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# Modernizing Government IT Infrastructures: Integrating ASP.NET Core in the Broader Context of Legacy Systems Transformation and Digital Public Sector Evolution

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**Abstract** This research article examines the nexus between modern software technologies—specifically the evolution from ASP.NET to ASP.NET Core—and the broader imperative of modernizing legacy information technology (IT) infrastructure within government and public sector organizations. The contemporary digital transformation landscape is marked by an urgent demand for scalable, secure, and future-ready technological frameworks that enable the delivery of efficient citizen-centric services, firefight technical debt, and align government digital capabilities with global benchmarks. Integrating theoretical foundations from public administration technology adoption research and grounded analysis on legacy system modernization strategies, this comprehensive study situates ASP.NET Core's evolution within the broader systemic pressures affecting digital government. Drawing on a spectrum of literature, including empirical findings on legacy systems' impacts on public sector performance (Irani et al., 2023), governance challenges highlighted by accountability institutions (United States Government Accountability Office, 2016), and strategic frameworks for modernization (Gartner, 2019), we elaborate on the potentials, challenges, and implications of adopting contemporary development frameworks. Through extensive discourse on technical debt, cloud migration rationales, public value theory, digital maturity models, and governance performance metrics, we underline both opportunities and risks associated with adopting ASP.NET Core as part of a holistic modernization

strategy. This article contributes a multidisciplinary perspective linking software engineering innovation with public administration imperatives, informing scholars, policymakers, and technology leaders navigating the complex pathway of IT reform in government contexts.

**Keywords:** Legacy systems, digital transformation, ASP.NET Core, public sector modernization, technical debt, cloud migration, governance performance

## **Introduction**

The persistent challenge of aging information systems within the public sector has emerged as a central concern for scholars, practitioners, and policymakers alike in the quest to design digital governments that are both responsive and resilient. Legacy IT systems—entrenched software and hardware configurations often dating back decades—pose significant hurdles in delivering effective public services, safeguarding data security, and enabling agile adaptation to emerging technological paradigms. As early as 2016, oversight institutions such as the United States Government Accountability Office documented how federal agencies were grappling with outdated systems that inhibited service delivery and exposed vulnerabilities in operational continuity (United States Government Accountability Office, 2016). Decades later, this issue remains salient, now further compounded by rapid advancements in cloud computing, AI-driven architectures, and evolving citizen expectations for seamless digital engagement.

Within this broader arena of digital transformation, the evolution of software development frameworks—specifically the transition from traditional platforms such as ASP.NET to more modular, cross-platform solutions like ASP.NET Core—represents an important microcosm of how technological innovation can facilitate, but also complicate, systemic transformation. ASP.NET Core, a reimagined, open-source, and high-performance framework, offers compelling technical advantages over its predecessor, including improved scalability, enhanced cross-platform capabilities, and tighter integration with modern deployment environments (Valiveti, 2025). However, adopting such advancements within government environments also surfaces a range of

strategic, organizational, and governance questions.

The problem addressed in this article rests at the intersection of two critical domains: the imperative to modernize legacy government IT infrastructure and the strategic evaluation of contemporary technology frameworks—embodied by ASP.NET Core—that promise to support such transformation. While existing studies have chronicled the adverse impacts of legacy systems on digital transformation efforts (Irani et al., 2023) and provided frameworks for evaluating modernization options (Gartner, 2019), a gap remains in synthesizing the implications of specific software platform transitions within the wider context of public sector digital reform. This article seeks to fill that gap by analytically interrogating how adopting modern frameworks like ASP.NET Core can align with public administration objectives, the management of technical debt, and the pursuit of value-driven governance.

Theoretical underpinnings for this analysis draw upon literature in technology innovation adoption, public value theory, digital maturity modeling, and systems modernization frameworks. Public value theory posits that government technological investments should be evaluated not merely on cost or technical performance but on their capacity to enhance outcomes meaningful to citizens. In parallel, digital maturity models offer lenses through which organizations can assess readiness for transformative change, including workforce capabilities, organizational culture, and governance structures that support innovation adoption. By situating ASP.NET Core within these theoretical frameworks and juxtaposing it against legacy system challenges, this article foregrounds not only technical rationales but also organizational dynamics and policy considerations integral to modernization success.

Fundamentally, the contribution of this article is twofold: (1) to elucidate how contemporary software frameworks like ASP.NET Core can serve as enablers in the digital transformation journeys of public sector entities, and (2) to critically examine the systemic constraints—rooted in legacy systems, technical debt, and institutional inertia—that can undermine such modernization efforts. Through this comprehensive

interrogation, we aim to advance scholarly discourse and provide actionable insights for practitioners navigating the complex terrain of government IT modernization.

## **Methodology**

This article is anchored in a multidisciplinary mixed-methods research design that integrates qualitative systematic literature review, conceptual synthesis, and interpretative analysis. The rationale for this approach stems from the inherently interdisciplinary nature of the research problem, which intersects information systems engineering, public administration, organizational behavior, and technology strategy. Rather than deploying primary empirical data collection—such as surveys or interviews—this research strategically synthesizes findings from existing literature and authoritative reports to construct a theoretical and analytical framework that captures the complex dynamics of legacy system modernization and software framework adoption.

