical greatness and top notch plan improves nimbleness.

• Straightforwardness is fundamental.

• Self-sorting out groups cultivate great engineering, prerequisites, and formats.

• The group is continually contemplating how to turn out to be more proficient and adjust appropriately.

Lithe advances are well established in these standards, yet have been marginally adjusted for project the board rather than programming improvement. These standards show a few attributes of Agile Project Management. Rather than developing lengthy project documentation, Agile project management focuses on two basic concepts. Concentrate on short cycles of well-defined deliverables to limit risk and communicate directly with development partners. These two concepts make it easier for project managers to respond to the complex and ever-changing environment in which most development projects occur.

Agile project management processes

Nimble undertaking the board ought to be straightforward and sensible. The six key results are utilized to follow progress and foster items to accomplish them. It likewise requires 5 basic jobs to run the program and 7 continuous exercises to construct the item.

Expectations:

• The item vision articulation is a blueprint that diagrams the motivation behind the undertaking.

• An item guide is a significant level image of the necessities expected to accomplish project objectives.

• The Product Backlog is a nitty gritty, focused on rundown of what your undertaking needs.

• A delivery plan is a delivery plan for a functioning item.

• The run log contains client solicitations, objectives, and errands for the current run.

• Gradual is an element of a functioning item that can be delivered to partners and made accessible to clients toward the finish of a run.

Roles:

There isn't any any set formulation for the suitable agile task control crew, however on the way to be effective, every crew ought to have the identical purpose and contain the 5 roles indexed below:

• The product proprietor, who's an professional and a consultant of the product withinside the business, is usually chargeable for dealing with the stock Backlog and supporting developers, partners, and users.

• A improvement crew is a network of experts that consists of engineers, developers, and creators that assemble and construct the increment object.

• A scrum grasp is likewise referred to as a task mentor or manager who gives aid to task groups and forestalls distractions. A super-prepared leader, they make certain that the crew remains on course and are chargeable for the scrum`s comprehension and implementation.

• Stakeholders are concerned withinside the great and feature thoughts for the way it is probably improved. They assist the product proprietor and developers, and even as they're now no longer in fee of the task, they play an critical function in agile task control.

• An agile mentor has great enjoy and cognizance of the real-international software of agile task control, however does now no longer take part in implementation.

Events:

• Project making plans is the primary segment withinside the agile venture control procedure that a enterprise will initiate. The enterprise includes a product imaginative and prescient announcement and roadmap into venture making plans.

• Release making plans is the procedure of figuring out the begin date and the following set of product capabilities to be released. The launch agenda is designed on a one-time basis.

• Sprints are often called prototypes, which might be speedy improvement intervals wherein the crew produces probably shippable items and may agenda their paintings primarily based totally on enter from earlier outcomes, that is a key aspect of agile venture control.

• Sprint making plans is a assembly this is used to talk about and determine on a dash intention in addition to the desires which can be required to acquire it.

• Daily Scrum is a 15-minute assembly held on the stop of every dash wherein crew participants speak their consequences and any capability difficulties.

• A dash evaluate is a level at which the venture crew suggests a running product to stakeholders. The product proprietor will alter the product backlog primarily based totally at the enter received.

• A dash retrospective is a procedure that happens on the stop of every dash wherein the scrum crew analyses their cycle and discusses what went well, what didn`t, and the way the subsequent dash enhancements ought to be implemented (Muslihat, 2020).

Agile project management approaches

From the perspective of flexible classification of project management, Vysotsky's iterative, adaptive and extreme management methods are under the auspices of flexible management. Linear strategy and incremental strategy are classic project management methodologies for agile project management. Project objectives and project methodologies are evaluated according to their scale of effectiveness or complexity. A contextual project approach is used to align project management strategies to problem types. When there is confusion about which quadrant a proposal falls into, the least expensive way is to choose the more important quadrant.

Various strategies are described to help distinguish it from other agile approaches. These methods vary in scope, design, configuration, testing, and deployment.

Linear strategy: The linear method is a traditional technique consisting of simple sequential motions with no feedback. Design decisions are not made until the final stage of a linear strategyThese characteristics make it suitable for Quadrant 1 projects. The linear method has the following advantages: (1) The whole project is planned. (2) Understand resource requirements. (3) You don't need the most qualified person. (4) You can designate a team. Some of the downsides are: (1) Plans and schedules may not effectively manage change. (2) Completion times may take longer, especially

when changes occur. (3) It can be expensive. (4) based on customer value rather than schedule performance.

Incremental strategy: Incremental approaches are similar to linear approaches in that each phase of the project requires releasing a partial solution and replicating business value before moving on to the final phase. This method is equally suitable for work in the first quadrant.Advantages of the incremental strategy include: (1) The market value is established early in the life cycle of the project. (2) Change needs are met step by step and incremental solutions can be discovered. (3) Focus more on customer satisfaction than a linear approach. Cons: (1) extensive documentation; (2) difficulty defining function/feature relationships; (3) requires more consumer input than the linear approach.

Iterative strategy: The iterative method consists of many iterative steps with feedback at the end of each group of steps. If the company needs it, the group can provide a partial solution at the final stage. This is a learning approach strategy that uses partial responses to gain insight into the holistic approach.The iterative method consists of many iterative steps with feedback at the end of each group of steps. If the company needs it, the group can provide a partial solution at the final stage. This is a learning approach strategy that uses partial responses to gain insight into the holistic approach.

Adaptive strategy :The adaptive approach is similar to the iteration strategy, except that the proposal in each iteration affects the next iteration to arrive at a solution. Iterations can release a limited number of customer's decision. The adaptation strategy is suitable for quadrants 2 and 3 as it is suitable for projects with partially known answers. To eliminate the risk, iterate over the current fix, then iterate to find a solution. As a result, the effectiveness of an adaptation strategy is highly dependent on its ability to withstand regular change and adapt accordingly. As a result, training is mostly timely.

The benefits of an adaptive approach include: (1) We do not waste time on value-added activities. (2) Provides the best commercial value for the time and budget constraints mentioned. Disadvantages: (1) The client must be actively involved in the project. (2) You cannot accurately predict what you will do after the project.

Extreme strategy: An extreme approach is similar to an adaptation strategy in that it always finds and converges to the project goals rather than adapting the plan at each iteration. The key difference between an adaptive strategy that requires a specific goal and an extreme strategy that doesn't is that there is no goal definition. This plan includes research and development or related programs for Quadrant 3 projects.

