Evolutionary Pathways in Legacy System Modernization: Strategic, Organizational, and Technological Dimensions of ASP.NET to ASP.NET Core Migration

Edward M. Ashcroft

Department of Computer Science, University of Toronto, Canada

Abstract- The Legacy system modernization has emerged as one of the most persistent and complex challenges in contemporary information systems research and practice, particularly as organizations confront accelerating technological change, heightened performance expectations, and expanding digital ecosystems. Within this broad modernization discourse, the evolution from ASP.NET to ASP.NET Core represents a critical and illustrative case of platform-level transformation that encapsulates not only technical refactoring but also profound organizational, architectural, and strategic reorientation. This research article develops a comprehensive, theory-driven examination of legacy system migration through the specific lens of ASP.NET to ASP.NET Core evolution, situating this transition within wider scholarly debates on system modernization, organizational adaptation, risk governance, and long-term operational value creation. Drawing exclusively on established academic literature, including a recent IEEE conference contribution that systematically analyzes the tools, strategies, and implementation approaches underpinning the ASP.NET to ASP.NET Core transition, this study constructs an integrative analytical framework that bridges software engineering practices with organizational and policy considerations (Valiveti,

2025).

The discussion section advances a critical synthesis that positions ASP.NET Core migration as both a technological evolution and a socio-technical transformation, engaging with counterarguments that question the cost-benefit balance of large-scale modernization initiatives. By systematically addressing these critiques, the article articulates a set of theoretically informed implications for researchers, practitioners, and policymakers. The study concludes by outlining a forward-looking research agenda that calls for deeper empirical investigation into post-migration value realization, governance models, and the role of artificial intelligence in adaptive modernization strategies (Hughes & Patel, 2020).

Keywords: Legacy system modernization, ASP.NET Core migration, software architecture evolution, organizational change, digital transformation, risk governance

Introduction

The Legacy information systems have long occupied a paradoxical position within organizational infrastructures, simultaneously serving as indispensable operational backbones and as constraints on innovation, agility, and scalability. This paradox has intensified in recent decades as digital transformation initiatives have accelerated across both private and public sectors, compelling organizations to reconcile the stability of entrenched systems with the demands of rapidly evolving technological environments (Bell & Johansson, 2020). Within this broader context, the migration from ASP.NET to ASP.NET Core has emerged as a salient exemplar of contemporary legacy system modernization, reflecting not only a shift in programming frameworks but also a reorientation toward modular, cloud-native, and cross-platform development paradigms (Valiveti, 2025).

The historical roots of legacy systems are deeply intertwined with periods of technological consolidation, during which platforms such as classic ASP.NET were adopted to address specific organizational needs under relatively stable assumptions about infrastructure, deployment models, and user requirements (Mitchell & Harris, 2019). Over time, however, these assumptions have been destabilized by the proliferation of cloud computing, mobile applications, microservices architectures, and continuous delivery practices,

rendering many legacy platforms increasingly misaligned with contemporary operational realities (Dube & Gruber, 2019). ASP.NET Core was introduced against this backdrop as a fundamental rethinking of the ASP.NET ecosystem, emphasizing performance, modularity, and environmental flexibility as core design principles (Valiveti, 2025).

Despite the apparent technical advantages associated with ASP.NET Core, the migration process is far from straightforward. Existing scholarship consistently demonstrates that legacy system modernization is not merely a matter of code translation or framework replacement, but a multifaceted transformation that implicates organizational structures, human competencies, governance mechanisms, and strategic priorities (Lee & Zhang, 2021). From this perspective, the evolution from ASP.NET to ASP.NET Core can be understood as a socio-technical transition that requires alignment across technical architectures and institutional contexts, rather than as a discrete engineering task (Brown & Gupta, 2021).

The theoretical foundation for examining such transitions draws on a rich body of information systems research that conceptualizes legacy systems as embedded artifacts within organizational routines and power structures (Alamoudi & Kumar, 2017). These systems accrue layers of complexity over time, reflecting accumulated business logic, regulatory requirements, and informal workarounds that resist simplification or wholesale replacement (Harris & Singh, 2020). Consequently, modernization efforts often encounter resistance rooted not only in technical risk but also in cultural inertia and perceived threats to professional identity (Brown & Gupta, 2021).

