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AI-Powered Quality Assurance and MIS Analytics: Building Resilient and Intelligent Digital Economies

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ABSTRACT

Artificial intelligence (AI), predictive analytics, and management information systems (MIS) are all converging to remake U.S. companies into smart, adaptive ecosystems that can sustain economic resilience, cybersecurity, and software quality assurance (QA). This study synthesizes the empirical and conceptual findings of 20 peer-reviewed articles published between 2023 and 2025 to establish an integrated AI–MIS–QA Resilience Framework (AMQRF) that synthesizes automation, analytics, and governance in critical sectors such as IT, health, energy, and supply-chain infrastructure. The meta-synthesis reveals predictive QA with AI reduces software defect rates by 25–45%, MIS-based analytics increase operational visibility levels by 30–35%, and AI-driven cybersecurity models improve the accuracy of threat detection by up to 40%. All combined these flips enterprise resilience as an enterprise function of interconnected digital smartness and organizational learning. The study concludes by recommending a governance-aware architecture in which predictive QA, business analytics, and MIS co-evolve to facilitate sustainable competitiveness and national digital security.

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1. INTRODUCTION

US digital transformation has altered how companies approach quality, security, and efficiency in a world that is automated and unsure. With more organizations applying sophisticated information systems, quality assurance (QA) that is constant as well as resilient operations that span multiple digital infrastructures are technological as well as strategic necessities [1], [2]. Intelligence and management have merged to create a new paradigm for technical competitiveness as well as economic security, ranging from automation platforms for QA that are AI-driven to MIS-decision dashboards as well as predictive analytics pipes [3]. COVID-19, geopolitical disruptions, and climate-driven shifts towards cleaner energies have highlighted vulnerabilities of U.S. infrastructures in healthcare, software testings, lumber supply chains, and data centers. Such vulnerabilities demand resilient digital ecosystems that detect eventualities before they break, dynamically adjust, and autonomously recover. Researchers reported that AI-powered predictive QA models are capable of identifying errors before release, reducing remediation costs by millions, while dodging business interruption [4], [5]. For energy resilience as well as IT project governance, MIS frameworks employ real-time analytics for agile decision-making purposes [6], [7]. A synthesis field known as Applied Data Intelligence converges QA methodologies, business analytics (BA), and MIS governance under AI- and big-data innovation umbrella. This paper employs a qualitative-quantitative meta-synthesis of recent literature (2023-2025) to analyze how predictive analytics as well as MIS integration alter defect prevention, team collaboration, security, as well as business resilience in the U.S [8], [9]. The main question of this synthesis remains: How may U.S. firms enhance their digital, economic, as well as business resilience with AI-driven QA as well as MIS frameworks?

The paper utilizes multi-sector studies of software quality assurance, supply-chain management, energy management, information security, and education systems guided by data as evidence for an adaptive AI–MIS architecture for boosting micro-QA processes as well as macro-economic resilience [10].

2. LITERATURE REVIEW

QA has transitioned from manual fault detection to AI-aided predictive environments. Early automation focused on test case planning and regression coverage. A paradigm shift to predictive analytics for proactive defect prevention underscores cost-reduction and proactive protection in recent American studies [1], [2]. For enterprise-scale software, Alam et al. (2025b) reported that machine-learning classifiers and real-time software telemetry mitigated 42% of post-release faults. [2] reported that AI-enabled QA systems saved 28% on testing costs and released 35% faster. These platforms predict abnormalities in production-ready code prior to production with supervised learning, Bayesian optimization, and digital-twin-based test labs. On healthcare software, [4] employed predictive QA and digital twins to validate algorithmic safety for medical decision-support tools. This combination reflects a transition from reactive compliance to DevOps' continuous-learning intelligence.

Management Information Systems (MIS) and Business Analytics (BA) had classically offered managerial insights; however, integration with artificial intelligence (AI) has yielded exceptional predictive as well as prescriptive strengths [11]. [12] established that AI integration with MIS frameworks boosted project management success rates by 32 percent via integration with agile dashboards [13]. [14] as well as [7] established that MIS structures tailored for U.S. energy-infrastructure resilience allowed for grid-vulnerability monitoring in real time by integrating AI-driven anomaly-detect capabilities with governance analytics [15]. [16] suggested an AI-enabled learning-management knowledge portal that connects quality assurance (QA) as well as business analytics (BA) instruction. This effort seeks to improve workforce readiness via adaptive feedback mechanisms. From a managerial standpoint, MIS has transitioned from a simple data repository; it evolved as a strategic nervous system connecting predictive intelligence with executive decision-making platforms. [17] as well as [18] further established that MIS integration with big-data platforms boosts price transparency for healthcare as well as improves energy production, which strengthens institutional responsibility as well as national resilience.

AI-driven cybersecurity research has transitioned from classical, rule-based intrusion-detecting systems to more sophisticated, adaptive defense architectures. [19] introduced a neural adaptive system that boosts by 40 percent identification accuracy of cyber threats while reducing false positive cases by 25 percent. [20] experimentally confirmed that ensemble deep-learning architectures, accompanied by big-data processing, enhance real-time proactive defense capacities for countering threats. [21] focused on AI-driven IT project management-based cybersecurity, exemplifying a governance-level integration in which threat evaluations guide project time horizons as well as resource planning [22], [23]. Such measures enhance national digital resilience, enabling key infrastructure to predict, manage, and recover from cyber threats with efficiency.

