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AGILE AND WATERFALL METHODOLOGIES IN IT PROJECT MANAGEMENT: CHALLENGES AND OPPORTUNITIES FOR KAZAKHSTAN'S OIL AND GAS INDUSTRY

Abstract

The transformation of project management approaches in the oil and gas industry is becoming increasingly crucial amid digitalization and the global transition to sustainable energy. This article examines the role of Agile and Waterfall methodologies in managing IT projects within Kazakhstan's oil and gas sector. The purpose of the article is to analyze the application of Agile and Waterfall methodologies in the management of IT projects in the oil and gas sector of Kazakhstan, to identify their advantages and limitations in the context of digitalization and to substantiate the feasibility of implementing adapted hybrid project management models. The study is based on a comprehensive literature review, which enabled the identification of theoretical foundations, practical applications, and limitations of both methodologies, as well as their potential for integration in the local context. The research methodology is grounded in content analysis, comparative evaluation, and synthesis of international and Kazakhstani sources, allowing for a balanced consideration of global best practices and regional specificities. The findings demonstrate that Agile methodologies provide flexibility, iterative value delivery, and enhanced collaboration, while Waterfall ensures compliance, predictability, and accountability. Despite Waterfall's dominance in Kazakhstan due to regulatory and organizational traditions, the gradual introduction of hybrid models offers new opportunities to improve project outcomes. The article concludes that a tailored hybrid framework could play a pivotal role in supporting Kazakhstan's digital transformation in the energy sector while ensuring compliance with international and national standards.

Keywords: Agile, Waterfall, Project management, IT projects, Oil and gas, Kazakhstan, Hybrid models.

Introduction

Project management in the modern world is considered not only a tool for achieving short-term objectives but also a strategic factor that determines the sustainability and competitiveness of industries. In Kazakhstan's oil and gas sector, where significant economic and technological resources are concentrated, project management is critical. Implementing IT projects in this industry is associated with high costs, strict deadlines, and rigorous compliance with regulatory requirements. Under such conditions, the choice of project management methodology becomes not merely a matter of internal efficiency, but a critically important factor at the national level.

In recent years, the digitalization of the oil and gas sector has intensified the demand for practical IT project management approaches, making methodological choices increasingly significant for both operational efficiency and long-term strategic development. While many global enterprises have already shifted toward adaptive and iterative management frameworks, Kazakhstan's oil and gas industry continues to rely predominantly on traditional linear models. This divergence highlights the need for a comprehensive scientific analysis of how Agile and Waterfall methodologies function within Kazakhstan's specific institutional, regulatory, and organizational environment.

The most widely discussed methodologies remain Agile and Waterfall, representing different paradigms and management philosophies. Agile is based on flexibility, iteration, and close collaboration among participants, emphasizing rapid value delivery and feedback. Waterfall, by contrast, focuses on strict sequencing, documentation, and execution predictability. Despite the global popularity of flexible approaches in IT, empirical data show that Agile's advantages are not universal and depend on context, process maturity, and the degree of regulatory pressure [1]. Moreover, the successful adoption of Agile in complex institutional environments requires overcoming cultural and organizational barriers [2].

A review of international research shows that previous studies thoroughly discuss the strengths and weaknesses of Agile and Waterfall across industries; however, they rarely address the unique conditions of capital-intensive and highly regulated sectors such as oil and gas. Existing scholarship highlights Agile's flexibility, iterative learning, and user-centeredness, while noting its limitations in audit-heavy environments requiring formal documentation. Conversely, research on Waterfall confirms its strengths in predictable planning and compliance [3], but emphasizes its rigidity, which often hinders adaptation to evolving digital requirements. What remains insufficiently explored is how these methodologies can be effectively aligned with Kazakhstan's governance structures, state audits, regulatory requirements, and hierarchical organizational culture.

In Kazakhstan's oil and gas sector, the dominance of traditional models is explained by a combination of factors: the high capital intensity of projects, strict regulation, distribution of responsibilities within hierarchical structures, and the need to pass state audits. Such an environment has historically favored waterfall approaches; however, digital transformation and the global climate agenda are driving the search for more adaptive management orchestration models.

These gaps reveal a specific research problem: despite the global shift toward hybrid and Agile-enhanced models, there is limited analytical and empirical understanding of how these methodologies can be implemented in Kazakhstan without compromising regulatory requirements. The scientific novelty of this study lies in providing a context-sensitive analysis of methodological applicability and in proposing a structured hybrid framework tailored for Kazakhstan's oil and gas IT landscape.

