
Project Management Methods for Digital Transformation in Ghana's Education Sector

Received: 12 September 2025

Accepted: 25 June 2026

Published: 27 July 2026

Emmanuel Kitcher^{1*}, Daniella Delali Sedegah²

Abstract

Ghana's education sector. This national priority aligns with Sustainable Development Goal 4. Many digital education projects fail to deliver intended outcomes. Poor planning organizational resistance and limited institutional capacity contribute to these failures. This desktop analytical study reviews national and institutional policy documents. It also reviews international development reports. A SWOT analysis evaluates project management approaches for digital initiatives in Ghanaian education. The SWOT analysis identifies hybrid methods as optimal. These methods integrate Waterfall structure with Agile adaptability. Strengths include flexibility, governance, alignment and stakeholder engagement. Weaknesses encompass skill gaps and coordination challenges. Opportunities arise from donor partnerships and policy harmonization. Threats involve institutional resistance and funding rigidity. The study proposes a context specific hybrid framework. This framework spans five phases. These phases include strategic planning stakeholder co creation iterative delivery institutional integration and dual loop evaluation. The approach aligns with Ghana's institutional realities. It enables responsive scalable and sustainable digital transformation. Targeted capacity building is recommended to pilot and refine the model for wider adoption.

Keyword: Digital, Transformation, Education, Project and Methods.

^{1*} Directorate of IT Systems and Operations, University of Environment and Sustainable Development-Somanya, Ghana,

*Corresponding author: ekitcher@uesd.edu.gh

² Department of Sustainable Development and Policy, University of Environment and Sustainable Development-Somanya, Ghana

Introduction

Digital Transformation (DT) is increasingly recognized as a cornerstone of educational reform and a catalyst for national development, particularly in emerging economies such as Ghana. The integration of digital technologies into teaching, learning, and administrative processes is central to the country's broader strategy for achieving Sustainable Development Goal (SDG) 4, which focuses on inclusive and equitable quality education and lifelong learning opportunities for all (Adipat & Chotikapanich, 2022). In recent years, Ghana has witnessed a growing number of digital initiatives in the education sector, ranging from school infrastructure upgrades and teacher training programs to e-learning platforms and digital libraries (Ministry of Education, 2018).

Despite these efforts, many projects have not yielded their intended outcomes. The shortcomings are often linked to systemic issues such as insufficient planning, under-resourced implementation, ineffective stakeholder engagement and coordination, and the absence of clear accountability structures (World Bank, 2020; Adarkwah, 2020). These challenges underscore the importance of adopting more strategic approaches to manage DT initiatives within the education system in Ghana.

One of the most promising strategies for addressing these challenges is the application of PMMs. Project management (PM) offers a disciplined framework for defining objectives, allocating resources, managing risks, monitoring progress, and ensuring that intended benefits are realized (Kerzner, 2017). This paper focuses on three main PM approaches: Waterfall, Agile, and Hybrid. It examines their potential in improving the design and delivery of digital project initiatives in education in Ghana. Agile methodologies, such as Scrum and Kanban are of particular interest due to their emphasis on adaptability, stakeholder collaboration, iterative planning, and continuous

improvement (Beck et al., 2001). These features make Agile a compelling option for educational environments, which often face changing requirements and high stakeholder expectations.

However, the practical implementation of Agile in Ghana's education sector faces several constraints. This paper adopts a literature-based approach, drawing on existing empirical and theoretical studies to assess the applicability of Agile Project Management (PM) within Ghana's educational context. A SWOT analytical framework is applied to the reviewed literature to evaluate the alignment of Hybrid PMMs with the sector's characteristics and constraints. The findings therefore represent a synthesis of documented evidence, highlighting strengths such as adaptability, iterative processes and stakeholder engagement. The synthesis is made alongside reported challenges including limited institutional familiarity with Agile practices, bureaucratic procurement systems, resistance to change and infrastructural deficits

While opportunities are evident in the form of increasing investments in digital infrastructure and the emergence of innovation-driven education, persistent threats such as bureaucratic inefficiencies and inconsistent policy support pose significant challenges to successful implementation (World Bank, 2020).

Further, the paper draws on documented case studies from existing literature, to highlight key enablers and constraints to digital transformation in Ghana. The challenges identified were policy inconsistencies, funding gaps, and capacity constraints (Ministry of Education, 2018). These findings highlight the essential role of PM in ensuring that digital education initiatives are effectively aligned with institutional priorities, optimized for efficient resource use, designed to anticipate and mitigate risks, and structured to

promote meaningful collaboration among all stakeholders involved.

To address these challenges, this paper proposes a context-specific hybrid Project Management (PM) framework for Ghana's educational system. The framework is conceptually developed from insights drawn from the reviewed literature and is not based on primary empirical analysis. It emphasizes iterative planning, stakeholder involvement, capacity building, and pilot implementation. The expected benefits are, improved strategic alignment, change management and sustainability of digital interventions.

Digital transformation (DT) in education reduces paper waste through digitized documents and e-learning platforms while minimizing physical travel via virtual classes thus lowering carbon footprints. Despite Ghana's national push for DT aligned with SDG 4 many projects underperform due to planning gaps resistance and capacity limits. Existing studies overlook context-specific project management solutions for Ghana's bureaucratic education systems. This paper fills that gap by evaluating hybrid PM methods via SWOT analysis.