The core component of the methodology is a systematic literature review, which adheres to established principles for identifying, screening, and analyzing relevant scholarly works and authoritative institutional reports. Sources were selected from peer-reviewed journals, conference proceedings, government accountability reports, and industry analyses that address legacy systems, digital transformation in the public sector, technical debt, cloud migration, and software framework evolution. Particular emphasis was placed on including literature that elucidates both the technical dimensions of modernization and the organizational, governance, and policy factors that shape technology adoption decisions.

The literature on legacy systems and public sector transformation was examined to establish the historical context and evolution of the challenges facing government IT infrastructures. Notably, the United States Government Accountability Office's assessment of aging legacy systems served as a foundational reference for articulating why legacy infrastructure remains a critical issue for public

administrations. Complementary case-based studies, such as those on European public administrations, provide empirical insights into the impacts of legacy technologies on digital transformation outcomes (Irani et al., 2023). These works collectively inform the problem definition and highlight recurring themes—such as risk aversion, budgetary constraints, and interoperability challenges—that influence modernization strategies.

To integrate the specific technological evolution of ASP.NET to ASP.NET Core into this broader context, a detailed analysis of Valiveti's (2025) work was conducted to extract insights on technical features, implementation strategies, and the potential implications of adopting ASP.NET Core. By juxtaposing these technical attributes with high-level modernization frameworks offered by organizations like Gartner (2019), we explored how particular software capabilities can align with strategic modernization options, such as refactoring, replatforming, or complete system replacement.

Analytical synthesis was used to build causal linkages between technical adoption decisions and organizational outcomes. For example, literature on technical debt, including industry analyses highlighting its impact on government operations, informed discussions on operational risk, maintenance burden, and the hidden costs associated with legacy systems. By drawing connections between abstract conceptual frameworks—such as public value theory—and concrete technological decisions, the analysis moves beyond descriptive summaries to offer nuanced interpretations.

A limitation inherent in this methodological design is the reliance on secondary sources without direct empirical verification through fieldwork or stakeholder engagement. While this limits the ability to generalize findings to specific organizational contexts, the depth and breadth of literature reviewed, combined with robust analytical synthesis, enable the construction of theoretically grounded and actionable insights relevant to a wide array of public sector environments.

## **Results**

The analysis reveals a multifaceted landscape in which legacy IT systems exert pervasive influences on government performance, digital transformation trajectories, and technology adoption decisions. Several emergent themes crystallize from the literature, each contributing to a layered understanding of why modernization remains both a strategic imperative and an operational challenge.

First, legacy systems continue to impede digital transformation efforts within public administration by limiting interoperability, increasing maintenance costs, and reinforcing siloed operational structures. Empirical evidence from studies examining European public administrations highlights how entrenched legacy technologies restrict the ability to deliver integrated digital services, resulting in constrained responsiveness to citizen needs and diminished organizational agility (Irani et al., 2023). Such constraints also manifest in data fragmentation, where disparate legacy systems hinder seamless information sharing across departments, undermining efforts to achieve whole-of-government digital integration.

Second, the financial and operational costs associated with maintaining legacy infrastructure—often referred to as technical debt—represent a significant burden on government agencies. Industry reports underscore that deferred modernization, while appearing cost-effective in the short term, escalates long-term expenditures due to escalating maintenance overheads, security vulnerabilities, and a shrinking pool of skilled professionals familiar with outdated technologies. This dynamic creates a vicious cycle in which technical debt compounds, further inhibiting modernization initiatives and crowding out investments in innovation.

Third, modern software frameworks like ASP.NET Core embody features that can directly address several limitations of legacy systems. The rearchitected nature of ASP.NET Core—built for cross-platform compatibility, modular deployment, and integration with cloud environments—positions it as a viable option for developing scalable and maintainable government applications (Valiveti, 2025). The alignment between contemporary software capabilities and modernization objectives suggests that

adopting modern frameworks can catalyze meaningful progress toward agile and citizen-centric digital services.

However, the transition to such frameworks is not without challenges. Organizational resistance to change, skill gaps among IT personnel, and legacy contract constraints often complicate modernization efforts. The literature points to the importance of governance structures that foster innovation, incentivize upskilling, and provide strategic direction to guide modernization priorities. Public administrations with clear digital transformation roadmaps and leadership commitment demonstrate higher levels of modernization progress, whereas those lacking coherent strategies tend to perpetuate status quo practices.

Moreover, the interaction between cloud migration and software modernization emerges as a critical area of strategic consideration. Cloud platforms offer elasticity, resource pooling, and advanced security features, making them attractive environments for deploying modern applications. Frameworks like ASP.NET Core—which natively support cloud deployment models—can facilitate smoother transitions to cloud-based architectures. However, cloud migration also introduces complexities related to data sovereignty, compliance with regulatory frameworks, and legacy data migration challenges that require careful planning and institutional capacity.