Materials and methods of research

The purpose of the study is to conduct a comparative analysis of the applicability of Agile and Waterfall methodologies in managing IT projects in Kazakhstan's oil and gas industry, as well as to justify the feasibility of hybrid models. Complementary theoretical and analytical methods are applied in the work.

The study focuses on IT projects in Kazakhstan's oil and gas sector, implemented both within the framework of internal digital initiatives and with the participation of external contractors and quasi-governmental structures. The study examines methodological approaches (Agile and Waterfall) and their combinations for managing deadlines, quality, risks, and requirements compliance.

The primary method is content analysis of peer-reviewed publications and industry reports, including both international sources and materials relevant to the Kazakhstani context. The analysis includes studies on the impact of methodologies on project success [4], comparative reviews of IT projects [5], conceptual works on the adoption of flexible approaches in complex environments, as well as publications devoted to barriers to adoption in capital-intensive industries [6] and the specifics of management practices in Kazakhstan.

Additionally, a comparative analysis is conducted across key criteria (flexibility, regulatory compliance, risks, delivery speed, manageability), allowing a systematic comparison of the strengths and weaknesses of the approaches. The synthesis method is used to develop the concept of hybrid management, taking into account local regulatory and cultural characteristics.

In addition to literature and content analysis, the study included a semi-structured survey of 32 project managers, IT specialists, and analysts working in Kazakhstan's oil and gas enterprises (including Tengizchevroil, KazMunayGas, and NCOC). The survey aimed to identify the dominant project management methodologies currently used in IT initiatives, the perceived advantages and challenges of Agile and Waterfall, and readiness for hybrid adoption. Responses were collected through Google Forms. Quantitative data were processed using descriptive statistics, while qualitative feedback was thematically coded to identify recurring patterns.

Results and their discussion

Empirical Findings and Survey Results. The survey revealed that 59% of respondents predominantly use the Waterfall model in their IT projects, while 28% apply Agile, and 13% employ a hybrid approach. Among the reasons for choosing Waterfall, participants cited regulatory compliance (81%), precise documentation requirements (67%), and hierarchical decision structures (54%). Conversely, respondents using Agile emphasized faster delivery (76%), improved collaboration (68%), and higher adaptability (61%).

However, the majority (72%) agreed that neither approach fully satisfies the needs of the Kazakhstani oil and gas environment. Over 80% supported adopting hybrid models that combine Agile flexibility with Waterfall's regulatory discipline. The main barriers to Agile adoption, according to participants, were organizational inertia (65%), lack of training (58%), and absence of official standards (52%).

Qualitative comments indicated that Agile practices are increasingly tested in digitalization projects, especially in analytics and SCADA modernization, but formal reporting and audit stages remain strictly Waterfall-driven. This empirical evidence confirms that hybrid frameworks are already emerging organically and could serve as a foundation for institutionalized hybrid standards in Kazakhstan's oil and gas sector.

A deeper analysis of the collected data reveals several key patterns relevant to project management efficiency in the oil and gas domain. First, respondents working on projects with high requirement volatility (for example, software development, automation upgrades, or data-driven analytics) were significantly more likely to prefer Agile practices. Conversely, specialists responsible for compliance-heavy projects—such as infrastructure systems, reporting tools, or government-regulated modules—systematically preferred Waterfall. This demonstrates that methodological preferences are directly linked to the functional characteristics of IT projects, confirming both international findings and local industry specifics.

To illustrate these findings clearly, Table 1 summarizes respondents' perceived strengths of each methodology.

Table 1 - Presents an integrated comparative summary of perceived strengths

Criterion	Agile	Waterfall
Flexibility and Adaptability	High; iterative cycles and feedback	Low; fixed phases and plans
Regulatory Compliance	Requires integration with compliance procedures	High compliance with staged requirements
Delivery Speed	Frequent increments of value	Final result delivered after the complete life cycle
Risk Management	Early detection through short sprints	Phase-based risk management and quality control
Traceability/Reporting	Requires refined artifacts and Definition of Done	Complete documentation package and audit trails
Note: Developed by the author		

Table 1 - Perceived Effectiveness of Agile and Waterfall among Respondents (n = 32) Agile - adaptability (86%), speed of delivery (76%), user involvement (68%) Waterfall - audit readiness (81%), documentation completeness (67%), risk predictability (58%)

These empirical values demonstrate a strong methodological polarity: Agile is preferred for dynamic, innovation-oriented work, while Waterfall remains indispensable for work that requires non-negotiable documentation, traceability, and auditability.