This study contributes to the evolving discourse on DT in education by offering practical, evidence-based recommendations for policymakers, educators, and technology professionals. Ultimately, aligning PMMs with digital educational goals, provides a structured yet flexible pathway for bridging the digital divide and fostering a more inclusive, innovative, resilient and sustainable educational ecosystem in Ghana.

Review of Related Literature

Globally, governments and institutions are investing in digital platforms, learning management systems (LMS), and e-governance tools to enhance both access and effectiveness in education delivery (UNESCO, 2022; World Bank, 2024).

PMMs play a central role in these transformations, providing structured approaches to plan, execute, and evaluate digital education initiatives. While traditional methodologies such as Waterfall emphasize compliance, control, and linear sequencing, Agile frameworks prioritize flexibility, rapid iteration, and stakeholder responsiveness (PMI, 2021). However, the singular use of either model has revealed limitations, particularly in public education systems where structure and adaptability are both required.

Several studies have examined the suitability of Agile methodologies for digital education reform. Agile is lauded for promoting collaboration, iterative design, and real-time feedback - valuable features in user-centred digital learning environments (Beck et al., 2001). Nonetheless, the practical adoption of Agile in the education sector of developing countries has encountered resistance due to bureaucratic hierarchies, procurement rigidity, and limited Agile literacy (Nuottila et al., 2016). On the other hand, Waterfall approaches, common in donor-funded or government-led infrastructure projects offer predictability and alignment with public sector governance structures but are often criticized for being inflexible and unresponsive to user feedback during implementation (PMI, 2021).

In Ghana, the strategic importance of digital education has been emphasized in the Education Strategic Plan (ESP) 2018–2030 and the ICT in Education Policy (ICTEP) (Ministry of Education, 2015). Flagship projects such as eTransform Ghana and GALOP have significantly enhanced ICT infrastructure and teacher digital literacy across basic and tertiary institutions (World Bank, 2020, 2024). Institutional strategies from public universities including the University of Ghana (UG) and Kwame Nkrumah University of Science and Technology (KNUST) further underscore this national commitment (Omollo, 2011).

Yet, empirical evidence suggests that these efforts remain fragmented, under-evaluated, and often hampered by weak PM capacity and low stakeholder participation (UNESCO, 2022).

Digital Maturity Models (DMMs) help assess how advanced institutions are in terms of infrastructure, skills, governance, and innovation. In Ghana's education sector, most institutions remain at low to mid-level maturity, characterized by capacity gaps, rigid structures, and uneven digital integration. This limits the effective adoption of fully Agile PMMs, which require high adaptability and digital readiness. Consequently, Hybrid PMMs are more suitable, as they balance existing bureaucratic structures with gradual, adaptive innovation. While the global literature increasingly advocates for hybrid approaches that integrate Agile's adaptability with Waterfall's structure, there is a scarcity of studies that contextualize hybrid PMMs within the governance and operational realities of African education systems. Few studies have systematically analysed how hybrid frameworks can align with both the compliance needs of government education projects, and the innovation demands of DT. Furthermore, the discourse tends to overlook the triangulation of national policy documents, institutional practices, and international development frameworks as a way of validating best-fit models for specific countries.

This paper addresses these gaps by conducting a triangulated thematic and comparative analysis across policy-level documents (e.g., ESP, ICTEP), institutional strategies (UG, KNUST, UEW, UCC, UDS), and development agency reports (World Bank, UNESCO, GIZ). In doing so, it offers an evidence-based, context-specific hybrid PMM tailored to Ghana's education sector. The proposed hybrid model advocates for mixed approaches in complex public sector projects, while grounded in the

practical realities of digital education in Ghana. By integrating iterative Agile cycles within Waterfall-oriented institutional structures, the proposed framework balances compliance and adaptability, which are key to achieving sustainable and inclusive digital transformation in education in Ghana.

Theoretical framework

The theory underpinning this paper is the Adaptive Governance Theory. Adaptive Governance Theory (Folke et al., 2005; Chaffin et al, 2014) provides a conceptual foundation for understanding how institutions manage complex and dynamic systems in contexts of uncertainty and rapid change. Originally developed in environmental governance, the theory highlights the importance of flexibility, learning, stakeholder participation and polycentric decision-making in achieving sustainable outcomes. Adaptive governance emphasizes that rigid, top-down structures are often insufficient in dynamic environments. Instead, successful governance requires iterative adjustment, experimentation and responsiveness to stakeholder needs and feedback.

This theory is highly relevant for analyzing the adoption of project management methods (PMMs) in digital transformation (DT) within Ghana's education sector. The sector is characterized by both institutional rigidity manifested in procurement systems, bureaucratic hierarchies and donor accountability frameworks, and rapidly changing technological demands that require adaptive responses. Purely traditional approaches like Waterfall align with the compliance needs of government and donor-funded projects but lack the responsiveness necessary for digital innovation. Conversely, Agile methods foster flexibility and collaboration but often clash with entrenched institutional structures. Adaptive Governance Theory helps explain why a hybrid PMM is contextually appropriate for Ghana. Hybrid approaches operationalize adaptive

governance by integrating the formal, compliance-driven structures of Waterfall with the iterative, learning-oriented practices of Agile. This dual approach allows institutions to maintain legitimacy and accountability while simultaneously adapting to evolving user needs and technological opportunities (Joslin & Müller, 2016).

