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SURVEY ON AGILE METHODOLOGY TO APPROACH TO ENHANCING ADAPTABILITY, COLLABORATION, AND QUALITY

A. Punitha,Research Scholar, Dr MGR Educational and Research Institute,Chennai
punitha26@gmail.com
Prof.Dr.T.Kumanan, Dr MGR Educational and Research Institute,Chennai
Kumanan.cse@drmgrdu.ac.in

ABSTRACT

Agile methodology has become one of the most commonly used approaches in software development over recent years. It has changed the way software and systems are built by focusing on flexibility, teamwork, and continuous improvement rather than rigid planning. Unlike traditional plan-driven models, Agile supports adaptive planning, iterative development, and regular feedback from customers during the development process.

This survey paper presents an overview of Agile methodology and discusses how it helps teams respond to changing requirements, improves collaboration among stakeholders, and enhances software quality. Major Agile frameworks are reviewed, existing research findings are analyzed, and common challenges and limitations are discussed. The paper also highlights possible future research directions. Overall, the study shows that Agile methodology plays an important role in handling the complexity and uncertainty found in modern software development environments.

KEYWORDS: Agile Methodology, Software Development, Adaptability, Collaboration, Software Quality, Scrum, Kanban, XP

1. INTRODUCTION

With rapid technological advancements and increasing competition, organizations are expected to deliver reliable software products in shorter timeframes while still meeting changing customer expectations. Traditional software development models, such as the Waterfall approach, often struggle in situations where requirements evolve frequently or are not clearly defined at the beginning of a project.

Arturs and Bērziša [1] carried out an empirical case study in an IT organization using sociometric surveys, motivation data, and project performance indicators such as task completion, defects, risks, and meeting patterns. Their study aimed to adapt Agile project management practices based on team-specific characteristics. The results showed noticeable improvements, including better communication, stronger team cohesion, improved risk handling, and increased motivation. One significant outcome was a reduction in software bugs from nearly 50% to about 26%.

Similarly, Prasada Rao [2] examined the role of Agile methodologies in managing changing requirements and improving collaboration using qualitative methods such as literature review and case study analysis. The study reported better adaptability, improved communication, faster delivery cycles,

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and increased productivity through the use of frameworks like Scrum and Kanban. However, challenges related to scaling Agile, organizational culture, and limited quantitative validation were also identified.

2.LITERATURE SURVEY

Samer and Hiba [3] conducted a systematic literature review based on 32 research papers published between 2011 and 2018. Their work examined Agile values, principles, and commonly used models such as Scrum, XP, and Test-Driven Development. The review indicated that Agile methods generally provide better adaptability, lower development costs, improved collaboration, and faster delivery when compared to traditional approaches. At the same time, the study pointed out that most conclusions were based on existing research rather than experimental validation.

Buresh [4] used quantitative survey data from 185 participants involved in both Agile-driven and plan-driven projects to study customer satisfaction. Statistical analysis showed no significant difference in satisfaction levels between the two approaches, suggesting that project context plays a key role in determining which methodology is more suitable.

Kim Maria Casper [5] focused on large-scale Agile transformations through a systematic literature review. The study identified several challenges and success factors, highlighting the importance of management support, training, coaching, and alignment of organizational mindset. The author suggested that long-term empirical studies would help in better understanding large-scale Agile adoption.

Tony et al. [6] adopted a mixed-method approach combining data analysis, surveys, interviews, and case studies to evaluate Agile transformation outcomes in U.S. organizations. The findings showed improvements in productivity, reduced defects, faster delivery cycles, and better customer satisfaction.

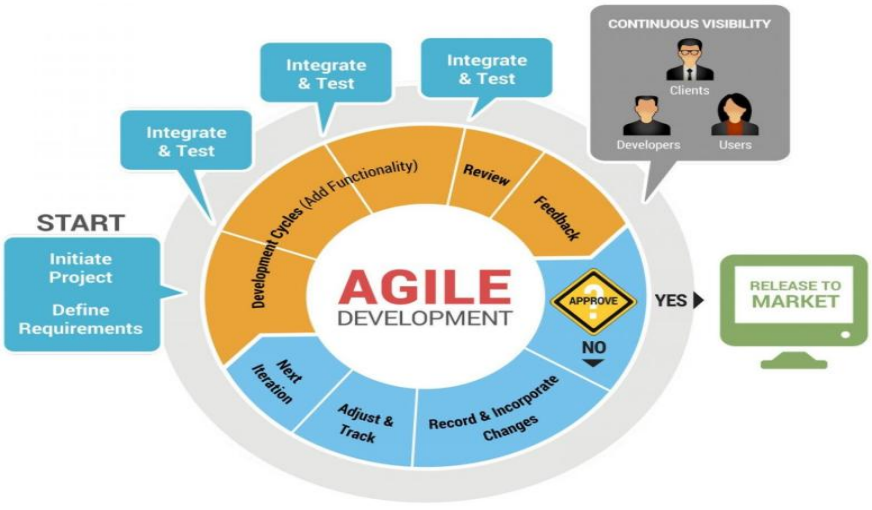

Figure 1:Integrate Design Systems with Agile Development

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3. INDUSTRIES THAT USE AGILE THE MOST

Agile methodology is most widely used in the software and technology sector, where companies rely on it to remain competitive and responsive to change. Industries such as finance and healthcare have also adopted Agile practices to better manage compliance requirements and improve service delivery.

