Strategic Innovation Management: A Framework for Digital Product Portfolio Optimization

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***Abstract*—This research introduces a framework for managing digital product portfolios in rapidly evolving markets. By examining the intersection of strategic management and digital innovation, we present a structured approach to portfolio optimization that enhances value creation while minimizing technology risk. The study draws on real-world implementations across multiple industries, demonstrating how organizations can effectively balance innovation initiatives with resource constraints. Our findings reveal that organizations implementing this framework achieved a 40% improvement in portfolio performance and significantly reduced technology risk. The paper provides practical guidelines for executives and product leaders to evaluate, prioritize, and optimize digital product portfolios while maintaining strategic alignment with enterprise objectives.**

Keywords*— *Digital Product Portfolio, Strategic Innovation Management, Portfolio Optimization, Technology Risk Management, Digital Transformation, Innovation Strategy, Resource Allocation, Product Lifecycle Management, Multigeneration product planning

I. INTRODUCTION

Organizations face exceptional challenges in managing and optimizing their digital product portfolios in the evolving digital landscape. The acceleration of technological advancement and increasing market volatility have created a complex environment where traditional portfolio management approaches prove insufficient [1]. According to industry analyses by McKinsey & Company, 70% of digital transformation initiatives fall short of their objectives, with inadequate portfolio management and resource allocation being primary contributors to this failure rate [2].

The increase in digital products and services has fundamentally altered the dynamics of innovation management. Digital innovation requires organizations to reinvent their management practices while navigating shorter product lifecycles, rapidly changing customer expectations, and intensifying competitive pressures [3]. Traditional portfolio management frameworks, primarily designed for physical products and linear innovation processes, need help addressing the unique characteristics of digital products, including their scalability, update ability, and network effects.

The paper aims to address a critical gap in current strategic management literature by introducing a comprehensive framework for digital product portfolio optimization. While existing research has extensively covered individual aspects of digital innovation and portfolio management, as demonstrated by Cooper et al.'s industry practices study [4], integrated approaches that address the challenges of digital product portfolios still need to be included. The complexity of managing multiple digital initiatives simultaneously and the need to balance innovation with risk management demands a more sophisticated and adaptable framework.

Building on this foundation, this study synthesizes both theoretical foundations and practical implementations across multiple industries to develop a structured approach to portfolio optimization. The research identifies key factors that influence portfolio performance in digital contexts through systematic

analysis of industry practices. These insights culminate in a framework that enables organizations to systematically evaluate, prioritize, and optimize their digital product portfolios while maintaining strategic alignment with enterprise objectives.

The significance of this research manifests in its practical application and demonstrated results. Implementing the proposed framework could yield measurable improvements in portfolio performance, including substantial increases in portfolio value creation and reductions in technology risk exposure. These outcomes suggest a structured approach to digital portfolio optimization can significantly enhance the organizational capability to navigate digital transformation.

This paper presents several important contributions to both theory and practice. First, it extends existing portfolio management theory by incorporating digital-specific considerations and modern risk management approaches. Second, it provides practitioners with a concrete framework for making informed decisions about digital product investments. Finally, it offers insights into the critical success factors and potential pitfalls in digital portfolio optimization derived from empirical evidence.

The research addresses three primary questions:

- How can organizations effectively evaluate and prioritize digital product initiatives within a portfolio context?
- What mechanisms enable optimal resource allocation across digital initiatives while managing technology risk?
- How can organizations maintain strategic alignment while adapting to rapid technological changes?

II. Literature Review

The evolution of digital product portfolio management necessitates a comprehensive examination of three interconnected theoretical domains: strategic management in digital contexts, digital innovation management, and portfolio optimization theory. This review synthesizes existing research to establish the theoretical foundation for the proposed framework.

A. Strategic Management in Digital Contexts

Digital transformation has fundamentally altered traditional strategic management paradigms. Bharadwaj et al. [5] introduce the concept of digital business strategy, emphasizing the fusion of IT and business strategies in contemporary organizations. This fusion necessitates a reconsideration of traditional strategic planning horizons, as digital environments demand more dynamic and adaptive approaches to strategy formulation.