Moreover, adaptive governance reveals the critical role of stakeholder engagement, experimentation and feedback loops in institutional transformation. In Ghana, involving teachers, students, ICT professionals and administrators in iterative co-creation processes enhances ownership and contextual relevance of digital education projects (Adarkwah, 2020). By embedding adaptive governance principles into project management, the education sector can better navigate uncertainty, overcome resistance to change, and sustain digital innovations beyond donor-driven phases. Thus, Adaptive Governance Theory provides a robust framework for understanding how Ghana's education sector can reconcile structural rigidity with the need for innovation. It positions hybrid PMMs not merely as a technical choice but as a governance innovation that enables flexibility, collaboration and long-term sustainability in digital transformation initiatives.

Methodology

This study adopts a desktop analytical approach, utilizing existing literature, policy documents, institutional reports, and publicly available case studies to examine how PMMs are applied to DT initiatives in the education sector in Ghana. This methodology is appropriate given the availability of diverse secondary sources and the study's exploratory and comparative nature. A systematic review was conducted across academic databases such as Google Scholar, JSTOR, ERIC, and Scopus using keywords including "project management in education", "Agile project management

Africa," and "digital transformation Ghana." The review focused on publications from 2010 to 2024 to ensure relevance and contemporary applicability. In addition, policy documents such as the ESP 2018–2030, the ICTEP 2015 and ICT policies from five (5) public universities were examined. Reports from international agencies (e.g., World Bank, GIZ, UNESCO) on ICT for Education (ICT4E) projects were also included in the analysis. These documents were assessed thematically to identify project goals, implementation strategies, challenges faced, and outcomes.

The study also employed a comparative framework analysis, evaluating the features, benefits, and drawbacks of major PMMs (Agile, Waterfall, and Hybrid) and assessing their contextual suitability based on Ghana's educational landscape. A SWOT analysis was conducted to systematically evaluate the strengths, weaknesses, opportunities, and threats associated with adopting hybrid PMMs in Ghana's education sector. The findings were triangulated across multiple sources to ensure credibility and to identify both consensus and divergence in the data. Through this desktop analytical approach, the paper offers a nuanced and evidence-based examination of how different PMMs align with institutional capacity, digital infrastructure, and policy frameworks for educational transformation in Ghana.

Thematic Assessment of ICT Policy Implementation in Education in Ghana

Analysis of Ghana's key educational policy documents, namely the ESP and the ICTEP, together with institutional ICT policies drawn from selected public universities, revealed policy frameworks shaped by national objectives and international development priorities. These documents reflect a growing convergence between institutional ambitions, national and international agendas, underscoring the importance of DT as a critical enabler of

education reform. Insights from international agencies, such as the World Bank, GIZ, and UNESCO, in addition to Ghana-specific ICT project initiatives such as the eTransform Ghana and the Ghana Accountability for Learning Outcomes Project (GALOP), further enrich the context for evaluation of goals, implementation progress, gaps, and outcomes of ICT interventions in Education throughout the country.

These documents consistently articulate goals aimed at leveraging ICT to improve the quality, equity, and relevance of education. At the national level, the ESP and the ICTEP identify digital technologies as essential instruments for fostering inclusive learning, enhancing teacher effectiveness, and increasing administrative efficiency (Ministry of Education, 2018; MoE, 2015). These priorities were highlighted in international assessments, where development partners such as UNESCO and the World Bank underscored the transformative role of digital education in addressing disparities, particularly in underserved and rural areas (UNESCO, 2022; World Bank, 2020). Institutional ICT strategies of selected public universities including UG, KNUST, University of Cape Coast (UCC), University of Development Studies (UDS), and University of Education, Winneba (UEW) also align with these national and international objectives. These materials underscore the need for advancement of digital learning environments, ICT-facilitated research, and enhanced access to virtual platforms in higher education.

Ghana's DT in education is being propelled largely by substantial external financial support. A flagship initiative in this regard is the World Bank-supported eTransform Ghana project, which has significantly enhanced ICT infrastructure and laid a solid foundation for the delivery of digital services across the education sector (World Bank, 2020). This project has been

instrumental in establishing platforms for e-learning and e-governance, enabling institutions to streamline administrative functions and improve access to digital education resources. Complementing this effort, GALOP has deployed digital training modules that have equipped thousands of teachers with essential ICT skills. Supported by the World Bank and other development partners, GALOP has implemented scalable digital innovations that revolutionized teacher training, enhanced student assessments, and refined education supervision in more than 10,000 basic schools across the country (World Bank, 2020). In parallel, the Ghana Digital Transformation Centre, supported by GIZ, also provided targeted technical expertise to strengthen institutional ICT capacities at both national and institutional levels (Adarkwah, 2020) thereby enhancing pedagogical effectiveness and digital literacy in the country.

At the tertiary level, the universities are implementing strategic digital initiatives to improve teaching, learning, and administrative work. These include the expansion of broadband connectivity, the deployment of Learning Management Systems (LMS), capacity building in digital pedagogy for academic staff, and the digitization of course content and student services. In response to the COVID-19 pandemic, universities such as UG and KNUST rapidly scaled up their digital infrastructure to support the widespread delivery of online and hybrid courses. Moreover, administrative functions such as student registration, academic records management, and faculty support services have been digitized, making them integral components of modern university operations. Ghana's institutional strategies, flagship programmes, and development-driven initiatives collectively underscore a strong commitment to DT within the education sector. These efforts reflect not only a growing recognition of ICT as a transformative tool for improving access to

quality education but also alignment between institutional and national development goals as well as international support systems. Through coordinated actions such as the eTransform Ghana project, GALOP, and the Ghana Digital Transformation Centre, stakeholders are working to embed digital technologies across all levels of education, purporting to foster an inclusive, efficient, and resilient learning environment.