Within this scholarly landscape, ASP.NET Core migration presents a particularly instructive case due to its explicit break from backward compatibility and its embrace of open-source development models, cross-platform deployment, and cloud integration (Valiveti, 2025). These characteristics amplify both the potential benefits and the risks associated with migration, intensifying debates over cost justification, skill retraining, and long-term maintainability (Patel & Roberts, 2021). The literature reflects divergent viewpoints on whether such transformative migrations deliver sustained operational value or merely substitute one form of technical debt for another (Kim & Zhao, 2021).

The problem statement that animates this research arises from a discernible gap in the existing literature. While numerous studies examine legacy system migration at a general level, relatively few offer an in-depth, integrative analysis of platform-specific evolution that connects architectural change with organizational and strategic dimensions (Roberts & Watson, 2021). Moreover, discussions of ASP.NET Core migration are often fragmented across practitioner-oriented sources or narrowly technical analyses, limiting their theoretical contribution to information systems scholarship (Valiveti, 2025). This fragmentation obscures the broader implications of platform evolution for legacy system theory and practice.

Addressing this gap, the present article seeks to develop a comprehensive, publication-ready analysis of ASP.NET to ASP.NET Core migration grounded entirely in peer-reviewed academic literature. By synthesizing insights from software engineering, organizational behavior, public policy, and digital transformation research, the study aims to elucidate the complex interplay of factors that shape modernization outcomes (Turner & Kumar, 2022). In doing so, it responds to calls for more holistic approaches to legacy system research that transcend purely technical considerations (Lee & Zhang, 2021).

The central research objective is not to prescribe a singular migration model, but to critically examine the conditions under which ASP.NET Core migration can be strategically justified, operationally viable, and organizationally sustainable. This objective aligns with broader scholarly efforts to reconceptualize legacy system modernization as an ongoing process of adaptation rather than a finite project with a definitive endpoint (Bell & Johansson, 2020). By situating ASP.NET Core within this evolutionary framework, the article contributes to a deeper understanding of how platform-level decisions reverberate across organizational and technological domains.

The remainder of the article is structured to support this analytical ambition through extensive theoretical elaboration and critical discussion. The methodology section outlines the interpretive, literature-based research design and its limitations, grounding the analysis in established qualitative synthesis approaches (Akinyode & Khan, 2018). The results section presents a descriptive interpretation of key themes emerging from the literature, while the discussion engages in a sustained theoretical dialogue that situates these

findings within ongoing scholarly debates. The conclusion synthesizes the core insights and articulates implications for future research and practice, maintaining a consistent focus on the evolution from ASP.NET to ASP.NET Core as a paradigmatic case of legacy system modernization.

Methodology

The methodological orientation of this study is grounded in an interpretive, qualitative research tradition that prioritizes depth of understanding, theoretical integration, and contextual sensitivity over empirical generalization. This approach is particularly appropriate for examining legacy system modernization, a phenomenon characterized by socio-technical complexity, path dependency, and institutional embeddedness (Alase, 2017). Rather than generating primary empirical data, the study relies exclusively on an extensive, critical engagement with established academic literature, treating prior research as both data and analytical substrate. This design aligns with recognized qualitative synthesis methodologies that emphasize systematic interpretation, reflexivity, and theoretical abstraction (Akinyode & Khan, 2018).

The central methodological rationale rests on the recognition that the evolution from ASP.NET to ASP.NET Core cannot be meaningfully understood through isolated technical metrics alone. Instead, it requires a holistic analytical lens capable of capturing interactions between software architecture, organizational processes, governance frameworks, and strategic intent (Lee & Zhang, 2021). By synthesizing insights across diverse scholarly domains, the study seeks to construct a coherent explanatory narrative that reflects the multi-layered nature of legacy system migration.

The literature corpus was delimited strictly to the references provided, encompassing peer-reviewed journal articles and a recent IEEE conference paper that offers a focused examination of ASP.NET to ASP.NET Core evolution (Valiveti, 2025). This constraint ensures analytical consistency and mitigates the risk of conceptual dilution that can arise from overly expansive literature sampling. Within this corpus, sources span multiple disciplinary perspectives, including software engineering, information systems research, organizational behavior, public administration, and artificial intelligence, thereby enabling theoretical triangulation (Harris & Singh, 2020).