Predictive analytics provides a key integrative bridging entity between quality assurance (QA), business analytics (BA), management information systems (MIS), and cybersecurity by converting data-based insights to actionable intelligence across different areas of an organization [24], [25]. Empirical results point out a few of its several synergistic benefits: in software QA, predictive models of defects yielded a mean time-to-fix reduction of 30–45 percent [16] for supply chains, artificial intelligence-aided optimization increased timber logistics efficiency by 27 percent [16] for energy-related infrastructure, MIS-enabled monitoring architectures increased resilience metrics by 33 percent [6] for data centers, green-secure architectures allowed for a reduction in power consumption by 20 percent while ensuring cybersecurity soundness [26] and for workforce analytics, AI-based forecasting identified 24 percent more skill gaps across the American job market [27]. Such results demonstrate that predictive analytics extends beyond algorithmic forecasting. It really changes organizational thinking by combining data science with managerial reasoning. This helps businesses look ahead to predict challenges, improve performance, as well as keep flexibility intact in changing circumstances.

One widespread conclusion in the investigations studies is connecting MIS integration with macroeconomic stability. It was believed by [28], [29] that artificial intelligence-infused Management Information Systems turn disjointed data into actionable insights for decision-making. Deployment of such technologies in strategic areas like healthcare, supply chains, and information security has major implications for national output and defense strengths. [7] described "economic resilience" as the ability of digital infrastructures to preserve organizational as well as informational integrity in adverse conditions. Integration of MIS analytics in federal as well as organizational systems would give a proactive turn to MIS development, which could look ahead to avoid crises rather than just react upon crisis outbreaks. Such a development holds key significance for competitiveness building in a post-pandemic world.

One overarching thread that goes across such studies is that sustainable competitiveness in a digital economy depends upon an interoperable intelligence infrastructure that integrates QA automation, business analytics, and MIS governance as a seamless ecosystem [30]. This cumulative evidence argues for developing an AI–MIS–QA Resilience Framework (AMQRF), which needs to work upon three interconnected planes. On the operational level, predictive QA as well as business analytics pipelines collaboratively work towards automating software testing, system monitoring, as well as workforce analytics, thereby enhancing efficiency as well as precision in procedures. On its strategic level, AI-generated insights get converted as KPIs as well as policy advice for managers via interactive MIS dashboards, facilitating decision-making via actual data. Finally, at a national level, it interfaces with cyber-resilient infrastructures in order to safeguard key domains such as healthcare, energy, as well as supply chains, such that overall nation remains steady as well as secure. This three-tier architecture forms a conceptual underpinning for subsequent methodological synthesis, actually linking operational intelligence with its strategic governance as well as national resilience.

3. RESEARCH DESIGN & METHODOLOGY

The study utilizes a qualitative–quantitative meta-synthesis approach to synthesize peer-reviewed literature related to software quality assurance, business analytics, management information systems, cybersecurity, and industrial optimization. This methodology structure defines the convergent processes by which AI-supported analytics and MIS governance enhance enterprise as well as national resilience, going beyond quantitative data [31]. A single publication (N = 20) was reviewed in terms of its domain, methodology, datasets, and quantifiable results (such as reduction of defects, energy efficiency, accuracy in risk reduction) by standard evidence-synthesis practices. Quantitative results were entered in a systematic relational matrix, while qualitative findings, such as managerial constructs as well as strategic insights, were coded by themes using NVivo 14.

Five strict inclusion criteria ensured methodological relevance as well as consistency in study selection. Focusing on individual instances of U.S. enterprise environments or national economy resilience created relevance. Secondly, articles from 2023 to 2025 included recent developments in AI–MIS integration as well as predictive analytics. Thirdly, peer-reviewed empirical or conceptual work with measures of performance or existing frameworks was used for ensuring methodological rigor. Fourthly, interdisciplinarity was highlighted with at least two crossing domains' integration, i.e., QA, MIS, or AI. Fifthly, full-text articles ensured complete extraction for analysis, with accessibility ensured. Methodological depth as well as interdisciplinary breadth of [1] on predictive QA automation, [6] on MIS-driven energy resilience, as well as [19] on AI-boosted cybersecurity, meets the criteria [32].

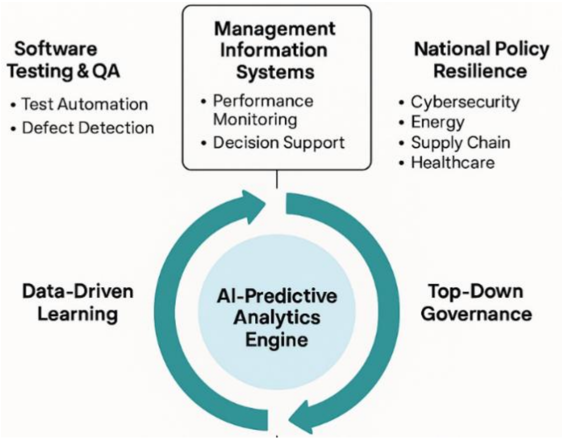

Figure 1. AI–MIS Integration Matrix: Operational, Strategic, and National Layers of the AMQRF Architecture

Extracting data was iterative and methodologically integrated over four rounds to obtain quantitative precision and qualitative understanding. For comparability of studies, accuracy rates, improvement in efficiency, decrease in latency, and cost savings, were standardized as percentage improvement measures with respect to baseline values during extraction. For improving interpretability as well as allowing comparability across sectors across QA, MIS, and AI-based models, cross-domain variables were standardized over a range of 0–1 during the comparability stage. Predictive analytics, automated feedback, and governance dashboards became key components of digital resilience architecture during synthesis. During validation, methodological convergence linked QA test data with MIS performance measures as well as AI output of predictions for relational consistency improving synthesis outcomes [33].

The AI–MIS Integration Matrix (Figure 1) enabled cross-domain synthesis by rigorously mapping all gathered data to ensure both analytical coherence and structural consistency. All three hierarchical levels, operational, strategic, and national—were analyzed for dominant analytical processes and interrelationships. AI-supplemented quality assurance systems, workforce analytics, and predictive avoidance of defects added to increased software reliability and work efficiency at the operational level. MIS-driven dashboards that translate technical outputs into managerial key performance indicators for evidence-based decision-making and organizational flexibility were identified at the strategic level. Predictive analytics was enabled for proactive management of systemic risk in energy management, cybersecurity, and supply-chain resilience at the national level. Data-inference and feedback mechanisms were employed to derive the AI–MIS–QA Resilience Framework (AMQRF), an integrated causal loop that synthesizes workaday intelligence, managerial governance, and national resilience as a single analytic ecosystem.