The advantages of the extreme method are: (1) Selection may be made as late as possible. (2) provides early insight into many promising alternatives. The downside is that (1) you can find the answer in the wrong place. (2) There is no guarantee that the initiative will result in a market benefit.

With regards to project the board and advancement, Wysotsky gives a clearer outline of this multitude of techniques to represent the progressions in the iterative cycle and how the venture the executive's stages associate with these cycles. The distinctions are especially articulated in functional preparation, checking, and the executives. Assuming a venture's boundaries are continually transforming, it very well might be attractive to change starting with one undertaking the board strategy then onto the next

Agile compared to Traditional method

• Nimble techniques are essentially founded absolutely on new item improvement processes, while regular designs are fundamentally founded absolutely on insights. Customary undertakings have all around recorded and surely knew characteristics, capacities, and details. Spry techniques, on the contrary hand, check out the whole challenge specification with the aid of using enforcing the idea in iterations, reducing and diminishing complexity. As a result, agile tasks are extra unstable than conventional tasks; yet, agile tasks have the ability to evolve to challenge necessities extra hastily and readily.

• Traditional project managers get work done according to budget, deadlines, and scale. Performance and variability are comparable to the expected baseline. The typical project manager tried to reduce risk while respecting budget and time constraints. Agile project managers, on the other hand, are more concerned with time and market performance, with money and timing being secondary considerations. Instead of following a process similar to that of a typical project manager, you are tasked with handing over a project to an agile project manager.

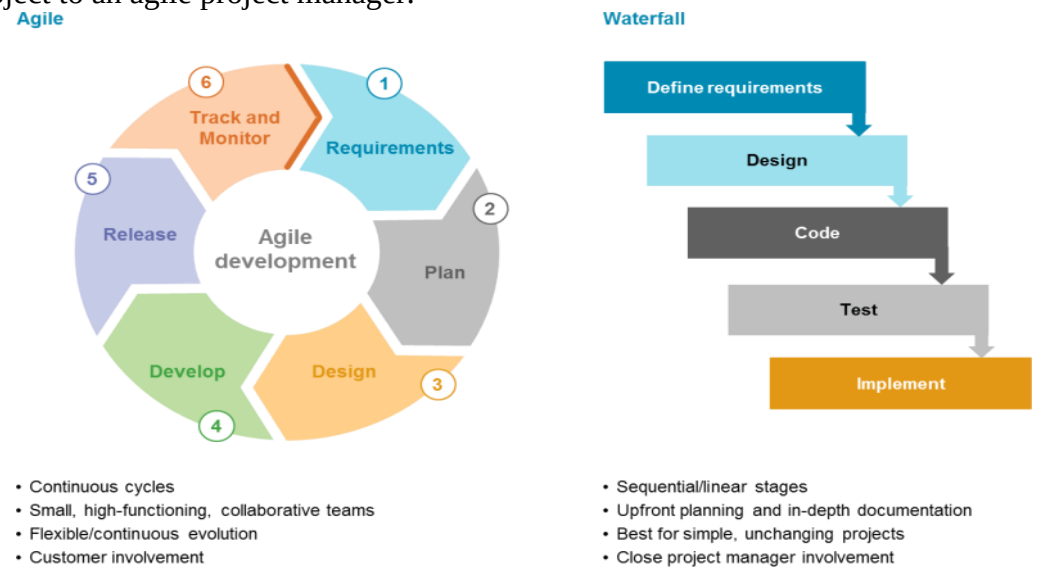

Fig:6Agile vs Waterfall Source: (Saigon Technology)•

In the customary model, groups work on a set timetable and have a definite rundown of capacities and exercises that should be finished over the course of the following not many months or item lifecycle. Prescient strategies rely basically upon gauge studies and great preparation toward the start of the cycle. All executed changes should be likely to characterized change the board and needs.

With well-defined specifications and extensive documentation, existing designs can better accommodate a diverse working group of experts and sub-contributors. Agile project teams rely on the participation of team members to implement changes and make improvements quickly. Teams working on projects in different locations can use a flexible approach in each location. The team uses an agile methodology at each project site that works in multiple locations.

There are advantages to finishing a venture utilizing Agile Project Management. It adopts a more powerful improvement strategy than conventional techniques and spotlights on further developing execution. This can immensely affect group execution and viability. Dexterous undertaking the executives is reasonable for dealing with intricate and dangerous ventures in light of its versatility. It's also ideal for teams developing new products and services because it can resolve unexpected events quickly. Agile project management identifies itself as a way to emphasize collaboration, adaptability, continuous improvement, and high-quality deliverables. Used for both complex and flexible tasks.

ATTRIBUTE	WATERFALL	AGILE
Phases	Linear, complete each phase of the project before proceeding to the next phase	Repeatedly, each phase allows you to move back and forth as needed.
Primary goal	Create a finished product	Create a Minimum Viable Product (MVP) and repeat to improve it
Scope & approach	Well defined before starting	Undefined before start
Budget	Set based on defined scope	Updates are primarily based on feedback from each boost; alternatively, can be set
Schedule	Set based on defined scope	Updates based on feedback from each boost; Other ways can be set
Progress measurements	Well documented and measured against the plan	Minimal documenting and measured against the availability of the MVP
Success measurements	Focused on whether the project was delivered on time, within budget, and to scope	Focused on end user outcomes and end results
Working product	Typically not available until at least the testing phase	Typically available in early phases of the project

Table1: differences between agile and water fall (source: www.glasscubes.com)

Scrum Framework

Scrum is a construction used to restore swift errands the leader's musings. Through participation, straightforwardness and iterative improvement, the goal is to configuration, produce and stay aware of the complex. It moreover empowers agreeable decision making and accommodating arrangements to further develop things even more gainfully. Scrum's usage of exercises, events, and things isolates it from other skilful endeavour the chiefs move close. Scrum depends on three essential parts: tasks, cycles, and assumptions, and the five characteristics: Commitment, Certainty, Concentration, Straightforwardness, and Steadfastness. The Scrum Expert is the endeavour chief liable for doing and taking out deterrents to Scrum values and practices. A Scrum Group is a cross-utilitarian and self-assembling gathering of 5-10 very sturdy people. This can be interpreted in different ways, but fundamentally it infers that the spot of the social occasion boss isn't fixed yet fluctuates as shown by the prerequisites of a particular cycle called a run. Bunch piece simply changes between runs. A thing owner is generally an assignments boss who gets what ought to be taken out to kick an endeavour away and how the endeavour will progress.