The analytical process followed a multi-stage interpretive procedure. First, each source was subjected to close reading to identify its core arguments, theoretical assumptions, and methodological orientation. Particular attention was paid to how each study conceptualized legacy systems, modernization drivers, and migration outcomes (Mitchell & Harris, 2019). Second, thematic coding was conducted at a conceptual level, focusing on recurring constructs such as scalability, risk management, organizational resistance, agile practices, and long-term value realization (Patel & Roberts, 2021). This coding was not mechanistic but interpretive, allowing themes to evolve iteratively as connections between sources became more apparent (Alase, 2017).

Third, these themes were synthesized into higher-order analytical categories that reflect the study's core research objective: understanding ASP.NET Core migration as an evolutionary, rather than purely technical, phenomenon. For example, discussions of cloud readiness, multi-platform deployment, and performance optimization were integrated under a broader category of architectural reconfiguration, while analyses of training, resistance, and skill realignment were grouped within organizational adaptation (Brown & Gupta, 2021). This abstraction process facilitated the development of an integrative framework that connects platform-level changes to systemic organizational effects.

A critical element of the methodology involves reflexive engagement with scholarly debates and counterarguments. Rather than privileging consensus, the analysis deliberately foregrounds tensions and contradictions within the literature, such as divergent assessments of migration risk or conflicting evaluations of agile methodologies in modernization contexts (Zhao & Tan, 2022). This reflexivity enhances analytical rigor by acknowledging the contested nature of legacy system research and resisting overly deterministic conclusions.

The methodological limitations of this study must be acknowledged explicitly. The reliance on secondary literature precludes direct observation of migration practices or outcomes, limiting the ability to assess contextual nuances that may arise in specific organizational settings (Sharma & Patel, 2022). Additionally, the focus on ASP.NET to ASP.NET Core migration, while analytically rich, may constrain the generalizability of findings to other technological ecosystems with different architectural philosophies or governance models (Roberts & Watson, 2021). Nevertheless, the depth of theoretical engagement compensates for these limitations by offering transferable insights into the dynamics of platform evolution and legacy modernization.

Ethical considerations in this study are primarily epistemological rather than procedural, given the absence of human subjects or proprietary data. The analysis adheres to principles of scholarly integrity by accurately representing prior research, avoiding misattribution, and maintaining critical distance from normative advocacy (Akinyode & Khan, 2018). By situating its arguments firmly within the bounds of the provided literature, the study ensures transparency and reproducibility of its interpretive logic.

In sum, the methodological design reflects a deliberate choice to privilege analytical depth and theoretical coherence over empirical breadth. This choice is consistent with the study's ambition to contribute meaningfully to academic discourse on legacy system modernization by offering a nuanced, integrative perspective on ASP.NET Core migration as a paradigmatic case of technological and organizational evolution (Valiveti, 2025).

Results

The results of this study are presented as a descriptive and interpretive synthesis of themes emerging from the analyzed literature, rather than as empirical findings derived from primary data collection. This approach reflects the study's methodological commitment to theoretical integration and conceptual clarification within the domain of legacy system modernization (Alase, 2017). Across the corpus, several interrelated patterns emerge that collectively illuminate how the migration from ASP.NET to ASP.NET Core exemplifies broader dynamics of platform evolution, organizational adaptation, and strategic recalibration.

One of the most prominent themes concerns architectural transformation. The literature consistently frames ASP.NET Core as a departure from monolithic, tightly coupled system designs toward modular, lightweight, and performance-optimized architectures (Valiveti, 2025). This shift is not merely technical but represents a redefinition of how applications are conceptualized, developed, and deployed. Studies on

cloud-enabled modernization emphasize that such architectural flexibility is a prerequisite for scalability and resilience in multi-cloud environments (Robinson & Zhang, 2020). The results indicate that organizations adopting ASP.NET Core often do so to align their systems with contemporary infrastructure paradigms, even when this alignment necessitates substantial refactoring and redesign.

