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Review Article

Enterprise Informatization under the Digital Economy: Integrating Architecture, Standards, and Technology Transfer

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Abstract: This study examines enterprise informatization under the digital economy through an integrated perspective of full-domain architecture, standardization systems, and technology achievement transformation. It argues that digital transformation should not be understood merely as the adoption of information systems, because its practical value may depend on the coordination of business processes, data resources, technical infrastructure, governance rules, and user participation. Drawing on the concepts of enterprise architecture, the "standards plus systems" mechanism, and industry–university–research–user collaboration, the study develops an analytical framework for explaining how digital technologies may be transformed into sustainable managerial capabilities. The analysis suggests that architecture maturity can provide a structural basis for system integration, while standardization may reduce ambiguity in data, processes, and responsibilities. Nevertheless, their effects are likely to vary across industries, organizational sizes, and levels of digital capability. The paper further discusses the roles of user adoption, cross-sector collaboration, and iterative adjustment in technology transformation. Further empirical research is needed to test the framework using comparative cases and longitudinal evidence.

Keywords: *Digital Economy; Enterprise Informatization; Full-Domain Architecture; Standardization System; Technology Transfer;*

1. Introduction

1.1 Background of the Study

The development of the digital economy has created new possibilities for enterprises to reorganize their managerial activities, coordinate dispersed resources, and respond to increasingly complex market and regulatory environments. Digital technologies, including cloud computing, data platforms, intelligent algorithms, automation systems, and collaborative applications, are now involved in a wide range of enterprise activities. These activities include internal decision-making, supply-chain coordination, customer service, product development, human-resource management, and risk control. Nevertheless, the expansion of digital tools does not necessarily imply that enterprises have developed effective informatization capabilities.

In many organizations, informatization still takes the form of separate projects initiated by individual departments. Finance departments may operate one set of systems, production departments another, and sales or service teams may rely on platforms that do not fully exchange information with the rest of the organization. Under such circumstances, the enterprise may possess a considerable amount of digital infrastructure while continuing to experience duplicated data entry, inconsistent reporting standards, delayed decision-making, and limited knowledge sharing. The problem is not simply technical incompatibility. It may also reflect fragmented organizational authority, unclear data ownership, and the absence of common standards for evaluating digital projects.

Research on the full-domain architecture of enterprise management informatization suggests that architecture should extend beyond the selection of hardware or software and should instead coordinate business processes, data resources, application

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systems, technical infrastructure, and governance arrangements [1]. This perspective is particularly useful because it recognizes that a digital system is embedded in an organizational environment. A customer relationship management platform, for example, may not improve service quality if customer data are incomplete, if different departments use incompatible classifications, or if employees do not understand how information should be shared and updated.

1.2 Problem Statement

The practical challenge of enterprise informatization may be summarized as a disconnect among three dimensions. The first is the architecture dimension, which concerns how digital systems, business processes, and data resources are structured. The second is the standardization dimension, which concerns how enterprises establish consistent rules for data, workflows, technical interfaces, security, and service delivery. The third is the technology-transfer dimension, which concerns whether technical achievements can move from research, design, or pilot projects into sustained organizational use.

These dimensions are often discussed separately. An enterprise may invest in an enterprise resource planning system without establishing a consistent data-governance framework. A technical standard may be issued without being incorporated into system functions or employee routines. Similarly, universities, research institutions, and technology providers may develop innovative tools, but the tools may remain at the prototype stage if enterprises cannot identify suitable application scenarios or if users regard the new system as burdensome. Such difficulties indicate that technology achievement transformation should not be viewed as a simple final stage after research and development; it may be shaped by architecture and standards from the beginning of the informatization process.

1.3 Literature Review and Research Gap

Existing research provides several foundations for this study. Feng's discussion of enterprise management informatization under the digital economy emphasizes the construction of a full-domain architecture system [1]. This work offers an important structural perspective, particularly in its recognition that enterprise informatization needs coordination across multiple domains. Yet architecture frameworks may face implementation difficulties when organizations have legacy systems, limited budgets, or highly decentralized management structures. The extent to which architecture maturity supports practical technology transformation may therefore require closer examination.