A Run Arranging Meeting is held at the beginning of each Run with the participation of the Scrum Expert, Scrum Group, and Item Proprietor. The two-segment organizing meeting all through the range of the day involves two key events, Part I and Part II. In an underlying advance, the gathering basically portrays an Item Build-up, which is a lot of endeavour requirements, and subsequently characterizes Run Objectives, which are the coordinated eventual outcomes of a specific Run. The essential justification for the ensuing fragment is to make the Run Excess. The initial shot social occasion is coordinated in basically the same manner as the run orchestrating meeting, with the fundamental difference being that the get-together discussions about project delays and the essential goals of the endeavour.

A Run Arranging Meeting is held toward the start of each Run with the interest of the Scrum Expert, Scrum Group, and Item Proprietor. The two-section arranging meeting throughout the span of the day comprises of two key occasions, Part I and Part II. In an initial step, the group basically characterizes an Item Overabundance, which is a bunch of undertaking prerequisites, and afterward lays out Run Objectives, which are the organized aftereffects of a particular Run. The principle reason for the subsequent area is to make the Run Accumulation. The opening shot gathering is organized similarly as the run arranging meeting, with the main contrast being that the gathering examines project delays and the primary objectives of the task. The motivation behind the Day-by-day Scrum isn't to tackle issues, however to assemble data about run delays. All things considered, it is utilized to follow group

progress and urge colleagues to speak with one another and with the Scrum Expert to wrap up responsibilities as fast and easily as could be expected.

A run audit meeting is held toward the finish of the run and permits item proprietors to see the highlights made during the run. Here colleagues don't meddle, in contrast to customary gatherings.

Scrum doodads are the last essential piece of the Scrum perspective, which joins the Thing Develop, Scrum Excess, and Burndown Diagram. The thing excess is a centered around summary of develop things managed by the thing owner that tends to project needs. Records can be made with project the board programming that is as easy to make as a bookkeeping page. For most endeavors, the thing excess is the super end result of the farewell or run organizing meeting. The thing aggregation can't be changed until the accompanying run organizing meeting.

At the run arranging meeting, the group ought to assess every thing in the item overabundance. Approval techniques utilized incorporate companion audit or age of grouping structures. These decisions are for hypothesis as opposed to demanding perception. No matter what the reviewing style utilized, evaluating includes setting the work-in-progress things into size gatherings, investigating diagram focuses, and afterward assessing the quantity of work hours or days expected to finish the things. In light of this appraisal, a joint choice can be made to decide how much speed or energy the group can appropriately convey in a run.

Contrasted with customary undertaking the executives, Scrum purposefully reflects work done through burnout outlines. Three sorts of achievements are usually utilized. An achievement archiving the advancement of a run, an achievement recording the advancement of a delivery, and an achievement reporting the general improvement of a task with item achievements. Burnout maps are intended to introduce data in a justifiable manner. Thus,. As a result, each feature is typically represented by time (x-axis) and duration (y-axis) (y-axis).

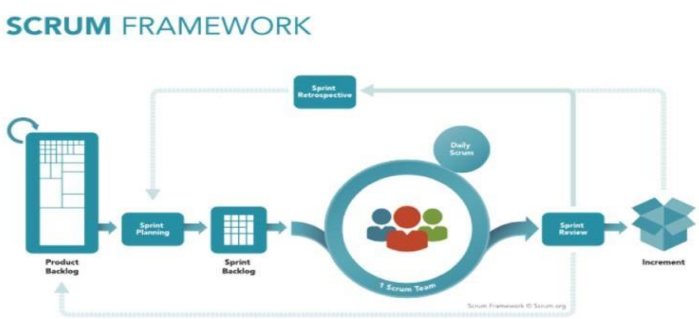

Fig:7 scrum Source: (scrum.org)

For example, a typical sprint burnout chart shows the average time remaining in the sprint and the total time remaining in the sprint incomplete each day. It is desirable that the sprint burnout chart be "burned out" so that there is no time left until the end of the sprint. However, not all burndown charts will "burn out" to zero as bugs can occur throughout the sprint. Similarly, the updated burndown chart shows the time remaining until the update is complete. Naturally, burn-in charts are used to demonstrate the success of the entire plant. The simplicity of the Scrum-based methodology is one of its strengths. This strategy allows both partners to reduce regulations and improve operational efficiencies by minimizing unnecessary regulatory restrictions, procedures, and project management activities. It is best suited for projects that require a scalable approach to the production of products or services involving teams of less than 7 people (Cervone, 2011).

Hybrid Method

A hybrid technique is a mix of a longtime framework and a brand-new detail or ideas supplied in diverse combinations. The hybrid approach`s essential additives are Waterfall-Agile, Agile-Agile, and Lean-Agile. This approach combines the best capabilities of each Waterfall and Agile and combines them with a bendy but organised method that may be carried out to a whole lot of projects. The Hybrid method, just like the waterfall approach, makes a speciality of the early choice and evaluation of requirements. From this factor on, the Agile approach`s simplicity takes priority over speedy iterations. The primary motives for the elevated use of the Hybrid method are uncertainty and complexity, aggressive markets, and excessive customer expectations. The following are the 3 primary thoughts for the Hybrid technique in order to get you started.

• Can be integrated into any business or team of any size

• Mixing occurs at the start of a project.

• Can be integrated into any business or team of any size

The Hybrid approach are as follows: (1) Increased Flexibility: During the making plans phase, the Hybrid method gives for a considerable development in performance over the Waterfall approach. You could make modifications so long as the specs do now no longer adjust considerably. (2) More structured: via way of means of adhering to the authentic waterfall coaching technique, the Hybrid method overcomes one of the most important proceedings approximately the agile system - a loss of shape and coaching. You will even get the "Best of Both Worlds." The drawbacks of the Hybrid Method are as follows: (1) Compromise Requirement: Because you're reconciling competing methodologies, all events need to agree on parameters and consistency. (2) "Best of each worlds" approach: This approach reduces the flexibility of Agile even as growing the stableness of Waterfall.

Some of the adjustments you're making will must paintings in the economic and organisational constraints which you installed withinside the first place (Muslihat, 2020).

The project begins using a typical waterfall planning model (Archer and Kaufman 2013; Baird and Riggins 2012; Jaziri et al. 2018; Salah et al. 2017). There will be application co-development sessions during the initial review period, with designs and criteria properly structured to create a solid foundation for a clear project scope. During the planning phase, team members work with the client's stakeholders to define and refine design and project requirements. At this point, 80% of the design and requirements are complete and the remaining 20% remains in the iteration sprint. The team will set future sprint goals based on the requirements translated into logical goals (Archer and Kaufman, 2013).