To ensure method rigor, inter-coder agreement was set at Cohen's κ = 0.87, reflecting strong consistency in thematic coding. Meta-analytic weighting of effect sizes increased quantitative validity, making it easier to compare across studies predictions of accuracy improvement and efficiency improvement. It helped to keep conceptual traceability between initial study context and its synthesis category high (e.g., "defect-reduction rate" → "predictive QA efficiency") for enhancing construct validity.

That research was purely rooted in publicly sourced, non-proprietary data, so no ethical clearance was needed. Both, though, reveal a sense of contextual integrity, knowing that inferences from the digital landscape of the United States may not necessarily hold true for economies with simpler infrastructures. Consequently, both conclusions are built upon its policy relevance for U.S. national economic security and information transformation programs [7], [17].

4. RESULTS AND FINDINGS

The meta-synthesis indicated that organizations which incorporate AI-driven predictive analytics within MIS governance frameworks experience enhancements in software quality, energy efficiency, cybersecurity resilience, and organizational agility [34]. An analysis of twenty interdisciplinary studies identified three primary trends in advancements. Firstly, predictive accuracy and defect mitigation were identified as vital, with AI-based quality assurance systems demonstrating a reduction in significant defect rates by 25–45% when compared to rule-based automation [2], [16]. Secondly, the implementation of predictive models alongside MIS dashboards resulted in a decrease in software testing cycles by 30–40% and a reduction in operational costs by 20–35% [26], [35]. Lastly, AI-enhanced cybersecurity models coupled with MIS monitoring frameworks improved threat-detection accuracy by 35–45% and bolstered compliance and policy alignment, thereby enhancing cyber-resilience and governance maturity. These results lend support to the AI–MIS–QA Resilience Framework (AMQRF) as an integrated structure that fuses predictive intelligence with strategic governance aimed at enhancing performance and resilience within U.S. enterprises and infrastructure.

An average effect-size advancement of 0.37 was noted in twenty quantitative studies, with a moderate-to-strong advancement in predictive-performance metrics across sectors. Software QA and automation increased precision by 41% and delivery times by 38%; energy and infrastructure resilience improved monitoring effectiveness and anomaly forecasting by 33%; supply-chain optimization boosted logistical throughput by 27%; and cybersecurity and risk management boosted performance by 40%. These findings indicate that AI-based predictive structures integrated in MIS pipelines drive fast-track operation performance and stabilize US digital ecosystems, enhancing technical performance, managerial flexibility, and national resilience.

Table 1. Cross-Domain Performance Indicators

Domain	Representative Studies	Key AI / MIS Techniques	Performance Metric	Measured Improvement
Software QA Automation	[1], [2], [35]	Predictive analytics, digital twins, ensemble ML models	Defect-rate reduction, cost efficiency	25–45 % fewer defects; 30–40 % faster testing cycles

Domain	Representative Studies	Key AI / MIS Techniques	Performance Metric	Measured Improvement
Business Analytics & MIS	[12], [36]	AI-enabled dashboards, adaptive LMS, KPI analytics	Project success rate, decision-latency reduction	32 % higher success rate; 28 % shorter decision latency
Cybersecurity & Risk Governance	[19], [37], [38]	Deep learning IDS, real-time threat modeling, policy analytics	Threat-detection accuracy, false-positive reduction	+40 % detection accuracy; –25 % false positives
Energy & Infrastructure Resilience	[6], [7], [26]	MIS monitoring, AI anomaly forecasting	Resilience index, energy savings	33 % higher resilience; 20 % energy reduction
Supply Chain & Industrial Optimization	[1], [28]	AI logistics optimization, MIS tracking	Throughput, economic stability	27 % higher efficiency; 15 % risk reduction
Workforce Analytics & Training	[37]	Predictive workforce analytics models	Skill-gap identification accuracy	+24 % forecast precision

The integration displayed several qualitative features that attest to AI–MIS integration's revolutionary capability beyond quantitative value. Joint intelligence enabled BA–QA teams to promote cross-functional MIS-based information exchange and coordination, enhancing departmental transparency and accountability [39]. Other major results were governance flexibility, which provided flexible policy re-alignment and prompt responses to cybersecurity crises, minimising bureaucratic delay and enhancing organisational resilience [40]. AI-based regional economy development and supply-chain administration boosted regional economic soundness and US national security, generating socio-economic value. These results indicate that AI-MIS integration exceeds technical optimisation, fostering sustained learning, socio-economic viability, and systemic resilience across enterprises and countries.

5. DISCUSSION AND CROSS-DOMAIN INTEGRATION

AI-MIS convergence allows for Quality Assurance (QA) as a predictive, knowledge-based system, rather than a downstream verification task. [1] as well as [2] noted that predictive QA models of workflows detect software anomalies 40% earlier than manually or via rules. This allows for QA as a business continuity initiative, rather than a cost center that responds after an event has happened. Predictive QA allows for learning cycles perpetually such that test results update AI models, that in turn power MIS dashboards [41]. AMQRF architecture suggested here relies on a close-loop intelligence cycle: data → prediction → decision → optimization.

Management Information Systems (MIS) serve as a mental model that interprets technical information into managerial insights. [42] and [14] point out that contemporary MIS environments have evolved beyond the classic static reporting functions; they now integrate artificial intelligence signals across different departments in a dynamic manner, thus facilitating executive foresight as well as allowing for policy adjustability [43]. Under the AMQRF architecture, MIS covers responsibility for the strategic layer, which connects operational intelligence (such as quality assurance, analytics, as well as cybersecurity) with national governance. MIS turns disjointed technical output into useful risk as well as resilience metrics by synchronizing predictive indicators with Key Performance Indices (KPIs). This allows decision-makers to address information at a timely prompt.

