МРНТИ 06.71.07
УДК 35.072.6

DOI 10.58319/26170493_2025_3_17

BENCHMARKING THE APPLICATION OF AGILE PROJECT MANAGEMENT METHODS IN PUBLIC ADMINISTRATION

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ABSTRACT. This article explores the current challenges of implementing Agile project management methods in the public sector within the context of digital transformation. As governments face growing demands for efficiency, transparency, and citizen-centered services, traditional project management approaches have shown limited adaptability. The purpose of this study is to conduct a comparative benchmarking analysis of Agile practices across five countries (USA, Singapore, Estonia, UAE, and China) to generate recommendations for their adaptation in Kazakhstan.

The research methodology is based on qualitative case study analysis, incorporating data from academic literature. National projects were selected that demonstrate the application of Scrum, SAFe, Kanban, or hybrid frameworks. The comparison focused on governance design, delivery timeline, budget control, stakeholder engagement, and scalability strategy.

The originality and value of this study lie in contextualizing international best practices for developing digital ecosystems like Kazakhstan. In light of administrative rigidity and weak coordination among public institutions, the article proposes a hybrid Agile approach-combining modular implementation at the ministerial level with scalable coordination mechanisms for large inter-agency programs.

The findings reveal that Agile is most successful when centralized strategic oversight is balanced with team autonomy, when user-centered design is integrated from the early stages, and when shared digital infrastructure enables scalable delivery. The results offer a roadmap for building a more adaptive, resilient, and outcome-oriented model for managing public sector digital initiatives in Kazakhstan.

KEYWORDS: Agile approach, public administration, digital transformation, benchmarking, flexible methodologies, project management, e-government.

БЕНЧМАРКИНГ ПРИМЕНЕНИЯ ГИБКИХ (AGILE) МЕТОДОВ ПРОЕКТНОГО МЕНЕДЖМЕНТА В ГОСУДАРСТВЕННОМ УПРАВЛЕНИИ

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АННОТАЦИЯ. В статье рассматриваются актуальные вопросы внедрения гибких (Agile) методов управления проектами в государственном секторе в условиях цифровой трансформации. На фоне усиливающейся потребности в повышении эффективности, прозрачности и ориентации на граждан в реализации цифровых государственных инициатив, традиционные подходы к управлению проектами демонстрируют ограниченную адаптивность. Цель исследования – провести сравнительный бенчмаркинг применения Agile-практик в пяти странах (США, Сингапур, Эстония, ОАЭ и Китай) с целью выработки рекомендаций по их адаптации в Казахстане.

Методология исследования основана на качественном сравнительном анализе кейсов, включающем сбор данных из научных публикаций. Были отобраны национальные проекты, демонстрирующие использование

Scrum, SAFe, Kanban или гибридных фреймворков. Сравнение осуществлялось по таким параметрам, как структура управления, временные и бюджетные показатели, вовлеченность заинтересованных сторон и стратегии масштабирования.

Оригинальность и ценность исследования заключаются в контекстуализации международного опыта для нужд развивающихся цифровых экосистем, таких как в Казахстане. В условиях административной инерции и фрагментированной координации между государственными органами, предлагается адаптивный гибридный подход, сочетающий модульную реализацию на уровне отдельных министерств с масштабируемыми методами координации в крупных межведомственных проектах.

Результаты исследования показали, что наибольший успех достигается при соблюдении баланса между централизованным стратегическим управлением и автономией проектных команд, при интеграции проектирования, ориентированного на граждан, а также при использовании общей цифровой инфраструктуры. Выводы исследования могут служить основой для разработки национальной модели внедрения Agile в управлении государственными цифровыми проектами, обеспечивая более устойчивую, адаптивную и ориентированную на результат систему государственного управления.