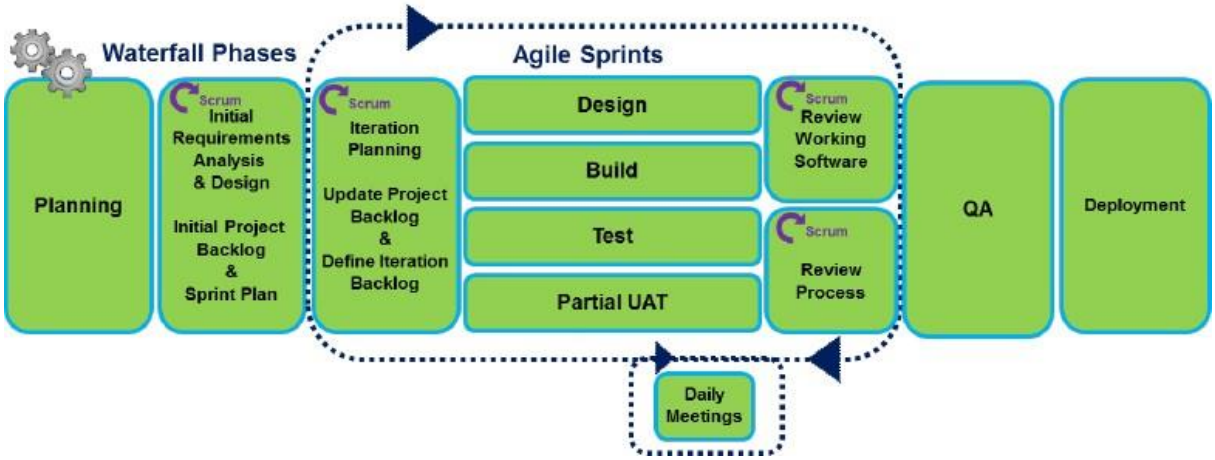

Fig:8 Hybrid waterfall and agile approach (Archer and Kaufman, 2013, pmi)

Iterations are planned according to the scope, priorities, and iterations of the final top-level design, assembly, and testing (Archer and Kaufman, 2013; Baird and Riggins, 2012). Iterative development sprints are scheduled every 3 weeks for 7 months. A hybrid approach recommends range-limited iterations. That is, the planned extent of the first iteration is completed before the beginning of the second iteration to ensure that the fixed extent is consistent and dependencies are managed correctly as scheduled (Baird and Riggins, 2012).

The combination of traditional and agile methods actually leads to unavoidable change because different approaches to project management are difficult to implement (Batra et al., 2010). If both waterfall and agile methods are used at the same time, it is considered difficult because disagreements may arise at the organizational level. The conflicting concepts and assumptions of waterfalls and agile methods lead to organizational chaos (Dickbert et al. (2016)), especially when businesses in general adopt agile project management. When agile is implemented in a traditional organisation, there will

be development process conflicts, personnel conflicts, and business conflicts (Bohem and Turner, 2004). Delayed tasks make it difficult to meet the sprint schedule (Archer and Kaufman, 2013). It takes time to adapt to changing methods and learn new ones (McHugh and Hogan, 2011). As organizations try to adopt new methods, they face a variety of issues, including team members who do not want to switch from previously used and created approaches (McHugh and Hogan, 2011).

Some of them consider the benefits of hybrid job management, including accelerated freedom of job owners across jobs and more rework through information transparency and the like (Cram and Marabelli, 2017). The introduction of a hybrid approach increased overall performance factors including commitment, leadership, and statistical accuracy (Salum et al., 2014). Following a hybrid task management procedure reduces the cost of unique software projects (Imani et al., 2017). A fundamental advantage of hybrid work management methods is their flexibility, which is also a major challenge with traditional work management techniques. The flexibility of work management reduces the need for remodeling and allows you to respond quickly to changes. Reduced remodeling leads to efficiencies and responsiveness to further development leads to flexibility, which may be a major benefit of hybrid work management techniques (Serrador and Pinto, 2015).

Agile	Traditional (waterfall)	Hybrid
Short-term planning with a focus on iterative goals	Long-term plan with an eye on the entire project life cycle	Short-term planning focuses on iteration, while long-term planning focuses on the entire project lifecycle.
Lean planning with iterative cycles through continuous revaluation and improvement.	The entire life cycle of a project requires complex planning.	Initial planning is a complex task that requires constant re-evaluation and improvement.
Incremental and sequential passing, compression, and informal documentation provide unpredictable, non-linear, and unmeasurable details.	Predictable, linear and measurable details with integrated or step-by-step delivery and detailed formal documentation	The level of detail is predictable, non-linear, and measurable throughout the cycle, but iteratively unpredictable and unmeasurable. With proper and formal documentation, both incremental and incremental delivery is possible.
It is based on a vision of what needs to be built. Comprehensive and figurative explanations of the objectives and expected outcomes are provided in an ambiguous and complex way.	Based on a clean description of what is going to be built. A designated and formal description of the dreams and anticipated results from contractual documents.	A long-term specification that includes a formal description of the project goals and expected outcomes, and a short-term vision of the iterations based on figurative and abstract representations of each iteration goal.
The changes are recorded and the plan for each allocation is changed.	Deviations are discovered and activities are changed to maintain the plan.	Changes are identified, and short-time period making plans is modified for every touch to keep away from long-time period deliberate deviations.
Composed of real and / or virtual visual artifacts and gadgets such as posters, murals, photographs, etc., with short and frequent team briefings	Performance indicators, timelines, formal documentation, performance reviews, and audits are used with large and rare team meetings.	Includes standard long-term governance and monitoring practices (project lifecycle), and agile short-term project iterations.
Adaptable, variable, and adaptable. Without the lifestyles of a challenge control figure. Multidisciplinary groups which can be self-controlled and feature a low hierarchy	In essence mechanical, formal and bureaucratic. The project leader has a strong presence. Working with a professional team requires a high degree of expertise.	Formal and adaptable. Existence of the figure of the project manager. Intermediate level interdisciplinary group.