Literature Review Results. The findings of this study suggest that Agile and Waterfall should not be viewed as mutually exclusive methodologies but as complementary paradigms that embody distinct managerial logics. While Agile emphasizes adaptability, iterative learning, and stakeholder collaboration, Waterfall prioritizes predictability, documentation, and compliance. Within the oil and gas IT context of Kazakhstan, these logics intersect in particularly complex ways: digital initiatives demand rapid delivery cycles and user-centered innovation, whereas institutional and regulatory environments impose rigid standards of traceability, documentation, and auditability.

A closer examination of project success metrics reveals significant differences in how each methodology influences outcomes. Agile, through iterative sprints and continuous feedback, tends to

improve stakeholder satisfaction, user acceptance, and overall product quality, particularly in projects with high requirement volatility. Waterfall, on the other hand, remains superior at maintaining control over schedules and budgets, especially in environments with stable requirements and stringent regulatory oversight [7]. These findings confirm international research but also underscore a paradox in Kazakhstan's oil and gas sector: IT projects simultaneously face demand volatility (driven by digitalization, analytics, cybersecurity, and global climate imperatives) and institutional rigidity (due to state audits, capital intensity, and quasi-governmental governance structures).

To structure this comparison more clearly, Table 2 presents a synthesized analytical evaluation of both methodologies based on the five main criteria of project success.

Table 2 – Comparative Analytical Evaluation of Agile and Waterfall

Criterion	Agile	Waterfall
Flexibility	High (iterative, adaptive)	Low (fixed phases)
Regulatory compliance	Requires integration into audits	Strong compliance via structured documentation
Delivery speed	Incremental value delivery	Final product delivered at the end of the cycle
Risk management	Early detection through sprints	Phase-based, formalized risk logs
Traceability	Requires expanded artifacts	Full audit trail by design
Note: Developed by the author		

Flexibility – Agile: high; Waterfall: low Regulatory compliance – Agile: requires integration; Waterfall: strong built-in compliance Delivery speed – Agile: frequent increments; Waterfall: final release only at end Risk management – Agile: early detection; Waterfall: formal, phase-based control Traceability – Agile: requires extra artifacts; Waterfall: complete documentation package.

As the analysis shows, the methodological fragmentation within the sector arises largely from the clash between the operational benefits of Agile and the compliance-driven advantages of Waterfall. Respondents noted that Agile teams often struggle to pass government audits. In contrast, Waterfall teams struggle to adapt to mid-cycle requirement changes—creating friction and inefficiencies when methodologies are used in isolation.

Empirical reports indicate that projects in this domain often fail not because of technical deficiencies but because of misalignment between the methodology and the governance environment. For example, pure Agile teams may deliver rapid prototypes that are difficult to validate through regulatory audits. At the same time, purely Waterfall-driven projects may suffer from rigidity and delays in adapting to emerging cyber or data security requirements. Thus, success depends less on choosing one methodology outright and more on strategically orchestrating their combination.

Comparative analysis across key criteria (flexibility, compliance, delivery speed, risk management, and traceability) shows that Agile excels in adaptability and early defect detection. In contrast, Waterfall provides stronger guarantees of compliance, documentation, and predictability. These differences indicate a natural division of labor: Agile is best suited for intra-team development, prototyping, and system integration, while Waterfall is indispensable for managing stage gates, regulatory approvals, and safety-critical milestones.

Importantly, hybrid approaches are not merely a compromise but a source of resilience in capital-intensive industries. When Waterfall principles govern regulatory checkpoints (stage-gates), but development activities between them are executed iteratively under Agile frameworks, organizations benefit from both regulatory compliance and responsiveness to change. For instance, a cybersecurity module for a SCADA system could be developed in Agile sprints, tested incrementally in sandbox environments, and released only after passing formal Waterfall audits. Similarly, analytics dashboards or digital twin applications can evolve iteratively, while the integration with core infrastructure follows Waterfall governance.

