COMPARATIVE ANALYSIS OF CLASSICAL AND AGILITY PROJECT MANAGEMENT METHODOLOGIES

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Abstract: Our article provides a comparative analysis of classic and agile project management methodologies. We examine the key principles, features, advantages, and disadvantages of each methodology. Particular attention is paid to practical aspects of application, including choosing the appropriate methodology based on the nature of the project, the stability of requirements, and the characteristics of the team.

Keywords: project management, Waterfall methodology, Agile, Scrum, Kanban, hybrid approaches, project team, project effectiveness, adaptation to change.

Аннотация: Наша статья посвящена сравнительному анализу классических и гибких методологий управления проектами. Мы рассматриваем основные принципы, особенности, преимущества и недостатки каждой методологии. Особое внимание уделено практическим аспектам применения, включая выбор подходящей методологии в зависимости от характера проекта, стабильности требований и особенностей команды.

Ключевые слова: управление проектами, методология Waterfall, Agile, Scrum, Kanban, гибридные подходы, проектная команда, эффективность проектов, адаптация к изменениям.

Introduction. In today's rapidly evolving economic and technological landscape, successful project implementation has become a key factor in organizational competitiveness. Effective project management helps mitigate risks, optimize resource utilization, and ensure that goals are achieved on time and with the required quality. The choice of project management methodology directly impacts project effectiveness.

Traditional classical approaches, such as Waterfall[1], are characterized by a strict sequence of stages, detailed planning, and fixed deadlines, making them effective for projects with clearly defined requirements. Meanwhile, flexible methodologies, including Agile, Scrum, and Kanban[2] focus on adapting to change, iterative

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[1] https://mihirpopat.medium.com/the-waterfall-model-in-software-development-a-classic-approach-to-structured-project-management-bebc579d6f66

[2] https://habr.com/ru/companies/kaiten/articles/906006/

development, and active engagement with the customer, which is especially important in a dynamic marketplace with unstable requirements.

The relevance of this study stems from the need to understand the strengths and weaknesses of both methodologies, as well as the potential for hybrid approaches to improve project management effectiveness. The purpose of this article is to conduct a comparative analysis of classical and agile methodologies, identify their advantages and disadvantages, and determine the conditions for optimal application in various types of projects.

The main part. Classic project management methodologies, such as Waterfall, are characterized by a strict sequence of stages: planning, design, implementation, testing, and deployment. Each stage is fully completed before moving on to the next, ensuring a clear structure, detailed documentation, and time and budget control[3]. This approach is effective for projects with minimal change and clearly defined requirements, such as in construction or the production of complex equipment[4]. The main advantage of Waterfall is the ability to accurately forecast resources and schedules; however, implementing changes late in the project is extremely difficult, increasing the risk of the final product not meeting customer expectations[5]. Unlike classical approaches, flexible methodologies, including Agile, Scrum, and Kanban, focus on adapting to change, iterative development, and active engagement with the customer. The project is broken down into short iterations (sprints), during which results are regularly demonstrated and tasks are adjusted. This approach ensures high team engagement, increases the speed of error detection, and enables timely response to changing requirements. Agile's flexibility allows organizations to quickly adapt to dynamic market conditions and increases the likelihood of successful project completion, particularly in IT, startups, and innovative industries. However, the methodology requires highly skilled and disciplined teams and makes accurate budget and timeline forecasting difficult.

The choice of an appropriate methodology depends on the nature of the project, the stability of the requirements, and the organization's goals. For projects with fixed and well-known requirements, Waterfall is preferable, where precise deadlines, budgets, and comprehensive documentation are essential. For projects with a high level of uncertainty and the need for rapid response to changes, Agile is more effective, where iterative development and constant customer feedback enable timely adjustments to the work. In today's environment, hybrid approaches that combine elements of classical and agile methodologies are becoming increasingly popular:

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[3] Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 7th Edition, 2021.

[4] Royce, W. W. "Managing the Development of Large Software Systems," Proceedings of IEEE WESCON, 1970.

[5] Sommerville, I. *Software Engineering*, 10th Edition, Pearson, 2015.

major stages are planned using Waterfall, while individual work units are executed using Agile, which ensures a balance between structure and flexibility. The use of such approaches optimizes resource utilization, minimizes risks, and increases the likelihood of achieving project goals on time and with high quality[6].

In practice, many organizations use hybrid approaches, combining the advantages of both methodologies: strategic planning and key project milestones are based on the classical model, while iterative development and results verification are carried out using the agile model. This approach allows to minimize risks, use resources efficiently and increases the likelihood of successful completion of the project.

Conclusion and suggestions. An analysis of classical and agile project management methodologies revealed that each has its own advantages and limitations. Classic methodologies, such as Waterfall, provide a strict sequence of stages, predictable deadlines and budgets, and highly structured processes, making them optimal for projects with clearly defined requirements and a low probability of change. At the same time, agile methodologies, including Agile, Scrum, and Kanban, are characterized by high adaptability, iterative development, and constant customer engagement, which is particularly relevant for projects in dynamic markets, unstable requirements, and innovative environments. Based on the analysis, it can be concluded that the optimal choice of methodology depends on the nature of the project, the stability of requirements, the team's skill level, and the organization's goals. In today's environment, hybrid approaches combining elements of classical and agile methodologies are becoming increasingly popular. They allow you to utilize the structured nature of Waterfall for large stages while simultaneously applying the flexibility of Agile to quickly respond to changes, minimizing risks, increasing resource efficiency, and improving the quality of the final product.

As a result of our research on this topic, we offer the following suggestions:

❖ For projects with fixed requirements and stable conditions, it is recommended to use a classical methodology, ensuring strict timeline and budget control.

❖ For projects with a high degree of uncertainty and frequent requirements changes, it is advisable to use agile methodologies focused on iterative development and active customer involvement.

❖ Consider implementing hybrid approaches, combining Waterfall and Agile, to maximize the benefits of both methodologies.

❖ Provide training and professional development for project teams to successfully implement agile and hybrid methodologies.

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[6] Conforto, E. C. et al. "Agile Project Management and Stage-Gate Hybrid Models in Product Development," Journal of Engineering and Technology Management, 2016.

❖ Regularly evaluate the effectiveness of the chosen methodology and adjust its use based on the specific needs of the specific project.

Thus, understanding the strengths and weaknesses of classical and flexible approaches, as well as the correct choice or combination of methodologies, allows organizations to improve the effectiveness of project management and achieve successful completion of projects with minimal risks.

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