Table: 2 Differences between Agile, Waterfall and Hybrid (source :PMI.org 2021,Flávio Copola Azenha1 , Diane Aparecida Reis1 , and André Leme Fleury)

RESEARCH METHOD

The fundamental target of the review is to distinguish the difficulties, benefits, and impediments of an association's progress from a conventional venture the board strategy to a half and half undertaking the executive's philosophy (waterfall Agile). This study utilized a subjective strategy beginning with a writing audit and study on cross breed project the executives (Waterfall agile). The writing audit is utilized to acquire fundamental ideas, and surveys are utilized to assemble data about the individual jobs and assessments of specialists. The survey was made in view of inspiration and writing audit and basically centres around the accompanying inquiries: What are all of the difficulties encountered while installing hybrid?

1. Transformation to Hybrid methodology?
2. Why is hybrid methodology used?
3. How is hybrid methodology implemented?

Primary data

This interview-based qualitative study was helpful in data collection and analysis. A qualitative approach is guided by a coherent set of norms and allows the exploration of new questions. To achieve the purpose of the study, the interviewer must prepare a questionnaire in. Meetings can be formal, semi-organized or unstructured. While organized meetings have a foreordained arrangement of inquiries and it is basically impossible to go past that, semi-organized and unstructured meetings are more adaptable in how the discussion is organized and the capacity to pose extra inquiries.

Semi-based interviews is performed for this studies project, and the questionnaire is given as an appendix. As formerly stated, the limitations encountered in qualitative evaluation even as acquiring statistics from interviews and transcribing them have been time, and method (Crescentini and Mainardi, 2009; Greener, 2008).

I chose the semi-structured interview because it is more suitable for our research project and gives more flexibility in how we conduct the interview. These semi-structured interviews can provide more information about the respondent's work experience. As an interviewer, I focused on our actions while remaining open, clear, friendly and sympathetic. At the request of the interviewees, significant components of the project they provided are not disclosed.

Secondary data

Review current research in project management through dissertations, scientific journals, project management agencies and research gateways, and prepare literature reviews for analysis. Our university library helped find additional articles related to this study. Another search engine used to identify relevant publications is Google Scholar. In search engines. I've seen about 30 publications based on traditional and agile methods. However, I found several articles (8-10) on hybrid project management. Compiled research literature review in this article.

Design of the interview

All interviewees were emailed about the study and asked to take time during the interview to share their views. The organization's project manager declined to share project details on the grounds that it was more confidential. I kept the respondents' information private and anonymous as they wished. Telephone interviews will be conducted due to geographic restrictions. All interviews were conducted in English and lasted between 30 minutes and an hour. The questionnaire encouraged us to continue to focus on our research.

The number one intention of this interview become to have a look at how the hybrid approach is utilized in a venture according with hybrid venture control standards. The interview questions are covered as an appendix. Before delving into hybrid approach, I desired to apprehend how they

transitioned from waterfall technique to agile technique, after which from agile to hybrid technique.

Interviewee selection

Hybrid approaches are still in their infancy, making it difficult to reach large numbers of interviewees. However, I persevered and worked with group contacts, eventually collecting interviews from numerous organizations.

S.No	Interviewee	Experience (Years)	Field	Location	Type Of Interview	Project Management Approaches
1	Project manager	20	Automotive sector	United kingdom	mail	Traditional and prince2
2	Team leader	25	Health care	United kingdom	mail	Brainstorming - Fishbone diagram - FMEA - Gantt Charts - Workshops - Benchmarking - Gap Analysis - Value Stream Mapping - Weekly Checkpoint Meetings - Milestone reporting - Board reporting - Risk Management
3	Team member	3	Automotive sector	United kingdom	phone call	Agile, Traditional
4	Project manager	3	Automotive sector	United kingdom	phone call	Waterfall and general project management
5	Team leader	7	Automotive sector	India	phone call	Agile
6	Team member	5	IT	India	mail	Waterfall and hybrid, agile scrum
7	Project manager	9	IT	India	phone call	Waterfall and hybrid and scrum
8	Team leader	6	Construction	India	phone call	Agile, Waterfall
9	Team member	5	Construction	India	phone call	Agile, traditional and hybrid
10	Team member	4	Construction	India	phone call	Agile, traditional and hybrid
11	Team member	12		India	phone call	Agile, traditional and hybrid
12	Team member	6	IT	United Kingdom	phone call	Agile hybrid
13	Team member	4	Manufacturing	India	phone call	Agile and lean methodologies
14	Team member	5	Manufacturing	India	phone call	Agile, Traditional, FEMA and hybrid
15	Project manager	17	Automotive sector	India	phone call	Waterfall and hybrid
16	Project manager	13	Automotive sector	India	Phone call	Hybrid, waterfall ,six sigma ,Agile, Kanban

Table 3 Information about the interviewees

Data Analysis

In order to meet the purpose of research, the data collected must be properly investigated and excluded. As a result, instead of using the software, I personally collected data, recognized the data of the interviews I conducted, became more aware of myself, and developed the structure. Interviews contain data is analyzed, so it can be difficult and time taking to see the data from the interview from the beginning. The data collected will be examined and discussed in the report.

Limitations

Due to the pandemic (COVID19) affecting the daily life of people around the world, most of the cases were not able to fill out the questionnaire. The daily life of people and organizations is collapsing due to the rapidly spreading Corona (COVID19) pandemic (a global pandemic). Most businesses are facing economic hardship due to the pandemic, causing many employees to be laid off and more staff available to others. Because project managers are busy with work, filling out questionnaires is difficult. We find that the environment and environment have a great impact on the work culture of employees.

FINDINGS

Transformation to Hybrid methodology

According to respondents, the steps the organization followed were start, plan, implementation, and completion. The waterfall method is used for the initial, planning, and final phases, and the agile method is used for the implementation phase They gather data about project necessities toward the start. They utilize the undertaking request to flag the beginning of the task and direct an effect examination. The arranging stage makes a reasonable arrangement for your assets. In this stage, we will have a friend panel meeting with all partners, providers, and undertaking members to talk about their contribution. In the execution stage, you apply a coordinated cycle. Consistently, they meet a panel to settle on significant asset choices. They hold a weekly core team meeting to handle the ongoing tasks of the project and meet with the local team every other week to discuss resources. For example, if you need additional support from your local team. They make a problem log call every Thursday or Friday to see what problems they have received and what initiatives are in progress. This tool is available to all project participants. These work in parallel. This means that this project in country x is in the process of being implemented, but at the same time it will start planning in country x. The closing phase applies a waterfall and presents plans. The software and designated user training documents must be provided to the steering committee. In this case, the steering committee needs the final deployment date of the software. Once the project learning is recognized, the waterfall approach

is used during the closed phase of the organization.