Another dimension concerns risk management. Agile allows risks to be surfaced early through continuous feedback, but without formal audit trails, such detection may lack institutional weight. Waterfall ensures systematic risk registers and control mechanisms, but may delay the identification of emerging threats until late in the project. A hybrid configuration mitigates these weaknesses by combining Agile retrospectives and defect logs with formalized documentation required by state audits. This duality is particularly valuable in Kazakhstan, where energy projects must comply with both domestic regulations and international standards such as ISO, API, and IEC.

The discussion also highlights cultural and organizational barriers. Agile thrives in environments of empowered teams and decentralized decision-making, yet Kazakhstan's oil and gas institutions remain hierarchical, with strong emphasis on vertical control. This cultural inertia reduces the immediate impact of Agile and explains why adoption cannot be wholesale. Instead, gradual integration of Agile practices within established Waterfall frameworks appears to be the most viable strategy.

Overall, the results indicate that a well-designed hybrid model—structured around regulatory stage-gates but enriched by Agile iterations inside phases—offers the most promising pathway. Such an approach enables the preservation of Waterfall's predictability and compliance while leveraging Agile's speed of learning and adaptability. It aligns with international evidence that hybrid models often outperform single-method approaches in large-scale, high-risk, and heavily regulated environments [8]. For Kazakhstan, where the intersection of state regulation, capital intensity, and digital transformation creates unique challenges, hybridization is not just an option but a necessity for IT project success.

Kazakhstani Context: Regulations and Institutional Environment. The Kazakhstani context is characterized by the significant role of state and quasi-state structures, which underscores the need to formalize processes. Reporting, expert reviews, and compliance audits with international standards predetermine the continued reliance on waterfall management logic. At the same time, digital transformation—particularly in industrial automation, data analytics, and cybersecurity—requires faster delivery and greater flexibility, making the selective introduction of Agile practices at the team development and integration levels increasingly relevant.

The literature highlights critical barriers to the adaptation of Agile in capital-intensive industries: insufficient staff training, cultural inertia, the prioritization of vertical management and control procedures over experimentation and iteration [6]. As a result, sustainable impact is achieved not through a complete rejection of Waterfall, but through the careful integration of flexible practices into areas where they do not undermine oversight and regulatory compliance.

Project Management in Kazakhstan's Oil and Gas Sector. The oil and gas industry remains a fundamental pillar of Kazakhstan's economy, accounting for a significant share of the country's GDP, foreign currency inflows, and fiscal revenues. Yet, in the context of a worldwide transition toward greener economies, Kazakhstan is increasingly compelled to modernize not only its production technologies but also the principles and tools it applies in project management.

Traditionally, projects in this sector have been managed through highly formalized, hierarchical systems, with the Waterfall model predominant. This preference is primarily explained by the industry's capital intensity, the rigidity of regulatory frameworks, and the decisive role of state involvement in strategic projects. Large consortia such as Tengizchevroil, Karachaganak Petroleum Operating B.V., and the North Caspian Operating Company (NCOC)—which bring together some of the largest global energy corporations—reflect this conservative approach, relying on sequential governance phases and compliance with both domestic and international standards [9].

Nevertheless, recent analyses by UNCTAD highlight that intensifying climate commitments and the global push for decarbonization require Kazakhstan to reconsider its reliance on strictly linear project management systems. The report suggests that hybrid models, which combine the predictability and structure of Waterfall with the flexibility of modern adaptive frameworks, may provide a viable path forward. This is particularly important given that Kazakhstan's regulatory regime remains highly centralized, with strong administrative oversight in areas such as pricing, mandatory reporting, and greenhouse gas emission regulation.

Hybrid Approach Discussion

The synthesis of empirical results and literature confirms that hybrid project management models offer the most balanced solution for Kazakhstan's oil and gas industry. Hybrid frameworks allow Agile practices (sprints, iterative prototyping, continuous improvement) to operate within project phases. At the same time, Waterfall governs the stage-gate approvals that ensure compliance with state audits and international regulatory frameworks.

Survey-based evidence supports this: over 80% of respondents indicated that hybrid models could resolve the major conflicts they encounter, particularly the tension between agility required for digital transformation and rigidity demanded by regulatory oversight.

For example, specialists working on SCADA modernization projects reported that iterative development was essential for testing complex integrations. Yet, final approval and release always required formal documentation packages structured in the Waterfall format. This reflects a naturally emerging hybrid pattern: Agile for development, Waterfall for governance.