Cross-disciplinary collaboration has also been discussed in educational informatization research [2]. Although the educational setting is different from the enterprise environment, the study is relevant because it indicates that informatization innovation may rely on the interaction of technology professionals, domain specialists, managers, and users. In the enterprise context, a similar issue arises when information-technology personnel, business managers, external vendors, and frontline employees interpret digital transformation objectives differently. The transfer of this insight across sectors should be cautious, but it helps reveal that digital innovation is both a technical and a social process.

The "standard + system" dual-drive model offers another useful direction [3]. It implies that standards should be connected with actual systems and operational procedures, rather than remaining as isolated institutional documents. However, standardization can produce different results across enterprises. In a large organization with mature governance mechanisms, standards may facilitate data sharing and accountability. In a smaller or rapidly changing enterprise, the same standards may be viewed as inflexible rules that slow adaptation. This suggests that the relationship between standardization and informatization performance is likely conditional rather than universal.

Finally, the transformation mechanism of enterprise informatization achievements has been examined from the perspective of industry–university–research–user integration [4]. This approach broadens the analysis by recognizing multiple participants in technology transformation. Still, further research is needed to connect this collaborative mechanism with the internal architecture and standardization capacity of enterprises. The present study addresses this gap by developing an integrated analytical framework.

2. Related Work

2.1 Enterprise Informatization and Digital Governance

Enterprise informatization refers to the planned use of digital technologies, information resources, systems, and governance mechanisms to support enterprise management and value creation. It includes, but is not limited to, information collection, data processing, system integration, process automation, managerial analysis, and digital service provision. In the context of the digital economy, informatization should also involve the ability to coordinate internal and external information flows.

Digital governance is an important element of this process. It concerns how enterprises define authority, responsibility, decision rights, data ownership, access rules, risk controls, and performance criteria in digital environments. Without governance arrangements, the introduction of new technologies may create additional uncertainty. For example, a data platform may increase the availability of information, but it may also produce disputes over who is authorized to modify data, who bears responsibility for inaccurate information, and whether sensitive information can be shared across departments or with external partners.

A full-domain architecture provides a possible means of addressing these issues. Rather than treating business, data, applications, and technology as separate areas, it connects them within an integrated management framework [1]. This framework does not imply that all enterprises must adopt identical systems or governance structures. Manufacturing enterprises may prioritize production data, equipment connectivity, and quality-control systems, while service enterprises may focus more strongly on customer information, service processes, and digital interaction. The value of architecture lies in its capacity to clarify relationships and dependencies among these elements.

2.2 Standardization as an Organizational Coordination Mechanism

Standardization can be understood as the development and application of shared rules, technical specifications, process requirements, data definitions, and evaluation criteria. In enterprise informatization, standards may cover master-data management, coding rules, interface design, cybersecurity procedures, software development, business workflows, service quality, and project evaluation. Their role is not limited to technical compatibility. Standards can also create a common language among departments that use different systems and pursue different operational objectives.

The “standard + system” dual-drive approach suggests that standards should be embedded within technical systems and organizational processes [3]. A data standard, for example, becomes operational only when it is incorporated into data-entry rules, validation mechanisms, system interfaces, and reporting procedures. Similarly, a cybersecurity policy may remain ineffective if it is not reflected in access-control mechanisms, employee training, incident-response processes, and system monitoring.

However, standardization should not be treated as automatically beneficial. Its effect may depend on the quality of design, the level of employee participation, and the enterprise’s capacity to revise standards as technologies and business models change. A standard created without input from users may be formally complete but practically ignored. This possibility suggests that standardization should be viewed as an adaptive governance process, not merely as a documentation exercise.

2.3 Collaborative Technology Transformation

Technology achievement transformation refers to the process through which technical knowledge is developed, tested, adapted, deployed, and sustained in practical settings. In the context of enterprise informatization, the achievement may be a platform, an algorithm, a data-governance method, a management model, or an integrated digital solution. The transformation process usually involves enterprises, universities, research institutions, technology vendors, government agencies, and users.

The industry–university–research–user perspective emphasizes that these actors may contribute different resources and knowledge [4]. Enterprises contribute practical scenarios, implementation resources, and market understanding. Universities and research institutions may contribute theoretical knowledge, experimental methods, and specialized technical capabilities.

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Technology providers may provide engineering capacity, system integration, and maintenance services. Users contribute operational experience and reveal the practical limitations of proposed solutions.

At the same time, collaboration may be difficult because participants often use different criteria for success. Researchers may focus on novelty and methodological rigor, whereas enterprises may prioritize reliability, scalability, cost, and speed of deployment. Users may evaluate a system according to convenience and whether it reduces, rather than adds to, their workload. These differences make it necessary to consider technology transformation as a process of negotiation and adaptation.