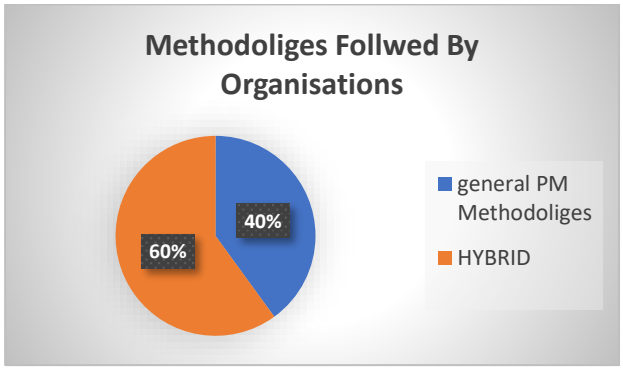

Fig:9 Methodologies followed by organization

. If the requirements are missing, you may need to start over. According to the organization's respondents, the benefits of hybrid technology included increased involvement in the project and the accuracy of the products offered. In addition, time savings and increased flexibility have been suggested as benefits. In addition, the efficiency of the work team has improved. Understanding the capabilities of the resources and using them effectively has helped in terms of cost and time. The availability of freedom within the project allowed team members to innovate and experiment with the project and improve results.

Why to use hybrid methodology in projects?

Adopting waterfall and agile approaches in organizations in response to evolving market trends will benefit agile customer satisfaction (According to all respondents, the main reason for using a hybrid approach is flexibility. The organization's project managers, team leaders, and team leaders emphasized that the hybrid approach was chosen because of its flexibility, data transparency, possible benefits, time savings, market trends and user requirements. The project leader said using a hybrid methodology is flexible, follows market trends and meets user requirements. Other organizations have stated that they have used a hybrid model for flexibility, potential benefits, and time savings.

Flexibility and adaptability were the main reasons for adopting a hybrid project management method. Proper distribution of work among team members helps to minimize iteration times. This analysis shows project managers choosing a hybrid methodology because it gives project team members the flexibility to empower innovation and experimentation with effective project outcomes. The hybrid approach makes it difficult to have an idea of resources, money, time, etc. Our research shows that using a hybrid approach can lead to innovation because team members are given the given powers. It gives you the opportunity to work flexibly, allowing you to think outside the scope and goals of your project. This helps hybrid projects stay up to date with market trends and consumer requirements.

There are several studies on the benefits of hybrid project management, including data transparency gives project members more freedom in their work and less redo (Cram and Marabelli, 2017). The flexibility of project management reduces rework and allows for changes (Serrador and Pinto, 2015). Reducing redo leads to efficiency, and responsiveness to changes leads to flexibility. This is two of the main advantages of the hybrid project management approach (Serrador and Pinto, 2015). This approach was to increase the openness of the data and reduce the follow-up work of team members. Working with a hybrid approach increases efficiency by reducing redo and increasing flexibility. Assigning the right work based on the strengths of project team members improves work efficiency and reduces iteration times. With good understanding and communication between team members, the service will be completed on time. Implementing the hybrid approach improved performance factors such as engagement, leadership, and information accuracy (Salum et al., 2014). Following a hybrid project management approach leads to higher success rates and lower costs for specific software projects (Imani et al., 2017). Flexibility availability helps develop and strengthen the commitment of project members. As a result, flexibility and adaptability were cited as the main reasons for using hybrid method

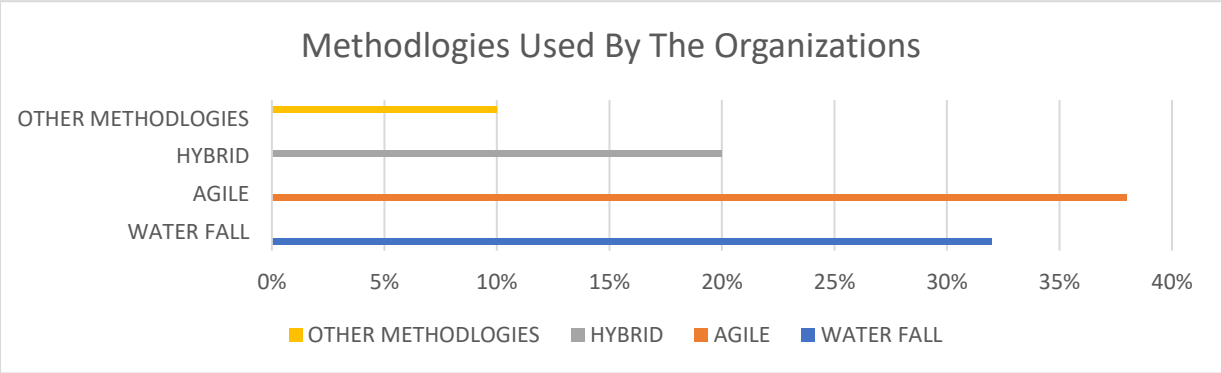

Fig :10 Types of Methodologies used by the organizations

How is hybrid methodology implemented in projects?

The obstacles of executing new undertaking models would learn new approaches, which would require more noteworthy commitment and participation from colleagues. For the colleagues, learning better approaches to utilize would be a time-consuming system. In project models with muddled objectives, the cycle length, and periods of the task, as well as the vital assets, ought to be enough arranged. Any venture model in which colleagues work in independent time regions will have correspondence issues or a powerlessness to give assistance whenever to the undertaking. Higher administration ought to grasp the task necessities and select the methodology that will be utilized to chip away at the

undertaking. Interviewees thought about a few methodologies that consolidate cascades and light-footed cycles. The cascade strategy and the nimble technique are two unique methodologies. Associations consolidate the smartest possible solution to make a cross breed procedure. Research shows that project supervisors in associations creating cross breed approaches should be acquainted with both customary and coordinated methodologies. The venture chief ought to likewise know about the necessities of the task and the upsides and downsides of various methodologies. Since this guarantees a smooth stream with a half and half methodology. They likewise underlined the significance of adaptability in project execution. The blend of the two methodologies emphatically affects the equilibrium, dependability and adaptability of the undertaking and has turned into a reasonable option for some, innovation-based organizations. The undertaking life cycle comprises of five stages: commencement, arranging, execution, checking and conclusion (Salah et al., 2017; Tonnquist, 2012). Interviews show that a few associations use arranging, execution, execution, and end processes. A few associations go through phases of inception, arranging, execution, and end. Every association follows an alternate period of the task. Project administrators who utilize a half breed philosophy to consolidate ventures from cascade and lithe methodologies into one procedure in light of undertaking prerequisites. There are various ways to deal with coordinate test works of art through method of method for consolidating extraordinary degrees. The levels stressed are both cascade or coordinated, yet at this point as of now not each on the equivalent time. Coming up next are a couple of instances of ways they incorporate different degrees while consolidating cascade and coordinated methodologies.