A second recurring theme relates to development methodologies and process reconfiguration. The transition to ASP.NET Core is frequently associated with the adoption or intensification of agile and DevOps practices, reflecting the framework's compatibility with iterative development, continuous integration, and rapid deployment cycles (Zhao & Tan, 2022). The literature suggests that these methodological shifts can enhance responsiveness and reduce time-to-market, but only when supported by corresponding changes in organizational culture and governance structures (Alahyari et al., 2017). Where such alignment is absent, the potential benefits of ASP.NET Core migration are often attenuated or unrealized.

Organizational adaptation emerges as a third critical theme, encompassing issues of skill development, resistance to change, and role redefinition. Human factors research underscores that legacy system migration frequently provokes anxiety and opposition among stakeholders who perceive modernization as a threat to established expertise or job security (Brown & Gupta, 2021). In the context of ASP.NET Core, this challenge is amplified by the framework's introduction of new programming paradigms and tooling ecosystems, which require sustained investment in training and knowledge transfer (Valiveti, 2025). The results indicate that successful migrations are typically accompanied by deliberate change management strategies that address both technical and emotional dimensions of transition.

Risk management constitutes a fourth thematic area with significant analytical weight. The literature presents migration risk as multi-dimensional, encompassing technical failure, cost overruns, operational disruption, and strategic misalignment (Patel & Roberts, 2021). ASP.NET Core migration is often characterized by heightened short-term risk due to compatibility breaks and the need for extensive testing, yet it is also associated with long-term risk mitigation through improved maintainability and security (Bell &

Johansson, 2020). The results reveal a nuanced risk calculus in which organizations must balance immediate uncertainties against prospective strategic gains.

A fifth theme concerns long-term value realization and performance outcomes. Empirical studies on post-migration impacts suggest that modernization can yield improvements in operational efficiency, system reliability, and user satisfaction, but these outcomes are neither automatic nor uniform (Kim & Zhao, 2021). In the ASP.NET Core context, value realization is closely linked to the extent to which migration is integrated into broader digital transformation initiatives rather than treated as an isolated technical upgrade (Lee & Zhang, 2021). The results indicate that organizations adopting a holistic modernization perspective are more likely to achieve sustained benefits.

Finally, the literature highlights the policy and institutional context as an influential factor, particularly in public sector environments. Regulatory constraints, procurement rules, and accountability requirements can shape migration strategies and timelines, sometimes limiting the flexibility needed to fully exploit ASP.NET Core's capabilities (Turner & Kumar, 2022). These contextual factors underscore the importance of aligning technical decisions with institutional realities, reinforcing the socio-technical nature of legacy system modernization.

Collectively, these results portray ASP.NET Core migration as a complex, multi-layered process that extends far beyond code conversion. The interpretive synthesis underscores that architectural innovation, methodological change, organizational adaptation, risk governance, and value realization are deeply intertwined, shaping both the trajectory and the outcomes of modernization efforts (Valiveti, 2025).

Discussion

The discussion section engages in an extensive theoretical interpretation of the synthesized results, situating them within broader scholarly debates on legacy system modernization and digital transformation. At the core of this discussion is the argument that the evolution from ASP.NET to ASP.NET Core exemplifies a paradigmatic shift in how legacy systems are conceptualized, managed, and justified within contemporary organizations (Bell & Johansson, 2020). Rather than representing a linear upgrade path, this evolution reflects a deeper reconfiguration of socio-

technical systems in response to changing technological and institutional environments.

From a theoretical standpoint, the architectural transformation associated with ASP.NET Core migration resonates with longstanding critiques of monolithic system design. Information systems scholars have long argued that tightly coupled architectures inhibit adaptability and exacerbate technical debt, particularly in dynamic environments characterized by frequent change (Alamoudi & Kumar, 2017). ASP.NET Core's emphasis on modularity and composability can thus be interpreted as a response to these critiques, embodying principles that align with contemporary theories of flexible system design (Valiveti, 2025). However, the discussion must also acknowledge counterarguments that caution against overestimating the benefits of modular architectures, particularly when organizational capabilities lag behind technical possibilities (Mitchell & Harris, 2019).

The integration of agile and DevOps methodologies into ASP.NET Core migration further illustrates the inseparability of technical and organizational change. Agile scholars emphasize that methodological frameworks are not merely procedural tools but embodiments of underlying values related to collaboration, experimentation, and continuous learning (Alahyari et al., 2017). The discussion reveals that when ASP.NET Core migration is pursued without corresponding cultural transformation, agile practices risk becoming superficial rituals rather than drivers of meaningful change (Zhao & Tan, 2022). This observation reinforces broader critiques of "methodology adoption" that neglect the social dimensions of organizational transformation.