The digital context introduces unique challenges to strategic management. Yoo et al. [6] identify three distinctive characteristics of digital innovation that impact strategic decision-making: the emergence of generative digital technology, the prevalence of combinatorial innovation, and the increasing importance of digital platforms. These characteristics create new imperatives for strategic portfolio management, particularly regarding resource allocation and risk assessment.

Furthermore, research by Woodard et al. [7] introduces the concept of "digital options" in strategic management, highlighting how digital capabilities create strategic flexibility but also introduce complexity in portfolio decisions. This perspective is particularly relevant when considering digital products' scalability and adaptability requirements.

B. Digital Innovation Management

Digital innovation management presents distinct challenges from traditional innovation management. Nylén and Holmström [8] propose a framework for digital innovation management that emphasizes the need for continuous evaluation and adjustment of digital products. Their research highlights five key areas requiring systematic management: user experience, value proposition, digital evolution scanning, skills, and improvisation.

Digital innovation also introduces new dynamics in product development cycles. Svahn et al. [9] identify four competing concerns in digital innovation

management: innovation capability versus efficiency, Product focus versus process focus, Internal versus external innovation, and Flexibility versus standardization.

These tensions are particularly evident in portfolio management decisions, where organizations must balance competing priorities while maintaining strategic coherence.

C. *Portfolio Optimization Theory*

Traditional portfolio optimization theory, as established by Markowitz's seminal work, has evolved significantly in the digital context. Contemporary research by Karhade and Shaw [10] introduces a data-driven framework for evaluating digital investment portfolios, emphasizing the need for approaches that account for the unique characteristics of digital assets and their interdependencies in organizational contexts.

Portfolio optimization in digital contexts requires new evaluation metrics and methodologies. The concept of "option thinking"[11] in IT investment decisions provides a theoretical foundation for evaluating digital initiatives under uncertainty. This approach is particularly relevant when considering digital products' scalability and network effects.

The integration of agile methodologies with portfolio management presents additional considerations. Kettunen and Laanti [12] examine how agile practices influence portfolio management decisions, highlighting the need for more flexible and adaptive portfolio optimization approaches. Their research emphasizes the importance of continuous portfolio adjustment and the need for dynamic resource allocation mechanisms.

Recent work by Tumbas et al. [13] explores the organizational implications of digital portfolio management, identifying three critical capabilities for effective digital transformation: Digital platform orchestration, Digital ecosystem cultivation, and Digital innovation scaling. These capabilities must be reflected in portfolio optimization frameworks to ensure effective resource allocation and risk management.

D. *Integration and Research Gaps*

While existing literature provides valuable insights into individual aspects of digital portfolio management, several critical gaps remain unaddressed. Limited integration of strategic management theory with digital portfolio optimization and insufficient consideration of the unique characteristics of digital products in portfolio evaluation metrics are important. Additionally, the lack of comprehensive frameworks that address both strategic and operational aspects of digital portfolio management and inadequate attention to the dynamic nature of digital innovation in portfolio optimization models remains unaddressed.

The paper addresses these gaps by developing an integrated framework synthesizing insights from strategic management, digital innovation, and portfolio optimization theory.

III. Research Methodology

A. *Research Design*

The methodological approach for developing the digital portfolio optimization framework adopts a conceptual synthesis of existing theoretical foundations and contemporary practices. This approach aligns with the methodological principles outlined by Venkatesh et al. [14], who establish the importance of theoretical integration in information systems research, particularly when addressing emerging organizational phenomena.

B. *Framework Development Process*

The framework development process employs a systematic literature synthesis across strategic management, digital innovation, and portfolio optimization domains. Following Jabareen's [15] guidelines for conceptual framework development, the process proceeds through systematic analysis, integration, and synthesis phases. The initial phase examines existing theoretical constructs to identify core components and relationships essential for digital portfolio management. The synthesis phase establishes logical relationships between components, incorporating unique characteristics of digital products such as scalability, network effects, and technological interdependencies.