Prisca et al. [7] analyzed the use of Agile frameworks in product management by combining literature review, case studies, expert insights, and empirical data. Their findings showed improved adaptability, faster time-to-market, and higher customer satisfaction due to continuous feedback. The study also observed that Agile practices are increasingly being applied in non-software areas such as human resources and marketing.

Ajibola [8] examined the broader impact of Agile practices on modern business operations using secondary data sources. The study concluded that Agile improves business flexibility, reduces delivery time, and supports a culture of continuous improvement. However, the lack of industry-specific empirical studies was identified as a limitation. Retail, telecommunications, and education sectors have also reported benefits from Agile, particularly in improving stakeholder involvement and faster value delivery.

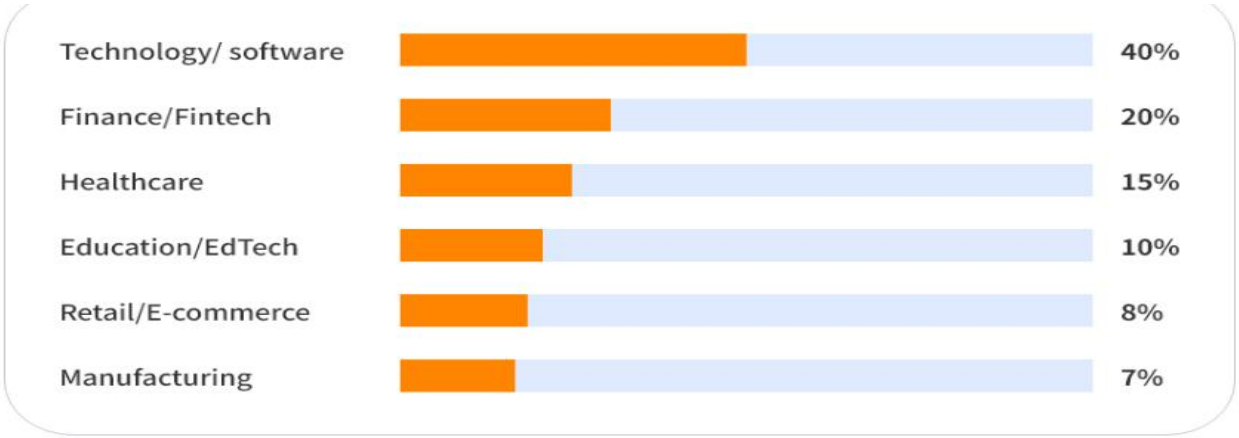

Figure 2: Industries used Agile

4. POPULAR AGILE FRAMEWORKS AND DEVELOPMENT TECHNIQUES:

Several Agile frameworks have been developed to implement Agile principles effectively:

Arun and Tejaswini [9]An experimental research study involved implementing an Agile framework and collecting data on key performance metrics to evaluate improvements in software development efficiency and quality. The results indicated increased productivity, reduced development time, and improved software quality. The primary limitations identified were a limited sample size, dependency on existing team skill levels, and the potential for variable results across different organizations. The integration of AI-based tools into the agile workflow, extending the methodology to other business domains, and the application of these findings to large-scale projects should be the primary areas of focus for subsequent research.

Eman A.Altameem [10]this study compared Agile practices like Scrum and XP Kanban and looked at how they affected software development quality, efficiency, and cost. Improvements in software quality, adaptability to shifting requirements, team motivation, and collaboration were all found through the analysis. High management overhead, a lack of formal documentation, and difficulties scaling to complex projects within hierarchical organizations were among the study's significant limitations. Quantitative empirical studies, the creation of hybrid

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Agile–traditional models, and the investigation of AI-supported management tools for widespread adoption are all potential future research avenues.

Scrum

Scrum is the most widely used Agile framework. It involves fixed-length sprints, defined roles (Product Owner, Scrum Master, Development Team), and ceremonies such as sprint planning, daily stand-ups, sprint reviews, and retrospectives. Scrum improves transparency, accountability, and team coordination.