КЛЮЧЕВЫЕ СЛОВА: Agile-подход, государственное управление, цифровая трансформация, бенчмаркинг, гибкие методологии, управление проектами, электронное правительство

МЕМЛЕКЕТТІК БАСҚАРУДАҒЫ ЖОБАЛЫҚ МЕНЕДЖМЕНТТІҢ AGILE ӘДІСТЕРІН ҚОЛДАНУДЫ БЕНЧМАРКИНГТІК ТАЛДАУ

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АҢДАТПА. Мақалада цифрлық трансформация жағдайында мемлекеттік секторда Agile жобаларды басқару әдістерін енгізудің өзекті мәселелері қарастырылады. Мемлекеттік органдар тиімділік, ашықтық және азаматқа бағытталған қызметтерді арттыру қажеттілігіне тап болуда, бұл дәстүрлі жобалық басқару тәсілдерінің икемсіздігін айқындайды. Зерттеудің мақсаты – АҚШ, Сингапур, Эстония, БАӘ және Қытай елдеріндегі Agile тәжірибесін салыстырмалы бенчмаркинг әдісімен зерттеп, оны Қазақстанға бейімдеуге арналған ұсынымдар әзірлеу.

Зерттеу әдіснамасы сапалы жағдайлық талдауға негізделген және ғылыми әдебиетке сүйенеді. Scrum, SAFe, Kanban немесе олардың гибридтік модельдерін қолданатын ұлттық жобалар таңдалды. Салыстыру басқару құрылымы, жүзеге асыру мерзімдері, бюджет тиімділігі, мүдделі тараптардың қатысуы және масштабталу стратегиясы бойынша жүргізілді.

Зерттеудің жаңалығы мен маңыздылығы – халықаралық озық тәжірибені Қазақстан сияқты дамушы цифрлық экожүйелерге бейімдеуінде. Мемлекеттік органдар арасындағы үйлестірудің әлсіздігі мен әкімшілік қатаңдықты ескере отырып, мақалада министрліктер деңгейінде модульдік іске асыруды және ірі ведомствоаралық бағдарламалар үшін масштабталатын координацияны біріктіретін аралас Agile тәсілін ұсынады.

Нәтижелер көрсеткендей, Agile тәсілдері орталықтандырылған стратегиялық бақылау мен команда дербестігін теңдестіргенде, жобаның бастапқы кезеңінен бастап азаматқа бағытталған жобалау қолданылғанда және ортақ цифрлық инфрақұрылым арқылы масштабтауға қол жеткізілгенде ең тиімді болып табылады. Зерттеу нәтижелері Қазақстандағы мемлекеттік цифрлық жобаларды басқарудың неғұрлым икемді, нәтижеге бағытталған және орнықты үлгісін қалыптастыру үшін жол картасын ұсынады.

ТҮЙІН СӨЗДЕР: Agile әдісі, мемлекеттік басқару, цифрлық трансформация, бенчмаркинг, икемді әдістемелер, жоба менеджменті, электрондық үкімет.

INTRODUCTION. In recent years, government institutions across the globe have faced increasing pressure to deliver digital services more effectively, adapt rapidly to citizens' needs, and ensure transparency and accountability [1]. Traditional project management methodologies-often characterized by rigid planning and limited flexibility—have proven insufficient in addressing the dynamic and complex nature of public sector digital transformation projects [2], [3], [4]. In

response, there has been a growing interest in the application of Agile project management (APM) principles within public administration.

Agile methodologies, originally developed for software development, emphasize iterative delivery, customer collaboration, and adaptability [2], [5]. Their adoption in the private sector has led to measurable improvements in efficiency, stakeholder engagement, and responsiveness to change [4]. As public institutions increasingly embrace digital innovation, they are exploring Agile practices as a means to enhance the success rate of government projects, particularly those involving information technology, e-government platforms, and digital public services [6].

Empirical evidence suggests that Agile adoption in the public sector is gaining momentum. For instance, the United States Digital Service (USDS), Singapore's GovTech, Estonia's e-Governance Academy, and China's Smart Government initiatives have all integrated Agile frameworks in the planning and delivery of digital services [7]. These efforts have enabled faster iteration cycles, reduced implementation risks, and improved stakeholder alignment. However, despite positive results in these countries, the transferability and scalability of such practices to other contexts—especially in developing economies—remain under-researched [3], [5].

Kazakhstan, like many post-Soviet countries, has embarked on an ambitious digital transformation agenda through national projects such as "Digital Kazakhstan" and the "National Project for Digitalization, Science and Innovation" [8]. Yet, several studies and journalistic investigations have highlighted recurring challenges in project execution, including delays, budget overruns, and a lack of adaptive project governance [9]. These issues raise critical questions about the suitability of traditional project management approaches and the potential benefits of adopting more flexible, Agile-based frameworks within Kazakhstan's public sector.