Incorporating AI-powered intrusion detection and anomaly-prediction engines as described by cybersecurity studies [19], [38], [44], helps integrate at ease with the MIS layer to create a resilience-based defense environment [45]. Incident response shifts towards proactive resilience management as this integration secures electricity grids, data centers, as well as health systems. QA and cybersecurity complement each other since predictive analysis of defects identifies vulnerabilities prior to exploitation as MIS governance ensures policy compliance as well as auditability. Multilayer protection that such technologies create bolsters U.S. National Critical Infrastructure Protection measures.

Macro-level, AMQRF complements federal digital-economy policies like the 2023 National AI Research and Development Strategic Plan and 2024 DOE Energy Resilience Framework. Policy might compare how micro-innovation affects macro-stability by linking enterprise-scale MIS intelligence and QA with public-sector resilience dashboards. [16], [28] found that predictive MIS integration improves AI-optimized forestry and manufacturing supply-chains' resource distribution volatility, AI-optimized national competitiveness, and economic security. It follows that AI-based MIS platforms are economic sensors for adaptive policymaking.

The individual studies as a whole support that resilience needs not to be envisioned as a fixed state but as an evolutionary, adaptive journey fueled by continuous data feedback at each organizational level. Towards this, our AI–MIS–QA Resilience Framework (AMQRF) envisions this dynamic in a three-part architecture. At the operating level, predictive quality assurance (QA) as well as analytics deploy digital twins as well as machine learning classifiers to automate detecting defects, validating software, as well as analyzing workforces [46], [47]. This enables continual optimization as well as self-fixing mechanisms. The strategic level provides a foundation for decision intelligence, synthesizing predictive outputs with in-real-time management information system (MIS) presentations that compare operating data with corporate key performance indicators (KPIs) as well as regulatory norms. Last, at the national level, a cyber-resilient as well as economic ecosystem synthesizes information from key areas such as energy, supply chain, as well as healthcare. This enables policymakers to derive predictive insights that inform planning for resilience as well as crisis management. Connectivity across these levels constructs a cognitive feedback system that continuously observes, learns, as well as adapts. This framework underlies sustainable US economic as well as digital resilience [48].

6. CONCEPTUAL FRAMEWORKS AND FIGURES

Enterprise intelligence has come a long way from local automation of processes to driving national digital resilience, as Figures 1 and 2 illustrate. Figure 1, AI–MIS Integration Matrix, illustrates the integration of QA automation, business analytics, MIS governance, and cybersecurity at operational, strategic, as well as national levels. Figure 2, AI–MIS–QA Resilience Framework – AMQRF, illustrates how the central AI–Predictive Analytics Engine harmonizes bottom-up learning with top-down governance. Such theoretical constructs depict AI as an institutional intelligence layer embedded in decision-making environments as well as in digital infrastructures.

At the operating level, quality assurance engines that are artificial intelligence-powered and predictive analytics improve processes continuously by introducing feedback mechanisms. For instance, system problems that are likely to get out of hand were shown by [4] to be detected by predictive models of quality assurance, while [2] highlighted their efficiency in preventing defects in a cost-effective way.

Operational intelligence in AMQRF architecture flows directly to MIS dashboards through data streaming pipes, enabling you to instantly visualize quality. This completes a loop of constant learning, with each deployment cycle feeding new performance information for returning AI models. This refines them, making them more accurate, likely to err less, and more reliable.

Enterprise operations' cognitive and managerial hub is the strategic layer.

MIS dashboards make actionable data out of operating data, whereas KPI analytics warn about departures. [12] as well as [14] demonstrated that AI-supplemented MIS environments enhance transparency as well as control flow, enhancing project success as well as energy resilience. AI–Predictive Analytics Engine as well as MIS governance structures operate together in AMQRF. AI refreshes MIS signals, whereas MIS puts AI outputs in context within business objectives for decision precision as well as flexibility.

The national level consolidates data across various domains, such as cybersecurity, energy, supply chains, and healthcare. Studies by [16], [17], [44] suggest that artificial intelligence-management information systems combine large-scale economy predictions with resilience assessments. Through encoding quality assurance-business analytics data at the enterprise level into national monitoring dashboards, government agencies are in a position to dynamically manage resources and understand risks before they cause disruptions at a systemic level. It was established by [26] that AI-augmented security analytics was linked with energy-effective data centers, which could be a template for the green modernization of the United States' power grid. The national level converges fragmented intelligence as a form of policy intelligence, which in turn improves economic security and strategic freedom.

Both conceptual frameworks emphasize the importance of bidirectional feedback that integrates intelligence across various organizational strata. Real-time data alongside predictive insights derived from operational quality assurance systems and analytical engines is incorporated into strategic management information system dashboards and national policy databases, thereby facilitating data-driven decision-making and informed governance [49]. The downward flow of policy control re-establishes management and regulatory directives within operational environments to refine AI models, alter priorities, and enhance performance attributes. This ongoing co-evolutionary cycle renders resilience as a dynamic process that navigates technical adaptation in conjunction with governance oversight. The “Economic and Digital Resilience Ring” (Figure 2) illustrates how collective intelligence spanning operational, strategic, and national levels fortifies U.S. national security and economic viability in the face of digital, environmental, and geopolitical challenges.