Despite these efforts, the implementation of digital project initiatives continues to face persistent structural challenges. Key among these is the pronounced infrastructure disparity between urban and rural institutions, as highlighted in various institutional and international assessments reports (UNESCO, 2022; World Bank, 2020). Many schools targeted by GALOP and tertiary institutions located in remote areas lack reliable electricity, consistent internet connectivity, and modern digital infrastructural equipment. These deficiencies limit their capacity to fully participate in ongoing DT initiatives. Compounding these infrastructural challenges are financial constraints that threaten the sustainability of donor-funded projects and hinder the scaling up of institutional programmes.

Another critical barrier is the limited digital literacy among educators, which remains a major obstacle to the effective integration of ICT in teaching and learning. (UNESCO 2022) notes that the absence of structured and continuous professional development in digital skills slows adoption and diminishes the pedagogical impact of technology in the classroom. In addition, weak monitoring and evaluation systems continue to undermine policy responsiveness. Although many policy documents include provisions for evaluation, the implementation of such frameworks is inconsistent, often lacking the robust feedback mechanisms necessary for adaptive learning and evidence-based decision-making.

Furthermore, the absence of coordinated inter-institutional collaboration remains a key impediment to progress. Many educational institutions function in isolation, resulting in fragmented efforts, resource duplication, and lost opportunities for synergy, innovation sharing, and system-wide learning. While sustainability is often emphasized in strategic discourse, few programmes incorporate long-term plans for financing, infrastructure maintenance, or digital project lifecycle management.

These findings highlight the urgent need for an integrated and equity-focused approach that goes beyond merely addressing infrastructure and capacity gaps. Ghana must invest in both digital infrastructure and human resource while fostering a coherent policy environment that supports interoperability, cross-sector collaboration, and strong governance. To ensure lasting impact, digital education strategies must embed sustainability and inclusivity at their core, guided by clear action plans and accountability mechanisms. Equally important should be a commitment to evidence-based practice and meaningful stakeholder engagement. These elements will ensure that ICT integration is not only effective but also responsive to the diverse needs of educators and learners. By aligning policy, investment, and practice, Ghana can unlock the full potential of digital technologies to enhance learning outcomes and support national development.

Comparative Analysis of PMM in Ghana's Education Sector

To effectively implement any ICT project, it is essential to select a suitable PMM. This section provides comparative analysis of three (3) main PMMs: Agile, Waterfall, and Hybrid. Their attributes, benefits, and drawbacks were examined to determine their suitability for Ghana's education sector. The analysis employs international PM standards and insights derived from ICT projects at the universities and government-

led educational reform programs. Table 1 presents a summary of the results.

Table 1: Summary of Comparative Analysis of PMM in Ghana's Education Sector

Criteria	Agile	Waterfall	Hybrid
Planning	Adaptive & incremental; Minimal upfront planning	Rigid and upfront; All phases defined before execution	Mix of upfront & iterative planning
Flexibility	High - responds quickly to change	Low - difficult to accommodate changes once the project starts	Medium – High: flexible in Agile components, structured in others
Stakeholder Input	Continuous throughout sprints and reviews	Minimal after initial planning phase	Phased and flexible - input varies by component and phase
Documentation	Light - often informal or evolving	Comprehensive. Detailed at each stage	Moderate and tailored: varies by component and compliance need
Risk Management	Reactive: addressed as issues arise	Predictive: risks identified and mitigated in planning phase	Balanced: combines proactive risk planning and adaptive responses
Governance & Accountability	Decentralized and team-driven: relies on transparency through sprints and retrospectives	Centralized and hierarchical: based on milestones, contracts, and formal oversight	Mixed model: centralized for structured phases, decentralized for adaptive parts; requires strong coordination
Suitability (Ghana)	High for innovation, pilots, LMS customization: less for bureaucratic settings	High for infrastructure and procurement-heavy projects	Best fit for mixed-scope ICT4E projects involving both fixed infrastructure and iterative components
Scalability	High for modular, small-scale digital solutions	High for large, well-defined infrastructure projects	Moderate – high: scalable with strong coordination and skilled project leadership

The table above, indicates that Ghana's educational landscape, where donor funding, public procurement, and institutional hierarchy shape digital project implementation realities, no single methodology fits all project types. Agile offers benefits in small-scale, user-centric initiatives but lacks the structure needed for large public programs. Waterfall aligns with government protocols but is less adaptable to changing digital needs within the sector. The Hybrid model stands out as the most contextually appropriate, allowing institutions to align with formal structures while embracing innovation in critical areas. As ICT in education continues to expand, capacity-building for PM and

institutional adoption of tailored hybrid frameworks will be essential to achieving scalable and sustainable DT in the education sector in Ghana.

SWOT Analysis of the Adoption of Hybrid PMM in Ghana's Education Sector

As Ghana's education sector increasingly adopts digital tools for education, there is a pressing need for adaptable PM frameworks that can accommodate both bureaucratic requirements and technological innovation. The Hybrid PMM, which combine structured (Waterfall) and adaptive (Agile) approaches offer a promising model. The SWOT analysis shown in table 2 evaluates

the strengths, weaknesses, opportunities, and threats associated with adopting hybrid PMs in the Ghanaian educational context.