• Waterfall initiation, planning, execution, and closure, in addition to agile implementation

• Initiation, planning, and execution according with the waterfall model, in addition to implementation, execution, and closure according with the agile model

• Initiation, planning, and closure according to waterfall principles, in addition to implementation and execution according to agile principles.The challenge`s performance and achievement are depending on an character who has a radical information of the gear and sports with the intention to make certain that the manner runs smoothly (Kannan and Jhajharia, 2014; Tonnquist, 2012). According to interviews, there's a loss of a unified definition of assets and gear in challenge control in firms. Such agencies appoint adaptable gear that meet their requirements. The interviewees referred to agile central, clever sheet, and challenge area as a number of the gear that those firms use of their levels

Waterfall is used to define project requirements, whereas Agile scrum is used for design, implementation, and termination (Salah et al., 2017). The waterfall method can be used in the testing phase (Salah et al., 2017). Waterfall methodology is used in areas that require strict timeliness, whereas Agile methodology is used in areas where timeline flexibility is provided. Studies show that different

organizations have different levels of flexibility in different areas. As a result, the specific phases of the project lifecycle are not fixed and the phases are waterfall or agile, depending on the needs of the project. As a result, organizational flexibility and understanding of project milestones help align hybrid project management methodologies.

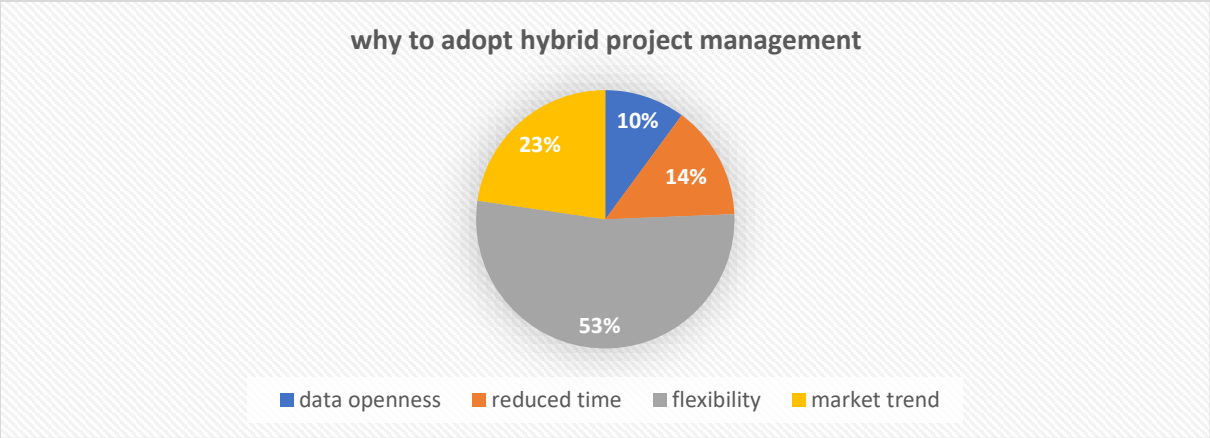

Fig:11 Reasons to adopt hybrid project management

The evaluation additionally indicated that the manner a task control desires to undertake the method according with task necessities differs relying at the task and the manner a task supervisor desires to integrate the waterfall and agile methodologies. Lozo and Jovanovic installed a bendy hybrid approach for dealing with IT projects, such as 4 awesome task existence cycle stages (Salah et al., 2017). The first and fourth ranges of the task existence cycle are constantly performed the use of the waterfall approach, while the second one and 1/3 stages are performed the use of the agilemethod (Salah et al., 2017). Waterfall or agile methodologies may be utilised to put into effect a flexed method (Salah et al., 2017). However, that is depending on the task type (Salah et al., 2017). It is totally depending on the task supervisor`s cap potential to deal with the task with flexibility. This evaluation discovered that due to the fact agile is iterative, it might be extra common to apply agile in place of waterfall in the course of the implementation phase. As a result, this aids in figuring out which stages of a task need to be waterfall or agile for you to put into effect a hybrid project control style.

CONCLUSION

This study examines why and how project managers use hybrid technologies. There are many advantages to using hybrid technology to manage a variety of software projects. This includes the ability for businesses to deliver desired outcomes as outputs, increase success rates, and create value for final users or project owners inside and outside the organization. Other benefits include data clarity, reduced rework, user requirements, flexibility for innovation, and timely results. How this methodology is implemented will be based entirely on the project manager's flexibility to manage the project, taking into account the project requirements, potential benefits, and performance outcomes

that can add value to the organization. This approach gives a solution to the problem of terminology clash that arise when making a hybrid model for the project management. This can help to provide a normal understanding of project management from different methodologies and make it easier for project teams to switch between the two.

RECOMMENDATIONS AND FUTURE WORK

Hybrid strategies are getting more and more famous in high-boom industries which include banking and consulting. Future observe is probably accomplished explicitly at the agile transition and adoption via way of means of authorities' bodies, as this thesis usually specializes in the hybrid strategies taken and tailored via way of means of many kinds of companies. This should cause sufficient observable evidence withinside the lengthy term, permitting professionals to do their new utilization even extra efficiently. Some of the findings on this paper from specialists and senior enterprise leaders nation that better control are hesitant to transport far far from conventional documentations however are possibly to extrude through the years and via way of means of gazing tremendous achievements throughout the hybrid technique, so destiny studies may also search for case research that concentrate on the period of the hybrid technique practised via way of means of the enterprises and in the event that they then pass in the direction of following natural agile. In addition, you can conduct a company survey to analyze the characteristics observed in this survey and identify further strengths and weaknesses. In addition, the identified characteristics of hybrid management can be used in new research to explore the criteria for choosing a project management approach and evolve into a model for choosing the most appropriate project management approach for a particular environment.