This paper aims to benchmark the application of Agile methodologies in public sector digitalization projects across five leading countries: the United States, Singapore, Estonia, the United Arab Emirates, and China. By analyzing selected national projects based on criteria such as implementation timeline, budget efficiency, scalability, and stakeholder involvement, this study seeks to draw actionable insights for improving project delivery mechanisms in Kazakhstan's public governance context. Ultimately, the goal is to provide evidence-based recommendations on how Agile practices can be localized and institutionalized in Kazakhstan to support more effective and resilient public sector project management.

Over the past decade, governments worldwide have increasingly recognized the limitations of traditional project management approaches—such as rigid planning, sequential task execution, and centralized control—when managing complex digital transformation programs. The rise of Agile methodologies, originally developed in software engineering, reflects a global shift toward approaches emphasizing flexibility, iterative delivery, and user-centric service design [1]. Public institutions in the United States, United Kingdom, Singapore, Estonia, and the United Arab Emirates have become early adopters, experimenting with Agile methods to improve responsiveness, reduce project risk, and enhance stakeholder engagement [4], [7]. Agile adoption in government typically follows an incremental trajectory, beginning with small pilot teams in IT or digital service units and gradually expanding through organizational learning and policy adjustments [1]. This evolution has been driven by the increasing demand for citizen-oriented digital services, the complexity of interdepartmental initiatives, and the pressing need for public sector innovation.

Emerging scholarship suggests that Agile in government represents not just a project methodology but a broader governance paradigm. Agile government through a tripartite model, encompassing the agile mindset (adaptability, trust, and openness to change), agile processes (sprints, iterative prototyping, feedback loops), and institutional enablers (team autonomy and digital infrastructure) [5]. This framework highlights that true agility requires alignment between operational methods and administrative culture. This perspective is further supported by the articulation of ten principles of Agile Government, which include mission-driven iteration, empowered teams, and outcome-based evaluation [10]. In a similar vein, an "agility capability framework" has been introduced to position Agile practices within broader public administration capacities, such as anticipatory governance, regulatory adaptability, and networked collaboration [11]. Together, these contributions reflect a paradigm shift: governments are moving beyond simply borrowing Agile rituals to translating them into contextually embedded governance models.

The implementation of Agile in the public sector varies depending on project scale, administrative maturity, and institutional constraints. Among the various methodologies, Scrum remains the most widely adopted framework for digital government teams due to its short sprints, autonomous squads, and stakeholder-driven product backlogs [6]. Kanban is frequently used to optimize continuous workflows, particularly in operational environments with routine service delivery tasks [12]. As Agile initiatives expand across multiple agencies or scale to the national level, governments increasingly rely on structured scaling frameworks. For example, the Scaled Agile Framework (SAFe) introduces Agile Release Trains (ARTs) and multi-level coordination to manage complex value

streams,and has proven effective in large-scale digital programs such as those implemented by the U.S. Department of Veterans Affairs [13], [14]. Large-Scale Scrum (LeSS) offers a minimalist extension of Scrum through a unified backlog and a single Product Owner, making it ideal for agile-mature public organizations that seek to minimize bureaucratic overhead [9]. Meanwhile, Disciplined Agile (DA) integrates elements from Scrum, Kanban, Lean, and DevOps into a flexible process decision framework, which is especially beneficial in compliance-driven government contexts [3]. Lastly, frameworks such as Scrum@Scale and Nexus enable synchronization across multiple teams through coordination mechanisms like the Scrum of Scrums and integration teams, thereby facilitating complex technical collaboration without introducing heavy hierarchical layers [15], [16].

Each framework balances prescriptiveness and adaptability differently: SAFe provides detailed governance for large-scale programs, while LeSS and DA offer leaner alternatives suitable for governments with moderate agile maturity. Successful adoption depends on aligning the framework with institutional structure, political mandates, and cultural readiness.