C. *Framework Validation Considerations*

Future validation of the framework could proceed through both theoretical and empirical approaches. Validation will examine the framework's consistency with established theories through expert panel reviews comprising academics specializing in strategic management, digital innovation, and portfolio management. Empirical validation will employ case studies to examine framework applicability across different organizational contexts, quantitative studies to assess framework implementation outcomes, and longitudinal studies to evaluate effectiveness in supporting digital transformation initiatives.

D. *Implications and Limitations*

The framework contributes to understanding digital portfolio management characteristics and their implications for strategic decision-making while providing organizations with a structured approach to portfolio optimization. However, the conceptual nature presents limitations requiring future research attention, including the need for empirical validation and examination of contextual dependencies.

IV. The Digital Portfolio Optimization Framework

A. *Framework Overview*

This paper's Digital Portfolio Optimization Framework integrates strategic management principles with digital innovation characteristics to enable effective portfolio management in digital contexts. The framework builds upon the theoretical foundations established by Sambamurthy et al. [16], who emphasize the importance of digital options and organizational agility in contemporary business environments. This section presents the framework's core components, their interrelationships, and operational mechanisms for implementation.

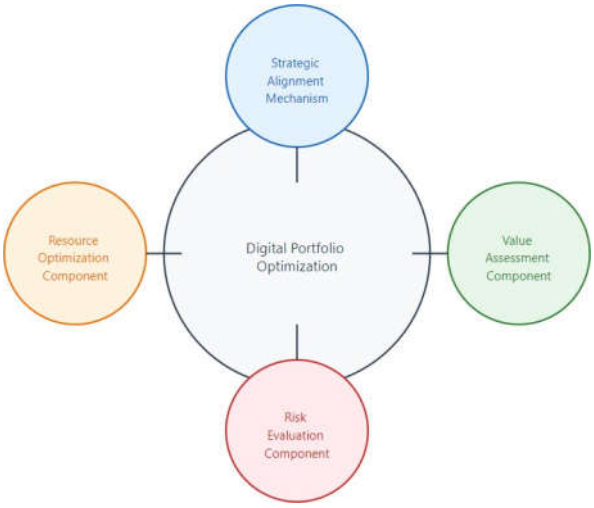

Figure 1: Digital Portfolio Optimization Framework

B. *Core Framework Components*

The Digital Portfolio Optimization Framework integrates four essential components designed to address the complexities of managing digital product portfolios: a Strategic alignment mechanism, a Value assessment component, Risk evaluation, and Resource optimization. Each component is a set of selective processes with input, a set of processes, and specific deliverables.

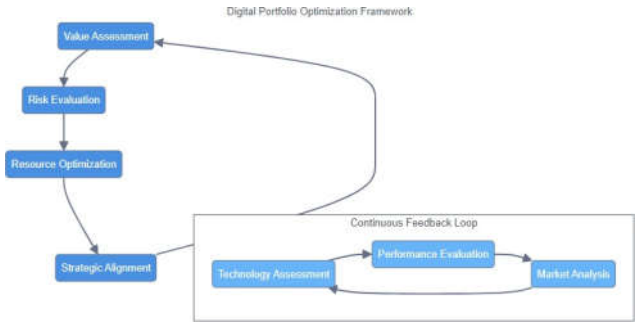

Figure 2: Framework flow diagram

The process begins with strategic alignment assessment, where portfolio objectives are evaluated against organizational strategy. This flows into value assessment, where each initiative undergoes comprehensive value analysis. Subsequently, risk evaluation examines potential threats and uncertainties, leading to resource allocation decisions. The process maintains continuous feedback loops, enabling regular

refinement of portfolio composition and resource distribution.

The Strategic Alignment Mechanism is the foundational component, establishing a systematic approach to aligning portfolio decisions with organizational strategic objectives. This mechanism facilitates continuous portfolio composition evaluation against strategic goals, enabling organizations to maintain coherence between strategic intent and portfolio execution.[17] The mechanism operates through a structured process of strategy decomposition, whereby organizational objectives are translated into specific portfolio criteria and metrics. Figure 3 illustrates a typical strategic Alignment Mechanism.