Table 2: SWOT Analysis of Hybrid PMM in Ghana's Education Sector

Strengths	Weaknesses
Flexible adaptation to structured and iterative phases	Requires skilled project managers and coordination
Aligns with public procurement and donor frameworks	Inconsistent adoption across departments
Supports incremental innovation and early feedback	Capacity gaps in Agile and hybrid execution
Enables phased stakeholder engagement	Scope creep risks due to evolving demands
Opportunities	Threats
Accelerates institutional digital transformation	Institutional resistance to adaptive structures
Aligns with global donor preferences (World Bank, GIZ, UNESCO)	Fragmented policy environments
Enables low-risk piloting of ICT innovations	Budget rigidity limits financial flexibility
Enhances system-wide ICT policy coherence	Risk of unsustainability post-donor funding

The strengths of hybrid methodologies lie in their ability to offer contextual flexibility while preserving the structure required by public institutions. For example, in ICT infrastructure procurement and classroom digitization projects, the Waterfall model ensures compliance and accountability. Conversely, the Agile components allow for user feedback and iterative improvement in areas such as e-learning module implementation and teacher ICT training. The hybrid model thus enables institutions to balance compliance with creativity. However, the adoption of hybrid approaches is not without challenges. The sector lacks a deep pool of project managers trained in both Agile and traditional methods, making it difficult to coordinate dual processes. Additionally, institutional fragmentation and hierarchical management structures can reduce the effectiveness of hybrid teams and dilute project ownership. If not well-integrated into a broader project governance framework, hybrid approaches risk becoming inconsistent or misunderstood.

On the opportunities front, Ghana's strong partnerships with international development organizations such as the World Bank, UNESCO, and GIZ provide avenues for funding and technical support aligned with

hybrid execution models. These agencies advocate for flexible, outcome-based planning, which matches the hybrid methodology's philosophy. Moreover, Ghana's long-term ESP encourages innovation and equity, both of which can be advanced through hybrid-managed digital projects. However, several threats exist. Organizational resistance to change, limited flexibility in public budgeting, and inadequate long-term planning could undermine hybrid project sustainability. There is also a danger that hybrid methods may become overly donor-dependent, with insufficient local ownership or institutionalization post-project.

Nonetheless, Hybrid PMM provide an effective approach for overseeing the intricate, multi-stakeholder, and dynamic characteristics of ICT-based project initiatives in education in Ghana. They integrate the advantages of both Agile and Waterfall methodologies, enabling educational institutions to adhere to regulatory requirements while innovating adaptively. To maximize their potential, Ghana's education sector must invest in training, policy alignment, and sustainable implementation frameworks that incorporate hybrid techniques into institutional norms and national strategies.

Triangulated Analysis: Adoption of Hybrid PMMs in Ghana's Education Sector

This section synthesizes the areas of convergence and divergence across the various data sources, drawing attention to how the evidence either reinforces or contests prevailing assumptions. In doing so, it strengthens the credibility and reliability of the findings while offering deeper explanatory power on the dynamics shaping hybrid PMM adoption. Beyond confirming consistency across perspectives, the triangulated approach uncovers nuanced opportunities and constraints that may not be visible through single-source analysis.

Consensus Across Sources

- i. **Flexibility and Adaptability are Essential:** There is strong agreement that ICT projects for education in Ghana require adaptive planning mechanisms. National documents such as the ESP (2018–2030) and institutional ICT strategies from public universities recognize the need for flexibility in project execution especially, the implementation of digital platforms, staff training, and infrastructure upgrade. International agencies such as the World Bank and GIZ emphasize the value of iterative implementation cycles in managing technology-driven interventions in developing countries.
- ii. **Alignment with Bureaucratic Structures is Necessary:** Across all sources, there is a shared recognition that PMMs in the Ghanaian context must conform to public sector planning, procurement, and reporting processes. Hybrid models are widely seen as a practical solution, with the Waterfall component ensuring regulatory compliance. Both national and donor-driven projects emphasize the need for structured planning phases, especially when public funds or

state accountability mechanisms are involved.

- iii. **Institutional Capacity is a Core Limitation:** Weak PM expertise especially in Agile methodologies is identified consistently as a constraint to successful DT initiatives in the education sector in Ghana. ICT strategy documents of public universities highlight significant skill gaps among both IT personnel and academic staff (Adarkwah, 2020; World Bank, 2020; GIZ, 2021). The UNESCO ICT Competency Framework similarly stresses that successful adoption of technology requires both technical and PM skills - areas where many education institutions in Ghana remain under-resourced (UNESCO, 2018).

Divergence Across Sources

- i. **Stakeholder Engagement Expectations:** While Ghana's national and tertiary-level ICT strategies tend to view stakeholder engagement as episodic, international organizations like UNESCO and the World Bank advocate for continuous, user-centred engagement, as promoted in Agile methodologies. This reflects a divergence in philosophical orientation: institutional frameworks often favour top-down decision-making, while international standards encourage participatory design and real-time feedback.
- ii. **Monitoring and Evaluation Practices:** National documents, such as the ESP and ICTEP, emphasize output-based monitoring (e.g., number of computers distributed, training sessions held), whereas development partners promote outcome-based evaluations, focusing on actual learning improvements, behavioural changes, or user satisfaction. This difference impacts how project success is defined and managed under different methodological frameworks.
- iii. **Risk Tolerance and Innovation:** Hybrid PMM often support controlled innovation through iterative processes.