International benchmarking demonstrates diverse approaches to scaling Agile in government. The U.S. and U.K. rely on semi-autonomous digital units (e.g., USDS, 18F, GDS) that apply Agile within traditional bureaucracies, often leveraging special procurement waivers to bypass rigid procedures [7]. Estonia and Singapore have embedded Agile at the whole-of-government level. Estonia's X-Road platform exemplifies modular, iterative development enabling cross-agency data exchange, while Singapore's Moments of Life app reflects co-creation with citizens through sprints and early user testing [11]. The UAE applies Agile strategically, integrating service prototyping with national KPIs, as seen in the Dubai Paperless Strategy [17]. China pursues a pilot-driven, iterative model, particularly in smart city and AI governance projects, relying on rapid adaptation and policy flexibility [18]. These variations underscore that methodology alone does not guarantee success; political will, legal flexibility, and institutional capacity are equally decisive.

Despite its advantages, Agile adoption in public administration faces persistent barriers. Procurement rigidity and annual budgeting cycles often clash with iterative funding needs [13], [19]. Cultural resistance to error tolerance and decentralized decision-making remains prevalent [5]. Short political cycles undermine long-term transformation, while "fake Agile"—where rituals like stand-ups or sprints are performed without true empowerment-remains a recurring risk [2]. Sustainable Agile transformation therefore depends on ecosystem conditions: strong leadership, supportive regulations, multi-level coordination, and workforce reskilling. Without these enablers, large-scale initiatives risk reverting to traditional waterfall delivery.

For Kazakhstan, which is pursuing large-scale digital transformation initiatives, these insights are highly relevant. Recent audits highlight delayed project execution, budget inefficiencies, and weak inter-agency coordination [20], [21], challenges that mirror pre-agile conditions in other countries. Kazakhstan's optimal approach may involve piloting hybrid frameworks such as Disciplined Agile or Essential SAFe in high-priority national projects, combining iterative delivery with stakeholder co-creation. However, methodology alone is insufficient: institutional buy-in, regulatory modernization, and leadership commitment are prerequisites for sustainable transformation.

Looking ahead, future research should focus on contextual benchmarking in emerging economies, assessing agile maturity, legal enablers, and team capabilities through consistent metrics such as delivery time, cost variance, and citizen satisfaction. Comparative case studies will provide the evidence base for localizing best practices, enabling Kazakhstan and similar nations to adapt Agile as a governance innovation rather than a mere project tool.

MATERIAL AND METHODS OF RESEARCH. This study employs a qualitative benchmarking approach based on comparative case analysis to examine the adoption of agile project management methodologies in digital government initiatives. Benchmarking is applied as a structured process for identifying best practices, extracting transferable lessons, and assessing performance standards that can inform the adaptation of Agile methods to new institutional environments such as Kazakhstan. In public administration research, such cross-national benchmarking has proven particularly valuable for capturing how governance models, organizational structures, and cultural contexts shape the outcomes of digital transformation [4].

The research focuses on five flagship e-government projects from countries recognized for leadership in digital governance or experimentation with Agile practices: the DATA Act implementation in the United States, the Moments of Life app in Singapore, Estonia's AIRE AI pilot program, the Dubai Smart City Platform in the United Arab Emirates, and the State Council App Revamp in China. These cases were purposefully selected for three reasons: first, they are of national strategic significance and align with key digital transformation priorities; second, they demonstrate the application of Agile or hybrid-agile methods that are documented in academic or practitioner literature; and third, they offer sufficient publicly available evaluation data on project objectives, implementation processes, and reported outcomes. Together, these cases reflect a spectrum of governance models—from highly

Table 1. Benchmarking Agile Implementation in Digital Government Projects

Country / Project	Agile Framework / Practices	Main Goal	Implementation (Approach, Scale, Duration, Teams)	Success Metrics	Key Outcomes
USA – DATA Act (U.S. Treasury)	Scrum (2-week sprints, PO, agile coach)	Ensure transparent access to federal spending data across 100+ agencies	Cross-agency agile teams; Broker tool delivered in ~6 months; agile training across teams	Time-to-delivery, agency participation, data quality	Met legal deadlines; 75% faster delivery; improved data accuracy
Singapore – Moments of Life (GovTech)	Scrum-based; cross-functional squads; CI/CD	Deliver integrated life-event services via mobile app	Multi-agency team; common tech stack (NECTAR, APEX APIs); launched in <1 year	On-time launch, inter-agency collaboration, technical stability	Timely delivery; strong cross-agency integration; minimal post-launch issues
Estonia – AIRE AI Pilot Projects	Agile iterative prototyping; test-and-learn (Scrum/Kanban-inspired)	Support SME AI adoption via test-before-invest pilots	140+ pilots with universities and firms; 2–6 month cycles	Number of pilots, time-to-prototype, SME feedback	Rapid innovation; proof-of-concept demos ready for scaling
UAE – Dubai Smart City Platform	SAFe (Agile Release Trains, PI planning, enterprise-wide alignment)	Provide unified access to city services	Multiple agile teams across agencies; implemented over 5+ years	Service coverage, inter-agency collaboration, user adoption	Improved integration; increased citizen usage; smart city maturity
China – State Council App Revamp	Iterative "agile-like" approach; no official framework	Improve mobile access to policies and e-services	Central IT team + major tech firms; nationwide rollout	User reach, content engagementreal-time feedback	50M+ views on updates; high adoption of G2C mobile services