REFERENCES

1. Bride, D.J, 2003. Project management concepts, methods, and applications. An international journal of business and production control.
2. Cervone, H.F., 2011. Understanding agile project management methodologies using Scrum. OCLC Systems & Services: Perspective of the International Digital Library.
3. Clark, A., 1999. Practical application of key success factors for improving the effectiveness of project management. International Journal of Project Management, 17 (3), pp.139145.
4. Ahmad, M.O., Dennehy, D., Conboy, K., Oivo, M., 2018. Kanban in software development: systematic mapping research. J.Syst. software 137、96–113。https：//doi.org/10.1016/J.JSS.2017.11.045
5. Archer, S., Kaufman, C., 2013. Accelerate results using a hybrid approach in a waterfall environment.
6. Salah, A., Ramadan, N., Ahmed, H., 2017. Towards a hybrid approach to software project management using ontology alignment. Int. J. Calculation. Appl。 168、12–19。https://doi.org/10.5120/ijca2017914438
7. Badewi, A., 2016. Impact of Project Management (PM) and Profit Management (BM) practices on project success: Towards the development of a project profit governance framework. International J.Proj. manage. 34, 761~778. https://doi.org/10.1016/j.ijproman.2015.05.005

8. Murray, A., 2016. Agility, waterfall, and modern project management keys, complete software project manager. John Wiley & Sons, Inc, Hoboken, NJ, USA, pp.7-16. https://doi.org/10.1002/9781119220015.ch2
9. Salah, A., Ramadan, N., Ahmed, H., 2017. Towards a hybrid approach to software project management using ontology alignment. Int. J. Calculation. AppL 168 12–19 https://doi.org/10.5120/ijca2017914438
10. Wysocki, R.K., 2012. Effective project management: traditional, agile, extreme. Wily.
11. Vijayasarathy, L.R., Butler, C.W., 2016. Software Development Method Choices: Are Organizational, Project, and Team Characteristics Important? IEEE software 33, 86-94. https://doi.org/10.1109/MS.2015.26
12. Mojdeh Rahmanian. (2014). A comparative study of hybrid IT project management using traditional project management and an agile approach. Department of Computer Engineering, Jahrom University, Jahrom, Iran.
13. Dave West and Tom Grant. (2010). Agile Development: Mainstream Adoption Has Changed Agility. For Application Development & Program Management Professionals.
14. Ratnmala Rawal and Haresh Rathod. (2014) Improving Agile Models Using Hybrid Theory for Software Development in Software Engineering. RK University, Rajkot, Gujarat, India.
15. Vishnu Vinekar, Craig W. Slinkman, Sridhar Nerur. (2006). Can agile and traditional systems development approaches coexist? University of Texas at Arlington.
16. R. Hoda, J. Noble and S. Marshall, "Agile Project Management", Conf. New Zealand Computer Science
17. Research Students (NZCSRSC), vol. 6, 2008, page 218221.
18. Fernandez, DJ, & Fernandez, JD (2008). Agile Project Management: Agile or Agile traditional approach. Journal of Computer Information Systems, 49(2), 1017.
19. E. Moster, "Using Hybrid Scrum to Perform Waterfall Process Delivery" [Online]. Available: http://thescholarship.ecu.edu/bitstream/handle/10342/1756/Moster_ecu_0600M_109 34.pdf? sequence = 1.
20. J. Sutherland. (2010, Jul.). Scrum Handbook. ScrumTrainingInstitute[Online].Available:http://www.knowledgehut.com/images/scrumhandbook.pdf
21. Z. Bougroun, A. Zeaaraoui, and T. Bouchentouf, "Projection of CMMI Models to Agile Techniques for Third Level Specific Practices: Scrum, XP, and Kanban," Int. conf. Information Science and Technology (CIST), Tetouan, 2014, S.174179.
22. F. Ruiz und J.R. Hilera Using Ontologies in Software Engineering and Technology Ontologies for Software Engineering and Software Technology Berlin：Springer 2006 S49 102
23. G. Ahmad et al. , "XSR: New Hybrid Software Development Model (Integration of XP, Scrum, RUP)", International Journal of Soft Computing and Engineering (IJSCE), vol. Second edition. March 2014.
24. Rouse, M. (August 2020). Confidentiality, integrity, and availability (CIA triad). Obtained from https://whatis.techtarget.com/definition/ConfidentialityintegrityandavailabilityCIA #: ~: text = Confidentiality, IntegrityandavailabilityCIA #: ~: text = Confidentiality, Integrity and Availability on September 23, 2020, from the Central Intelligence Agency.
25. Smith, H. A., & McKeen, J. D. (2015). Becoming agile. IOC-Easy 2.0, 20 (3). Doi: 10.1002 / 9781119182351
26. Project Management Institute (PMI). (2017). Project Management Knowledge Base Guide (PMBOK® Guide) – 6th Edition. author.
27. Schmitz, K., Mahapatra, R., & Nerur, S. (2019). User engagement in the era of hybrid agile methodology. IEEE Software, 36(4), 32–40.

28. Lappi T, Karvonen T, Lwakatare LE, Aaltonen K, and Kuvaja P (2018). How to better understand agile project management: systematic literature review. Project Management Journal, 49 (6), 39-63.
29. Böhm, B.W. (1984). Verification and validation of software requirements and design specifications. IEEE software, 1 (1),
75-88
30. Abhinav Chandrababu and Anusha Muddangula,Adoption of hybrid methodology in projectsmarch (2019) Ångströmlaboratoriet Lägerhyddsvägen 1House 4, Level 0Postal address:Box 536751 21 Uppsala

31. Dikert, K., Paasivaara, M. , And Lassenius, C. (2016). Large-scale agile transformation challenges and success factors: systematic literature review. Journal of Systems and Software, 119, 87–108.
32. Comfort、E.C. Salum、F. Amaral D.C.da Silva、S.Lde & Almeida、L.F M. (2014). Can Agile Project Management be adopted in industries other than software development? Project Management Journal, 45 (3), 21-34
33. Hobbs, B. & Petit, Y. (2017) Agile method for large projects of large organizations. Project Management Journal, 48 (3), 3-19.
34. https://www.glasscubes.com/agile-vs-waterfall/

APPENDIX

Questionnaire

1. What is the name of your organization?
2. In what sector does your organization operate?
3. How long have been involved with project management?
4. What project management tools and techniques have you used in your years in project management?
5. What methods and software does your organization use when managing projects?
6. Have you heard about hybrid project management?
7. What factors do you think should be considered before implementing hybrid project management
8. How can lean and agile techniques make project management more efficient?
9. Do have any idea how long it would typically take your organisation to adopt techniques such as lean, agile project management or hybrid project management?
10. What do you think would be the main barriers preventing the adoption of hybrid project management?
11. Do you believe hybrid project management and agile project management techniques are business specific or transferable?