However, Ghana's public institutions, as noted in both national policy and ICT strategies of public universities, show a low tolerance for risk, especially regarding budget variability and procurement adjustments. Development agencies, by contrast, encourage experimentation and piloting, even if it means revising scope or timelines - suggesting a divergence in risk management culture.

Validation and Credibility through Triangulation

The credibility of the findings is reinforced by a clear convergence of evidence across multiple sources on several critical themes. These include the imperative for flexible and adaptive planning, persistent challenges in institutional capacity, and the growing consensus around the viability of hybrid PMMs to reconcile structural rigidity with the demands of digital innovation. Such cross-cutting issues highlights areas of strategic alignment and sector-wide concern.

This synthesis draws on a broad base of inputs, including policy-level directives such as the ESP and the ICTEP, institutional strategies from public universities as well as empirical findings and best practices from international development partners like the World Bank, UNESCO, and GIZ. By integrating these sources, the analysis captured both macro-level policy aspirations and micro-level implementation realities, offering a holistic and context-sensitive understanding of PM approaches in Ghana's DT in education. This ensures that the recommendations are grounded in practical realities, international standards, and institutional capabilities.

Triangulated Insight on Hybrid PMM

Triangulation confirms that hybrid PMM are contextually suitable for Ghana's educational landscape. There is broad consensus on their potential to balance control and adaptability, particularly in ICT projects in education that span

infrastructure, digital content, and training. However, divergences in stakeholder engagement models, evaluation practices, and innovation culture highlight areas where institutional transformation and mindset shifts are required. To close these gaps, Ghana must invest in PM capacity-building to reorient ICT project implementation culture to embrace a more participatory, evidence-driven, and flexible PM environment.

The Proposed Context-Specific Hybrid PM Framework for Ghana's Education Sector

To address the unique challenges of ICT project implementation in Ghana's education sector, a context-specific hybrid PM framework is proposed. This framework integrates the rigorous structure of Waterfall with the adaptive and participatory strengths of Agile, enabling phased delivery while ensuring compliance with public sector protocols. Table 3 present the summary of the proposed hybrid PM for Ghana's education sector.

Foundation Phase: Waterfall-Oriented (Strategic Planning and Compliance)

Purpose: Ensure alignment with national policy, budget structures, and donor or procurement requirements.

The key Activities are to:

- i. Define project scope, objectives, and key deliverables.
- ii. Secure approvals from GES, MoE, or the Academic board.
- iii. Develop budget, procurement timelines, and compliance documentation.

Tools: Project charter, logical framework, risk register, procurement plan.

Stakeholders Involved: Ministry officials, university leadership, legal/procurement teams.

Outputs:

- i. Approved project initiation plan.
- ii. Signed-off budget and resource schedule.

Rationale: Aligns with public sector requirements and build institutional legitimacy.

Design Phase: Transitional (Stakeholder Engagement and Co-Creation)

Purpose: Translate strategic intent into functional requirements through collaborative planning.

Key Activities:

- i. Conduct participatory needs assessments (teachers/lecturers, students, ICT staff/admin. staff).
- ii. Co-develop user stories, feature lists, and learning objectives.
- iii. Identify technology and capacity-building needs.

Tools: Stakeholder mapping, user personas, storyboarding, Gantt charts (for fixed components).

Stakeholders Involved: Project teams, users, donor reps, ICT service providers.

Outputs:

- i. Functional specifications (for software/tools).
- ii. Stakeholder-informed design blueprint.

Rationale: Encourages ownership, contextualization, and relevance in project design

Implementation Phase: Agile-Oriented (Iterative Delivery)

Purpose: Deliver working components through short cycles with embedded feedback.

Key Activities:

- i. Break down implementation into sprints (2–4 weeks each).
- ii. Develop/test content modules, features, or digital tools.
- iii. Host feedback loops with users at the end of each sprint.

Tools: Kanban boards, sprint backlogs, demo reviews, digital M&E dashboards.

Stakeholders Involved: Agile team (including developers, teachers/lecturers, content creators), end users.

Outputs: Incremental releases of working digital systems, content, or services.

Rationale: Facilitates rapid learning, user alignment, and correction.

Integration Phase: Waterfall-Oriented (System Rollout and Institutional Embedding)

Purpose: Consolidate outputs into the wider institutional system with support structures.

Key Activities:

- i. Train trainers and institutional ICT leads.
- ii. Finalize integrations with institutional MIS, academic calendars, or national databases.
- iii. Standardize policies, manuals, and support protocols.

Tools: SOPs, checklists, training evaluations, integration plans.

Stakeholders Involved: Implementation teams, faculties/directorates, IT units.

Outputs:

- i. Operational systems and trained user base.
- ii. Institutional policies aligned with new practices.

Rationale: Embeds innovations within stable systems and enables long-term sustainability.

Evaluation and Adaptation Phase: Agile + Waterfall (Dual Monitoring Loop)

Purpose: Ensure accountability, learning, and readiness for scale or replication.

Key Activities:

- i. Conduct structured evaluations against original KPIs.
- ii. Use real-time data to assess usability, adoption, and educational impact.
- iii. Host reflection sessions with stakeholders; adapt future phases accordingly.

Tools: Balanced scorecards, surveys, focus groups, iterative learning reviews.

Stakeholders Involved: M&E officers, end users, funders, project managers.

Outputs:

- i. Final evaluation report.
- ii. Lessons-learned repository.

Rationale: Combines formal accountability with adaptive learning for future application.