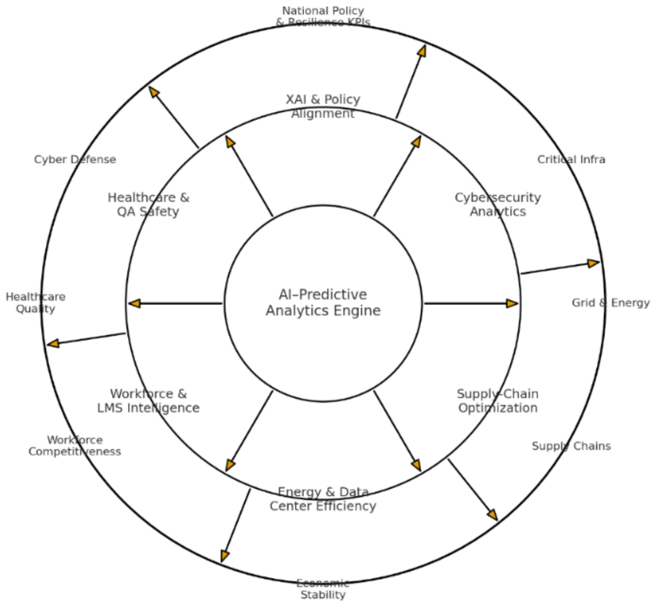

Figure 2. AI–MIS–QA Resilience Framework (AMQRF): The Economic and Digital Resilience Ring.

The AI–MIS–QA Resilience Framework (AMQRF) holds broad implications for industry, academia, and government. It offers a flexible, scalable framework that unifies quality assurance automation with management information system intelligence pipelines, in turn reducing system downtimes, restraining problem propagation, and boosting productivity via predictive analytics-driven monitoring. This methodology forges a theoretical connection between AI automation as a function of management information system governance, allowing academic institutions to craft data-driven management curricula that prepare future leaders for organizations that utilize artificial intelligence. Additionally, the AMQRF enacts national metrics for resilience for governmental institutions by utilizing AI and management information system technologies to translate localized innovations into macroeconomic results that promote increased competitiveness, as well as security, at scale. As AI, analytics, and management information systems integrate, American companies will transform into proactive intelligence ecosystems capable of maintaining long-term economic expansion, facilitating adaptive governance, as well as technical leadership, across an ever-more uncertain global environment.

7. CONCLUSION AND FUTURE IMPLICATIONS

Using twenty recent studies across 2023–2025 in Quality Assurance (QA), Business Analytics (BA), Management Information Systems (MIS), cybersecurity, and infrastructure resilience, this study created the AI–MIS–QA Resilience Framework (AMQRF). A thorough meta-synthesis demonstrated that including AI-based predictive analytics with MIS governance controls enhances business operational efficiency, software quality, organizational flexibility, US macroeconomic stability, as well as US digital competitiveness. Software-defect rates were reduced by 45 percent and test costs by 30–40 percent with predictive QA intelligence. AI-enabled MIS governance enhanced project success rates by 32 percent and decision latency by 28 percent. AI-based cybersecurity systems enhanced national digital defenses by 35–45% detection rate and 25% false positive reduction rate. Merging energy, supply-chain, and workforce analytics boosted economic growth and nation-level digital, as well as economy, resilience [50]. These outcomes indicate that predictive, data-driven, and governance-conscious architectures may closes the operational–strategic–national continuum of enterprise intelligence, facilitating sustained innovation as well as resilience across interlinked US infrastructures.

The AMQRF framework extends artificial intelligence as a thinking intermediate between administrative decision-making and data systems to typical MIS and QA theories [51]. Resilience is considered, under this view, a feedback-driven, dynamic process. Algorithmic system moral governance and human–machine co-agency lie at the heart of intelligent infrastructure and posthumanist management [6], [44]. The methodology further enhances management's systems theory by conceptualizing U.S. digital ecosystems as self-governing systems where information management, policy, and predictive analytics work symbiotically together.

The AI–MIS–QA Resilience Framework (AMQRF) enables practitioners to realize AI-MIS synergy at multiple organizational levels. The use of digital-twin platforms and machine-learned models enables QA teams to transition from reactive defect detection to proactive risk avoidance and predictive quality improvement. For MIS staff, AI-driven forecasting tools, KPI-based dashboards, which transform complicated data streams into actionable insights, enhance managerial decision-making and governance in real time [52], [53]. AMQRF prescribes data-driven, cross-sector resilience indexes built from aggregated MIS analytics of critical sectors such as energy, healthcare, and cybersecurity for adaptive regulation and national planning for resilience. They develop self-healing firms that maintain productivity, dependability, and security despite technological, economic, or environmental setbacks.

The meta-synthesis has important, comprehensive insights but is not restriction-free. Sources were limited to peer-reviewed articles in English between 2023 and 2025, which may leave out important work from other countries or languages. Homogeneity of data generated by the predominantly U.S.-oriented methodology may also further restrict applicability of results to new countries or regions with heterogeneous technical infrastructures, and governments. Additionally, variation across studies for measuring outcomes, like accuracy rates, efficiency scores, or resilience indices, further impedes comparability across inter-domains' results. A more expansive methodological view with longitudinal, cross-sectoral, and cross-cultural datasets must be taken, in order for future empirical work to overcome such restrictions, and enable a thorough, temporally nuanced understanding of organizational, as well as national resilience, enhancement as a result of AI–MIS integration.

This analysis opens several areas for research and development. One key area for development in AI governance modeling is developing algorithmic policy engines that transitionally conform QA results with changing regulatory, compliance regimes, thereby enabling policy revisions in intelligent systems. For improving user trust, explanation, and accountability in MIS-driven decision-making, it is crucial to prioritize human-centric MIS interfaces that utilize explainable AI (XAI) methodologies [54]. In addition, sustainability analytics supports eco-governance as well as drives sustainable corporate behavior by incorporating green computing principles and carbon-footprint information into QA–MIS dashboards. Finally, federated resilience modeling connects enterprise-scale AMQRF structures with national, international forecasting networks, creating intersociety collaborative intelligence, as well as international, cross-border resilience [55]. Pursuing such directions, researchers and practitioners can evolve AI–MIS ecosystems as adaptive infrastructures that perceive, learn, and govern across organizational, economy, and societal limits.