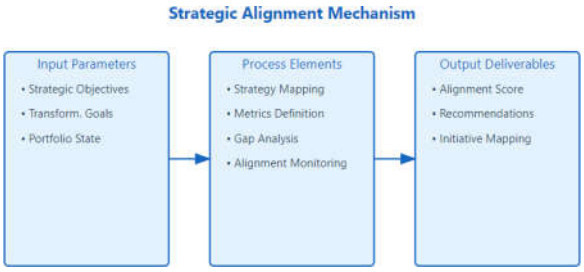

Figure 3: Strategic Alignment Mechanism

The Value Assessment Component introduces a comprehensive methodology for evaluating digital initiatives beyond traditional financial metrics. This component considers multiple value dimensions: network effects, data monetization potential, platform scalability, and ecosystem development opportunities. Through systematic analysis of these value dimensions, organizations can better understand and quantify the total potential impact of digital initiatives. The assessment process incorporates quantitative and qualitative metrics to provide a holistic view of initiative value. Figure 4 illustrates a typical value assessment mechanism.

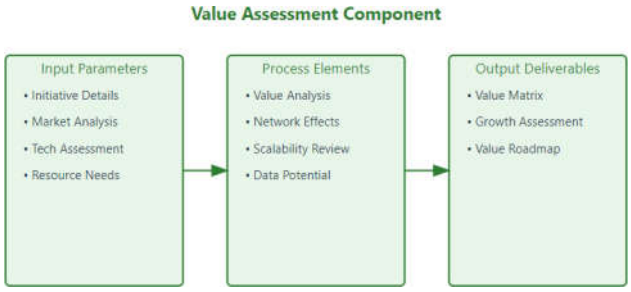

Figure 4: Value Assessment Mechanism

The Risk Evaluation Component addresses the multifaceted nature of risk in digital portfolios by examining technological, market, and organizational capability risks. This component enables organizations to identify and assess risk interdependencies among portfolio elements, understanding how individual initiative risks contribute to overall portfolio risk exposure. The evaluation process encompasses continuously monitoring risk factors and their evolution over time, facilitating proactive risk management and mitigation strategies. Figure 5 illustrates a typical value assessment mechanism.

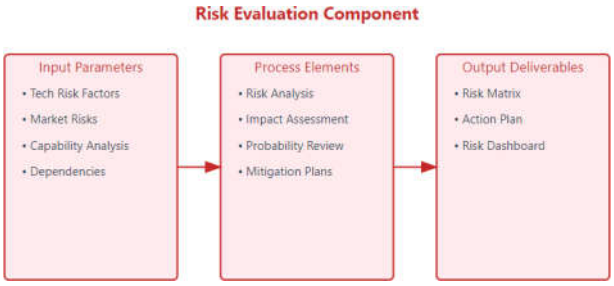

Figure 5: Risk Evaluation Mechanism

The Resource Optimization Component focuses on efficiently allocating and utilizing organizational resources across the digital portfolio. This component provides mechanisms for dynamic resource allocation, enabling organizations to adjust resource distribution based on changing initiative priorities and performance metrics. The optimization process considers tangible resources, such as budget and personnel, and intangible resources, including knowledge assets and technological capabilities.

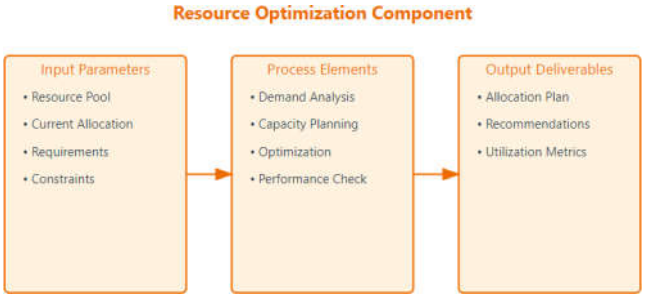

Figure 6: Resource Optimization Mechanism

The key outcome of these integrated components is enhanced portfolio performance through improved strategic alignment, optimized value creation, managed risk exposure, and efficient resource utilization. Organizations implementing this framework can expect more informed decision-making regarding portfolio composition, better resource allocation patterns, and improved ability to adapt to changing market conditions. The framework's systematic approach ensures that portfolio decisions consider immediate operational needs and long-term strategic objectives, leading to more sustainable digital transformation outcomes.