Kanban

Kanban focuses on visualizing workflow and limiting work in progress. It enhances efficiency by identifying bottlenecks and improving flow without fixed iterations.

Extreme Programming (XP)

XP emphasizes technical excellence through practices such as pair programming, test-driven development, continuous integration, and frequent releases.

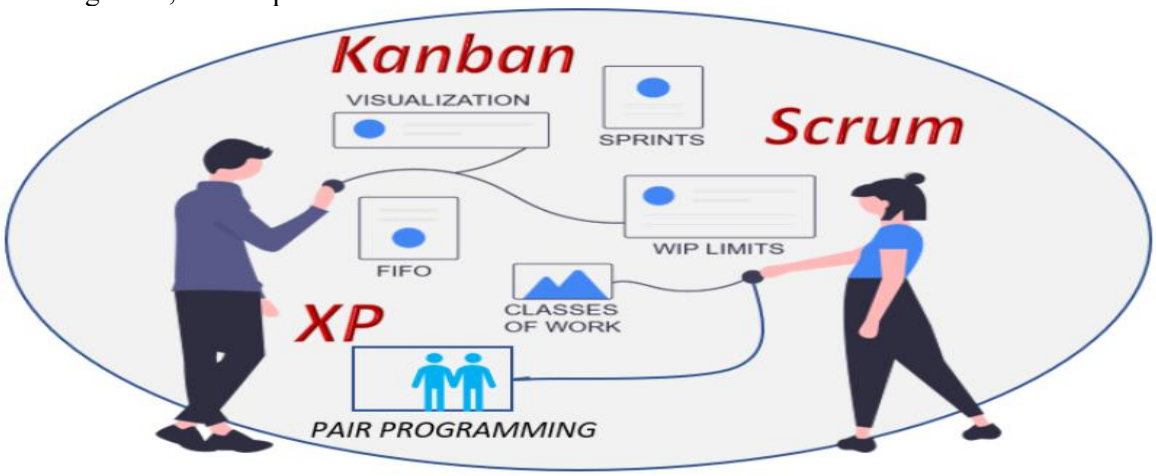

Figure 3: Popular Agile Frameworks

4. POPULAR AGILE FRAMEWORKS AND DEVELOPMENT TECHNIQUES

Several Agile frameworks have been developed to apply Agile principles in real-world projects.

Arun and Tejaswini [9] conducted an experimental study that implemented an Agile framework and measured its impact on productivity and software quality. The results showed improved efficiency and reduced development time, although the study was limited by sample size and team skill variation.

Altameem [10] compared Agile practices such as Scrum, XP, and Kanban to evaluate their influence on quality, efficiency, and cost. The study reported better adaptability, improved collaboration, and higher team motivation. However, challenges related to documentation, management overhead, and scalability were also noted.

Scrum

Scrum is one of the most commonly used Agile frameworks. It is based on short development cycles called sprints, defined team roles, and regular meetings such as daily stand-ups and sprint reviews. Scrum helps improve transparency and coordination within teams.

Kanban

Kanban focuses on visualizing work processes and limiting work in progress to improve workflow efficiency. It allows teams to identify bottlenecks and continuously refine their processes.

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Extreme Programming (XP)
XP emphasizes technical practices such as pair programming, test-driven development, continuous integration, and frequent software releases to improve code quality.

5. ADAPTABILITY, COLLABORATION, AND QUALITY IN AGILE

Collaboration is a key element of Agile methodology. Agile teams typically consist of members from different functional areas who work closely together and communicate regularly. Practices such as daily stand-ups, customer involvement, and shared responsibility help build trust and improve decision-making. Studies suggest that smaller Agile teams often perform better due to clearer communication and coordination.

Okolie et al. [11] examined Agile practices in product development and cross-functional collaboration. Their findings showed improved responsiveness and efficiency, although cultural resistance was identified as a common challenge.

Adaptability is another major strength of Agile. Through iterative development, flexible planning, and continuous customer feedback, Agile teams are able to respond to changes even at later stages of development. Priyanka [12] noted that this flexibility reduces rework and improves customer satisfaction, making Agile suitable for startups and innovation-driven projects.

Bandaru [13] studied the impact of team size on Agile productivity and found that smaller teams achieved better communication, timely delivery, and reduced defect rates. Continuous testing, regular reviews, and early defect detection contribute to improved software quality throughout the development process.

6. CONCLUSION

This survey paper shows that Agile methodology is an effective approach for improving adaptability, collaboration, and software quality in modern development environments. Its iterative nature and focus on teamwork allow organizations to better manage uncertainty and frequent change. Although challenges related to scalability and organizational culture remain, ongoing improvements and hybrid approaches continue to address these issues. Overall, Agile methodology remains an important factor in shaping the future of software development and organizational agility.

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7. REFERENCES

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