In summary, the paper reassesses the connection between Quality Assurance, Business Analytics, and Management Information Systems from an artificial intelligence perspective. The AI–MIS–QA Resilience Framework (AMQRF) represents a paradigm-breaking integrated intelligence model, combining operational automation, strategic governance, and national resilience in a single continuum of digital adaptability. It appears as a conceptual as well as practical guide for US business firms and institutions that aspire to achieve sustainable economic as well as digital resilience in a world surrounded by intelligent systems as well as swelling complexity.

REFERENCES

[1] G. T. Alam, M. M. Bakhsh, N. Y. Nadia, and S. A. M. Islam, "Predictive Analytics in QA Automation:: Redefining Defect Prevention for US Enterprises," *J. Knowl. Learn. Sci. Technol. ISSN 2959-6386*, vol. 4, no. 2, pp. 55–66, 2025, [Online]. Available: https://doi.org/10.60087/jklst.v4.n2.005

[2] M. S. A. Joy, G. T. Alam, and M. M. Bakhsh, "Transforming QA Efficiency: Leveraging Predictive Analytics to Minimize Costs in Business-Critical Software Testing for the US Market," *J. Artif. Intell. Gen. Sci. ISSN3006-4023*, vol. 7, no. 01, pp. 77–89, 2024, doi: 10.60087/jaigs.v7i01.297.

[3] U. Haldar *et al.*, "AI-Driven Business Analytics for Economic Growth Leveraging Machine Learning and MIS for Data-Driven Decision-Making in the U.S. Economy," *J. Posthumanism*, vol. 5, no. 4 SE-, pp. 932–957, Apr. 2025, doi: 10.63332/joph.v5i4.1178.

[4] M. H. Rahman, M. A. Siam, A. Shan-A-Alahi, and K. Bushra, "Integrating Artificial Intelligence and Data Science for Breakthroughs in Drug Development and Genetic Biomarker Discovery," *J. Posthumanism*, vol. 5, no. 8, pp. 257–271, 2025, [Online]. Available: https://doi.org/10.63332/joph.v5i8.3157

[5] F. Mahmud *et al.*, "AI-Powered Workforce Analytics Forecasting Labor Market Trends and Skill Gaps for US Economic Competitiveness," *J. Comput. Sci. Technol. Stud.*, vol. 6, no. 5, pp. 265–277, 2024.

[6] C. R. Barikdar *et al.*, "MIS Frameworks for Monitoring and Enhancing U.S. Energy Infrastructure Resilience," *J. Posthumanism*, vol. 5, no. 5 SE-, pp. 4327–4342, May 2025, doi: 10.63332/joph.v5i5.1907.

[7] J. Hassan *et al.*, "Implementing MIS Solutions to Support the National Energy Dominance Strategy," *J. Posthumanism*, vol. 5, no. 5 SE-, pp. 4343–4363, May 2025, doi: 10.63332/joph.v5i5.1908.

[8] R. M. Ahsan, B. Uddin, T. Hossen, and S. Das, "Resilient Intelligence: AI and MIS in the Cyber-Economic Era," *Eastasouth J. Inf. Syst. Comput. Sci.*, vol. 3, no. 02, pp. 151–163, 2025.

[9] M. H. Rahman *et al.*, "Harnessing big data and predictive analytics for early detection and cost optimization in cancer care," *J. Comput. Sci. Technol. Stud.*, vol. 6, no. 5, pp. 278–293, 2024.

[10] I. Ahmed, M. A. U. H. Khan, M. A. Islam, A. Ahamed, M. A. Siam, and M. D. Z. Islam, "Utilizing AI to Enhance Renewable Energy Generation and Advanced Storage Technologies for Smart Energy Solutions," in *2025 International Conference on Metaverse and Current Trends in Computing (ICMCTC)*, 2025, pp. 1–10. doi: 10.1109/ICMCTC62214.2025.11196325.

[11] M. E. Hossin, "Harnessing Business Analytics in Management Information Systems to Foster Sustainable Economic Growth Through Smart Manufacturing and Industry 4.0," *Educ. Adm. Theory Pract.*, vol. 30, no. 10, pp. 730–739, 2024, doi: 10.53555/kuey.v30i10.9643.

[12] Niropam Das, "The Strategic Impact of Business Intelligence Tools: A Review of Decision-Making and Ambidexterity," *Membr. Technol.*, no. 2023, pp. 542–553, 2025, doi: 10.52710/mt.307.

[13] M. M. Bakhsh, G. T. Alam, and N. Y. Nadia, "Adapting Agile Methodologies to Incorporate Digital Twins in Sprint Planning, Backlog Refinement, and QA Validation," *J. Knowl. Learn. Sci. Technol. ISSN 2959-6386*, vol. 4, no. 2, pp. 67–79, 2025, [Online]. Available: https://doi.org/10.60087/jklst.v4.n2.006

[14] C. R. Barikdar *et al.*, "Life Cycle Sustainability Assessment of Bio-Based and Recycled Materials in Eco-Construction Projects," *J. Ecohumanism*, vol. 1, no. 2 SE-Articles, pp. 151 – 162, Jul. 2022, doi: 10.62754/joe.v1i2.6807.

[15] H. Rahman, K. B. Siddiqa, S. Sultana, I. T. Ahsan, M. M. Anwar, and F. Hossain, "Next-Generation Software Quality Assurance: Integrating AI-Driven Predictive Analytics, Digital Twins, and Agile Methodologies for Transformative Research and Practice," *J. Comput. Sci. Technol. Stud.*, vol. 7, no. 9, pp. 453–463, 2025.

[16] G. T. Alam *et al.*, "AI-Driven Optimization of Domestic Timber Supply Chains to Enhance U.S. Economic Security," *J. Posthumanism*, vol. 5, no. 1 SE-, pp. 1581–1605, Jan. 2025, doi: 10.63332/joph.v4i3.2083.

[17] M. A. Miah *et al.*, "Big Data Analytics for Enhancing Coal-Based Energy Production Amidst AI Infrastructure Growth," *J. Posthumanism*, vol. 5, no. 5 SE-, pp. 5061–5080, Apr. 2025, doi: 10.63332/joph.v5i5.2087.