2.4 Analytical Framework

This paper proposes that architecture maturity, standardization capability, collaborative quality, and user participation may jointly influence technology achievement transformation. Architecture maturity may improve the compatibility of systems and data resources. Standardization capability may reduce ambiguity in processes and interfaces. Collaborative quality may improve communication among participants. User participation may increase the likelihood that digital solutions fit actual work scenarios.

The proposed relationships should remain open to alternative explanations. Enterprises with stronger financial resources or more experienced managers may be more likely to invest in architecture, standards, and collaborative innovation simultaneously. Positive outcomes may therefore result partly from broader organizational capability rather than from any single factor. Future research should use comparative cases and longitudinal evidence to examine these possibilities.

3. Methodology

3.1 Principles of Architecture Construction

The construction of enterprise informatization architecture should follow several principles. First, architecture should be aligned with enterprise strategy. Digital initiatives need to respond to identifiable business needs, such as improving supply-chain visibility, reducing manual reporting, strengthening customer response, or supporting innovation management. Second, architecture should be modular. Enterprises may not be able to replace all legacy systems at once, so new systems should, where possible, be integrated gradually through shared interfaces and data standards.

Third, architecture should emphasize data governance. Data are frequently described as a strategic resource, but their value depends on accuracy, timeliness, accessibility, and appropriate use. Enterprises need to define data sources, data ownership, quality-control responsibilities, and access permissions. Fourth, architecture should incorporate security and compliance requirements from the early stages of design. Cybersecurity, privacy protection, and business continuity should not be treated as additional tasks added only after systems have been deployed.

3.2 Five-Dimensional Architecture

The business dimension identifies the enterprise's core value chains, business processes, management responsibilities, and decision scenarios. It asks what problems the digital system is expected to solve and which users will be affected. The data dimension establishes data standards, classification rules, storage mechanisms, quality requirements, and data-sharing boundaries. The application dimension includes management applications such as enterprise resource planning, customer relationship management, supply-chain systems, human-resource systems, and knowledge-management platforms.

The technology dimension provides infrastructure, cloud resources, networks, interfaces, computing capabilities, and cybersecurity support. Research on cloud-native lakehouse architecture in semiconductor analytics demonstrates the importance of balancing real-time performance, operating cost, and energy efficiency in industrial data environments [5]. Although the industrial context differs, the study provides a useful reminder that technical architecture must deal with trade-offs. Enterprises may seek stronger computing capacity, but they also need to consider cost control, system maintainability, and energy consumption.

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The governance dimension links the other dimensions through responsibility allocation, project review, performance evaluation, risk management, and compliance mechanisms. This dimension may be particularly important when multiple departments use shared data resources. Without clear governance, the technical integration of systems may produce new conflicts rather than improve coordination.

3.3 Intelligent Applications and Operational Adaptation

Intelligent algorithms may enhance enterprise decision-making, but their adoption requires careful contextual adaptation. Research on machine-learning-based logistics network optimization shows how computational methods can be used to support network coordination and resource allocation [6]. For enterprise informatization, this example indicates that algorithms can become part of a broader architecture when they are connected with operational processes, data sources, and managerial decision rules.

However, the direct transfer of a logistics optimization approach to other industries may not always be appropriate. Algorithmic performance may depend on stable data patterns, well-defined objectives, and available feedback mechanisms. In some enterprises, data may be incomplete or collected according to inconsistent rules. In others, managers may need to make decisions based on qualitative information that cannot easily be incorporated into a model. These limitations suggest that intelligent applications should support, rather than completely replace, managerial judgment.

3.4 Environmental and Sustainability Considerations

The evaluation of enterprise informatization may also include environmental effects. Intelligent automation can improve operational efficiency, but it may involve additional energy use, hardware replacement, and infrastructure demand. Research on the environmental assessment of intelligent logistics automation illustrates that automation should be considered not only through productivity indicators but also through sustainability-related consequences [7].

This perspective may be incorporated into the standardization system. Enterprises could consider including energy-efficiency targets, equipment lifecycle requirements, and resource-use indicators in relevant digital project standards. Such measures may be more important in logistics, manufacturing, and data-intensive industries, although their applicability may vary across sectors. The inclusion of sustainability criteria broadens the understanding of informatization from a narrow technical project to a more comprehensive organizational transformation.