Table 3 Summarized Ghana-Specific Hybrid PM Framework

Phase	Orientation	Purpose	Main Outputs
Foundation	Waterfall	Planning, compliance, budgeting	Approved scope, budget, risk plan
Design	Mixed	User needs integration	Context-driven technical and content design
Implementation	Agile	Iterative delivery & feedback	Working components, tested outputs
Integration	Waterfall	Rollout and institutionalization	Trained staff, embedded systems
Evaluation & Adaptation	Mixed	Learning and accountability	Evaluation report, adaptation strategy

Strategic Enablers for Successful Adoption

To operationalize this hybrid model within Ghana's education system, the following enablers are necessary. They are:

- i. Capacity Building: Targeted training in hybrid PMMs for education project leads and ICT directorate staff.
- ii. Policy Alignment: Develop national guidelines that endorse and regulate hybrid project approaches.
- iii. Digital M&E Tools: Invest in tools for real-time monitoring and iterative learning (e.g., dashboards, mobile feedback apps).
- iv. Change Management Structures: Deploy champions and steering committees within institutions to manage transitions.
- v. Sustainability Planning: Include lifecycle budgeting, vendor support, and community-based maintenance models.

This tailored hybrid framework offers a strategic and culturally responsive approach to project delivery in Ghana's education sector. By recognizing the dual demands of public sector structure and technological adaptability, the proposed framework supports both policy compliance and innovation readiness. If systematically implemented, it can enhance the success and sustainability of ICT projects in education

and DT initiatives across all levels of Ghana's educational landscape.

Discussion

This study contributes to the evolving discourse on DT in education by presenting a context-specific hybrid PM framework tailored to the governance, infrastructural, and capacity conditions in Ghana's education sector. The triangulated analysis confirms that while Ghana's education policy environment strongly advocates for digital innovation, effective implementation is often hindered by structural rigidity, weak institutional capacity, and fragmented project oversight. These findings reinforce the argument by Aubry and Hobbs (2010) that successful project outcomes are contingent not only on the choice of methodology but also on the fit between PM structures and organizational context.

The hybrid framework proposed in this study responds directly to the dual challenge of maintaining bureaucratic accountability while fostering agile responsiveness. Drawing on project governance theory (Joslin & Müller, 2016), the model incorporates elements of centralized control (via Waterfall) and decentralized innovation (via Agile), enabling institutions to align digital interventions with national policy mandates without sacrificing adaptability. This dual approach echoes best practices in global ICT4E initiatives where flexible, user-centred implementation is nested

within structured delivery systems (UNESCO, 2022).

Importantly, the study validates hybrid PMM as the most contextually suitable approach for Ghana's education sector, as it balances the need for policy compliance, particularly in procurement and funding with the iterative experimentation required for successful deployment of educational technology. The capacity for phased stakeholder engagement and iterative rollout, as embedded in the Agile components, supports improved user alignment, rapid feedback loops, and more sustainable digital adoption. This aligns with findings from international development projects where hybrid methods have been linked to improved project agility, user satisfaction, and implementation success in complex environments (PMI, 2021; GIZ, 2021).

From a practical perspective, this study highlights the importance of equipping education-sector project managers with dual competencies in Agile and traditional methods. It also emphasizes the need to institutionalize hybrid frameworks through policy reforms, capacity building, and national guidelines. The Ghanaian government and tertiary institutions must invest in training programs and change management structures that promote iterative learning, risk tolerance, and adaptive planning. Development partners such as the World Bank, UNESCO, and GIZ can play a catalytic role by aligning their support with hybrid implementation models that reinforce institutional capacity while maintaining project discipline.

At the policy level, the findings suggest an urgent need to standardize M&E systems across education projects, shifting from purely output-based metrics to outcome-focused indicators that capture learning effectiveness, system resilience, and user satisfaction. Embedding real-time feedback mechanisms and agile evaluation loops into

national ICT and education strategies will allow Ghana to better track and respond to evolving needs during project implementation.

However, the study is not without limitations. First, the analysis is based entirely on secondary data. While triangulation enhances the credibility of the findings, the absence of primary data from project implementers or end-users limits the depth of insight into lived implementation experiences. Second, the study's scope is geographically confined to Ghana, which, while providing rich context-specific insights, limits the generalizability of the proposed hybrid framework to other national or regional contexts without further adaptation.

Future research should focus on empirical testing of the proposed framework through pilot projects, stakeholder interviews, and cross-country comparative studies. Such efforts would validate the practical applicability of the model, refine its phases, and generate actionable lessons for DT in similar governance environments across sub-Saharan Africa.

In sum, this study affirms the potential of hybrid PMMs in bridging the structural and adaptive demands of DT in Ghana's education sector. By anchoring innovation within robust institutional frameworks, Ghana can chart a more effective, inclusive, and sustainable path toward its digital educational goals.

Conclusion and Recommendations

This study examined the applicability of PMMs in advancing DT in Ghana's education sector. Drawing on a triangulated analysis of national policy documents, institutional strategies, and international development reports, the study established that while both Agile and Waterfall methodologies offer distinct benefits, each in isolation is insufficient to meet the complex demands of educational reform in

a highly structured public sector environment. This study also contributes to project management and digital transformation literature by operationalizing Adaptive Governance Theory through a novel Ghana-specific hybrid framework that reconciles Waterfall compliance with Agile adaptability in bureaucratic education systems. Agile's flexibility, adaptability, and iterative nature are critical for innovation and user engagement, but its application is constrained by procurement rules, hierarchical governance, and low familiarity among institutional actors. Conversely, the Waterfall model offers structure and accountability, aligning well with bureaucratic expectations, but lacks the responsiveness needed for real-time digital adaptation.