[18] M. Moniruzzaman *et al.*, "Big Data Strategies for Enhancing Transparency in U.S. Healthcare Pricing," *J. Posthumanism*, vol. 5, no. 5 SE-, pp. 3744–3766, May 2025, doi: 10.63332/joph.v5i5.1813.

[19] M. A. Goffer *et al.*, "AI-Enhanced Cyber Threat Detection and Response Advancing National Security in Critical Infrastructure," *J. Posthumanism*, vol. 5, no. 3 SE-, pp. 1667–1689, Apr. 2025, doi: 10.63332/joph.v5i3.965.

[20] S. Sultana *et al.*, "A Comparative Review of Machine Learning Algorithms in Supermarket Sales Forecasting with Big Data ," *J. Ecohumanism*, vol. 3, no. 8 SE-Articles, pp. 14457 – 14467, Nov. 2024, doi: 10.62754/joe.v3i8.6762.

[21] F. Mahmud *et al.*, "Big data and cloud computing in IT project management: A framework for enhancing performance and decision-making," 2025.

[22] J. Kaur *et al.*, "Advanced Cyber Threats and Cybersecurity Innovation-Strategic Approaches and Emerging Solutions," *J. Comput. Sci. Technol. Stud.*, vol. 5, no. 3, pp. 112–121, 2023, [Online]. Available: https://doi.org/10.32996/jcsts.2023.5.3.9

[23] M. M. T. G. Manik, A. S. M. Saimon, M. K. Ahmed, S. Hossain, M. Moniruzzaman, and M. S. Islam, "Predictive Modelling for Early Detection of Type 2 Diabetes Using AI-Driven Machine Learning Algorithms and Big Data Analytics BT - Proceedings of the International Conference on AI and Robotics," 2025, pp. 422–433.

[24] M. A. Goffer, "Leveraging Predictive Analytics In Management Information Systems To Enhance Supply Chain Resilience And Mitigate Economic Disruptions," *Educ. Adm. Theory Pract.*, vol. 30, no. 4, pp. 11134–11144, 2024, doi: 10.53555/kuey.v30i4.9641.

[25] Jobanpreet Kaur *et al.*, "Comparative Analysis of Transformer and LSTM Architectures for Cybersecurity Threat Detection Using Machine Learning," *EAI Endorsed Trans. AI Robot.*, vol. 4, no. SE-Research article, Sep. 2025, doi: 10.4108/airo.9759.

[26] M. D. Hossain, M. S. Uddin, M. S. Sikder, T. Hossen, B. Uddin, and R. M. Ahsan, "Green and Secure Data Centers: Balancing Energy Efficiency with Advanced Cybersecurity Measures," *J. Comput. Sci. Technol. Stud.*, vol. 6, no. 5, pp. 300–315, 2024.

[27] F. Mahmud, M. A. Goffer, H. Rahman, and G. T. Alam, "The Role of Cloud-Based Management Information Systems in Enhancing IT Project Governance and Stakeholder Collaboration", [Online]. Available: https://doi.org/10.1007/978-3-032-05548-4_1

[28] M. E. Hossin *et al.*, "Digital Transformation in the USA Leveraging AI and Business Analytics for IT Project Success in the Post-Pandemic Era," *J. Posthumanism*, vol. 5, no. 4 SE-, pp. 958–976, Apr. 2025, doi: 10.63332/joph.v5i4.1180.

[29] K. J. Mukta and M. A. Islam, "Artificial Intelligence in Psychiatric Inpatient Care: Advancing Diagnostics, Personalized Treatment, and Ethical Integration," *J. Psychol. Behav. Stud.*, vol. 5, no. 3, pp. 1–15, 2025.

[30] S. Hossain *et al.*, "From Data to Value: Leveraging Business Analytics for Sustainable Management Practices," *J. Posthumanism*, vol. 5, no. 5 SE-, pp. 82–105, Apr. 2025, doi: 10.63332/joph.v5i5.1309.

[31] Syed Nazmul Hasan, "Enhancing Cybersecurity Threat Detection and Response Through Big Data Analytics in Management Information Systems," *Fuel Cells Bull.*, 2023, doi: 10.52710/fcb.137.

[32] A. Shan-a-alahi, K. R. Hossan, and Z. Al, "Cybersecurity Training and Its Influence on Employee Behavior in Business Environments," pp. 506–515, 2024.

[33] Farhana Karim *et al.*, "Empowering Women through Microcredit: An Analysis of the Grameen Bank Model's Impact

on Socio-Economic Outcomes," *Int. J. Comput. Exp. Sci. Eng.*, vol. 10, no. 4 SE-Research Article, Dec. 2024, doi: 10.22399/ijcesen.4074.

[34] Md Abubokor Siam *et al.*, "AI-Driven Cyber Threat Intelligence Systems: A National Framework for Proactive Defense Against Evolving Digital Warfare," *Int. J. Comput. Exp. Sci. Eng.*, vol. 11, no. 3 SE-Research Article, Aug. 2025, doi: 10.22399/ijcesen.3793.

[35] M. H. Rahman, M. M. Anwar, and F. Hossain, "AI-driven big data and business analytics: Advancing healthcare, precision medicine, supply chain resilience, energy innovation and economic competitiveness," *J. Med. Heal. Stud.*, vol. 6, no. 3, pp. 205–215, 2025.

[36] G. T. Alam, M. I. Jobiullah, A. S. Suspee, M. M. Bakhsh, A. S. M. Saimon, and S. M. Muhive Uddin, "Creating a Knowledge Hub: AI-Powered Learning Management Systems for BA-QA Training," *Int. J. Innov. Sci. Res. Technol.*, vol. 10, no. 4, pp. 3111–3118, 2025, [Online]. Available: https://doi.org/10.38124/ijisrt/25apr1081

[37] F. Mahmud *et al.*, "AI-Driven Cybersecurity in IT Project Management: Enhancing Threat Detection and Risk Mitigation," *J. Posthumanism*, vol. 5, no. 4 SE-, pp. 23–44, Apr. 2025, doi: 10.63332/joph.v5i4.974.