4. Experimental Results and Discussion

4.1 Stages of Technology Achievement Transformation

Technology achievement transformation may involve several connected stages: problem identification, collaborative development, prototype design, pilot implementation, user feedback, system adjustment, scaled deployment, and continuous optimization. These stages may not follow a fully linear sequence. During pilot implementation, users may identify problems that were not visible during system design. New requirements may lead to changes in technical functions, data standards, training arrangements, or governance rules.

This iterative process is especially relevant in enterprise informatization. A technically sophisticated platform may fail to gain organizational acceptance if its interface is difficult to use, if it creates additional reporting tasks, or if managers do not trust the data it produces. Conversely, a relatively simple system may generate substantial value when it fits existing work routines and addresses an urgent business problem. The quality of transformation should thus be assessed through several dimensions, including technical feasibility, user adoption, organizational learning, maintainability, and practical business improvement.

4.2 Multi-Actor Collaboration

The industry–university–research–user model can support technology transformation by combining different forms of expertise [4]. Enterprises may provide authentic application scenarios and implementation resources. Researchers may contribute

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advanced methods and analytical capability. Technology vendors may support software development and system integration. Users may provide feedback on usability and operational suitability.

Yet collaboration can also generate tension. Enterprises may expect short implementation cycles, while research institutions may require longer periods for experimentation and validation. Questions of data access, intellectual-property ownership, and responsibility for maintenance may remain unclear. For this reason, a collaborative project should establish governance arrangements early, including shared objectives, data-sharing rules, evaluation criteria, feedback channels, and responsibilities for post-project maintenance.

4.3 Empirical Research Design

A mixed-method design may be used to investigate the proposed framework. The first stage could involve comparative case studies of enterprises with different levels of digital maturity. Cases may be selected from manufacturing, logistics, services, and technology-intensive sectors. Interviews with managers, digital-technology personnel, business users, and external partners could help identify the practical mechanisms through which architecture and standardization influence technology transformation.

The second stage could involve a survey measuring architecture maturity, standardization capability, user participation, collaboration quality, and transformation performance. The use of multiple data sources would be important because managers may overestimate their organization's digital maturity or project success. Project documentation, system-usage records, user feedback, and follow-up interviews may help reduce this bias.

Research on multi-task learning for anomaly detection and remaining useful life prediction in semiconductor manufacturing provides an example of a technical solution intended to support industrial operational decisions [8]. However, the organizational success of such a solution may depend on more than predictive performance. It may also depend on data quality, employee skills, management support, integration with maintenance procedures, and the willingness of users to act on algorithmic recommendations. This suggests that technology transformation should be evaluated from both technical and organizational perspectives.

4.4 Possible Alternative Explanations

If enterprises with mature architecture and strong standards appear to have better technology-transfer performance, the relationship should be interpreted carefully. One explanation may be that architecture and standards genuinely improve coordination and reduce implementation barriers. Another possibility is that well-resourced enterprises are more capable of investing in all aspects of digital transformation. Industry conditions may also matter. Highly regulated sectors may benefit more directly from standardization, while innovative or rapidly changing sectors may require more flexible arrangements.

Negative cases should also be examined. A failed digital project may result from weak architecture, but it may also be caused by poor communication, unrealistic expectations, market changes, insufficient training, or inadequate long-term maintenance. A more open interpretation of such cases can help avoid the assumption that technological investment necessarily produces organizational value.

5. Conclusion

Enterprise informatization under the digital economy may be better understood as a continuing governance and organizational-learning process rather than as the simple accumulation of systems, platforms, or algorithms. Full-domain architecture can provide a structural basis for coordination; standardization can establish common rules for data, processes, and responsibilities; and collaborative technology transformation can connect technical achievements with practical business needs. Their interaction may support enterprise digital capability to some extent, but the outcome is likely to depend on industry context, organizational resources, user participation, and the capacity to revise systems and standards over time. Future research should examine this framework through comparative and longitudinal evidence, with particular attention to how enterprises balance

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control and flexibility, technical performance and user acceptance, as well as short-term implementation outcomes and longer-term organizational learning.

Data Availability Statement

Data will be made available on request.

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Conflicts of Interest

The author(s) declare no conflicts of interest.

Ethical Approval and Consent to Participate

Not applicable.

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