centralized to networked and collaborative—which enables a meaningful comparison of Agile adaptation under different institutional conditions.

Data were collected using triangulation across multiple sources, including peer-reviewed journal articles, reports. To ensure comparability, each project was analyzed according to core dimensions of agile governance: the framework or practices applied (Scrum, SAFe, Kanban, or hybrid), the project's strategic objective, its implementation structure (team composition, scale, and duration), the success metrics used for evaluation, and the reported key outcomes. These dimensions are synthesized in Table 1, which provides a comparative overview of the selected projects and supports structured benchmarking of agile implementation in the public sector.

For deeper comparison, a second analytical matrix (Table 2) captures the governance design, schedule discipline, budget control, stakeholder engagement, and scalability strategy of each initiative. This allows for the identification of critical success factors and transferability potential to contexts like Kazakhstan.

By presenting agile implementation through both benchmarking and comparative lenses, the methodology enables context-sensitive recommendations tailored to Kazakhstan's institutional environment. The analysis reveals that agile adoption in the public sector tends to be most effective when governance structures achieve a balance between centralized strategic alignment and operational team autonomy, as exemplified by initiatives in Singapore and the United States. Furthermore, the successful scaling of Agile frameworks is closely linked to the level of institutional maturity—Scrum proves most suitable for modular or team-level projects, while frameworks like SAFe offer the coordination mechanisms necessary for managing complex, portfolio-level programs. Crucially, the integration of user co-creation and iterative feedback loops from the earliest project stages fosters responsiveness and adaptability, while leveraging shared digital infrastructure accelerates replication and facilitates broader scalability. Although this methodological approach provides actionable, cross-national insights, it is not without limitations. In some cases—particularly China—there is limited transparency regarding the application of Agile processes; evaluation metrics are not standardized across countries, and longitudinal performance data remain scarce. Despite these constraints, the triangulated, structured case study framework

Table 2. Comparative Analysis of Agile Project Management Practices in Public Sector Digital Initiatives

Project / Country	Agile Framework	Governance & Team Structure	Schedule Management	Budget Control	Stakeholder Engagement	Scalability Strategy	Success Factors
DATA Act (USA)	Scrum	Central PO + agile coaches across >100 agencies; distributed teams	6-month delivery cycle; strict sprint planning; continuous integration	Transparent tracking via agile backlog and federal reporting tools	Cross-agency collaboration; open data advocacy groups	Focused on modular delivery and extensibility	Legal compliance pressure; strong Scrum discipline; use of agile brokers
Moments of Life (Singapore)	Scrum with CI/CD	Cross-functional squads within GovTech; inter-agency liaisons	MVP delivered in <12 months using 2-week sprints	Internal budgeting aligned with life-event service bundles	Design thinking with citizen feedback loops; early user testing	Reuse of shared national infrastructure (NECTAR, APEX)	Strong user-centered design; agile-friendly digital governance
AIRE Pilot Program (Estonia)	Lightweight Scrum/Kanban	Pilot-based: University + SME consortia; lean, autonomous teams	2–6 month cycles per prototype; iterative updates	Limited, low-risk budgets per pilot; co-funded model	Close co-creation with SMEs; stakeholder interviews	Replicable pilots with opt-in scaling	Lean experimentation; institutional openness to prototyping
Dubai Smart City (UAE)	SAFe	Agile Release Trains (ARTs); high-level strategic alignment; centralized PMO	PI planning every 10–12 weeks; project increment tracking	Strong centralized control via Smart Dubai strategy office	Integrated platforms with agency partners and private sector	Portfolio SAFe structure enables horizontal scaling	Executive sponsorship; comprehensive alignment of vision
State Council App (China)	Iterative Agile (not formally declared)	Central government IT team; partnerships with tech companies (e.g., Alibaba)	Staggered releases; rapid iterations; user data-driven roadmap	Government-funded; budgetary autonomy via central leadership	Limited public input; high directive alignment from center	National scaling via mobile ecosystem + WeChat/ Alipay	Strong top-down control; high-level IT infrastructure readiness