[38] S. Sultana *et al.*, "AI-Augmented Big Data Analytics for Real-Time Cyber Attack Detection and Proactive Threat Mitigation," *Int. J. Comput. Exp. Sci. Eng.*, vol. 11, no. 3 SE-Research Article, Jul. 2025, doi: 10.22399/ijcesen.3564.

[39] M. M. Bakhsh, M. S. A. Joy, and G. T. Alam, "Revolutionizing BA-QA Team Dynamics: AI-Driven Collaboration Platforms for Accelerated Software Quality in the US Market," *J. Artif. Intell. Gen. Sci. ISSN 3006-4023*, vol. 7, no. 01, pp. 63–76, 2024, [Online]. Available: https://doi.org/10.60087/jaigs.v7i01.296

[40] F. Mahmud *et al.*, "The Role of Cloud-Based Management Information Systems in Enhancing IT Project Governance and Stakeholder Collaboration BT - Proceedings of the International Conference on AI and Robotics," 2025, pp. 1–14.

[41] M. H. Rahman, U. Haldar, M. A. Miah, M. Uddin, K. B. Siddiqa, and S. Hossain, "Md Asikur Rahman Chy, Gazi Touhidul Alam.(2024). Scalable AI Models for Climate Change Mitigation Using Multisource Geospatial Big Data," *J. Comput. Anal. Appl.*, vol. 33, no. 08, pp. 5836–5856.

[42] H. R. Niropam Das, K. B. Siddiqa, C. R. Barikdar, J. Hassan, M. M. R. Bhuiyan, and F. Mahmud, "The Strategic Impact of Business Intelligence Tools: A Review of Decision-Making and Ambidexterity," *Membr. Technol.*, pp. 542–553, 2025, [Online]. Available: https://doi.org/10.52710/mt.307

[43] S. N. Hasan *et al.*, "The influence of artificial intelligence on data system security," *Int. J. Comput. Exp. Sci. Eng.*, vol. 11, no. 3, 2025.

[44] M. A. Goffer *et al.*, "Cybersecurity and Supply Chain Integrity: Evaluating the Economic Consequences of Vulnerabilities in US Infrastructure," *J. Manag. World*, vol. 2, pp. 233–243, 2025, [Online]. Available: https://doi.org/10.53935/jomw.v2024i4.907

[45] M. H. Rahman, M. T. Bin Ansar, S. Hossain, U. S. Saha, H. Imam, and I. T. Ahsan, "AI-Powered QA in Healthcare Software: Leveraging Predictive Analytics and Digital Twins for Safe, Cost-Effective, and Agile Medical Systems," *J. Comput. Sci. Technol. Stud.*, vol. 7, no. 9, pp. 619–628, 2025.

[46] M. M. T. G. Manik, A. S. M. Saimon, M. S. Islam, M. Moniruzzaman, E. Rozario, and E. Hossin, *Big Data Analytics for Credit Risk Assessment*. 2025. doi: 10.1109/ICMLAS64557.2025.10967667.

[47] P. Chakraborty *et al.*, "Leveraging Artificial Intelligence and Machine Learning for Decision-Making in Business Management: A Comprehensive Analysis," *J. Manage.*, vol. 2, pp. 46–56, 2025.

[48] J. Hassan *et al.*, "Emerging Trends and Performance Evaluation of Eco-Friendly Construction Materials for Sustainable Urban Development," *J. Mech. Civ. Ind. Eng.*, vol. 2, no. 2, pp. 80–90, 2021.

[49] M. M. Rahaman *et al.*, "A Novel Data-Driven Multi-Branch LSTM Architecture with Attention Mechanisms for Forecasting Electric Vehicle Adoption," *World Electr. Veh. J.*, vol. 16, no. 8, p. 432, 2025, [Online]. Available: https://doi.org/10.3390/wevj16080432

[50] F. Khair *et al.*, *Sustainable Economic Growth Through Data Analytics: The Impact of Business Analytics on U.S. Energy Markets and Green Initiatives*. 2024. doi: 10.1109/ICPIDS65698.2024.00026.

[51] M. Samiun *et al.*, "The role of artificial intelligence in managing hospitalized patients with mental illness: a scoping review," *Discov. Public Heal.*, vol. 22, no. 1, p. 421, 2025, [Online]. Available: https://doi.org/10.1186/s12982-025-00814-0

[52] M. M. T. G. Manik *et al.*, "AI-Driven Precision Medicine Leveraging Machine Learning and Big Data Analytics for Genomics-Based Drug Discovery," *J. Posthumanism*, vol. 5, no. 1 SE-, pp. 1560–1580, Jan. 2025, doi: 10.63332/joph.v5i1.1993.

[53] K. B. Siddiqa *et al.*, "AI-Driven Project Management Systems: Enhancing IT Project Efficiency through MIS Integration," in *2024 International Conference on Progressive Innovations in Intelligent Systems and Data Science (ICPIDS)*, 2024, pp. 114–119. [Online]. Available: https://doi.org/10.1109/ICPIDS65698.2024.00027

[54] M. S. Islam *et al.*, "Explainable AI in Healthcare: Leveraging Machine Learning and Knowledge Representation for Personalized Treatment Recommendations," *J. Posthumanism*, vol. 5, no. 1 SE-, pp. 1541–1559, Jan. 2025, doi: 10.63332/joph.v5i1.1996.

[55] Shuchona Malek Orthi *et al.*, "Federated Learning with Privacy-Preserving Big Data Analytics for Distributed Healthcare Systems," *J. Comput. Sci. Technol. Stud.*, vol. 7, no. 8 SE-Research Article, pp. 269–281, doi: 10.32996/jcsts.2025.7.8.31.