Considering these findings, the study reaffirms the value of a context-specific hybrid PMM that strategically integrates Agile and Waterfall principles. The proposed hybrid framework, comprising five interlinked phases (Foundation, Design, Implementation, Integration, and Evaluation/Adaptation) offers a structured yet flexible pathway for planning, executing, and scaling digital education projects. It accommodates compliance-driven processes while enabling iterative learning, phased stakeholder engagement, and adaptive feedback loops, making it uniquely suited to Ghana's institutional realities.

To operationalize this framework and unlock the full potential of DT in Ghana's education sector, the following recommendations are proposed:

- For Policymakers:
 - i. Institutionalize hybrid PMMs within national ICT and education policy frameworks by developing guidelines, standards, and regulatory protocols that endorse mixed-method approaches.
 - ii. Strengthen governance structures by embedding agile monitoring and evaluation systems within the

education sector, ensuring projects are assessed based on both outcomes and adaptability.

- iii. Promote policy coherence and inter-agency collaboration to avoid duplication and fragmentation across digital initiatives and foster shared ownership and accountability.

- For Educational Institutions:

- i. Invest in capacity building to develop institutional expertise in both Agile and traditional PMMs, targeting project leads, ICT units, and academic management staff.
- i. Adopt the hybrid PMM framework in the design and delivery of digital initiatives, particularly in projects involving e-learning systems, ICT training, and digital content deployment.
- ii. Establish change management teams or steering committees to support institutional transitions, manage stakeholder engagement, and ensure the sustainability of digital projects.

- For Development Partners and Researchers:

- ii. Align funding and technical support with hybrid implementation models that balance structure with innovation and prioritize institutional capacity development over project-level delivery.
- iii. Support pilot testing of the hybrid framework in selected institutions or education sub-sectors, with clear evaluation metrics to assess scalability and impact.
- iv. Conduct further empirical research through case studies, interviews, and longitudinal assessments to refine the framework and examine its applicability in other low- and middle-income country contexts.

In conclusion, this paper presents a grounded and adaptable approach to PM that aligns with Ghana's strategic vision for

DT in education. By adopting a hybrid PMM tailored to national realities and institutional structures, stakeholders can improve the effectiveness, inclusivity, and

sustainability of digital initiatives, thereby contributing meaningfully to the realization of SDG 4 and national development goals.

References

- Adarkwah, M. A. (2020). "I'm not against online teaching, but what about us?": ICT in Ghana post Covid-19. *Education and Information Technologies*, 26(2), 1665–1685.
<https://doi.org/10.1007/s10639-020-10331-z>
- Adipat, S., & Chotikapanich, R. (2022). Sustainable development goal 4: An education goal to achieve equitable quality education. *Academic Journal of Interdisciplinary Studies*, 11(6,174-183).
- Aubry, M., & Hobbs, B. (2010). The project management office (PMO): A quest for understanding. *Project Management Journal*, 41(3), 64–78.
- Barker, M. S., Barker, D., Bormann, N. F., & Zahay, D. (2013). *Social media marketing: A strategic approach* (2nd ed.). Cengage Learning.
- Beck, K., Beedle, M., van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., ... & Thomas, D. (2001). *Manifesto for Agile Software Development*. <https://agilemanifesto.org/>
- Chaffin, B. C., Gosnell, H., & Cosens, B. A. (2014). A decade of adaptive governance scholarship: synthesis and future directions. *Ecology and society*, 19(3)
- Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.*, 30(1), 441-473.
- GIZ. (2021). *Programme for Sustainable Economic Development (PSED) in Ghana: Digital Transformation Center (DTC)*. <https://giz2021-en-digital-transformation-center-dtc.pdf>
- Kerzner, H. (2017). *Project management: A systems approach to planning, scheduling, and controlling* (12th ed.). Wiley.
- Joslin, R., & Müller, R. (2016). The relationship between project governance and project success. *International Journal of Project Management*, 34(4), 613–626.
- Ministry of Education. (2018). *Education Strategic Plan 2018–2030*. Ghana Education Service.
- Ministry of Education. (2015). *ICT in Education Policy*. Ghana Education Service.
- Nuottila, J., Aaltonen, K., & Kujala, J. (2016). Challenges of adopting agile methods in a public organization. *International Journal of Information Systems and Project Management*, 4(3), 65-85.
- Omollo, K. L. (2011). *Information and communication technology infrastructure analysis of Kwame Nkrumah University of Science and Technology and University of Ghana*.
- PMI. (2021). *A guide to the project management body of knowledge (PMBOK Guide) (7th ed.)*. Project Management Institute.
- UNESCO. (2022). *Digital learning and transformation in Ghana: National education response to COVID-19*. <https://unesdoc.unesco.org/ark:/48223/pf0000381872>
- UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. <https://unesdoc.unesco.org/ark:/48223/pf0000379707>
- UNESCO. (2018). *ICT competency framework for teachers (Version 3)*. United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000265721>
- World Bank. (2024). *Ghana Accountability for Learning Outcomes Project (GALOP): Implementation Status Report*.

<https://projects.worldbank.org/en/projects-operations/project-detail/P165557>
World Bank. (2020). Ghana Accountability
for Learning Outcomes Project

(GALOP): Project appraisal document.
<https://documents.worldbank.org/>