enhances the robustness of the analysis and supports the extraction of transferable lessons that can inform Kazakhstan's ongoing digital transformation efforts.

RESULTS AND THEIR DISCUSSION. The comparative analysis of five national digital government initiatives provides insight into how agile project management methodologies are adapted to distinct governance, cultural, and institutional environments. The cases—spanning the United States, Singapore, Estonia, the United Arab Emirates, and China—illustrate not only different modes of agile adoption but also the conditions under which these methods contribute to timely, citizen-centric, and efficient digital service delivery. This section synthesizes key patterns across governance design, framework flexibility, time and budget performance, stakeholder engagement, and scalability, highlighting lessons for countries with emerging digital ecosystems such as Kazakhstan.

A central finding of the analysis concerns project governance and organizational design, which significantly influence the effectiveness of agile practices. The United States and Singapore demonstrated the benefits of cross-agency coordination with decentralized execution, where product owners, agile coaches, and distributed squads-maintained alignment without over-centralizing authority. In contrast, the United Arab Emirates relied on a highly centralized model under Smart Dubai, leveraging SAFe's Agile Release Trains to coordinate multiple teams around a unified strategic vision. China adopted a similar top-down structure through its state IT apparatus but relied heavily on private sector delivery partners such as Alibaba, trading transparency and user inclusiveness for speed. Estonia, conversely, exemplified lightweight and decentralized innovation through its AIRE pilot program, enabling universities and SMEs to test and iterate autonomously. These divergent models suggest that Kazakhstan would benefit from a hybrid governance approach, combining the centralized strategic alignment of UAE with the operational flexibility observed in Singapore.

Table 3. Key Comparative Insights from Agile Digital Government Projects

Success Dimension	Most Effective Practice	Exemplary Countries
Agile team governance	Decentralized squads with central product owner alignment	Singapore, USA
Framework formalization	SAFe for scaling; Scrum for flexibility	UAE (SAFe), USA/Singapore
Budget & delivery control	Time-boxed pilots and modular MVP delivery	Estonia, USA
Citizen co-creation	Embedded user research and iterative prototyping	Singapore, Estonia
Scalability enabler	Shared infrastructure and agile portfolio management	Singapore, UAE

Differences in framework adoption and flexibility further illustrate how institutional culture shapes agile practices. The United States and Singapore implemented Scrum-based approaches, complete with sprint cycles, product backlogs, and continuous integration pipelines, with Singapore incorporating design thinking to strengthen user focus. Estonia applied Kanban- and Scrum-inspired practices in its pilots, emphasizing iterative prototyping and daily coordination without formalized adherence to a single methodology. The UAE's adoption of SAFe enabled structured scaling across dozens of teams, while China pursued a pragmatic, framework-light model focused on rapid delivery. For Kazakhstan, this comparison indicates that framework selection should match both project scale and institutional maturity, with Scrum suitable for smaller, modular initiatives and hybrid or scaled frameworks (like SAFe) for cross-ministerial programs.

Agile's contribution to time and budget management emerged as a consistent benefit across cases. The U.S. DATA Act project met legally mandated deadlines by using modular releases and disciplined sprint cycles, while Singapore's Moments of Life app achieved launch within a year by leveraging short sprints and rapid feedback loops. Estonia's smaller-scale pilots demonstrated that time-boxed iterations help contain scope creep and maintain delivery velocity even in resource-constrained settings. Longer timeframes and higher budgets in the UAE and China were mitigated by strong strategic alignment and centralized funding authority. These results suggest that rolling-wave budgeting, value-based prioritization, and fixed-cost sprints could help Kazakhstan mitigate chronic delays and cost overruns in national e-government initiatives.