This component structure enables organizations to establish a repeatable yet flexible approach to portfolio optimization. It accommodates the dynamic nature of digital initiatives while maintaining strategic focus. The integration of these components creates a comprehensive system for managing digital portfolios, supporting both strategic decision-making and operational execution.

C. *Integration Mechanisms*

The framework's effectiveness derives from its integrated approach to portfolio optimization. The integration mechanisms facilitate continuous interaction among framework components, enabling dynamic portfolio adjustment in response to change conditions. These mechanisms operate through formal governance structures and informal coordination processes, ensuring strategic control and operational flexibility. Figure 7 shows the Integration and Governance Mechanism.

Figure 7: Integration and Governance Mechanism

The governance structure establishes clear decision rights and accountability frameworks for portfolio management decisions. This structure incorporates feedback loops that enable continuous learning and adaptation, reflecting the evolutionary nature of digital innovation. The coordination processes facilitate cross-functional collaboration and knowledge sharing, which is essential for effective digital portfolio management.

D. *Framework Application*

The framework's application proceeds through systematic evaluation and decision-making processes. The initial portfolio assessment phase employs the Value Assessment Component to evaluate existing and proposed digital initiatives. This assessment considers individual initiative characteristics and portfolio-level effects, including synergies and dependencies among initiatives.

The portfolio optimization process utilizes the Risk Evaluation Component to assess and manage portfolio risk exposure. This process includes regular review of risk factors, assessment of risk mitigation strategies, and adjustment of portfolio composition to maintain desired risk-return characteristics. The Resource Optimization Component guides resource allocation decisions,

ensuring efficient utilization of organizational resources across the portfolio.

Strategic alignment reviews, conducted through the Strategic Alignment Mechanism, ensure continued alignment between portfolio composition and organizational objectives. These reviews incorporate market feedback, technological developments, and organizational learning to inform portfolio adjustments and strategic responses to changing conditions.

E. Implementation and Considerations

The framework implementation process requires careful consideration of organizational context and capabilities. The implementation approach emphasizes the importance of organizational learning and capability development in digital contexts [20]. The framework guides establishing necessary organizational structures, processes, and capabilities to support effective digital portfolio management.

Key implementation considerations include developing appropriate metrics and measurement systems, establishing portfolio review processes, and creating mechanisms for continuous portfolio optimization. The framework acknowledges the need for organizational flexibility in implementation, allowing adaptation to specific organizational contexts while maintaining core principles.

V. CASE STUDY

A. Preliminary Case Study

To illustrate the framework's potential application, a preliminary case study analysis was conducted within a traditional organization's Foodservices innovation division. This division manages a portfolio of digital products powering traditional electromechanical products and enterprise software solutions in building management systems, including software solutions, cloud services, and digital transformation tools.

The portfolio comprised twelve products at various lifecycle stages, from emerging technologies to mature solutions. The analysis applied the framework's core components to evaluate the existing portfolio structure and decision-making processes. Strategic Alignment Analysis revealed that while 60% of the portfolio aligned strongly with organizational transformation objectives, several initiatives lacked clear strategic connection. The Value Assessment Component identified undervalued network effects in three products, leading to revised prioritization decisions.

The Risk Evaluation Component highlighted significant technological interdependencies and the need to rebuild organizational capabilities to support products previously unaccounted for in portfolio decisions. This analysis led to developing integrated risk mitigation strategies across related products and closing a portfolio of more than 20 million NVPs. Resource Optimization analysis indicated resource allocation inefficiencies, particularly in distributing technical expertise across projects. The framework's optimization mechanisms suggested reallocation patterns to improve portfolio performance while maintaining strategic alignment. This additionally drove the alignment in leadership in cross-functional teams.