These findings coalesce into a picture in which modernization is not simply a technical upgrade but a systemic transformation encompassing organizational culture, governance practices, and strategic foresight. While ASP.NET Core presents technical advantages conducive to modernization, its adoption must be contextualized within broader institutional ecosystems that mediate technology uptake and sustainability.

## **Discussion**

The discussion synthesizes the results within theoretical and practical dimensions, exploring how the interplay between technological innovation, institutional dynamics, and governance frameworks shapes modernization outcomes. At the heart of this

synthesis lies an appreciation of how digital transformation in public sectors is inherently socio-technical, encompassing technological artifacts and organizational practices that co-evolve.

A central theoretical lens for interpreting the findings is public value theory, which asserts that government technology investments should be evaluated not merely on technical performance but on their capacity to generate outcomes meaningful to citizens. From this vantage point, modern software frameworks like ASP.NET Core contribute to public value by enabling the development of responsive, reliable, and accessible digital services. The cross-platform nature of such frameworks supports broader access across diverse user devices, while integration with cloud environments can improve uptime, scalability, and security—factors that directly affect citizen trust and satisfaction. However, public value is not realized solely through technological choice; it also depends on institutional governance, transparent processes, and alignment between digital strategy and service delivery objectives.

Institutional dynamics further shape the adoption landscape. Legacy systems are often entrenched due to historical investments, contractual obligations with vendors, and workforce familiarity with established technologies. These factors create pockets of resistance that challenge modernization efforts. Research on legacy systems indicates that organizational inertia, coupled with risk-averse cultures, can delay crucial decision-making and perpetuate outdated technologies. Overcoming such inertia requires strategic leadership that prioritizes modernization as a core organizational goal and deploys change management practices that incentivize innovation and mitigate fear of disruption.

The literature on technical debt reinforces this understanding by highlighting how accumulated deferred maintenance and outdated technologies erode organizational capacity over time. Technical debt functions as both a symptom of past decisions and a constraint on future progress. As borrowed resources are consumed by patchwork maintenance, fewer resources remain for transformative projects. In this context, adopting modern frameworks like ASP.NET

Core can be viewed as a step toward retiring legacy technical debt. However, this transition must be accompanied by governance mechanisms that prevent future debt accumulation—for example, through rigorous architectural standards, continuous refactoring practices, and investment in workforce upskilling.

Cloud migration emerges as another domain where strategic alignment is critical. Cloud environments offer substantial potential for efficiency gains and scalability, yet they require navigation of regulatory, security, and data governance frameworks that differ markedly from traditional on-premises IT environments. Frameworks like ASP.NET Core, designed with cloud compatibility in mind, can simplify this transition from a technical perspective. Nonetheless, government entities must address organizational readiness, including data classification policies, risk management frameworks, and compliance requirements, to ensure that cloud adoption reinforces rather than undermines trust and accountability.

Comparing opposing viewpoints within the literature reveals important nuances. For example, some scholars emphasize incremental modernization—such as refactoring specific legacy components—arguing that wholesale replacement may be infeasible due to resource constraints. Others advocate for more radical replatforming strategies when legacy systems are fundamentally misaligned with current requirements. This tension underscores that modernization strategies must be contextually tailored, balancing risk, resource availability, and strategic priorities.

A recurring theme across studies is the importance of developing a digital maturity framework that accounts not only for technological artifacts but also for organizational competencies and governance mechanisms. Digital maturity assessments can illuminate areas where workforce skills, data management practices, or leadership engagement must be strengthened before ambitious modernization initiatives can succeed.

Despite advances in understanding modernization pathways, limitations remain in scholarly knowledge.

Empirical studies grounded in longitudinal data across diverse public sector contexts are scarce, making it difficult to generalize best practices broadly. Moreover, rapid technological change continues to outpace organizational adaptation, raising questions about how institutions can build resilience and agility into their modernization strategies.

Future research should thus prioritize longitudinal investigations that track modernization outcomes over time, incorporate comparative analyses across jurisdictions, and explore how emerging technologies—such as AI-driven analytics—can complement foundational modernization frameworks. Additionally, integrating stakeholder perspectives, including those of frontline civil servants and citizens, can yield holistic insights into how modernization affects lived experiences of public services.

## Conclusion

In summary, the evolution of software frameworks such as ASP.NET Core represents a significant technical development with meaningful implications for public sector digital transformation efforts. However, realizing the potential benefits of such technologies requires holistic consideration of legacy system constraints, organizational dynamics, governance structures, and strategic priorities. This article has elucidated how modern software capabilities intersect with broader modernization imperatives, offering a theoretical and analytical foundation to guide both scholarly inquiry and pragmatic decision-making in government IT modernization. Continued attention to the socio-technical dimensions of transformation will be essential for public administrations to deliver innovative, efficient, and citizen-centric digital services in an era of rapid technological change.

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