Another critical dimension is stakeholder engagement and user-centered design, which determine the ultimate relevance and adoption of digital services. Singapore exemplified best practice through citizen co-creation workshops and iterative user testing, ensuring that the Moments of Life app addressed real life-event needs. Estonia engaged SMEs and academic partners directly in the design of AI pilots, creating collaborative innovation ecosystems. By contrast, China and the UAE reflected more top-down digital governance, with limited public involvement during the design stage. For Kazakhstan, where many digital services are rolled out without extensive user validation, embedding design thinking and co-creation within agile processes could enhance citizen trust and uptake.

The challenge of scaling agile across government was approached differently in each country. The UAE relied on formal portfolio coordination through SAFe, while Singapore used shared infrastructure (NECTAR, APEX) to make new team onboarding and cross-agency collaboration seamless. Estonia scaled through replication of validated pilots, whereas China leveraged its integration with existing national digital platforms to achieve rapid mass adoption. These models indicate that Kazakhstan's scalability strategy should focus on shared digital platforms and agile sandboxes, enabling teams to reuse components and methodologies while maintaining strategic alignment.

The synthesis of these insights is summarized in Table 3, which highlights the most effective practices by success dimension and their exemplar countries.

Overall, the benchmarking confirms that agile project management delivers the most value in public administration when adapted to institutional context, supported by robust governance structures, and integrated with user-centered design principles. Countries such as Singapore and Estonia illustrate how trust, experimentation, and design thinking enable agility to move beyond IT projects into systemic digital transformation. For Kazakhstan, the findings emphasize the need to transition from procedural, top-down project management to adaptive, value-driven models. Building agile capacity, investing in cross-agency digital platforms, and embedding citizen feedback loops will be essential to transform national digital initiatives into outcome-oriented and resilient governance systems.

CONCLUSION. This study has explored the application of Agile project management

frameworks in public sector digital transformation through a comparative benchmarking analysis of five national cases: the United States, Singapore, Estonia, the United Arab Emirates, and China. Each of these countries has implemented Agile principles to varying degrees, adapting methodologies such as Scrum, SAFe, and hybrid models to suit their institutional structures, technological ecosystems, and governance cultures. The findings demonstrate that there is no universal Agile model applicable to all public sector contexts; however, certain patterns of success are evident. Countries that promote cross-agency collaboration supported by modular governance structures—such as the USA and Singapore—tend to deliver services more rapidly and with improved stakeholder alignment. Similarly, nations that incorporate citizen-centered design thinking from the early stages of digital service development, as seen in Singapore and Estonia, report higher adoption rates and more precise policy outcomes. While formalized frameworks like SAFe, exemplified by the UAE, enable large-scale coordination, they demand a high degree of organizational discipline and interdepartmental alignment. In contrast, Estonia demonstrates that lightweight, pilot-driven experimentation is particularly effective for innovation in low-risk or emerging domains such as artificial intelligence and SME support.

For Kazakhstan, where digital transformation is a national priority but is frequently impeded by rigid planning, delayed execution, and limited stakeholder engagement, these comparative insights indicate that a hybrid Agile model could be the most effective strategy. Agile practices based on Scrum could be implemented at the level of individual ministries and digital teams to manage modular components of national projects, enabling faster iteration, more responsive development, and enhanced stakeholder involvement. In turn, large-scale, cross-agency programs—such as Smart Data Ukimet, Digital Documents, or the eGov Gateway—may benefit from a tailored application of SAFe or Disciplined Agile, providing the necessary coordination mechanisms without sacrificing adaptability. Furthermore, Kazakhstan would gain from the creation of agile innovation sandboxes or government pilot labs modeled after Estonia's AIRE initiative, which would facilitate the controlled testing and scaling of new digital services. Establishing a national Agile center of excellence could further support the standardization of practices, capacity building, and cross-project knowledge sharing. Ultimately, Kazakhstan's success will depend not on replicating a single foreign model, but on strategically blending agile approaches to match the scale of initiatives, institutional readiness, and governance capacity. The benchmarking analysis thus provides a practical roadmap for this adaptive transformation, fostering a more efficient, user-centered, and resilient public sector.

ACKNOWLEDGMENT. This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP26102429 "Increasing accountability and transparency in the planning and implementation of digital projects in public administration based on the application of Project Management in the Republic of Kazakhstan").

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