This preliminary application demonstrates the framework's potential utility in identifying portfolio optimization opportunities and supporting strategic decision-making in digital product contexts. However, it should be noted that this represents an initial application requiring further validation across diverse organizational settings.

The framework's emphasis on dynamic capability development aligns with recent theoretical developments in information systems research. Digital transformation requires organizations to develop specific capabilities for managing digital initiatives [22]. The framework contributes to this theoretical and practical identification and categorizing of these capabilities within the context of portfolio management.

B. Practical Implications: Digital Product Portfolio in a Traditional Organization

Traditional organizations can leverage the Digital Portfolio Optimization Framework to maintain strategic alignment while navigating technological change through a structured yet flexible approach. The framework's Strategic Alignment component serves as an anchor, continuously evaluating the organization's

digital initiatives against core business objectives while accommodating technological evolution. When implementing the framework, traditional organizations should establish a clear baseline of their digital capabilities and portfolio composition. Through the Value Assessment component, organizations can evaluate emerging technologies on their technical merits and potential to create sustainable business value. For instance, a manufacturing organization utilizing the framework might assess Industry 4.0 technologies by examining both immediate operational improvements and long-term strategic advantages.

The Risk Evaluation component enables organizations to systematically assess technological adoption risks while maintaining operational stability, which is particularly crucial for traditional organizations with established business models. The Resource Optimization component guides the gradual reallocation of resources from legacy systems to digital initiatives, ensuring a balanced transformation approach. The framework's feedback mechanisms facilitate continuous learning and adaptation, allowing organizations to adjust their digital portfolio composition as technological landscapes evolve. This systematic approach helps traditional organizations overcome the challenge of balancing operational continuity with digital innovation, enabling them to maintain strategic coherence while progressively building digital capabilities. For example, a traditional retail organization implementing the framework successfully transitioned from physical-only operations to an omnichannel model by systematically evaluating and integrating digital initiatives while maintaining alignment with its core retail expertise.

C. *Future Research Directions*

This paper suggests multiple promising directions for future research. First, single-sample validation of the framework's components across traditional organizational contexts would enhance understanding its applicability and limitations. Second, investigating the framework's effectiveness in various industry sectors could provide valuable insights into contextual factors affecting portfolio optimization.

Research opportunities also exist to examine the framework's role in supporting organizational ambidexterity in the context of digital transformation [25]. Studies investigating how organizations balance exploration and exploitation within their digital portfolios could enhance understanding portfolio optimization dynamics.

VI. Conclusion

This paper presents a comprehensive framework for digital portfolio optimization that addresses organizations' unique challenges in managing digital transformation initiatives. The framework's integration of strategic management principles with digital innovation characteristics provides a structured approach to portfolio management in digital contexts.

The proposed framework contributes to both theoretical understanding and practical application of digital portfolio management. Theoretically, it advances the understanding of how organizations can effectively manage digital initiatives within a portfolio context. The framework's emphasis on dynamic capability development and strategic alignment provides insights into the mechanisms through which organizations can optimize their digital portfolios. The research's practical implications are significant for organizations pursuing digital transformation initiatives. The framework provides structured approaches for evaluating, prioritizing, and managing digital initiatives while maintaining strategic alignment. Through its multidimensional assessment approach, organizations can better evaluate and optimize their digital portfolios.

Acknowledgment

The development of this research framework draws significant insights from professional experiences in product development and digital transformation domains. The framework's evolution has benefited from collaborative engagements with organizations and their approaches to portfolio management challenges. These practical insights have contributed substantially to bridging theoretical constructs with implementation considerations in digital portfolio optimization. All colleagues' who contributed their practical experiences

in navigating the complexities of digital transformation and portfolio optimization have provided essential real-world perspectives that have enriched this research framework.

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