Human factors and resistance to change represent another critical axis of discussion. Organizational behavior research consistently demonstrates that technological change disrupts established identities and power relations, often provoking defensive responses that can undermine modernization efforts (Brown & Gupta, 2021). In the ASP.NET Core context, the need to acquire new skills and abandon familiar tools can intensify these dynamics. The discussion highlights that successful migrations are less about eliminating resistance than about engaging constructively with it, reframing migration as an opportunity for professional growth rather than obsolescence (Lee & Zhang, 2021).

Risk management emerges as a particularly fertile area

for theoretical debate. Traditional risk assessment models often prioritize quantifiable technical risks, such as system downtime or defect rates (Patel & Roberts, 2021). However, the discussion underscores that many of the most consequential risks associated with ASP.NET Core migration are relational and strategic, encompassing stakeholder trust, organizational coherence, and long-term alignment with business goals (Turner & Kumar, 2022). This perspective challenges reductionist risk frameworks and calls for more holistic, data-informed governance models.

The question of long-term value realization invites further critical scrutiny. While proponents of modernization frequently cite performance gains and efficiency improvements, empirical evidence suggests that these benefits are contingent on sustained investment and strategic integration (Kim & Zhao, 2021). The discussion engages with skeptical viewpoints that question whether large-scale migrations merely defer, rather than resolve, structural problems associated with legacy systems (Roberts & Watson, 2021). In response, the analysis argues that ASP.NET Core migration should be evaluated not as an endpoint but as a platform for ongoing adaptation, a stance consistent with evolutionary theories of technology (Bell & Johansson, 2020).

The role of emerging technologies, particularly artificial intelligence, adds another layer of complexity to the discussion. Scholars have suggested that AI-driven tools can enhance migration planning, testing, and optimization, potentially reducing uncertainty and accelerating value realization (Hughes & Patel, 2020). Within the ASP.NET Core ecosystem, such tools may support automated code analysis, performance tuning, and predictive maintenance. However, the discussion cautions that reliance on AI does not obviate the need for human judgment and organizational learning, reinforcing the socio-technical character of modernization.

Institutional and policy considerations further complicate the modernization landscape. Public sector studies reveal that governance constraints can limit experimentation and prolong migration timelines, even when technical solutions are readily available (Turner & Kumar, 2022). The discussion situates ASP.NET Core migration within these institutional contexts, emphasizing that technical rationality must be balanced with accountability, transparency, and regulatory

compliance. This balance underscores the need for adaptive governance frameworks that accommodate both innovation and oversight.

In synthesizing these perspectives, the discussion advances a central theoretical contribution: legacy system modernization, as exemplified by ASP.NET Core migration, is best understood as an ongoing evolutionary process shaped by reciprocal interactions between technology, organization, and environment. This process resists simplistic narratives of progress or decline, instead reflecting contested negotiations over value, risk, and identity (Valiveti, 2025). By foregrounding these dynamics, the study contributes to a more nuanced and reflexive understanding of platform evolution in the digital era.

Conclusion

The evolution from ASP.NET to ASP.NET Core offers a compelling lens through which to examine the broader challenges and possibilities of legacy system modernization. This study has argued that such migration cannot be reduced to a technical upgrade but must be understood as a complex socio-technical transformation involving architectural reconfiguration, organizational adaptation, methodological change, and strategic realignment (Lee & Zhang, 2021). By synthesizing insights from a diverse body of academic literature, the analysis has demonstrated that ASP.NET Core migration exemplifies the tensions inherent in balancing stability and innovation within contemporary information systems.

The findings underscore that while ASP.NET Core provides a robust foundation for scalable, cloud-native application development, its successful adoption depends on factors that extend well beyond code and tooling (Valiveti, 2025). Organizational readiness, human capital development, risk governance, and institutional context all play decisive roles in shaping migration outcomes. Consequently, modernization initiatives that neglect these dimensions risk falling short of their intended benefits, regardless of technical sophistication (Brown & Gupta, 2021).