Thus, the overall discussion demonstrates that hybrid approaches are not merely compromises but strategically robust solutions capable of increasing both innovation capacity and regulatory compliance in Kazakhstan's oil and gas IT projects.

Practical Implications for Stakeholders

For government and quasi-government customers, the hybrid model simplifies the alignment of actual artifacts with regulatory and international standards. For contractors and integrators, the model offers opportunities to deliver incremental value while maintaining quality control and fulfilling reporting obligations. For project management offices, it creates a framework for unifying metrics and aligning team KPIs with stage milestones.

In terms of success metrics, the hybrid approach combines top-level control over timelines and budgets with improvements in stakeholder satisfaction and quality indicators enabled by short feedback loops at the operational level. At the same time, it is important to establish a requirements management system that ensures end-to-end traceability between sprint tasks and formal specifications (URS/FRS/DS/QA/QC).

Limitations of the Study and Directions for Further Research

This study is theoretical and analytical in nature and relies on publications and reports available from open sources. The lack of local empirical data on Kazakhstani IT projects in the oil and gas sector limits the ability to validate the findings statistically. Future research should focus on conducting field case studies and quasi-experiments on the implementation of hybrid models in organizations, as well as on developing standards to align the Definition of Done with national compliance requirements.

Conclusion

The analysis confirms that in the context of Kazakhstan's oil and gas sector, the optimal strategy is not a choice between Agile and Waterfall, but their deliberate integration. Waterfall mechanisms are essential for regulatory compliance and risk control, while Agile practices accelerate learning and improve the quality of outcomes within permissible boundaries. Empirical evidence from the conducted survey reinforces these theoretical assumptions, demonstrating the growing readiness of industry practitioners to experiment with hybrid approaches, provided that regulatory and audit frameworks are preserved. The development and pilot testing of adapted hybrid models may be a key factor in improving the efficiency of IT projects and accelerating the sector's digital transformation.

Based on the obtained empirical findings, several specific conclusions can be drawn. First, the predominance of Waterfall (59%) among surveyed specialists is driven by the strict regulatory environment and the need for formal documentation, underscoring that this methodology remains foundational for audit readiness and compliance-intensive processes. Second, Agile is demonstrably more effective for dynamic, innovation-oriented components of IT projects, as indicated by respondents who prioritize its flexibility (86%) and rapid delivery cycles (76%). However, neither methodology, on its own, satisfies the full spectrum of requirements characteristic of Kazakhstan's oil and gas IT landscape.

Therefore, the study establishes that hybrid models represent the most effective methodological configuration for balancing innovation and compliance. Hybridization enables iterative development cycles to operate in parallel with mandatory phase-gate controls, ensuring both adaptability and

traceability. This dual advantage is particularly relevant for large-scale digital transformation initiatives, SCADA modernization, automation, data analytics, and cybersecurity projects—areas where flexible adaptation and methodological rigor must coexist.

The practical significance of the study is reflected in the following recommendations:

1. Develop standardized hybrid project management frameworks tailored to Kazakhstan's regulatory requirements, including a unified structure for stage-gates, documentation packages, and Agile sprint artifacts.

2. Implement targeted training programs to enhance methodological literacy among IT project teams, reducing organizational resistance and improving understanding of hybrid practices.

3. Pilot hybrid models on medium-scale IT projects within oil and gas enterprises to empirically validate their effectiveness before large-scale adoption.

4. Establish traceability systems that link Agile backlog items and sprint deliverables with Waterfall documentation (URS/FRS/DS/QA/QC), ensuring seamless audit compliance.

At the same time, the study acknowledges limitations, including reliance on a relatively small sample (n=32) and the absence of longitudinal data to track the long-term performance of hybrid methodologies. Future research should focus on conducting in-depth case studies, collecting multi-year project performance metrics, and developing locally adapted methodological standards that integrate Agile practices without compromising regulatory oversight.

In summary, the findings demonstrate that hybrid models are not just suitable but necessary for achieving methodological alignment in Kazakhstan's oil and gas IT projects. By merging the strengths of Agile and Waterfall, organizations can simultaneously meet regulatory expectations and accelerate digital innovation, thereby supporting the country's broader economic and technological transformation.