From a theoretical perspective, the study contributes to legacy system research by articulating an evolutionary view of platform migration that emphasizes continuity, adaptation, and learning rather than rupture and replacement (Bell & Johansson, 2020). This perspective invites scholars to reconceptualize modernization as an ongoing process embedded in organizational life, with implications for how success, failure, and value are defined and measured (Kim & Zhao, 2021).

For practitioners, the analysis highlights the importance of adopting holistic, context-sensitive strategies that align technical decisions with organizational and strategic objectives (Roberts & Watson, 2021). For policymakers, particularly in the public sector, the study underscores the need for governance frameworks that support innovation while maintaining accountability and public value (Turner & Kumar, 2022).

Future research should build on this foundation by incorporating longitudinal empirical studies that examine post-migration trajectories, comparative analyses across technological ecosystems, and deeper exploration of AI-enabled modernization tools (Hughes & Patel, 2020). Such research would further enrich understanding of how legacy systems evolve in an era of continuous technological change.

In conclusion, ASP.NET Core migration stands as a paradigmatic case of contemporary legacy system modernization, illustrating both the promise and the complexity of technological evolution in the digital age. Recognizing and engaging with this complexity is essential for realizing the full potential of modernization initiatives and for advancing scholarly discourse in information systems research.

References

1. Alahyari, H., Berntsson Svensson, R., & Gorschek, T. (2017). A study of value in agile software development organizations. Journal of Systems and Software, 125, 271–288.

2. Robinson, T., & Zhang, W. (2020). Scalability challenges in legacy system migration: Addressing the multi-cloud environment. Journal of Cloud Computing, 27(1), 59–75.

3. Brown, T., & Gupta, M. (2021). Human factors in legacy system migration: Overcoming resistance to change. Journal of Organizational Behavior, 23(1), 56–72.

4. Kim, S., & Zhao, X. (2021). Long-term impact of legacy system migration on operational efficiency. Journal of Business and Technology, 20(2), 34–49.

5. Turner, M., & Kumar, S. (2022). Policy implications of legacy system migration in the public sector. Journal of Public Administration Research, 31(4),

112–127.

6. Akinyode, B. F., & Khan, T. H. (2018). Step by step approach for qualitative data analysis. International Journal of Built Environment and Sustainability, 5(3), 163–174.

7. Hughes, M., & Patel, D. (2020). Building adaptive strategies for legacy system migration: The role of AI in system modernization. International Journal of AI and Systems Engineering, 14(2), 75–88.

8. Lee, K., & Zhang, T. (2021). Holistic approach to legacy system migration: Integrating organizational, operational, and technical data. Journal of Information Systems Research, 28(3), 135–150.

9. Mitchell, R., & Harris, B. (2019). Evaluating migration models for legacy systems: An empirical comparison. Journal of Information Technology Research, 11(2), 93–107.

10. Dube, S., & Gruber, S. (2019). Leveraging cloud services for legacy system modernization. Journal of Cloud Solutions, 22(3), 105–120.

11. Patel, N., & Roberts, D. (2021). Risk management in legacy system migration: A data-driven approach. Journal of Systems and Software Engineering, 45(4), 126–145.

12. Bell, M., & Johansson, P. (2020). The future of IT infrastructure: Legacy system modernization in the digital era. Journal of IT and Digital Transformation, 12(1), 40–55.

13. Zhao, L., & Tan, W. (2022). The role of Agile methodologies in system modernization. International Journal of Software Engineering, 15(3), 88–102.

14. Roberts, A., & Watson, C. (2021). Best practices in legacy system migration: A comprehensive framework. Journal of IT Systems and Management, 16(4), 211–230.

15. Harris, G., & Singh, R. (2020). Incorporating emerging technologies in legacy system modernization. International Journal of Technology Trends, 16(2), 88–104.

16. Alamoudi, D., & Kumar, A. (2017). Information system complexity and business value. International Journal of Economics & Management Sciences, 6(2), 1–4.

17. Alase, A. (2017). The interpretative phenomenological analysis: A guide to a good qualitative research approach. International Journal of Education and Literacy Studies, 5(2), 9–19.

18. Sharma, P., & Patel, V. (2022). A comparative study of migration models in healthcare IT. Journal of Healthcare Information Management, 19(3), 34–50.