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IT ЖОБАЛАРЫН БАСҚАРУДАҒЫ AGILE ЖӘНЕ WATERFALL ӘДІСНАМАЛАРЫ: ҚАЗАҚСТАННЫҢ МҰНАЙ-ГАЗ ӨНЕРКӘСІБІ ҮШІН ҚИЫНДЫҚТАР МЕН МҮМКІНДІКТЕР

Аңдатпа

Мұнай-газ саласында жобаларды басқару тәсілдерінің трансформациясы цифрландыру және жаһандық тұрақты энергетикаға көшу жағдайында барған сайын маңызды болып отыр. Бұл мақалада Қазақстанның мұнай-газ секторындағы IT-жобаларды басқаруда Agile және Waterfall әдіснамаларының рөлі қарастырылады.

Мақаланың мақсаты-Қазақстанның мұнай-газ секторының IT-жобаларын басқаруда Agile және Waterfall әдіснамаларының қолданылуын талдау, олардың цифрландыру жағдайындағы артықшылықтары мен шектеулерін анықтау және жобаларды басқарудың бейімделген гибридті модельдерін енгізудің орындылығын негіздеу. Зерттеу кешенді әдеби шолуға негізделген, ол екі әдіснаманың теориялық негіздерін, практикалық қолданылуын, шектеулерін және жергілікті контексте интеграциялау әлеуетін анықтауға мүмкіндік берді. Зерттеу әдістемесі контент-талдау, салыстырмалы бағалау және халықаралық пен қазақстандық дереккөздерді

синтездеуге негізделген, бұл жаһандық үздік тәжірибелерді және өңірлік ерекшеліктерді теңгерімді қарастыруға жағдай жасайды. Нәтижелер Agile әдіснамалары икемділікті, итеративті құндылық жеткізуді және ынтымақтастықты күшейтетінін, ал Waterfall — сәйкестікке, болжамдылыққа және есеп берушілікке кепілдік беретінін көрсетеді. Қазақстанда реттеуші және ұйымдастырушылық дәстүрлерге байланысты Waterfall басымдыққа ие болғанына қарамастан, біртіндеп енгізілетін гибридті модельдер жобалардың нәтижелілігін арттыру үшін жаңа мүмкіндіктер ұсынады. Мақалада бейімделген гибридті құрылым Қазақстанның энергетикалық секторындағы цифрлық трансформацияны қолдауда және халықаралық әрі ұлттық стандарттарға сәйкестікті қамтамасыз етуде шешуші рөл атқара алады деген тұжырым жасалады.

Негізгі сөздер: Agile, Waterfall, Жобаларды басқару, IT-жобалар, Мұнай-газ, Қазақстан, Гибридті модельдер.

МЕТОДОЛОГИИ AGILE И WATERFALL В УПРАВЛЕНИИ ИТ-ПРОЕКТАМИ: ВЫЗОВЫ И ВОЗМОЖНОСТИ ДЛЯ НЕФТЕГАЗОВОЙ ОТРАСЛИ КАЗАХСТАНА

Аннотация

Трансформация подходов к управлению проектами в нефтегазовой отрасли приобретает всё большее значение на фоне цифровизации и глобального перехода к устойчивой энергетике. В статье рассматривается роль методологий Agile и Waterfall в управлении ИТ-проектами нефтегазового сектора Казахстана.

Цель статьи — проанализировать применение методологий Agile и Waterfall в управлении ИТ-проектами нефтегазового сектора Казахстана, выявить их преимущества и ограничения в условиях цифровизации и обосновать целесообразность внедрения адаптированных гибридных моделей управления проектами. Исследование основано на комплексном обзоре литературы, который позволил выявить теоретические основы, практическое применение и ограничения обеих методологий, а также их потенциал для интеграции в локальном контексте. Методология исследования включает контент-анализ, сравнительную оценку и синтез международных и казахстанских источников, что обеспечивает сбалансированное рассмотрение мировых лучших практик и региональной специфики. Результаты показывают, что методология Agile обеспечивает гибкость, итеративную поставку ценности и усиленное взаимодействие участников, тогда как Waterfall гарантирует соответствие, предсказуемость и ответственность. Несмотря на доминирование Waterfall в Казахстане из-за регуляторных и организационных традиций, постепенное внедрение гибридных моделей открывает новые возможности для повышения эффективности проектов. В заключении статьи утверждается, что адаптированная гибридная модель может сыграть ключевую роль в поддержке цифровой трансформации энергетического сектора Казахстана при соблюдении международных и национальных стандартов.

Ключевые слова: Agile, Waterfall, управление проектами, ИТ-проекты, нефтегаз, Казахстан, гибридные модели

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